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Service Manual

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JEEP®

SERVICE MANUAL

2003
CHEROKEE

FOREWORD

The information contained in this service manual has been prepared for the professional automotive technician involved in daily repair operations. Information describing the operation and use of standard and optional equipment is included in the Owner's Manual provided with the vehicle.

Information in this manual is divided into groups. These groups contain description, operation, diagnosis, testing, adjustments, removal, installation, disassembly, and assembly procedures for the systems and components. To assist in locating a group title page, use the Group Tab Locator by clicking to the following page. The first page of the group has a contents section that lists major topics within the group.

A Service Manual Comment form is included at the rear of this manual. Use the form to provide DaimlerChrysler Corporation with your comments and suggestions.

Tightening torques are provided as a specific value throughout this manual. This value represents the midpoint of the acceptable engineering torque range for a given fastener application. These torque values are intended for use in service assembly and installation procedures using the correct OEM fasteners. When replacing fasteners, always use the same type (part number) fastener as removed.

DaimlerChrysler Corporation reserves the right to change testing procedures, specifications, diagnosis, repair methods, or vehicle wiring at any time without prior notice or incurring obligation.

GROUP TAB LOCATOR

INTRODUCTION

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FASTENER IDENTIFICATION

DESCRIPTION

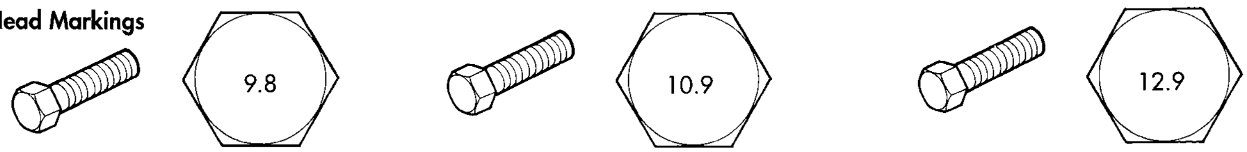
The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 10.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts (Fig. 1) and (Fig. 2).

FASTENER IDENTIFICATION (Continued)

Bolt Markings and Torque - Metric

Commercial Steel Class: 9.8 | 10.9 | 12.9

Bolt Head Markings

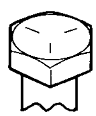


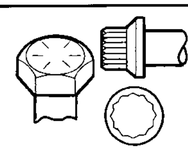
Body Size	Torque (9.8)				Torque (10.9)				Torque (12.9)			
Diam.	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7
7	14	9	11	7	18	14	14	11	23	18	18	14
8	25	18	18	14	32	23	25	18	36	27	28	21
10	40	30	30	25	60	45	45	35	70	50	55	40
12	70	55	55	40	105	75	80	60	125	95	100	75
14	115	85	90	65	160	120	125	95	195	145	150	110
16	180	130	140	100	240	175	190	135	290	210	220	165
18	230	170	180	135	320	240	250	185	400	290	310	230

Bolt Markings and Torque Values - U.S. Customary

SAE Grade Number: 5 | 8

Bolt Head Markings
These are all SAE Grade 5 (3) line





Body Size	Bolt Torque - Grade 5 Bolt: Cast Iron		Aluminum		Bolt Torque - Grade 8 Bolt: Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	12	9
- 28	12	9	9	7	18	13	14	10
5/16 - 18	20	15	16	12	30	22	24	18
- 24	23	17	19	14	33	24	25	19
3/8 - 16	40	30	25	20	55	40	40	30
- 24	40	30	35	25	60	45	45	35
7/16 - 14	60	45	45	35	90	65	65	50
- 20	65	50	55	40	95	70	75	55
1/2 - 13	95	70	75	55	130	95	100	75
- 20	100	75	80	60	150	110	120	90
9/16 - 12	135	100	110	80	190	140	150	110
- 18	150	110	115	85	210	155	170	125
5/8 - 11	180	135	150	110	255	190	205	150
- 18	210	155	160	120	290	215	230	170
3/4 - 10	325	240	255	190	460	340	365	270
- 16	365	270	285	210	515	380	410	300
7/8 - 9	490	360	380	280	745	550	600	440
- 14	530	390	420	310	825	610	660	490
1 - 8	720	530	570	420	1100	820	890	660
- 14	800	590	650	480	1200	890	960	710

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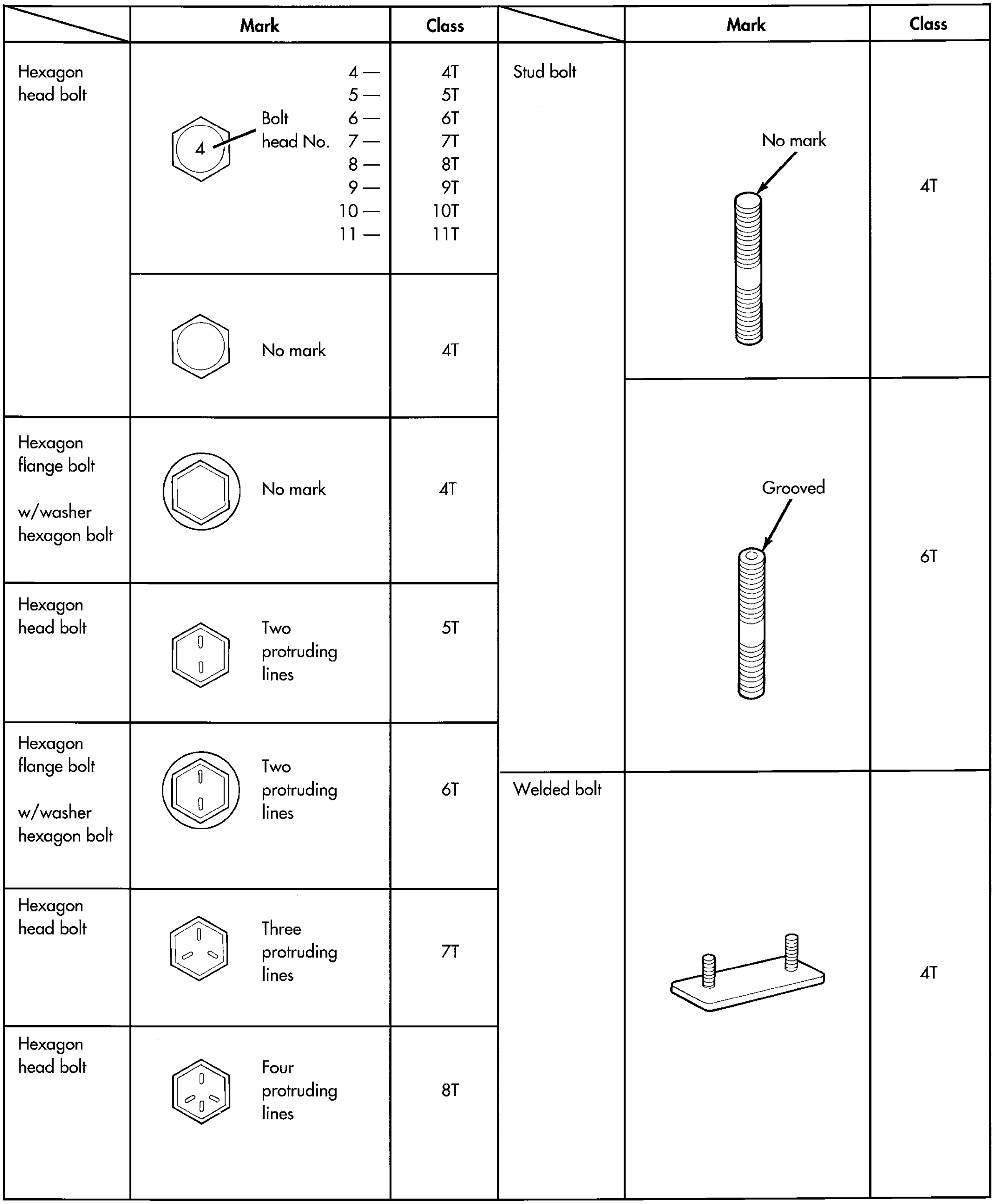
Fig. 1 FASTENER IDENTIFICATION

FASTENER IDENTIFICATION (Continued)

HOW TO DETERMINE BOLT STRENGTH



	Mark	Class		Mark	Class
Hexagon head bolt	Bolt head No. 4 — 5 — 6 — 7 — 8 — 9 — 10 — 11 —	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt	No mark	4T
	No mark	4T		Grooved	6T
Hexagon flange bolt w/washer hexagon bolt	No mark	4T	Welded bolt		4T
Hexagon head bolt	Two protruding lines	5T			
Hexagon flange bolt w/washer hexagon bolt	Two protruding lines	6T			
Hexagon head bolt	Three protruding lines	7T			
Hexagon head bolt	Four protruding lines	8T			

95IN-4

Fig. 2 FASTENER STRENGTH

FASTENER USAGE

DESCRIPTION

DESCRIPTION - FASTENER USAGE

WARNING: USE OF AN INCORRECT FASTENER MAY RESULT IN COMPONENT DAMAGE OR PERSONAL INJURY.

Fasteners and torque specifications references in this Service Manual are identified in metric and SAE format.

During any maintenance or repair procedures, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

DESCRIPTION - THREADED HOLE REPAIR

Most stripped threaded holes can be repaired using a Helicoil®. Follow the vehicle or Helicoil® recommendations for application and repair procedures.

INTERNATIONAL SYMBOLS

DESCRIPTION

The graphic symbols illustrated in the following International Control and Display Symbols Chart (Fig. 3) are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

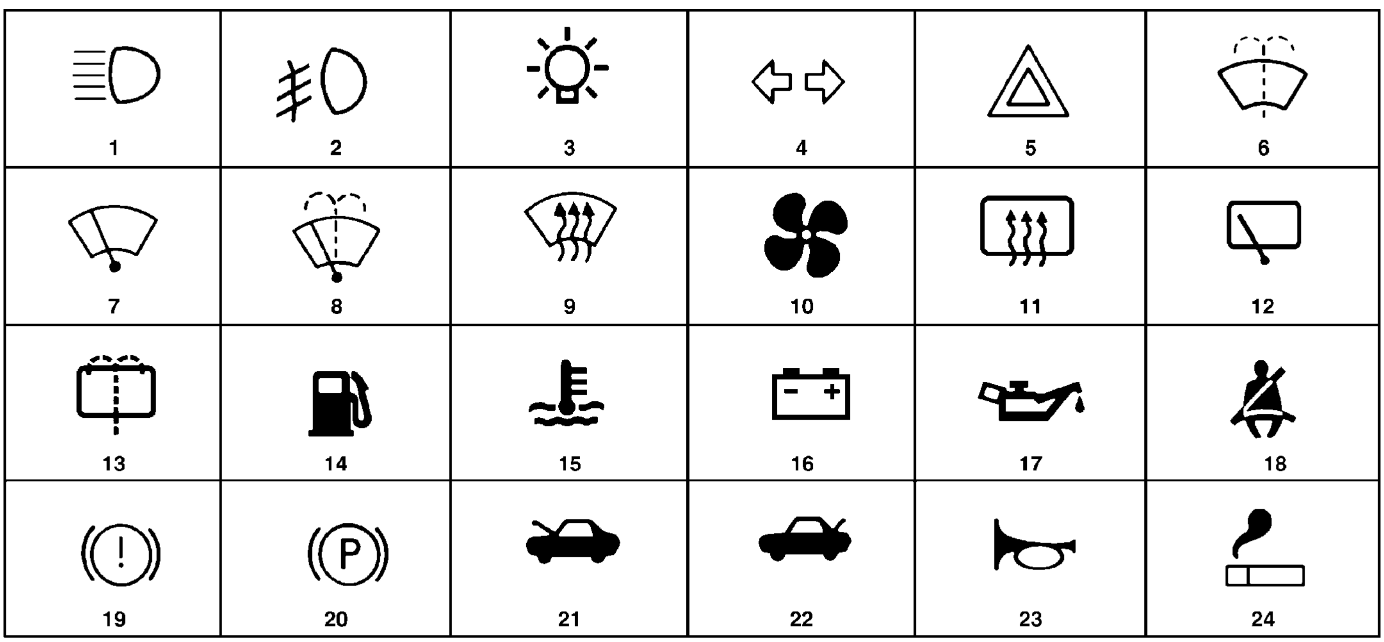


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Fig. 3 INTERNATIONAL CONTROL AND DISPLAY SYMBOLS

1 High Beam
2 Fog Lamps
3 Headlamp, Parking Lamps, Panel Lamps
4 Turn Warning
5 Hazard Warning
6 Windshield Washer
7 Windshield Wiper
8 Windshield Wiper and Washer
9 Windscreen Demisting and Defrosting
10 Ventilating Fan
11 Rear Window Defogger
12 Rear Window Wiper
13 Rear Window Washer
14 Fuel
15 Engine Coolant Temperature
16 Battery Charging Condition
17 Engine Oil
18 Seat Belt
19 Brake Failure
20 Parking Brake
21 Front Hood
22 Rear hood (Decklid)
23 Horn
24 Lighter

METRIC SYSTEM

DESCRIPTION

The metric system is based on quantities of one, ten, one hundred, one thousand and one million.

The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

CONVERSION FORMULAS AND EQUIVALENT VALUES

MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET
in-lbs	x 0.11298	= Newton Meters (N·m)	N·m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton Meters (N·m)	N·m	x 0.7376	= ft-lbs
Inches Hg (60° F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters	M	x 1.0936	= Yards
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec	x 0.3048	= Meters/Sec (M/S)	M/S	x 3.281	= Feet/Sec
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

COMMON METRIC EQUIVALENTS

1 inch = 25 Millimeters	1 Cubic Inch = 16 Cubic Centimeters
1 Foot = 0.3 Meter	1 Cubic Foot = 0.03 Cubic Meter
1 Yard = 0.9 Meter	1 Cubic Yard = 0.8 Cubic Meter
1 Mile = 1.6 Kilometers	

Refer to the Metric Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.) (Fig. 4).

METRIC SYSTEM (Continued)

in-lbs to N•m

in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966

N•m to in-lbs

N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb
.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N•m

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820

N•m to ft-lbs

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
.13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

in. to mm

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384
.17	3.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400

mm to in.

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

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Fig. 4 METRIC CONVERSION CHART

TORQUE REFERENCES

DESCRIPTION

Individual Torque Charts appear within many or the Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts (Fig. 5).

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque: Hexagon head bolt N•m	kgf-cm	ft-lbf	Hexagon flange bolt N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

Fig. 5 TORQUE SPECIFICATIONS

VEHICLE EMISSION CONTROL INFORMATION (VECI) LABEL

DESCRIPTION

All models have a Vehicle Emission Control Information (VECI) Label. DaimlerChrysler permanently attaches the label in the engine compartment (Fig. 6). The label cannot be removed without defacing label information and destroying label.

The label contains the vehicle's emission specifications and vacuum hose routings. All hoses must be connected and routed according to the label.

The label also contains an engine vacuum schematic. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both the English and French languages.

The VECI label contains the following:

- Engine family and displacement
- Evaporative family
- Emission control system schematic
- Certification application
- Engine timing specifications (if adjustable)
- Idle speeds (if adjustable)
- Spark plug and gap

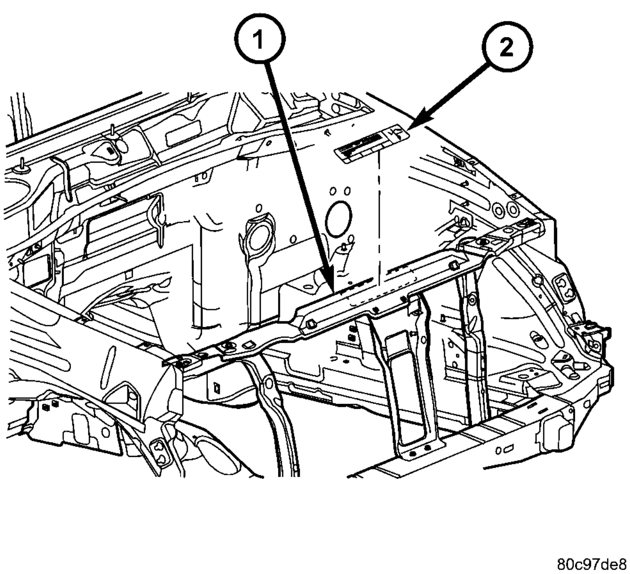


Fig. 6 VECI LABEL LOCATION

1 - RADIATOR SUPPORT
2 - VECI LABEL

VEHICLE IDENTIFICATION NUMBER

DESCRIPTION

The Vehicle Identification Number (VIN) plate is located on the lower left A-pillar and is visible through the windshield (Fig. 7). The VIN contains 17 characters that provide data concerning the vehicle. Refer to the VIN decoding chart to determine the identification of a vehicle.

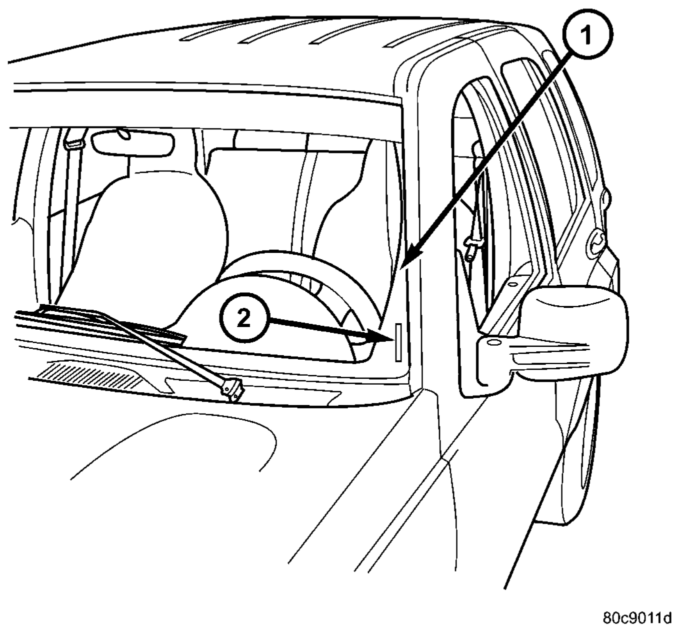


Fig. 7 VIN NUMBER LOCATION

1 - A-PILLAR
2 - VIN CODE PLATE

The Vehicle Identification Number is also imprinted on the:

- Vehicle Safety Certification Label.
- Frame rail.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.

VEHICLE IDENTIFICATION NUMBER (Continued)

VEHICLE IDENTIFICATION NUMBER DECODING CHART

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = Manufactured by DaimlerChrysler Corporation
2	Make	J = Jeep
3	Vehicle Type	4 = MPV W/O Side Airbags. 8 = MPV With Side Airbags.
4	Gross Vehicle Weight Rating	F = 4001 - 5000 lbs. G = 5001 - 6000 lbs.
5	Vehicle Line	K = Liberty 4X2 (LHD) L = Liberty 4X4 (LHD) M = Cherokee 4X4 (RHD)
6	Series	3 = Liberty Renegade 4 = Liberty Sport/Cherokee Sport 5 = Liberty Limited/Cherokee Limited
7	Body Style	8 = Sport Utility - 4 Door
8	Engine	K = 3.7L 6 cyl MPI Gasoline 1 = 2.4L 4 cyl MPI Gasoline 7 = 2.5L 4 cyl Diesel
9	Check Digit	0 through 9 or X
10	Model Year	3=2003
11	Assembly Plant	W = Toledo North Assembly Plant
12 thru 17	Vehicle Build Sequence	

VEHICLE SAFETY CERTIFICATION LABEL

DESCRIPTION

A vehicle safety certification label (Fig. 8) is attached to every DaimlerChrysler Corporation vehicle. The label certifies that the vehicle conforms to all applicable Federal Motor Vehicle Safety Standards. The label also lists:

- Month and year of vehicle manufacture.
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure.
- Vehicle Identification Number (VIN).
- Type of vehicle.
- Type of rear wheels.
- Bar code.
- Month, Day and Hour (MDH) of final assembly.
- Paint and Trim codes.
- Country of origin.

The label is located on the driver-side door shut-face.

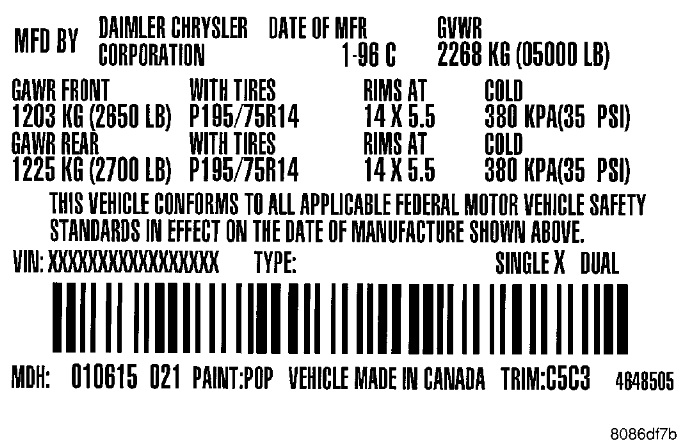


Fig. 8 VEHICLE SAFETY CERTIFICATION LABEL - TYPICAL

LUBRICATION & MAINTENANCE

TABLE OF CONTENTS

INTERNATIONAL SYMBOLS

DESCRIPTION

DaimlerChrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations (Fig. 1).

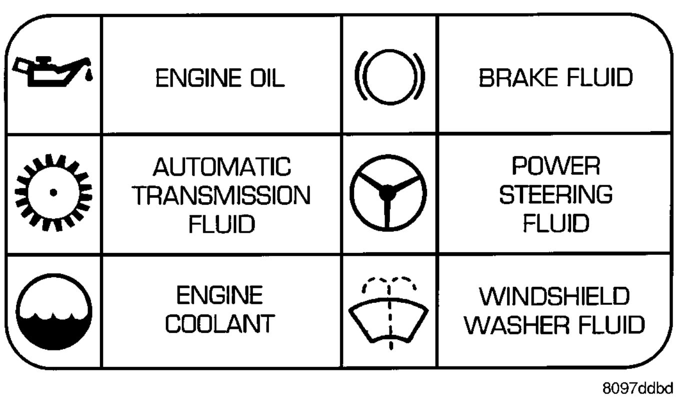


Fig. 1 INTERNATIONAL SYMBOLS

PARTS & LUBRICANT RECOMMENDATION

DESCRIPTION

DESCRIPTION - FLUID TYPES

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used to service a Chrysler Corporation vehicle.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API) (Fig. 2)
- National Lubricating Grease Institute (NLGI) (Fig. 3)

SAE VISCOSITY RATING

An SAE viscosity grade is used to specify the viscosity of engine oil. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Example SAE 5W-30 = multigrade engine oil.

DaimlerChrysler Corporation only recommends multigrade engine oils.

PARTS & LUBRICANT RECOMMENDATION (Continued)

API QUALITY CLASSIFICATION

This symbol (Fig. 2) on the front of an oil container means that the oil has been certified by the American Petroleum Institute (API) to meet all the lubrication requirements specified by DaimlerChrysler Corporation.

9400-9

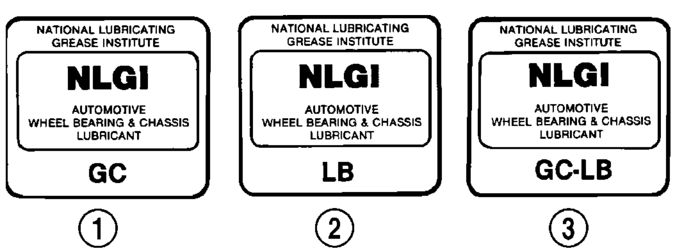
Fig. 2 API Symbol

GEAR LUBRICANTS

SAE ratings also apply to multigrade gear lubricants. In addition, API classification defines the lubricants usage. Such as API GL-5 and SAE 75W-90.

LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 3) on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter “G”. Chassis lubricant is identified by the latter “L”. The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.



9200-7

Fig. 3 NLGI Symbol

1 - WHEEL BEARINGS
2 - CHASSIS LUBRICATION
3 - CHASSIS AND WHEEL BEARINGS

SPECIALIZED LUBRICANTS AND OILS

Some maintenance or repair procedures may require the use of specialized lubricants or oils. Consult the appropriate sections in this manual for the correct application of these lubricants.

DESCRIPTION - LUBRICANT RECOMMENDATIONS

Chassis

Component	Fluid, Lubricant, or Genuine Part
Steering Gear & Linkage, Ball Joints, Prop Shafts & Yokes, Wheel Bearings	Mopar® Multi-Purpose Lubricant NLGI Grade 2 EP, GC-LB

Body

Component	Fluid, Lubricant, and Genuine Part
Hinges:	
Door & Hood	Mopar® Engine Oil
Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Latches: Door, Hood/Safety Catch, Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Seat Regulator & Track	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Lock Cylinders	Mopar® Lock Cylinder Lube

FLUID TYPES

DESCRIPTION

DESCRIPTION - FLUID TYPES

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used to service a Chrysler Corporation vehicle.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API) (Fig. 4)
- National Lubricating Grease Institute (NLGI) (Fig. 5)

SAE VISCOSITY RATING

An SAE viscosity grade is used to specify the viscosity of engine oil. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Example SAE 5W-30 = multigrade engine oil.

DaimlerChrysler Corporation only recommends multigrade engine oils.

API QUALITY CLASSIFICATION

This symbol (Fig. 4) on the front of an oil container means that the oil has been certified by the American Petroleum Institute (API) to meet all the lubrication requirements specified by DaimlerChrysler Corporation.

9400-9

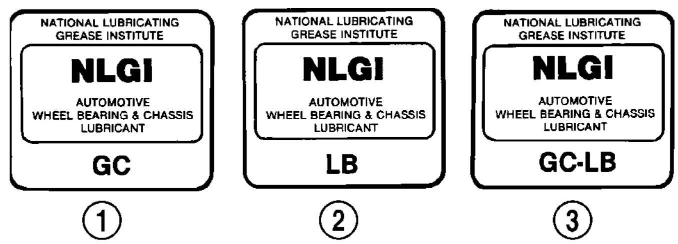
Fig. 4 API Symbol

GEAR LUBRICANTS

SAE ratings also apply to multigrade gear lubricants. In addition, API classification defines the lubricants usage. Such as API GL-5 and SAE 75W-90.

LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 5) on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter "G". Chassis lubricant is identified by the latter "L". The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.



9200-7

Fig. 5 NLGI Symbol

1 - WHEEL BEARINGS
2 - CHASSIS LUBRICATION
3 - CHASSIS AND WHEEL BEARINGS

SPECIALIZED LUBRICANTS AND OILS

Some maintenance or repair procedures may require the use of specialized lubricants or oils. Consult the appropriate sections in this manual for the correct application of these lubricants.

DESCRIPTION - AXLE

NOTE: DaimlerChrysler recommends using Mopar® lubricants or lubricants of equal quality.

FRONT AXLE

- 186FIA (Model 30) - Mopar® Synthentic Gear Lubricant 75W-140

REAR AXLE

- 8 1/4 - Mopar® Gear Lubricant 75W-90 (Trailer Towing - Mopar® Synthentic Gear Lubricant 75W-140

NOTE: Trac-lok® equipped axles require 118 ml (4 ounces) of Limited Slip Additive be added to the lubricant.

FLUID TYPES (Continued)

DESCRIPTION - MANUAL TRANSMISSION

NOTE: DaimlerChrysler recommends using Mopar® lubricants or lubricants of equal quality.

- NV1500 - Mopar® Manual Transmission Lubricant
- NV3550 - Mopar® Manual Transmission Lubricant

DESCRIPTION - AUTOMATIC TRANSMISSION FLUID

NOTE: Refer to Service Procedures in this group for fluid level checking procedures.

Mopar® ATF +4, Automatic Transmission Fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

Dexron II fluid IS NOT recommended. Clutch chatter can result from the use of improper fluid.

Mopar® ATF +4, Automatic Transmission Fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

FLUID ADDITIVES

DaimlerChrysler strongly recommends against the addition of any fluids to the transmission, other than those automatic transmission fluids listed above. Exceptions to this policy are the use of special dyes to aid in detecting fluid leaks.

Various "special" additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of DaimlerChrysler and these additives **must not be used.** The use of transmission "sealers" should also be avoided, since they may adversely affect the integrity of transmission seals.

DESCRIPTION - TRANSFER CASE - NV231

Recommended lubricant for the NV231 transfer case is Mopar® ATF +4, Automatic Transmission Fluid.

DESCRIPTION - TRANSFER CASE - NV242

Recommended lubricant for the NV242 transfer case is Mopar® ATF+4, Automatic Transmission Fluid.

DESCRIPTION - ENGINE COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

FLUID TYPES (Continued)

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water-Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water-Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

DESCRIPTION - ENGINE OIL - DIESEL ENGINES

Use only Diesel Engine Oil meeting standard **MIL-2104C** or API Classification **CD or higher** or **CCML D4, D5**.

SAE VISCOSITY GRADE

CAUTION: Low viscosity oils must have the proper API quality or the CCMC G5 designation.

To assure of properly formulated engine oils, it is recommended that SAE Grade 10W-40 engine oils that meet Chrysler material standard MS-6395, be used. European Grade 10W-40 oils are also acceptable.

Oils of the SAE 5W-40 or 5W-30 grade number are preferred when minimum temperatures consistently fall below -12°C.

DESCRIPTION - POWER STEERING FLUID

The recommended fluid for the power steering system is MOPAR® Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

OPERATION - AUTOMATIC TRANSMISSION FLUID

The automatic transmission fluid is selected based upon several qualities. The fluid must provide a high level of protection for the internal components by providing a lubricating film between adjacent metal components. The fluid must also be thermally stable so that it can maintain a consistent viscosity through a large temperature range. If the viscosity stays constant through the temperature range of operation, transmission operation and shift feel will remain consistent. Transmission fluid must also be a good conductor of heat. The fluid must absorb heat from the internal transmission components and transfer that heat to the transmission case.

FLUID CAPACITIES

SPECIFICATIONS - FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
FUEL TANK	18.5 U.S. Gallons (70 Liters)****
ENGINE OIL	
Engine Oil - with Filter - 2.4L	4.7L (5.0 qts.)
Engine Oil - with Filter - 3.7L	4.7L (5.0 qts.)
Engine Oil - With Filter - 2.5L Diesel	6.5L (6.9 qts.)
ENGINE COOLANT	
Cooling System - 2.4L	9.5L (10.0 qts.)
Cooling System - 3.7L	13.2L (14.0 qts.)
Cooling System - 2.5L Diesel	12.5L (13.2 qts.)
POWER STEERING SYSTEM	
Power steering fluid capacities are dependent on engine/chassis options as well as steering gear/cooler options. Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these capacities may vary. Refer to 19, Steering for proper fill and bleed procedures.	
AUTOMATIC TRANSMISSION	
Service Fill - 45RFE	4.73L (10.0 pts)
O-haul Fill - 45RFE	13.33L (28.0 pts)
Service Fill - 42RLE	3.8L (8.0 pts)
O-haul Fill - 42RLE	8.3L (17.6 pts)
Dry fill capacity Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. (Refer to 21 - TRANSMISSION/AUTOMATIC/ FLUID - STANDARD PROCEDURE)	
TRANSFER CASE	
NV231	1.4L (2.95 pts.)
NV242	1.6L (3.4 pts.)
MANUAL TRANSMISSION	
NV1500 (Approximate dry fill or fill to bottom edge of the fill plug hole.)	2.3L (4.8 pts.)
NV3550 (Approximate dry fill or fill to bottom edge of fill plug hole.)	4X4 - 1.98L (4.2 pts.) 4X2 - 2.28L (4.8 pts.)

DESCRIPTION	SPECIFICATION
FRONT AXLE	
186 FIA (Model 30)	1.24L (2.6 pts.)
REAR AXLE	
8 1/4	2.08L (4.4 pts.)*
* When equipped with Trac-lok, include 118 ml (4.0 ounces) of Limited Slip Additive.	
****Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.	

FLUID FILL/CHECK LOCATIONS

DESCRIPTION

The fluid check/fill point locations are located in each applicable service manual section.

MAINTENANCE SCHEDULES

DESCRIPTION

Maintenance Schedule Information not included in this section, is located in the appropriate Owner's Manual.

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule ″**B**″. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Day or night temperatures are below 0°C (32°F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32°C (90°F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert driving.

NOTE: Most vehicles are operated under the conditions listed for Schedule "B."

Second is Schedule **"A"**. It is for vehicles that are not operated under any of the conditions listed under Schedule "B."

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

MAINTENANCE SCHEDULES (Continued)

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent, add as required.

Once a Month

- Check the tire pressure and look for unusual wear or damage.
- Inspect the battery, and clean and tighten the terminals as required.
- Check the fluid levels of the coolant reservoir, brake master cylinder, power steering, and transmission, and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect brake hoses.
- Check the coolant level, hoses, and clamps.
- Rotate the tires.
- Inspect manual transmission fluid level — if equipped.
- After completion of off-road operation, the underside of the vehicle should be thoroughly inspected. Examine threaded fasteners for looseness.

Schedule "B"

Follow schedule "B" if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 0°C (32°F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32°C (90°F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert driving.

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (14 000)**	**12,000 (19 000)**	**15,000 (24 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air cleaner element (2.4L Only).		X		X	
Replace the engine air cleaner element (2.4L Only).					
Inspect the brake linings.				X	
Drain and refill the front and rear axle fluid‡				X	

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**18,000 (29 000)**	**21,000 (34 000)**	**24,000 (38 000)**	**27,000 (43 000)**	**30,000 (48 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary.					X
Inspect the brake linings.			X		
Drain and refill the front and rear axle fluid‡			X		
Drain and refill the automatic transmission fluid, and replace main sump filter.					X

Miles (Kilometers)	**33,000 (53 000)**	**36,000 (58 000)**	**39,000 (62 000)**	**42,000 (67 000)**	**45,000 (72 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.		X			
Drain and refill the front and rear axle fluid‡		X			
Inspect the drive belt and replace as needed.					X

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**48,000 (77 000)**	**51,000 (82 000)**	**54,000 (86 000)**	**57,000 (91 000)**	**60,000 (96 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary.					X
Replace the ignition cables (2.4L Only).					X
Inspect the brake linings.	X				X
Drain and refill the front and rear axle fluid‡	X				X
Drain and refill the automatic transmission fluid, and replace main sump filter.					X
Inspect the drive belt and replace as needed. Not required if belt was previously					X
Drain and refill the transfer case fluid.					X

Miles (Kilometers)	**63,000 (101 000)**	**66,000 (106 000)**	**69,000 (110 000)**	**72,000 (115 000)**	**75,000 (120 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.				X	
Drain and refill the front and rear axle fluid‡				X	
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**78,000 (125 000)**	**81,000 (130 000)**	**84,000 (134 000)**	**87,000 (139 000)**	**90,000 (144 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary.					X
Inspect the brake linings.			X		
Drain and refill the front and rear axle fluid‡			X		
Drain and refill the automatic transmission fluid, and replace transmission filter (s).					X
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Replace the timing belt (2.4L Only).					X

Miles (Kilometers)	**93,000 (149 000)**	**96,000 (154 000)**	**99,000 (158 000)**	**102,000 (163 000)**	**105,000 (168 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.		X			
Drain and refill the front and rear axle fluid‡		X			
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Flush and replace the engine coolant.			X		

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers)	**108,000 (173 000)**	**111,000 (178 000)**	**114,000 (182 000)**	**117,000 (187 000)**	**120,000 (192 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary.					X
Replace the ignition cables (2.4L Only).					X
Inspect the brake linings.	X				X
Drain and refill the front and rear axle fluid‡	X				X
Drain and refill the automatic transmission fluid, and replace main sump filter.					X
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Drain and refill the transfer case fluid.					X

Inspection and service should be performed anytime a malfunction is observed or suspected. Retain all receipts.

‡Off-highway operation, trailer towing, taxi, limousine, bus, snow plowing, or other types of commercial service or prolonged operation with heavy loading, especially in hot weather, require front and rear axle service indicated with a ‡ in Schedule "B". Perform these services if the vehicle is usually operated under these conditions.

MAINTENANCE SCHEDULES (Continued)

Schedule "A"

Miles (Kilometers) [Months]	**6,000 (10 000) [6]**	**12,000 (19 000) [12]**	**18,000 (29 000) [18]**	**24,000 (38 000) [24]**	**30,000 (48 000) [30]**
Change the engine oil and engine oil filter.	X	X	X	X	X
Replace the engine air filter element.					X
Replace the spark plugs.					X
Inspect the brake linings.			X		
Inspect the transfer case fluid.					X

Miles (Kilometers) [Months]	**36,000 (58 000) [36]**	**42,000 (67 000) [42]**	**48,000 (77 000) [48]**	**54,000 (86 000) [54]**
Change the engine oil and engine oil filter.	X	X	X	X
Inspect the brake linings.	X			X

Miles (Kilometers) [Months]	**60,000 (96 000) [60]**	**66,000 (106 000) [66]**	**72,000 (115 000) [72]**	**78,000 (125 000) [78]**
Change the engine oil and engine oil filter.	X	X	X	X
Inspect the brake linings.			X	
Replace the engine air filter element.	X			
Replace the spark plugs.	X			
Replace the ignition cables (2.4L Only).	X			
Inspect and replace the PCV valve, if necessary.	X			
Inspect the drive belt and replace, if needed.	X			
Inspect the drive belt and replace as needed. Not required if previously replaced.			X	
Flush and replace the engine coolant at 60 months, regardless of mileage.	X			
Inspect the transfer case fluid.	X			

MAINTENANCE SCHEDULES (Continued)

Miles (Kilometers) [Months]	**84,000 (134 000) [84]**	**90,000 (144 000) [90]**	**96,000 (154 000) [96]**	**102,000 (163 000) [102]**
Change the engine oil and engine oil filter.	X	X	X	X
Inspect the brake linings.		X		
Replace the engine air filter element.		X		
Replace the spark plugs.		X		
Inspect and replace the PCV valve, if necessary.		X		
Inspect the drive belt and replace as needed. Not required if previously replaced.	X		X	
Flush and replace the engine coolant if not done at 60 months.				X
Drain and refill the automatic transmission fluid, and replace transmission filter(s).				X
Inspect the transfer case fluid.		X		

Miles (Kilometers) [Months]	**108,000 (173 000) [108]**	**114,000 (182 000) [114]**	**120,000 (192 000) [120]**
Change the engine oil and engine oil filter.	X	X	X
Inspect the brake linings.	X		
Replace the engine air filter element.			X
Replace the spark plugs.			X
Inspect and replace the PCV valve, if necessary.			X
Replace the ignition cables (2.4L Only).			X
Inspect the drive belt and replace as needed. Not required if previously replaced.	X		X
Flush and replace the engine coolant if not done at 163 000 km (102,000 miles).			X
Replace the timing belt (2.4L Only).			X
Drain and refill the transfer case fluid.			X

Inspection and service should be performed anytime a malfunction is observed or suspected. Retain all receipts.

HOISTING

STANDARD PROCEDURE - HOISTING RECOMMENDATIONS

Refer to the Owner's Manual for emergency vehicle lifting procedures.

When properly positioned, a floor jack can be used to lift a Jeep vehicle (Fig. 6). Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.

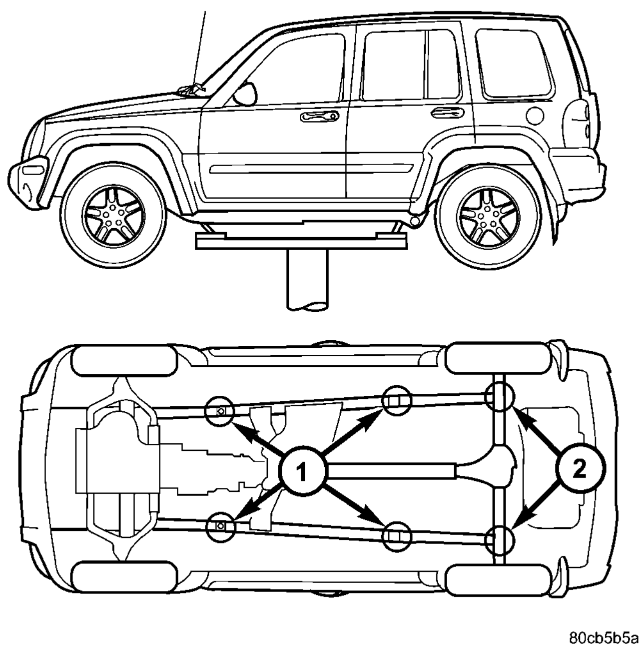


Fig. 6 Correct Vehicle Lifting Locations

1 -	Frame Contact Lift (Single Post) Chassis Lift (Non-Axle Dual Post) Outboard Lift (Dual Post) Floor Jack
2 -	Floor Jack

CAUTION: Do not attempt to lift a Jeep vehicle with a floor jack positioned under:

- A body side sill.
- A steering linkage component.
- A drive shaft.
- The engine or transmission oil pan.
- The fuel tank.
- A front suspension arm.
- Transfer case.

NOTE: Use the correct sub-frame rail or frame rail lifting locations only.

HOIST

Refer to the Owner's Manual for emergency vehicle lifting procedures.

A vehicle can be lifted with:

- A single-post, frame-contact hoist.
- A twin-post, chassis hoist.
- A ramp-type, drive-on hoist.

NOTE: When a frame-contact type hoist is used, verify that the lifting pads are positioned properly.

WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE VEHICLE TO HOISTING DEVICE WHEN THESE CONDITIONS EXIST.

JUMP STARTING

STANDARD PROCEDURE - JUMP STARTING PROCEDURE

WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN THE BATTERY SYSTEM SECTION OF THE SERVICE MANUAL. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE)

• DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT.

• IF EQUIPPED, DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR.

• DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES.

• DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE.

• DO NOT USE OPEN FLAME NEAR BATTERY.

• REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.

• WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

JUMP STARTING (Continued)

CAUTION: When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

TO JUMP START A DISABLED VEHICLE:

(1) Raise hood on disabled vehicle and visually inspect engine compartment for:

- Generator drive belt condition and tension.
- Fuel fumes or leakage, correct if necessary.
- Frozen battery.
- Yellow or bright color test indicator, if equipped.
- Low battery fluid level.

CAUTION: If the cause of starting problem on disabled vehicle is severe, damage to booster vehicle charging system can result.

(2) When using another vehicle as a booster source, turn off all accessories, place gear selector in park or neutral, set park brake or equivalent and operate engine at 1200 rpm.

(3) On disabled vehicle, place gear selector in park or neutral and set park brake or equivalent. Turn OFF all accessories.

(4) Connect jumper cables to booster battery. RED clamp to positive terminal (+). BLACK clamp to negative terminal (-). DO NOT allow clamps at opposite end of cables to touch, electrical arc will result (Fig. 7). Review all warnings in this procedure.

(5) On disabled vehicle, connect RED jumper cable clamp to battery positive (+) terminal. Connect BLACK jumper cable clamp to the engine as close to the ground cable connection as possible (Fig. 7).

CAUTION: Do not crank starter motor on disabled vehicle for more than 15 seconds, starter will overheat and could fail.

(6) Allow battery in disabled vehicle to charge to at least 12.4 volts (75% charge) before attempting to start engine. If engine does not start within 15 seconds, stop cranking engine and allow starter to cool (15 min.), before cranking again.

DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp from engine ground on disabled vehicle.
- When using a Booster vehicle, disconnect BLACK cable clamp from battery negative terminal. Disconnect RED cable clamp from battery positive terminal.
- Disconnect RED cable clamp from battery positive terminal on disabled vehicle.

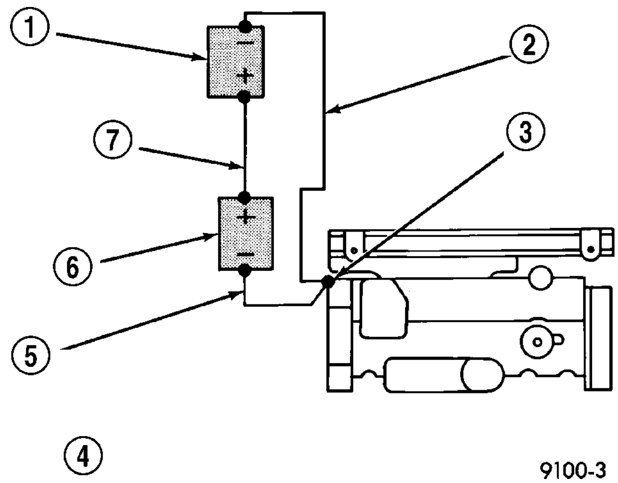


Fig. 7 Jumper Cable Clamp Connections

1 - BOOSTER BATTERY
2 - NEGATIVE JUMPER CABLE
3 - ENGINE GROUND
4 - DO NOT ALLOW VEHICLES TO TOUCH
5 - BATTERY NEGATIVE CABLE
6 - DISCHARGED BATTERY
7 - POSITIVE JUMPER CABLE

TOWING

STANDARD PROCEDURE - TOWING

A vehicle equipped with SAE approved wheel lift-type towing equipment can be used to tow Jeep vehicles. When towing a 4WD vehicle using a wheel-lift towing device, use tow dollies under the opposite end of the vehicle. A vehicle with flatbed device can also be used to transport a disabled vehicle (Fig. 8).

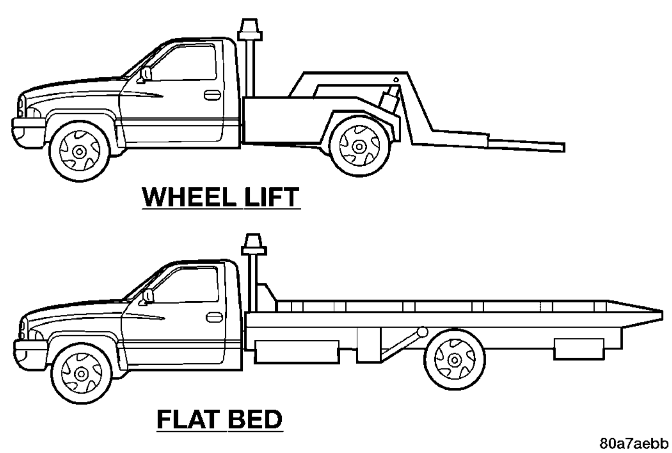


Fig. 8 Tow Vehicles With Approved Equipment

TOWING (Continued)

SAFETY PRECAUTIONS

CAUTION: The following safety precautions must be observed when towing a vehicle:

- Secure loose and protruding parts.
- Always use a safety chain system that is independent of the lifting and towing equipment.
- Do not allow towing equipment to contact the disabled vehicle's fuel tank.
- Do not allow anyone under the disabled vehicle while it is lifted by the towing device.
- Do not allow passengers to ride in a vehicle being towed.
- Always observe state and local laws regarding towing regulations.
- Do not tow a vehicle in a manner that could jeopardize the safety of the operator, pedestrians or other motorists.
- Do not attach tow chains, T-hooks, or J-hooks to a bumper, steering linkage, drive shafts or a non-reinforced frame hole.
- Do not tow a heavily loaded vehicle. Use a flatbed device to transport a loaded vehicle.

TWO-WHEEL-DRIVE VEHICLE TOWING

DaimlerChrysler Corporation recommends that a vehicle be towed with the rear end lifted, whenever possible.

WARNING: WHEN TOWING A DISABLED VEHICLE AND THE DRIVE WHEELS ARE SECURED IN A WHEEL LIFT OR TOW DOLLIES, ENSURE THE TRANSMISSION IS IN THE PARK POSITION (AUTOMATIC TRANSMISSION) OR A FORWARD DRIVE GEAR (MANUAL TRANSMISSION).

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

TWO WHEEL DRIVE TOWING-REAR END LIFTED

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

2WD vehicles can be towed with the front wheels on the surface for extended distances at speeds not exceeding 48 km/h (30 mph).

(1) Attach wheel lift device to rear wheels.
(2) Place the transmission in neutral.
(3) Raise vehicle to towing position.
(4) Attach safety chains. Route chains so not to interfere with tail pipe when vehicle is lifted.
(5) Turn the ignition switch to the OFF position to unlock the steering wheel.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(7) Place transmission in park.

TWO WHEEL DRIVE TOWING-FRONT END LIFTED

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

(1) Attach wheel lift device to rear wheels.
(2) Place the transmission in neutral.
(3) Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.
(4) Attach wheel lift device to front wheels and raise vehicle to towing position.
(5) Attach the safety chains.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.
(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(8) Place transmission in park.

FOUR-WHEEL-DRIVE VEHICLE TOWING

DaimlerChrysler Corporation recommends that a 4WD vehicle be transported on a flat-bed device. A Wheel-lift device can be used provided **the trailing wheels are off the ground and positioned in tow dollies.**

WARNING: WHEN TOWING A DISABLED VEHICLE AND THE DRIVE WHEELS ARE SECURED IN A WHEEL LIFT OR TOW DOLLIES, ENSURE THE TRANSMISSION IS IN THE PARK POSITION.

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

FOUR WHEEL DRIVE TOWING—REAR END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

(1) Attach wheel lift device to front wheels.
(2) Place the transmission in neutral.

TOWING (Continued)

(3) Raise the front of the vehicle off the ground and install tow dollies under front wheels.

(4) Attach wheel lift device to rear wheels and raise vehicle to towing position.

(5) Attach safety chains. Route chains so not to interfere with tail pipe when vehicle is lifted.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.

(8) Place transmission in park.

FOUR WHEEL DRIVE TOWING—FRONT END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

(1) Attach wheel lift device to rear wheels.

(2) Place the transmission in neutral.

(3) Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.

(4) Attach wheel lift device to front wheels and raise vehicle to towing position.

(5) Attach the safety chains.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.

(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.

(8) Place transmission in park.

MAINTENANCE SCHEDULES

TABLE OF CONTENTS

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO

DESCRIPTION

DESCRIPTION

Maintenance Schedule Information not included in this section, is located in the appropriate Owner's Manual.

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule ″**B**″. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Day or night temperatures are below 0°C (32°F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32°C (90°F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert driving.

NOTE: Most vehicles are operated under the conditions listed for Schedule "B."

Second is Schedule **"A"**. It is for vehicles that are not operated under any of the conditions listed under Schedule "B."

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent, add as required.

Once a Month

- Check the tire pressure and look for unusual wear or damage.
- Inspect the battery, and clean and tighten the terminals as required.
- Check the fluid levels of the coolant reservoir, brake master cylinder, power steering, and transmission, and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect brake hoses.
- Check the coolant level, hoses, and clamps.
- Rotate the tires.
- Inspect manual transmission fluid level — if equipped.
- After completion of off-road operation, the underside of the vehicle should be thoroughly inspected. Examine threaded fasteners for looseness.

Schedule "B"

Follow schedule "B" if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 0°C (32°F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32°C (90°F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert driving.

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers (Miles)	**5 000 (3,000)**	**10 000 (6,000)**	**14 000 (9,000)**	**19 000 (12,000)**	**24 000 (15,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air cleaner element (2.4L Only).		X		X	
Replace the engine air cleaner element (2.4L Only).					
Inspect the brake linings.				X	
Drain and refill the front and rear axle fluid‡				X	

Kilometers (Miles)	**29 000 (18,000)**	**34 000 (21,000)**	**38 000 (24,000)**	**43 000 (27,000)**	**48 000 (30,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary. ♢					X
Inspect the brake linings.			X		
Drain and refill the front and rear axle fluid‡			X		
Drain and refill the automatic transmission fluid, and replace main sump filter.					X

Kilometers (Miles)	**53 000 (33,000)**	**58 000 (36,000)**	**62 000 (39,000)**	**67 000 (42,000)**	**72 000 (45,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.		X			
Drain and refill the front and rear axle fluid‡		X			
Inspect the drive belt and replace as needed.					X

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers **(Miles)**	**77 000** **(48,000)**	**82 000** **(51,000)**	**86 000** **(54,000)**	**91 000** **(57,000)**	**96 000** **(60,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary. ♢					X
Replace the ignition cables (2.4L Only).					X
Inspect the brake linings.	X				X
Drain and refill the front and rear axle fluid‡	X				X
Drain and refill the automatic transmission fluid, and replace main sump filter.					X
Inspect the drive belt and replace as needed. Not required if belt was previously					X
Drain and refill the transfer case fluid.					X

Kilometers **(Miles)**	**101 000** **(63,000)**	**106 000** **(66,000)**	**110 000** **(69,000)**	**115 000** **(72,000)**	**120 000** **(75,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.				X	
Drain and refill the front and rear axle fluid‡				X	
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers (Miles)	**125 000 (78,000)**	**130 000 (81,000)**	**134 000 (84,000)**	**139 000 (87,000)**	**144 000 (90,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary. ♢					X
Inspect the brake linings.			X		
Drain and refill the front and rear axle fluid‡			X		
Drain and refill the automatic transmission fluid, and replace transmission filter (s).					X
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Replace the timing belt (2.4L Only).					X

Kilometers (Miles)	**149 000 (93,000)**	**154 000 (96,000)**	**158 000 (99,000)**	**163 000 (102,000)**	**168 000 (105,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).		X		X	
Replace the engine air filter element (2.4L Only).					
Inspect the brake linings.		X			
Drain and refill the front and rear axle fluid‡		X			
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Flush and replace the engine coolant.			X		

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers **(Miles)**	**173 000 (108,000)**	**178 000 (111,000)**	**182 000 (114,000)**	**187 000 (117,000)**	**192 000 (120,000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary (3.7L Only).					X
Clean and dry the engine air filter element (2.4L Only).	X		X		
Replace the engine air filter element (2.4L Only).					X
Replace the spark plugs.					X
Inspect and replace the PCV valve, if necessary. ◊					X
Replace the ignition cables (2.4L Only).					X
Inspect the brake linings.	X				X
Drain and refill the front and rear axle fluid‡	X				X
Drain and refill the automatic transmission fluid, and replace main sump filter.					X
Inspect the drive belt and replace as needed. Not required if belt was previously replaced.					X
Drain and refill the transfer case fluid.					X

Inspection and service should be performed anytime a malfunction is observed or suspected. Retain all receipts.

◊ This maintenance is recommended by the manufacturer to the owner, but it is not required to maintain emissions warranty.

‡Off-highway operation, trailer towing, taxi, limousine, bus, snow plowing, or other types of commercial service or prolonged operation with heavy loading, especially in hot weather, require front and rear axle service indicated with a ‡ in Schedule "B". Perform these services if the vehicle is usually operated under these conditions.

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Schedule "A"

Kilometers (Miles) [Months]	**12 000 (7,500) [6]**	**24 000 (15,000) [12]**	**36 000 (22,500) [18]**	**48 000 (30,000) [24]**	**60 000 (37,500) [30]**
Change the engine oil and engine oil filter.	X	X	X	X	X
Replace the engine air filter element.				X	
Replace the spark plugs.				X	
Inspect the brake linings.			X		
Inspect the transfer case fluid.				X	

Kilometers (Miles) [Months]	**72 000 (45,000) [36]**	**84 000 (52,500) [42]**	**96 000 (60,000) [48]**	**108 000 (67,500) [54]**
Change the engine oil and engine oil filter.	X	X	X	X
Replace the engine air filter element.			X	
Check and replace the PCV Valve, if necessary♢.			X	
Replace the ignition cables (2.4L Only).			X	
Replace the spark plugs.			X	
Inspect the brake linings.	X			X
Inspect and replace the Auto Tension Drive Belt, as needed.			X	
Inspect the transfer case fluid.			X	

Kilometers (Miles) [Months]	**120 000 (75,000) [60]**	**132 000 (82,500) [66]**	**144 000 (90,000) [72]**	**156 000 (97,500) [78]**
Change the engine oil and engine oil filter.	X	X	X	X
Inspect the brake linings.			X	
Replace the engine air filter element.			X	
Replace the spark plugs.			X	
Inspect and replace the PCV valve, if necessary.♢			X	
Inspect the drive belt and replace as needed. Not required if previously replaced.	X		X	
Flush and replace the engine coolant at 60 months, regardless of mileage.	X			
Inspect the transfer case fluid.			X	

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers (Miles) [Months]	**160 000 (100,000)**	**168 000 (105,000) [84]**	**180 000 (112,500) [90]**	**192 000 (120,000) [96]**
Change the engine oil and engine oil filter.		X	X	X
Inspect the brake linings.			X	
Replace the engine air filter element.				X
Replace the spark plugs.				X
Replace the ignition cables (2.4L Only).				X
Inspect and replace the PCV valve, if necessary. ◊				X
Inspect the drive belt and replace as needed. Not required if previously replaced.		X		X
Flush and replace the engine coolant if not done at 60 months.	X			
Drain and refill the automatic transmission fluid, and replace transmission filter(s).	X			
Replace the timing belt (2.4L Only).				X
Drain the transfer case, and refill.				X

Inspection and service should be performed anytime a malfunction is observed or suspected. Retain all receipts.

◊ This maintenance is recommended by the manufacturer to the owner, but it is not required to maintain emissions warranty.

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

DESCRIPTION — DIESEL ENGINES

Maintenance Schedule Information not included in this section, is located in the appropriate Owner's Manual.

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **"B"**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Extensive engine idling.
- Driving in dusty conditions.
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″.

Second is Schedule **"A"**. It is for vehicles that are not operated under any of the conditions listed under Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add if required.

Once a Month

- Check the tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, power steering and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Check the manual transmission fluid level — if equipped.
- Check the coolant level, hoses, and clamps.
- Inspect engine accessory drive belts. Replace as necessary.
- Inspect for the presence of water in the fuel filter/water separator unit.
- Rotate the tires.

Schedule "B"

Follow schedule "B" if you usually operate your vehicle under one or more of the following conditions.

- Extensive engine idling.
- Driving in dusty conditions.
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers	**10 000 km**	**20 000 km**	**30 000 km**	**40 000 km**	**50 000 km**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the ball joints.	X	X	X	X	X
Inspect engine accessory drive belt.	X	X	X	X	
Replace engine accessory drive belt.					X
Inspect the engine air filter element. Replace as necessary.	X		X		X
Replace the engine air filter element.		X		X	
Replace the engine timing belt.					X
Inspect idler pulleys and timing belt tensioner‡.					X
Replace fuel filter/water separator unit.		X		X	
Inspect the brake linings.	X	X	X	X	X
Drain and refill the front and rear axle fluid.		X		X	
Drain and refill automatic transmission fluid and replace transmission main sump filter.					X

Kilometers	**60 000 km**	**70 000 km**	**80 000 km**	**90 000 km**	**100 000 km**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the ball joints.	X	X	X	X	X
Inspect engine accessory drive belt.	X	X	X	X	X
Replace engine accessory drive belt.					X
Inspect the engine air filter element. Replace as necessary.		X		X	
Replace the engine air filter element.	X		X		X
Inspect idler pulleys and timing belt tensioner‡.					X
Replace the engine timing belt.					X
Inspect the brake linings.	X	X	X	X	X
Drain and refill the front and rear axle fluid.	X		X		X
Replace the fuel filter/water separator unit.	X		X		X
Drain and refill the transfer case fluid.					X
Drain and refill the automatic transmission fluid and replace transmission main sump filter.					X

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Kilometers	**110 000 km**	**120 000 km**	**130 000 km**	**140 000 km**	**150 000 km**	**160 000 km**
Change the engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the ball joints.	X	X	X	X	X	X
Inspect the engine air filter element. Replace as necessary.	X		X		X	
Replace the engine air filter element.		X		X		X
Inspect engine accessory drive belt.	X	X	X	X		X
Replace engine accessory drive belt.					X	
Inspect the idler pulleys and timing belt tensioner‡.					X	
Replace the engine timing belt.					X	
Inspect the brake linings.	X	X	X	X	X	X
Drain and refill the front and rear axle fluid.		X		X		X
Replace the fuel filter/water separator unit.		X		X		X
Flush and replace the engine coolant.						X
Drain and refill automatic transmission fluid and replace transmission filter (s).					X	

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

‡ Replace if there is superficial wear, bearing clearance, or evident grease leak.

MAINTENANCE SCHEDULES FOR ALL MARKETS EXCEPT U.S., CANADA and MEXICO (Continued)

Schedule “A”

Kilometers	20 000 km	40 000 km	60 000 km	80 000 km	100 000 km
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the ball joints.	X	X	X	X	X
Inspect the brake linings.		X		X	
Inspect the engine air filter element. Replace as necessary.	X		X		X
Replace the engine air filter element.		X		X	
Inspect the engine accessory drive belt.	X	X	X	X	X
Replace the engine accessory drive belt.					X
Replace the fuel filter/water separator unit.	X	X	X	X	X
Inspect idler pulleys, and timing belt tensioner‡.					X
Replace the engine timing belt.					X
Inspect the transfer case fluid.			X		

Kilometers	120 000 km	140 000 km	160 000 km	180 000 km
Change the engine oil and engine oil filter.	X	X	X	X
Inspect the ball joints.	X	X	X	X
Inspect the brake linings.	X		X	
Inspect the engine accessory drive belt.	X	X	X	X
Inspect the engine air filter element. Replace as necessary.		X		X
Replace the engine air filter element.	X		X	
Replace the fuel filter/water separator unit.	X	X	X	X
Flush and replace the engine coolant.			X	
Inspect the transfer case fluid.	X			
Drain and refill the transfer case fluid.				X
Drain and refill automatic transmission fluid and replace transmission filter (s).			X	

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

‡ Replace if there is superficial wear, bearing clearance, or evident grease leak.

WARNING: You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

SUSPENSION

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SUSPENSION

DIAGNOSIS AND TESTING - SUSPENSION AND STEERING SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components.	1. Replace wheel bearings. 2. Tighten or replace components as necessary.
EXCESSIVE PLAY IN STEERING	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Loose or worn steering gear.	1. Replace wheel bearings. 2. Tighten or replace components as necessary. 3. Adjust or replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Tires worn or out of balance. 4. Alignment.	1. Replace wheel bearings. 2. Tighten or replace components as necessary. 3. Replace or balance tires. 4. Align vehicle to specifications.
VEHICLE INSTABILITY	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Tire pressure. 4. Alignment.	1. Replace wheel bearings. 2. Tighten or replace components as necessary. 3. Adjust tire pressure. 4. Align vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear. 2. Power steering fluid low. 3. Column coupler binding. 4. Tire pressure. 5. Alignment.	1. Adjust or replace steering gear. 2. Add fluid and repair leak. 3. Replace coupler. 4. Adjust tire pressure. 5. Align vehicle to specifications.
VEHICLE PULLS TO ONE SIDE DURING BRAKING	1. Uneven tire pressure. 2. Worn brake components. 3. Air in brake line.	1. Adjust tire pressure. 2. Repair brakes as necessary. 3. Repair as necessary.

SUSPENSION (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
VEHICLE LEADS OR DRIFTS FROM STRAIGHT AHEAD DIRECTION ON UNCROWNED ROAD	1. Radial tire lead. 2. Brakes dragging. 3. Weak or broken spring. 4. Uneven tire pressure. 5. Wheel Alignment. 6. Loose or worn steering or suspension components. 7. Cross caster out of spec.	1. Cross front tires. 2. Repair brake as necessary. 3. Replace spring. 4. Adjust tire pressure. 5. Align vehicle. 6. Repair as necessary. 7. Align vehicle.
KNOCKING, RATTLING OR SQUEAKING	1. Worn shock bushings. 2. Loose, worn or bent steering/ suspension components. 3. Shock valve.	1. Replace shock. 2. Inspect, tighten or replace components as necessary. 3. Replace shock.
IMPROPER TRACKING	Loose, worn or bent steering/ suspension components.	Inspect, tighten or replace components as necessary.

WHEEL ALIGNMENT

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WHEEL ALIGNMENT

DESCRIPTION

NOTE: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber and toe (Fig. 1).

CAUTION: Never attempt to modify suspension or steering components by heating or bending.

NOTE: Periodic lubrication of the front suspension/steering system components may be required. Rubber bushings must never be lubricated. Refer to Lubrication And Maintenance for the recommended maintenance schedule.

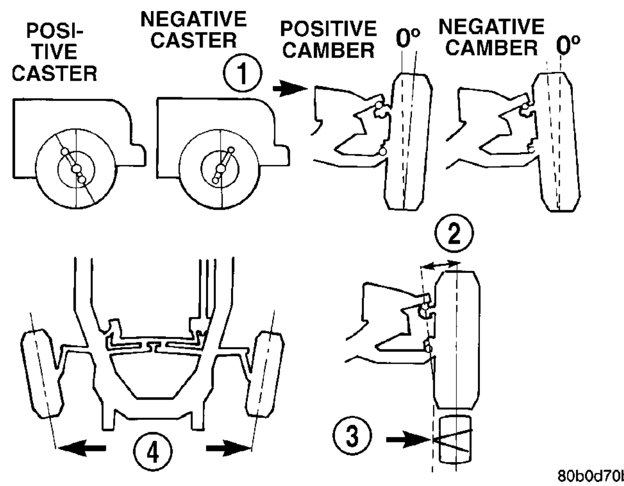

Fig. 1 Wheel Alignment Measurements

1 - FRONT OF VEHICLE
2 - STEERING AXIS INCLINATION
3 - PIVOT POINT
4 - TOE-IN

OPERATION

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle forward provides negative caster. Tilting the top of the knuckle rearward provides positive caster. Positive caster promotes directional stability. This angle enables the front wheels to return to a straight ahead position after turns (Fig. 1)
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire (Fig. 1)
- **TOE** is the difference between the leading inside edges and trailing inside edges of the front tires. Wheel toe position out of specification cause's unstable steering, uneven tire wear and steering wheel off-center. The wheel toe position is the **final** front wheel alignment adjustment (Fig. 1)
- **THRUST ANGLE** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle (Fig. 1)

WHEEL ALIGNMENT (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - HEIGHT MEASUREMENT

RIDE HEIGHT

NOTE: The suspension is non-adjustable.

The vehicle suspension height should be measured before performing wheel alignment procedure. Also when front suspension components have been replaced. This measure must be performed with the vehicle supporting it's own weight and taken on both sides of the vehicle.

Front and rear ride heights are not adjustable. The spring selections at assembly determine ride height for acceptable appearance of the vehicle. Ride height dimensions assume full fluids (including fuel) and zero passengers. Refer to the table below for front ride height dimensions.

Vehicle ride height audits should be performed utilizing the following procedure:

(1) Drive the vehicle straight and forward on a non-tacky surface for a minimum of 20 feet to neutralize track width.

(2) Bounce the front of the vehicle five times.

(3) Measure and record the dimensions

FRONT RIDE HEIGHT Front ride height is defined by the relative vertical distance between the spindle center line and the rear pivot point of the front lower control arm to cradle attachment. The spindle center line is to be measured at the outer wheel face (point A). The rear pivot point is to be measured at the center of the cam/pivot bolt (point B) at its rearward most end (nut end). (Fig. 2)

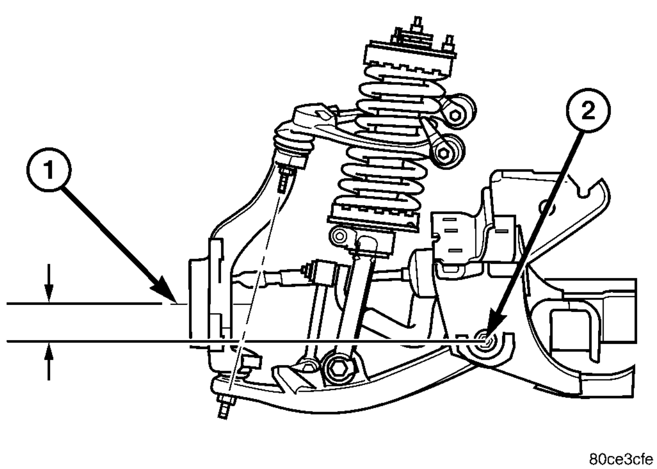

Fig. 2 FRONT RIDE HEIGHT MESUREMENT

1 - POINT - A
2 - POINT - B

REAR RIDE HEIGHT Rear ride height is defined by the relative vertical distance between the top of the lower spring seat strike surface and the bottom of the jounce cup (true metal to metal jounce travel). This is to be measured vertically inside the coil from the point intersecting the inboard edge and the for/aft center of the jounce cup (point C) down to the strike surface (point D). (Fig. 3)

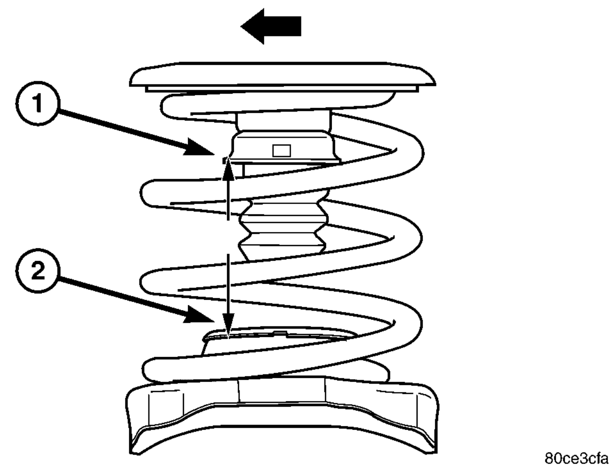

Fig. 3 REAR RIDE HEIGHT MESUREMENT

1 - POINT - C
2 - POINT - D

Measurement	Target	Minimum	Maximum
Front Ride Height Distance AB	69.8 mm Z=996.8 - 927.0 mm	59.8 mm	79.8 mm
Front Cross Ride Height Left - Right	0.0 mm	-10.0 mm	10.0 mm
Rear Ride Height Distance CD	97.1 mm	87.1 mm	107.1 mm
Rear Cross Ride Height Left - Right	0.0 mm	-10.0 mm	10.0 mm

WHEEL ALIGNMENT (Continued)

STANDARD PROCEDURE - CAMBER AND CASTER ADJUSTMENT

Camber and caster angle adjustments involve changing the position of the lower control arm cam bolts. (Fig. 4)

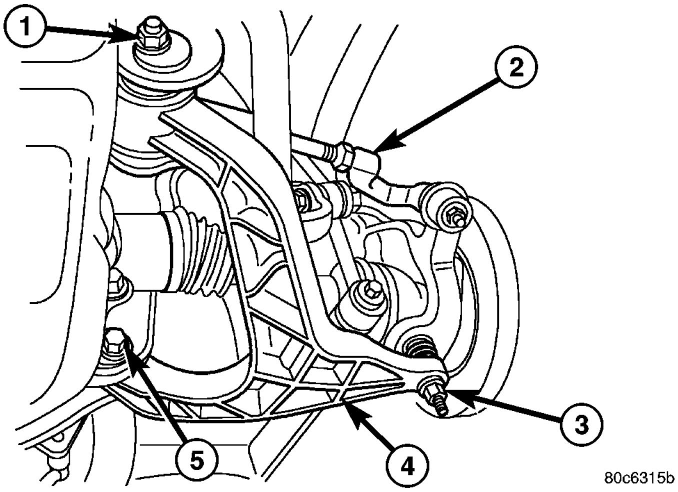

Fig. 4 LOWER CONTROL ARM

1 - FRONT CAM BOLT
2 - OUTER TIE ROD END
3 - LOWER BALL JOINT NUT
4 - LOWER CONTROL ARM
5 - REAR CAM BOLT

STANDARD PROCEDURE - TOE ADJUSTMENT

4X4 SUSPENSION HEIGHT MESUREMENT MUST BE PERFORMED BEFORE AN ALIGNMENT.

The wheel toe position adjustment is the final adjustment.

(1) Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.

(2) Loosen the tie rod jam nuts.

NOTE: Each front wheel should be adjusted for one-half of the total toe position specification. This will ensure the steering wheel will be centered when the wheels are positioned straight-ahead.

(3) Adjust the wheel toe position by turning the tie rod as necessary (Fig. 5).

(4) Tighten the tie rod jam nut to 75 N·m (55 ft. lbs.).

(5) Verify the specifications

(6) Turn off engine.

STANDARD PROCEDURE - CAMBER, CASTER AND TOE ADJUSTMENT

Camber and caster angle adjustments involve changing the position of the lower suspension arm cam bolts. (Fig. 4)

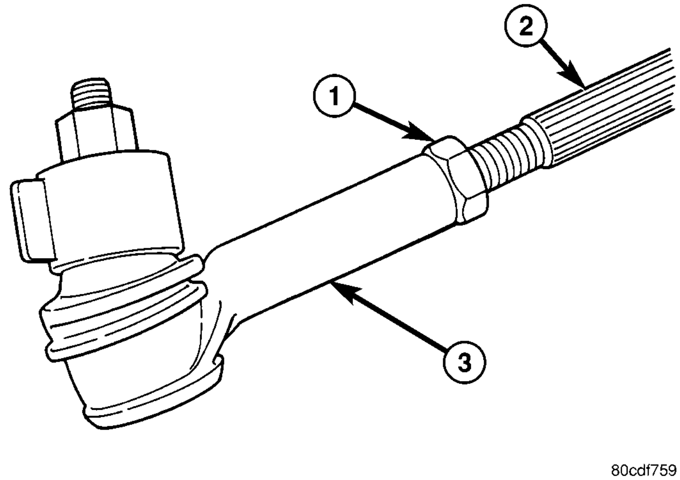

Fig. 5 TIE ROD END

1 - JAM NUT
2 - TIE ROD - INNER
3 - TIE ROD END - OUTER

CASTER

Moving the rear position of the cam bolt in or out, will change the caster angle significantly and camber angle only slightly. To maintain the camber angle while adjusting caster, move the rear of the cam bolt in or out. Then move the front of the cam bolt slightly in the opposite direction. (Fig. 4)

To increase positive caster angle, move the rear position of the cam bolt outward (from the engine). Move the front of cam bolt inward (toward the engine) slightly until the original camber angle is obtained. (Fig. 4)

CAMBER

Move both of the cam bolts together in or out. This will change the camber angle significantly and caster angle slightly. (Fig. 4)

After adjustment is made tighten the cam bolt nuts to proper torque specification.

TOE ADJUSTMENT

The wheel toe position adjustment is the final adjustment.

(1) Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.

(2) Loosen the tie rod jam nuts.

NOTE: Each front wheel should be adjusted for one-half of the total toe position specification. This will ensure the steering wheel will be centered when the wheels are positioned straight-ahead.

(3) Adjust the wheel toe position by turning the tie rod as necessary (Fig. 5).

(4) Tighten the tie rod jam nut to 75 N·m (55 ft. lbs.).

(5) Verify the specifications

(6) Turn off engine.

WHEEL ALIGNMENT (Continued)

SPECIFICATIONS

ALIGNMENT

NOTE: Specifications are in degrees.

FRONT

SPECIFICATIONS

DESCRIPTION	SPECIFICATION		
PREFERRED	CASTER 3.9° ± 0.5°	CAMBER -0.375° ± 0.375°	TOTAL TOE-IN .2° ± 0.125°
RANGE	3.4° to + 4.4°	–0.750° to 0°	+0.075° to +0.325°
MAX RT/LT DIFFERENCE	0.5°	0.7°	0.13°

REAR

SPECIFICATIONS

DESCRIPTION	SPECIFICATION		
PREFERRED	CAMBER –.25°± .375°	THRUST ANGLE 0° to ± 0.25°	TOTAL TOE-IN .25° to ± .41°
RANGE	–.625° to .125°	–.25° to +.25°	–.16° to .66°

FRONT

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FRONT

DESCRIPTION

NOTE: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

The front suspension is designed to allow each wheel to adapt to different road surfaces independently. The wheels are mounted to hub bearings on the steering knuckle spindles. The double-row hub bearings are sealed and lubricated for life. The steering knuckles turn (pivot) on ball joints integral to the outboard portion of the upper control arms and pressed into the lower steering knuckle. The ball joints are lubricated for life. (Fig. 1)

FRONT (Continued)

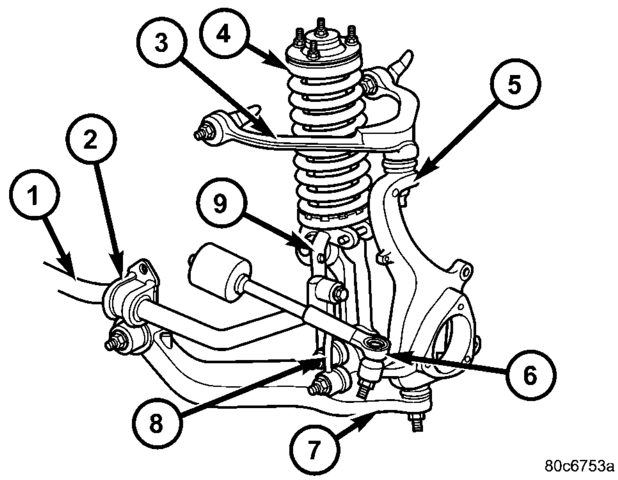


Fig. 1 FRONT SUSPENSION

1 - SWAY BAR
2 - SWAY BAR BUSHING/BRACKET
3 - UPPER CONTROL ARM
4 - SPRING / SHOCK ASSEMBLY
5 - STEERING KNUCKLE
6 - OUTER TIE ROD END
7 - LOWER CONTROL ARM
8 - SWAY BAR LINK
9 - CLEVIS BRACKET

WARNING

WARNING: SUSPENSION COMPONENTS WITH RUBBER BUSHINGS MUST BE TIGHTENED WITH THE VEHICLE AT NORMAL RIDE HEIGHT. IT IS IMPORTANT TO HAVE THE SPRINGS SUPPORTING THE WEIGHT OF THE VEHICLE WHEN THE FASTENERS ARE TORQUED. IF SPRINGS ARE NOT AT THEIR NORMAL RIDE POSITION, VEHICLE RIDE COMFORT WILL BE AFFECTED AND CAUSE PREMATURE BUSHING WEAR.

SPECIFICATIONS

TORQUE CHART

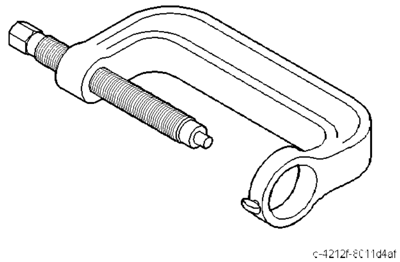
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front Shock Absorber Clevis Bracket Upper Nut	136	100	—
Front Shock Absorber Clevis Bracket Lower Nut	150	110	—
Front Shock Absorber Top (4) Mounting Nuts	108	80	—
Front Shock to Spring and Insulator Nut	41	30	—
Upper Suspension Arm Front Nut	122	90	—
Upper Suspension Arm Rear Nut	122	90	—
Lower Suspension Arm Front Nut	170	125	—
Lower Suspension Arm Rear Nut	170	125	—
Stabilizer Bar Clamp Nut	149	110	—
Stabilizer Bar Link Upper Nut	136	100	—
Stabilizer Bar Link Lower Nut	115	85	—
Hub/Bearing Bolt	130	96	—
Hub/Bearing Halfshaft Nut	135	100	—
Upper Ball Joint Nut	81	60	—
Lower Ball Joint Nut	81	60	—
Wheel Speed Sensor	13.5	10	—

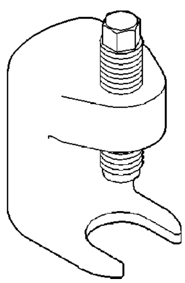
FRONT (Continued)

SPECIAL TOOLS

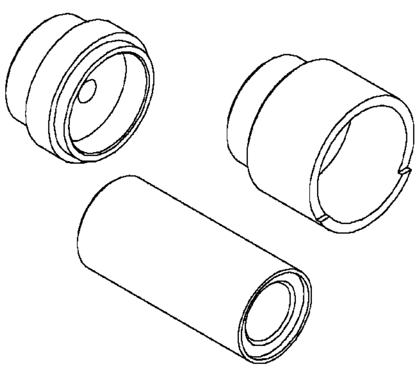
FRONT SUSPENSION



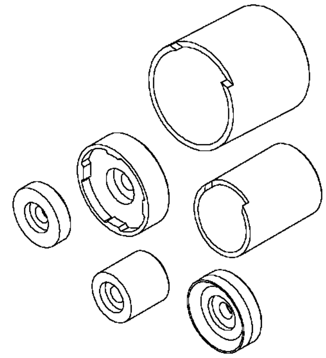
BALL JOINT PRESS - C-4212F



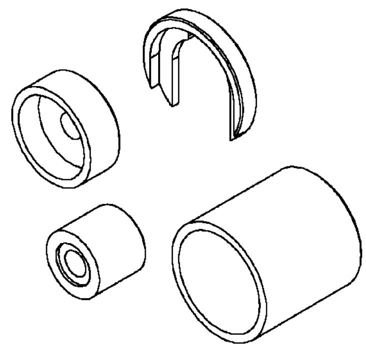
Remover C-4150A



REMOVER / INSTALLER FRONT LOWER BALL JOINT - 8859



FRONT LOWER CONTROL ARM & CLEVIS BUSHING REMOVER/INSTALLER - 8858



FRONT LOWER CONTROL BUSHING REMOVER/ INSTALLER - 8830

BUSHINGS

REMOVAL

REMOVAL - STABILIZER BAR BUSHINGS

(1) Raise vehicle on hoist.

(2) Remove the stabilizer bushing clamps.

(3) Remove the stabilizer bushings from the stabilizer bar.

REMOVAL - LOWER CONTROL ARM BUSHING

(1) Remove the lower control arm (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL).

(2) Secure the control arm in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(3) Press the bushing out using special tools 8858-5 (Receiver), 8858-6 (Driver) and 8839 with the threaded rod and the bearing as shown (Fig. 2)

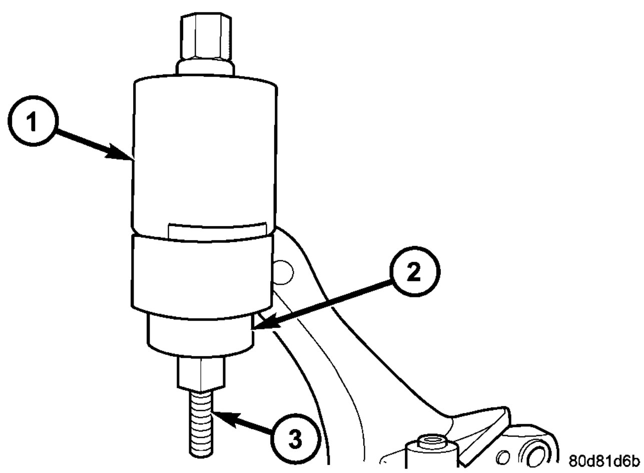


Fig. 2 LOWER CONTROL ARM BUSHING - REMOVAL

1 - 8858-5 RECEIVER
2 - 8858-6 DRIVER
3 - 8839 THREADED ROD

REMOVAL - CLEVIS BRACKET BUSHING

(1) Remove the clevis bracket from the shock (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - REMOVAL).

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(2) Press the bushing out using special tools 8858-1 (receiver), 8858-3 (driver) and 8839 with the threaded rod 8839 and the bearing as shown (Fig. 3)

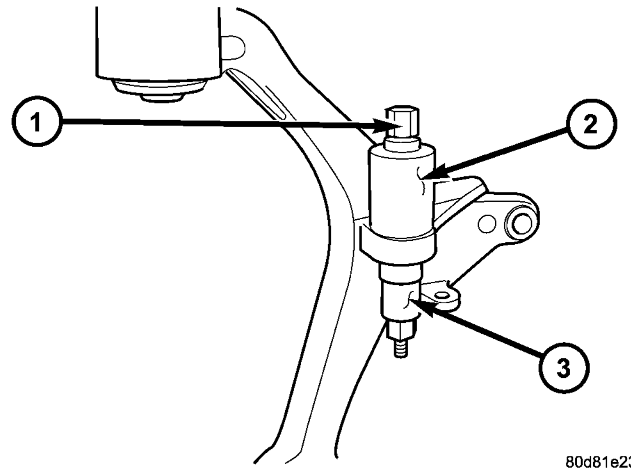


Fig. 3 CLEVIS BRACKET BUSHING

1 - 8839 THREADED ROD
2 - 8858-1 RECEIVER
3 - 8858-3 DRIVER

REMOVAL - UPPER CONTROL ARM BUSHINGS

(1) Remove the upper control arm (Refer to 2 - SUSPENSION/FRONT/UPPER CONTROL ARM - REMOVAL).

(2) Secure the control arm in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(3) Install bushing remover tools 8830-3 (Adapter), 8830-2 (Receiver) and 8830–4 (Driver) with the threaded rod 8838 and the bearing as shown (Fig. 4)

(4) Press out the bushing.

INSTALLATION

INSTALLATION - STABILIZER BAR BUSHINGS

(1) Install the stabilizer bushings to the stabilizer bar.

(2) Install the stabilizer bushing clamps. Tighten the nuts to 149 N·m (110 ft.lbs.).

(3) Lower the vehicle.

BUSHINGS (Continued)

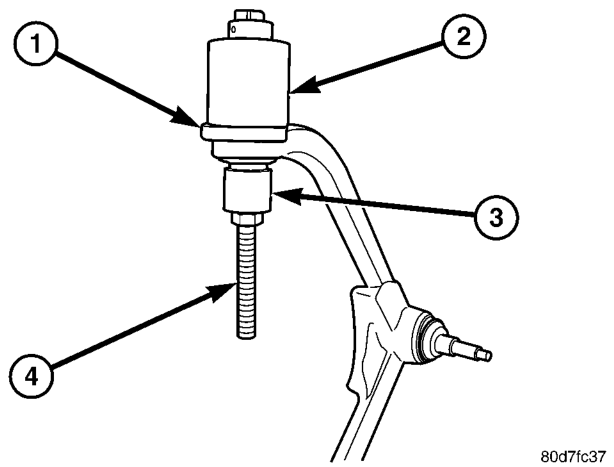


Fig. 4 UPPER CONTROL ARM BUSHING REMOVAL

1 - 8830-3 (ADAPTER)
2 - 8830-2 (RECIEVER)
3 - 8830-4 (DRIVER)
4 - 8838 (THREADED ROD)

INSTALLATION - LOWER CONTROL ARM BUSHING

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(1) Install the new lower control arm bushings into the lower control arm using tools 8858-5 (driver), 8858-6 (receiver) and the bearing with the threaded rod 8839 (Fig. 5) making sure to properly orient the bushing in the control.

(2) Remove the control arm from the vise.

(3) Install the lower control arm (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION).

(4) Reset the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

(5) Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

INSTALLATION - CLEVIS BRACKET BUSHING

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

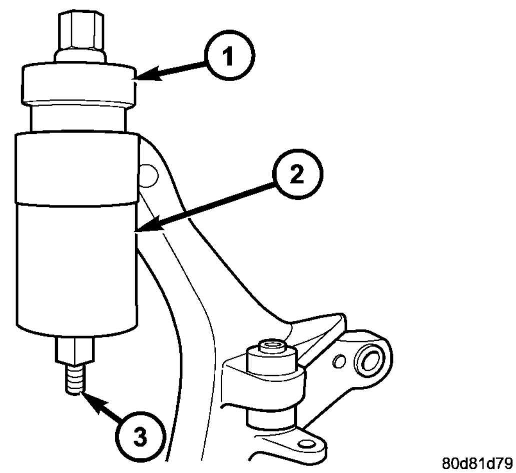


Fig. 5 LOWER CONTROL ARM BUSHING - INSTALLATION

1 - 8858-5 DRIVER
2 - 8858-6 RECEIVER
3 - 8839 THREADED ROD

(1) Install the new clevis bracket bushing into the lower control arm using tools 8858-2 (driver), 8858-1 (receiver) and the bearing with the threaded rod 8839 (Fig. 6) making sure to properly orient the bushing in the control.

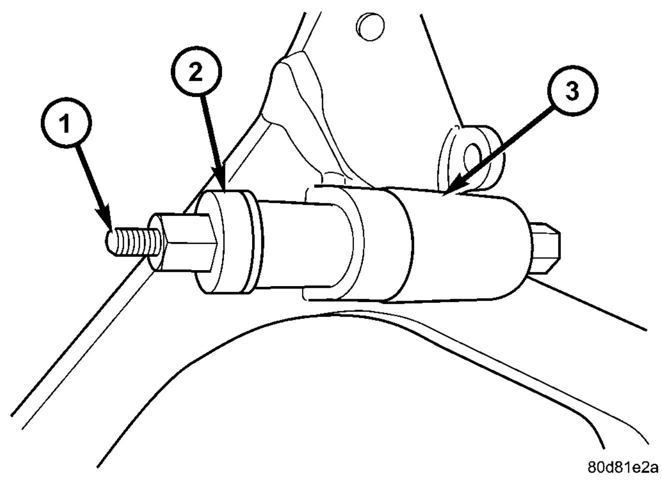


Fig. 6 CLEVIS BRACKET BUSHING

1 - 8839 THREADED ROD
2 - 8858-2 DRIVER
3 - 8858-1 RECEIVER

(2) Install the clevis bracket (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - INSTALLATION).

BUSHINGS (Continued)

INSTALLATION - UPPER CONTROL ARM BUSHINGS

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(1) Install the new upper control arm bushings into the upper control arm using tools 8830-3 (Adapter), 8830-1 (Driver) and 8830-2 (Receiver) the bearing with the threaded rod 8838 (Fig. 7) making sure to properly orient the bushing in the control arm.

(2) Remove the control arm from the vise.

(3) Install the upper control arm (Refer to 2 - SUSPENSION/FRONT/UPPER CONTROL ARM - INSTALLATION).

(4) Reset the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

(5) Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

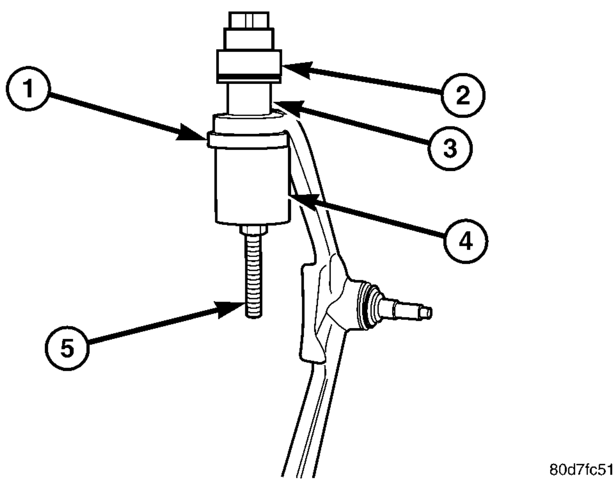


Fig. 7 UPPER CONTROL ARM BUSHING - INSTALLATION

1 - 8830-3 (ADAPTER)
2 - 8830-1 (DRIVER)
3 - BUSHING
4 - 8830-2 (RECEIVER)
5 - 8838 (THREADED ROD)

HUB / BEARING

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

(3) Remove the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

(4) Remove the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

(5) Remove the wheel speed sensor (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - REMOVAL).

(6) Remove the bracket securing the wheel speed sensor wire.

(7) Remove the axle shaft nut. (if equipped with four wheel drive)

(8) Remove the three mounting bolts for the hub/bearing assembly.

(9) Remove the hub/bearing.

INSTALLATION

(1) Install the hub/bearing assembly to the vehicle.

(2) Install the three mounting bolts for the hub/bearing. Tighten the bolt to 130 N·m (96 ft.lbs.).

(3) Install the axle shaft nut. Tighten the nut to 135 N·m (100 ft.lbs.). (if equipped with four wheel drive)

(4) Install the bracket to the wheel speed sensor wire.

(5) Install the wheel speed sensor to the hub. Tighten the bolt to 13.5 N·m (10 ft.lbs.) (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - INSTALLATION).

(6) Install the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(7) Install the disc brake caliper adapter. Tighten the nut to 135 N·m (100 ft.lbs.) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(8) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

KNUCKLE

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the tire and wheel assembly.
(3) Remove the caliper adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

(4) Remove the disc brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
(5) Remove the wheel speed sensor. (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - REMOVAL).
(6) Remove the axle shaft nut. (if equipped with four wheel drive)
(7) Remove the hub/bearing. (Refer to 2 - SUSPENSION/FRONT/HUB / BEARING - REMOVAL).
(8) Seperate the outer tie rod end from the steering knuckle. (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).
(9) Remove the lower ball joint nut.
(10) Seperate the lower ball joint from the suspension arm using tool C–4150A.
(11) Remove the upper ball joint nut.
(12) Seperate the upper ball joint from the knuckle using tool C–4150A.
(13) Remove the knuckle from the vehicle.

INSTALLATION

(1) Install the knuckle to the vehicle.
(2) Install the upper ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.).
(3) Install the lower ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.).
(4) Install the outer tie rod end to the steering knuckle. (Refer to 19 - STEERING/LINKAGE/TIE ROD END - INSTALLATION).
(5) Install the hub/bearing. (Refer to 2 - SUSPENSION/FRONT/HUB / BEARING - INSTALLATION).
(6) Install the axle shaft nut. Tighten the nut to 135 N·m (96 ft.lbs.).(if equipped with four wheel drive).
(7) Install the wheel speed sensor. (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - INSTALLATION).
(8) Install the disc brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
(9) Install the caliper adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
(10) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
(11) Perform the set toe procedure (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

LOWER BALL JOINT

DIAGNOSIS AND TESTING - LOWER BALL JOINT

(1) Raise the vehicle on a drive-on hoist.

NOTE: If a drive-on hoist is not available, use wooden blocks with jack stands to support the lower control arm in the ball joint area. Place the jack stands appropriately and lower the hoist placing weight on the lower control arm. The lower control arms should now be supporting the vehicle weight.

(2) With the use of jack stands, lift the front end off the hoist and position wooden blocks underneath both lower control arms supporting the vehicles weight.
(3) Remove the tire and wheel assembly.
(4) Attach a dial indicator to the base of the lower control arm and align the dial indicator's contact point with the direction of the stud axis, touch the machined flat on the knuckle and zero the dial indicator. (Fig. 8)

NOTE: Use care when applying the load to the knuckle, so the parts are not damaged using care not to tear the boot.

(5) From the front of the vehicle, insert a pry bar to get it rested on the lower control arm and use lever principle to push the knuckle up until the arm of the dial indicator no longer moves.

LOWER BALL JOINT (Continued)

(6) Record the ball joint movement on each side of the vehicle. The end play is acceptable with no more than 1.5mm of end play back to back.

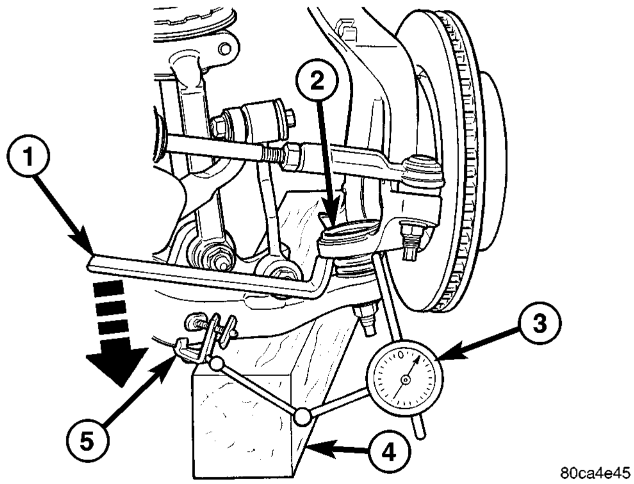


Fig. 8 SUSPENSION IN THE CURB POSITION

1 - PRY BAR
2 - BALL JOINT
3 - DIAL INDICATOR
4 - WOODEN BLOCK OR SUPPORT
5 - CLAMP

REMOVAL

(1) Remove the tire and wheel assembly.

(2) Remove the brake caliper and rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

(3) Disconnect the tie rod from the steering knuckle (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).

(4) Remove the steering knuckle (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL).

(5) Move the halfshaft to the side and support the halfshaft out of the way (If Equipped).

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(6) Secure the steering knuckle in a vise.

(7) Press the ball joint from the steering knuckle using special tools C-4212–F (PRESS), 8859-2 (RECEIVER) and 8859-1 (DRIVER) (Fig. 9).

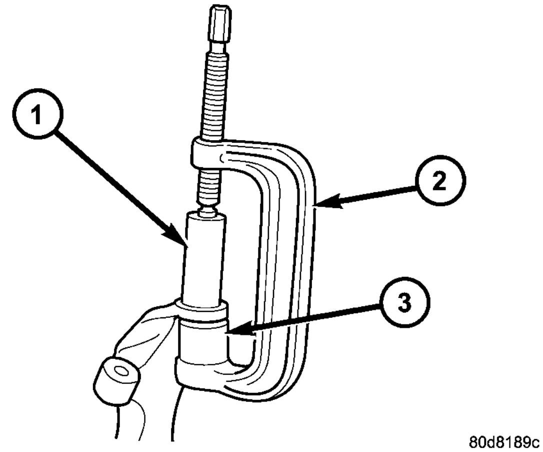


Fig. 9 LOWER BALL JOINT

1 - 8859-1 DRIVER
2 - C-4212F PRESS
3 - 8859-2 RECEIVER

INSTALLATION

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(1) Install the ball joint into the steering knuckle and press in using special tools C-4212–F (press), 8859-3 (driver) and 6761 (receiver) (Fig. 10).

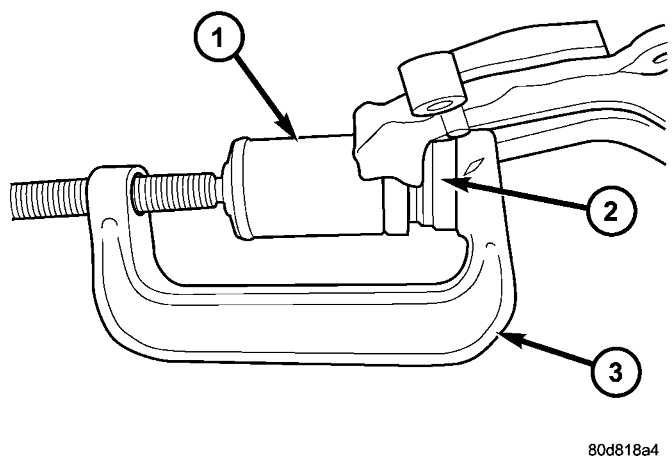


Fig. 10 LOWER BALL JOINT

1 - 6761 RECEIVER
2 - 8859-3 DRIVER
3 - C-4212F PRESS

LOWER BALL JOINT (Continued)

(2) Install the ball joint boot.

(3) Remove the support for the halfshaft and install into position (If Equipped).

(4) Install the steering knuckle (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - INSTALLATION).

(5) Install the tie rod end into the steering knuckle (Refer to 19 - STEERING/LINKAGE/TIE ROD END - INSTALLATION).

(6) Install and tighten the halfshaft nut to 136 N·m (100 ft. lbs.).

(7) Install the brake caliper and rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(8) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Check the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

(10) Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

LOWER CONTROL ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

(3) Remove the lower clevis bracket bolt at the lower control arm.

(4) Remove the stabilizer link bolt at the lower control arm.

(5) Remove the lower ball joint nut.

(6) Separate the lower ball joint from the lower control arm using tool C-4150A.

NOTE: Marking the lower control arm pivot bolts front and rear will aid in the assembly procedure.

(7) Mark the lower control arm pivot bolts front and rear.

(8) Remove the front cam/pivot bolt. (Fig. 11)

(9) Remove the rear cam/pivot bolt. (Fig. 11)

(10) Remove the lower control arm from the vehicle.

INSTALLATION

(1) Install the lower control arm to the vehicle.

(2) Install the rear cam/pivot bolt.

(3) Install the front cam/pivot bolt.

(4) Install the lower ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.)

(5) Align the marks front and rear at the cam/pivot bolts and tighten the nuts. Tighten the nuts to 170 N·m (125 ft.lbs.)

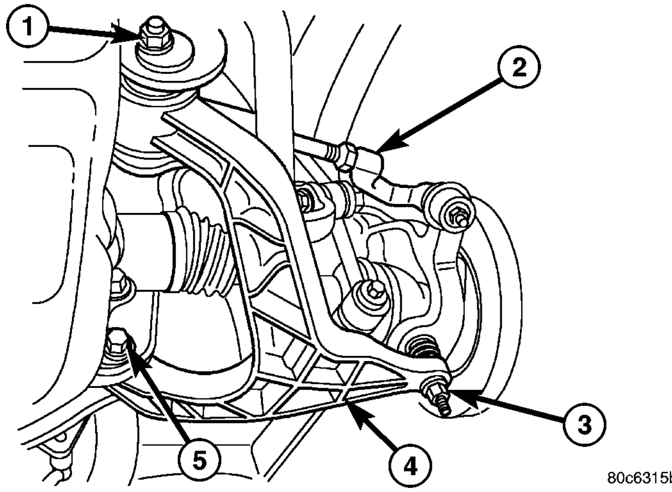


Fig. 11 LOWER CONTROL ARM

1 - FRONT CAM BOLT
2 - OUTER TIE ROD END
3 - LOWER BALL JOINT NUT
4 - LOWER CONTROL ARM
5 - REAR CAM BOLT

(6) Install the stabilizer link bolt at the lower control arm. Tighten the nut to 136 N·m (100 ft.lbs.)

(7) Install the lower clevis bracket bolt at the lower control arm. Tighten the nut to 150 N·m (110 ft.lbs.)

(8) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Perform a full wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

SHOCK

REMOVAL

REMOVAL - LEFT SIDE

(1) Disconnect the battery.

(2) Remove the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).

(3) Unclip the power center and move it to the side out of the way.

(4) Remove the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - REMOVAL).

(5) Disconnect the battery temperature sensor from the battery tray.

(6) Remove the four upper shock mounting nuts.

(7) Raise and support the vehicle.

(8) Remove the left tire and wheel assembly.

(9) Remove the lower bolt at the lower control securing the clevis bracket.

SHOCK (Continued)

(10) Remove the stabilizer link (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - REMOVAL).

(11) Remove the lower ball joint nut.

(12) Seperate the lower ball joint from the lower control arm using tool C-4150A.

(13) Rotate the lower control arm downward to allow access.

(14) Remove the clevis bracket at the shock.

(15) Remove the shock assembly from the vehicle. (Fig. 12)

(16) Remove the spring from the shock (if needed).

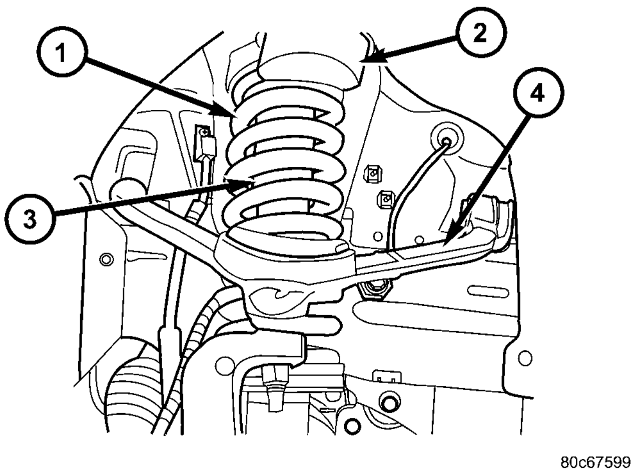


Fig. 12 SHOCK ASSEMBLY

1 - SPRING
2 - JOUNCE BUMPER
3 - SHOCK
4 - UPPER CONTROL ARM

REMOVAL - RIGHT SIDE

(1) Remove the air box (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).

(2) Remove the two cruise control servo mounting nuts.

(3) Remove the upper shock mounting nuts.

(4) Raise and support the vehicle.

(5) Remove the right side tire assembly.

(6) Remove the lower bolt at the lower control securing the clevis bracket.

(7) Remove the stabilizer link (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - REMOVAL).

(8) Remove the lower ball joint nut.

(9) Seperate the lower ball joint from the lower control arm using tool C-4150A.

(10) Rotate the lower control arm downward to allow access.

(11) Remove the clevis bracket at the shock. (Fig. 13)

(12) Remove the shock assembly from the vehicle. (Fig. 13)

(13) Remove the spring from the shock (if needed). (Refer to 2 - SUSPENSION/FRONT/SPRING - REMOVAL).

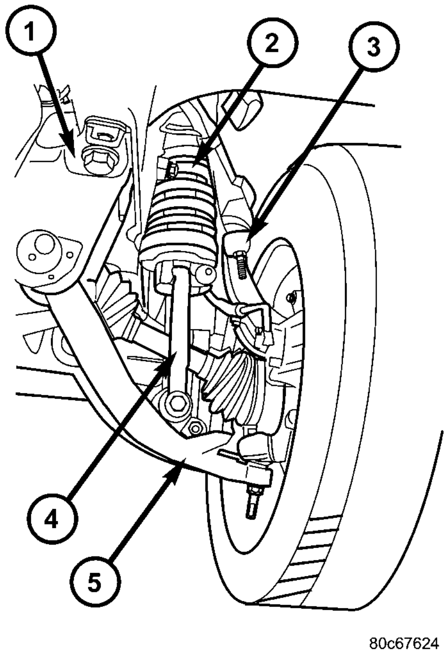


Fig. 13 SHOCK & CLEVIS ASSEMBLY

1 - FRONT CRADLE
2 - SPRING & SHOCK ASSEMBLY
3 - STEERING KNUCKLE
4 - CLEVIS BRACKET
5 - LOWER CONTROL ARM

INSTALLATION

INSTALLATION - LEFT SIDE

(1) Install the spring to the shock (if removed).

(2) Install the shock assembly to the vehicle.

(3) Install the four upper shock mounting nuts. Tighten the nuts to 108 N·m (80 ft.lbs.).

(4) Install the clevis bracket at the shock. (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - INSTALLATION). Tighten the bolt to 88 N·m (65 ft.lbs.).

(5) Raise the lower control into place and reconnect the lower ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.).

(6) Install the clevis bracket at the lower control arm. (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - INSTALLATION). Tighten the bolt to 150 N·m (110 ft.lbs.).

(7) Install the lower stabilizer link at the lower control arm. Tighten the bolt to 136 N·m (100 ft.lbs.) (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - INSTALLATION).

(8) Install the left tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

SHOCK (Continued)

(9) Lower the vehicle.

(10) Reconnect the battery temperature sensor.

(11) Install the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - INSTALLATION).

(12) Install the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

(13) Reconnect the battery cables.

INSTALLATION - RIGHT SIDE

(1) Install the spring to the shock (if removed). (Refer to 2 - SUSPENSION/FRONT/SPRING - INSTALLATION).

(2) Install the shock assembly to the vehicle.

(3) Install the four upper shock mounting nuts. Tighten the nuts to 108 N·m (80 ft.lbs.).

(4) Install the clevis bracket at the shock. (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - INSTALLATION). Tighten the bolt to 88 N·m (65 ft.lbs.).

(5) Raise the lower control into place and reconnect the lower ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.).

(6) Install the clevis bracket at the lower control arm. (Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - INSTALLATION). Tighten the bolt to 150 N·m (110 ft.lbs.).

(7) Install the lower stabilizer link at the lower control arm. Tighten the bolt to 136 N·m (100 ft.lbs.) (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - INSTALLATION).

(8) Install the right tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Lower the vehicle.

(10) Install the cruise control servo mounting nuts.

(11) Install the airbox (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - INSTALLATION).

SPRING

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

(3) Remove the shock. Refer to the proper side shock removal procedure being worked on. (Refer to 2 - SUSPENSION/FRONT/SHOCK - REMOVAL).

(4) Secure the shock assembly into a Pentastar Service Equipment W-7200 Spring compressor. (Fig. 14)

(5) Compress the spring.

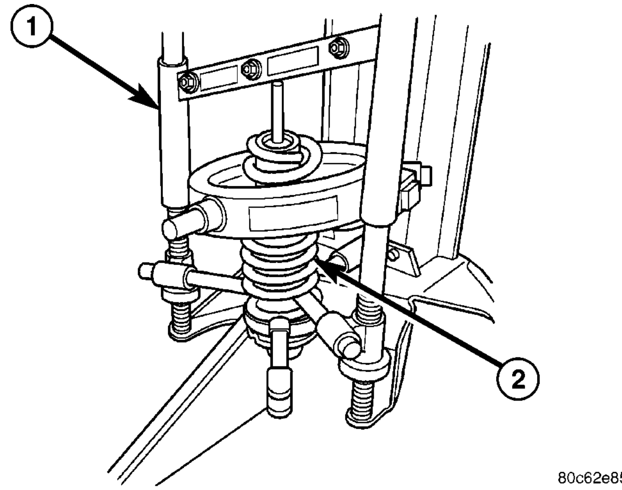


Fig. 14 SPRING COMPRESSOR

1 - SPRING COMPRESSOR
2 - SPRING

(6) Remove the shock mount nut.

(7) Remove the shock from the spring compressor.

(8) Transfer the necessary parts to the type of repair being done (Insulator, Spring, shock and mount).

INSTALLATION

(1) Install the shock to the spring and spring compressor, After the transfer of the necessary parts to the type of repair being done (Insulator, Spring, shock and mount).

(2) Install the shock mounting nut. Tighten the bolt to 41 N·m (30 ft.lbs.).

(3) Loosen the compressed spring.

(4) Remove the shock assembly from the spring compressor.

(5) Install the shock to the vehicle. (Refer to 2 - SUSPENSION/FRONT/SHOCK - INSTALLATION).

(6) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(7) Remove the support and lower the vehicle.

CLEVIS BRACKET

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the tire and wheel assembly.
(3) Remove the lower clevis bolt at the lower control arm. (Fig. 15)
(4) Remove the upper clevis bolt at the shock. (Fig. 15)

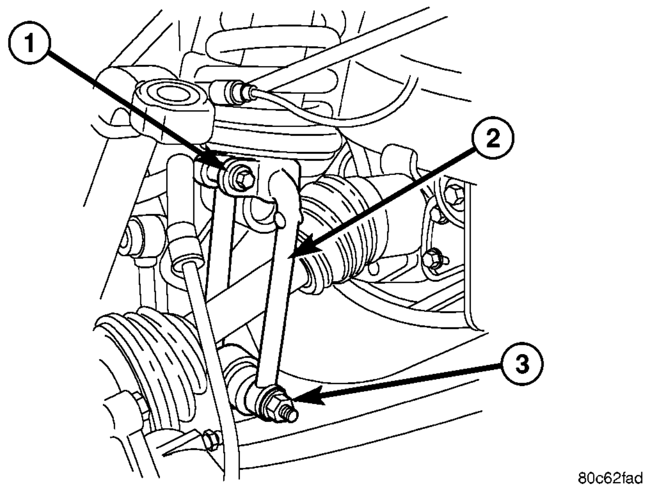


Fig. 15 CLEVIS BRACKET

1 - UPPER BOLT
2 - CLEVIS BRACKET
3 - LOWER BOLT

(5) Remove the lower stabilizer link bolt at the lower control arm.
(6) Remove the lower ball joint nut.
(7) Seperate the lower ball joint from the lower control arm using tool C-4150A.
(8) Swing the lower control arm downward to allow clearence to remove the clevis braket.
(9) Remove the clevis bracket from the vehicle.

INSTALLATION

(1) Install the clevis bracket to the shock. Tighten the bolt to 136 N·m (100 ft.lbs.) (Fig. 15).
(2) Raise the lower control arm to the lower ball joint.
(3) Install the nut to the lower ball joint. Tighten the nut to 81 N·m (60 ft.lbs.).
(4) Install the clevis bracket to the lower control arm. Tighten the bolt to 150 N·m (110 ft.lbs.).
(5) Install the lower stabilizer link bolt at the lower control arm. Tighten the bolt to 115 N·m (85 ft.lbs.).
(6) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
(7) Lower the vehicle.

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the tire and wheel assembly.
(3) Remove the upper stabilizer link bolts at the stabilizer bar.
(4) Remove the stabilizer bar bushing clamps from the frame (Fig. 16).
(5) Remove the stabilizer bar from the vehicle.

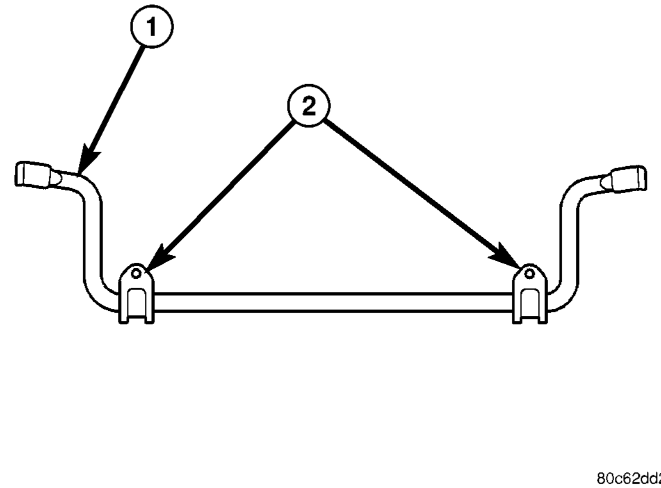


Fig. 16 SWAY BAR

1 - SWAY BAR
2 - SWAY BAR BUSHINGS

INSTALLATION

(1) Install the stabilizer bar to the vehicle.
(2) Install the stabilizer bar bushing clamps (Fig. 16). Tighten the nuts to 149 N·m (110 ft.lbs.).
(3) Install the upper stabilizer link bolts and washer at the stabilizer bar. Tighten the bolt to 136 N·m (100 ft.lbs.).
(4) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
(5) Lower the vehicle.

STABILIZER LINK

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

(3) Remove the lower stabilizer link bolt at the lower control arm.

(4) Remove the upper stabilizer link bolt at the stabilizer bar.

(5) Remove the stabilizer link. (Fig. 17)

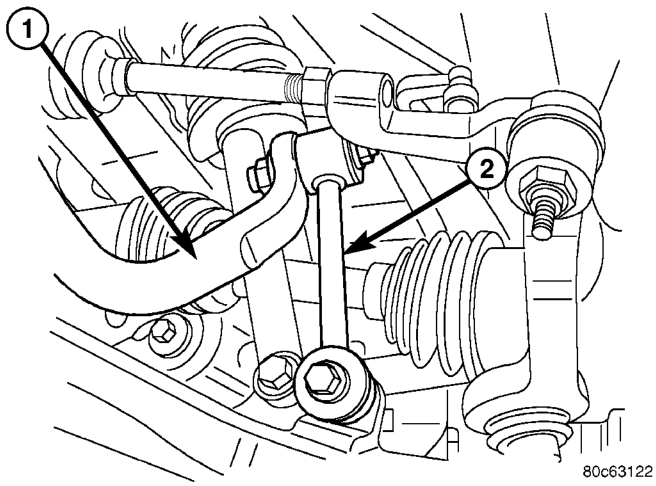


Fig. 17 STABILIZER BAR LINK

1 - STABILIZER BAR
2 - STABILIZER BAR LINK

INSTALLATION

(1) Install the stabilizer link (Fig. 17).

(2) Install the upper stabilizer link bolt and washer at the stabilizer bar. Tighten the bolt to 136 N·m (100 ft.lbs.).

(3) Install the lower stabilizer link bolt and washer at the lower control arm. Tighten the nut to 115 N·m (85 ft.lbs.).

(4) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

UPPER CONTROL ARM

REMOVAL

REMOVAL - RIGHT SIDE

(1) Raise and support the vehicle.

(2) Remove the right side tire and wheel assembly.

(3) Remove the upper ball joint nut.

(4) Separate the upper ball joint from the steering knuckle using tool C-4150A.

(5) Lower the vehicle.

(6) Remove the air box (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).

(7) Remove the cruise control servo mounting nuts.

(8) Remove the upper control arm rear bolt.

(9) Remove the upper control arm front bolt.

(10) Remove the upper control arm from the vehicle.

REMOVAL - LEFT SIDE

(1) Raise and support the vehicle.

(2) Remove the left side tire and wheel assembly.

(3) Remove the upper ball joint nut.

(4) Separate the upper ball joint from the steering knuckle using tool C-4150A.

(5) Lower the vehicle.

(6) Remove the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).

(7) Unclip the power center and move it to the side out of the way.

(8) Remove the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - REMOVAL).

(9) Disconnect the battery temperature sensor from the battery tray.

(10) Remove the upper control arm rear bolt by using a ratchet and extension under the steering shaft and positioned by the power steering reservoir. (Fig. 18)

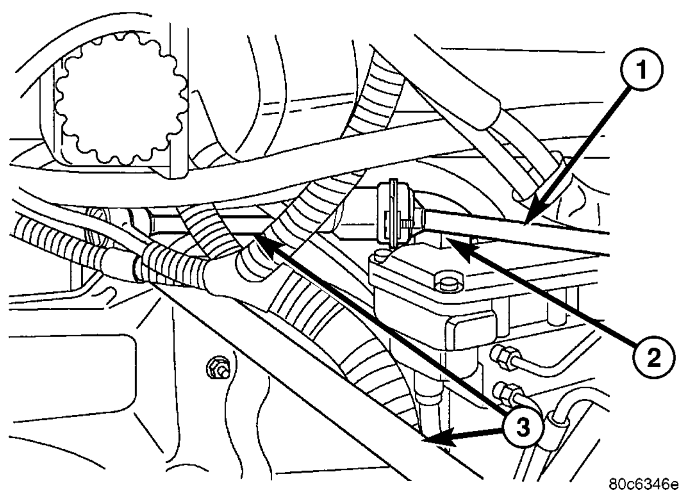


Fig. 18 REAR BOLT

1 - STEERING SHAFT
2 - REAR BOLT
3 - RATCHET WITH AN EXTENSION

(11) Remove the upper control arm front bolt.

(12) Remove the upper control arm from the vehicle.

UPPER CONTROL ARM (Continued)

INSTALLATION

INSTALLATION - RIGHT SIDE

(1) Install the upper control arm to the vehicle.

(2) Install the upper control arm front bolt. Tighten the bolt to 122 N·m (90 ft.lbs.).

(3) Install the upper control arm rear bolt. Tighten the bolt to 122 N·m (90 ft.lbs.).

(4) Install the cruise control servo mounting nuts.

(5) Install the air box (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - INSTALLATION).

(6) Install the upper ball joint nut. Tighten the nut to 81 N·m (60 ft.lbs.).

(7) Install the right side tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(8) Lower the vehicle.

(9) Set the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

INSTALLATION - LEFT SIDE

(1) Install the upper control arm to the vehicle.

(2) Install the upper control arm front bolt (Fig. 19). Tighten the bolt to 122 N·m (90 ft.lbs.).

(3) Install the upper control arm rear bolt (Fig. 19). Tighten the bolt to 122 N·m (90 ft.lbs.).

(4) Reconnect the battery temperature sensor to the battery tray.

(5) Install the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - INSTALLATION).

(6) Install the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

(7) Reclip and mount the power center.

(8) Install the upper ball joint nut (Fig. 19). Tighten the nut to 81 N·m (60 ft.lbs.).

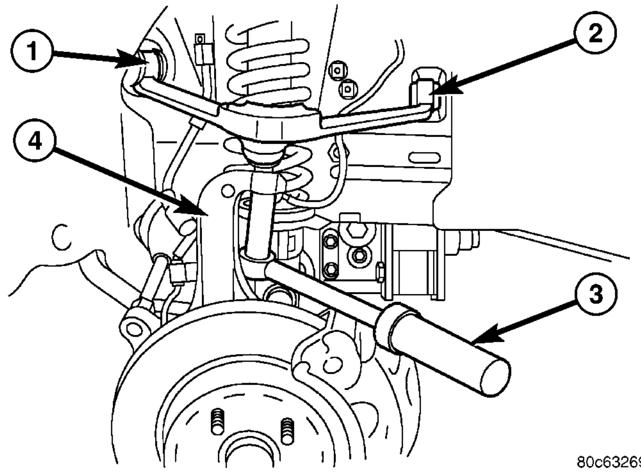


Fig. 19 UPPER CONTROL ARM

1 - FRONT PIVOT BOLT
2 - REAR PIVOT BOLT
3 - RATCHET TOOL
4 - STEERING KNUCKLE

(9) Install the left side tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(10) Lower the vehicle.

(11) Set the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

REAR

TABLE OF CONTENTS

REAR

DESCRIPTION

The rear suspension (Fig. 1) is comprised of :

- Drive axle
- Shock absorbers
- Coil springs
- Lower suspension arms
- Upper suspension arm
- Stabilizer bar

CAUTION: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. This will maintain vehicle ride comfort and prevent premature bushing wear.

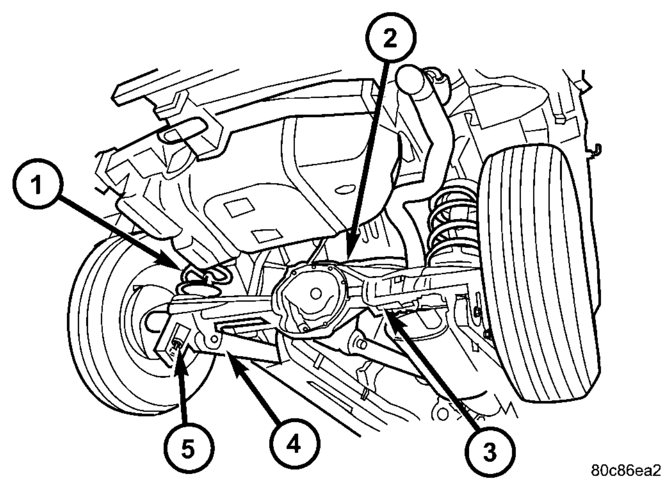


Fig. 1 REAR SUSPENSION

1 - COIL SPRING
2 - UPPER SUSPENSION ARM
3 - STABILIZER BAR
4 - LOWER SUSPENSION ARM
5 - SHOCK

REAR (Continued)

WARNING

WARNING: SUSPENSION COMPONENTS WITH RUBBER BUSHINGS MUST BE TIGHTENED WITH THE VEHICLE AT NORMAL RIDE HEIGHT. IT IS IMPORTANT TO HAVE THE SPRINGS SUPPORTING THE WEIGHT OF THE VEHICLE WHEN THE FASTENERS ARE TORQUED. IF SPRINGS ARE NOT AT THEIR NORMAL RIDE POSITION, VEHICLE RIDE COMFORT WILL BE AFFECTED AND CAUSE PREMATURE BUSHING WEAR.

DIAGNOSIS AND TESTING - REAR SUSPENSION

CONDITION	POSSIBLE CAUSES	CORRECTION
VEHICLE INSTABILITY	1. Loose or worn wheel bearings. 2. Loose, worn or bent suspension components. 3. Tire pressure.	1. Replace wheel bearings. 2. Inspect, tighten or replace components as necessary. 3. Adjust tire pressure.
VEHICLE PULLS TO ONE SIDE	1. Weak or broken spring. 2. Alignment. 3.Tires. 4. Brakes.	1. Replace spring. 2. Align vehicle to specifications. 3. Replace tires. 4. Repair as necassary.
KNOCKING, RATTLING OR SQUEAKING	1. Worn shock bushings. 2. Loose shock mounting. 3. Shock valve. 4. Loose upper ball joint. 5. Loose, worn or bent suspension components.	1. Replace shock. 2. Tighten to specifications. 3. Replace shock. 4. Replace ball joint. 5. Inspect, tighten or replace components as necessary.
IMPROPER TRACKING	1. Loose, worn or bent suspension components. 2. Bent axle.	1. Inspect, tighten or replace components as necessary. 2.Replace axle.

SPECIFICATIONS

TORQUE CHART

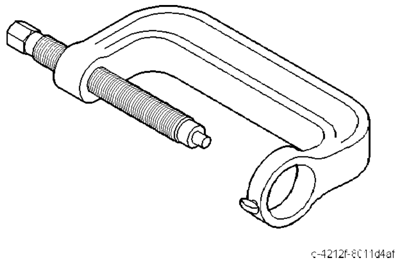
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Shock Absorber Upper Nut	108	80	—
Shock Absorber Lower Nut	115	85	—
Suspension Arm Upper Ball Joint Nut	95	70	—
Suspension Arm Upper Frame Bolts	100	74	—
Rear Upper Ball Joint Bracket Bolts	136	100	—
Suspension Arms Lower Body/Axle Bracket Nut	163	120	—
Suspension Arms Lower Frame Bracket Nut	163	120	—
Stabilizer Bar Bolts	99	73	—

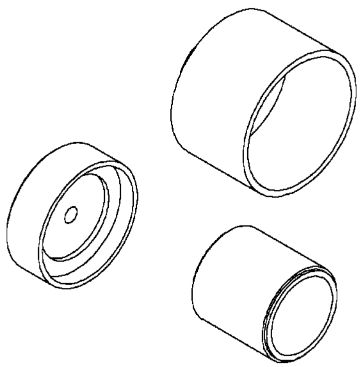
REAR (Continued)

SPECIAL TOOLS

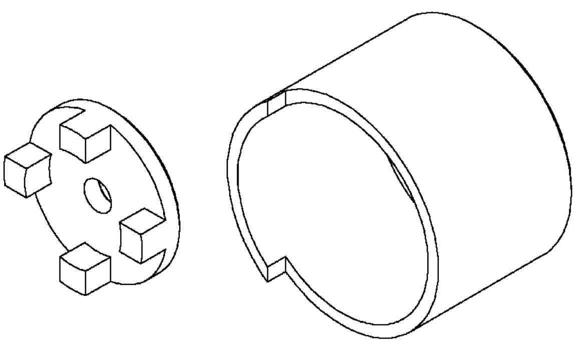
REAR SUSPENSION



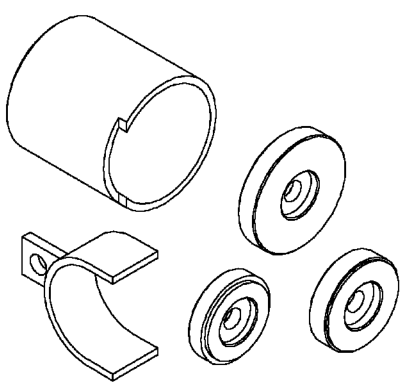
BALL JOINT PRESS - C-4212F



REMOVER / INSTALLER REAR UPPER BALL JOINT - 8861



REMOVAL / INSTALLATION REAR UPPER CONTROL ARM BUSHINGS - 8860



REAR LOWER CONTROL ARM BUSHING REMOVER/INSTALLER - 8862

SHOCK

REMOVAL

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support the axle.

CAUTION: Do not allow the axle to hang from the upper suspension arm ball joint.

(2) Remove the upper nut and bolt from the frame bracket (Fig. 2).

(3) Remove the lower nut and bolt from the axle bracket. Remove the shock absorber.

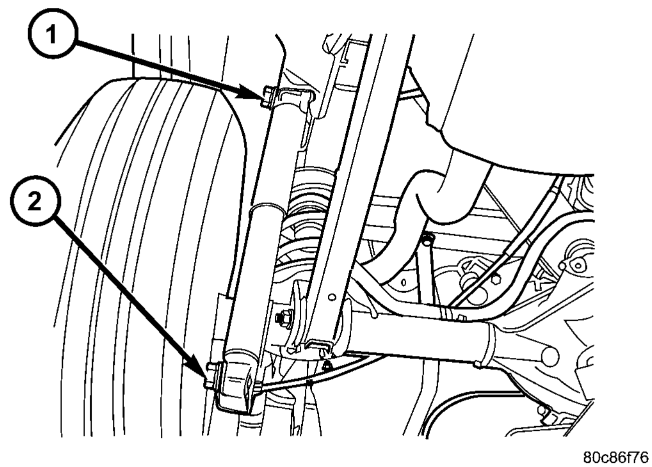


Fig. 2 SHOCK ABSORBER

1 - UPPER MOUNTING BOLT
2 - LOWER MOUNTING BOLT

INSTALLATION

(1) Install the shock absorber in the frame bracket and install the bolt and nut (Fig. 2).

(2) Install the shock absorber in the axle bracket and install the bolt and nut (Fig. 2).

(3) Remove the supports and lower the vehicle.

(4) Tighten the upper mounting nuts to 108 N·m (80 ft. lbs.). Tighten the lower mounting nuts to 115 N·m (85 ft. lbs.).

SPRING

REMOVAL

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support the axle.

(2) Remove the shock absorber lower bolt from the axle bracket.

(3) Lower the hydraulic jack and tilt the axle and remove the coil spring (Fig. 3).

(4) Remove and inspect the upper and lower spring isolators (Fig. 3).

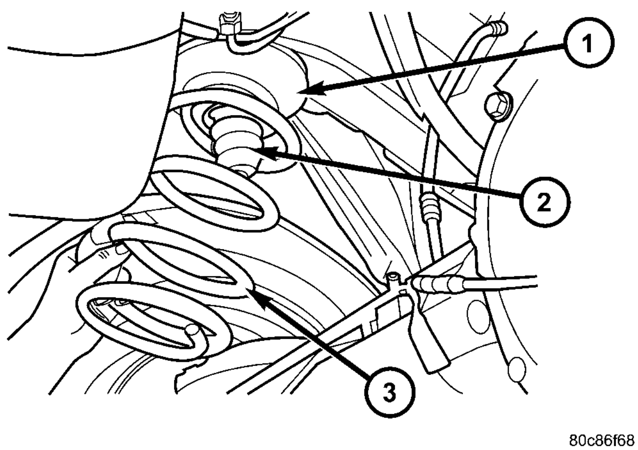


Fig. 3 COIL SPRING

1 - UPPER INSULATOR
2 - JOUNCE BUMPER
3 - COIL SPRING

INSTALLATION

(1) Install the upper isolator (Fig. 3).

(2) Install the lower isolator (Fig. 3).

(3) Pull down on the axle and position the coil spring in the lower isolator.

CAUTION: Ensure the spring is positioned on the lower isolator.

(4) Raise the axle with the hydraulic jack.

(5) Install the shock absorber to the axle bracket and tighten to 115 N·m (85 ft. lbs.).

(6) Remove the supports and lower the vehicle.

(7) Tighten the stabilizer bar links to 99 N·m (73 ft. lbs.).

JOUNCE BUMPER

REMOVAL

(1) Remove the shock (Refer to 2 - SUSPENSION/REAR/SHOCK - REMOVAL).

(2) Remove the coil spring (Refer to 2 - SUSPENSION/REAR/SPRING - REMOVAL).

(3) Pull the jounce bumper downwards to remove. (Fig. 4)

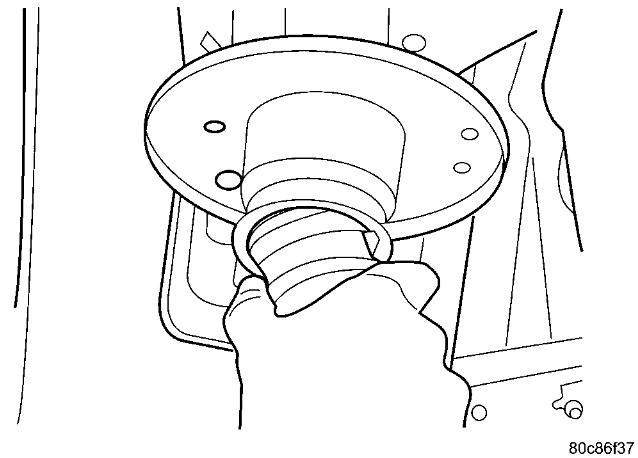


Fig. 4 JOUNCE BUMPER

INSTALLATION

(1) Install the jounce bumper into the mount by twisting the bumper into place (Fig. 4).

(2) Install the coil spring (Refer to 2 - SUSPENSION/REAR/SPRING - INSTALLATION).

(3) Install the shock (Refer to 2 - SUSPENSION/REAR/SHOCK - INSTALLATION).

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the stabilizer bar bolts from the lower suspension arm. (Fig. 5).

(3) Remove the stabilizer bar.

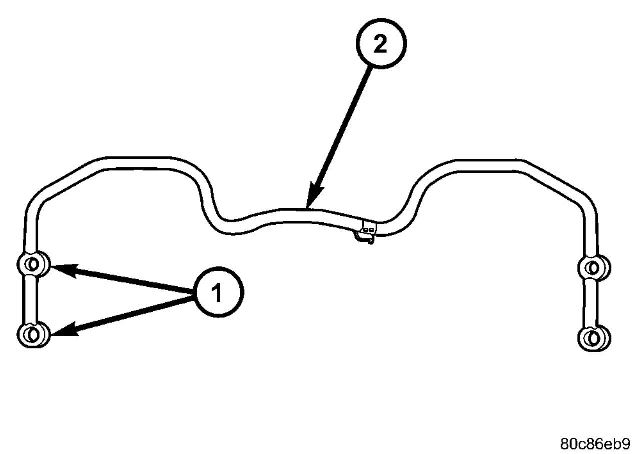


Fig. 5 REAR STABILIZER BAR

1 - MOUNTING HOLES
2 - STABILIZER BAR

STABILIZER BAR (Continued)

INSTALLATION

(1) Position the stabilizer bar over the axle and install the bolts to the lower suspension arm (Fig. 6). Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 99 N·m (73 ft. lbs.).

(2) Remove support and lower the vehicle.

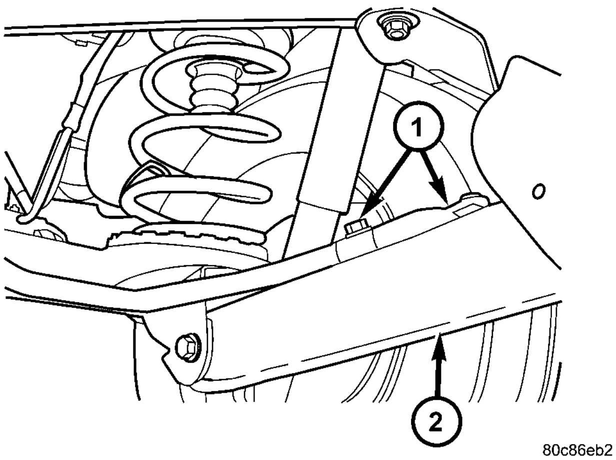


Fig. 6 STABILIZER BAR MOUNTS

1 - STABILIZER BAR MOUNTING BOLTS
2 - LOWER SUSPENSION ARM

UPPER BALL JOINT

REMOVAL

(1) Raise and support the vehicle.

(2) Support the rear axle with a hydraulic jack.

(3) Remove the ball joint pinch bolt from the top of the axle. (Fig. 7)

(4) Separate the ball joint arm assembly from the differential housing by prying upwards.

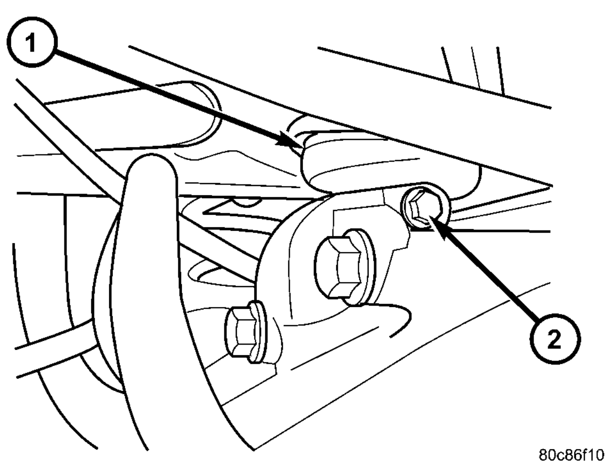


Fig. 7 BALL JOINT PINCH BOLT

1 - UPPER BALL JOINT
2 - PINCH BOLT

(5) Remove the upper suspension arm from the vehicle (Refer to 2 - SUSPENSION/REAR/UPPER CONTROL ARM - REMOVAL).

(6) Secure the suspension arm in a vise.

(7) Install special tools C-4212F (press), 8861-3 (driver) and 8861-2 (receiver) (Fig. 8)

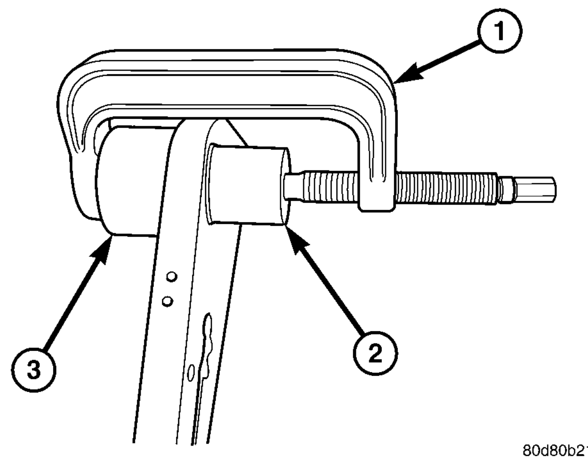


Fig. 8 UPPER BALL JOINT - REMOVAL

1 - C-4212F PRESS
2 - 8861-3 DRIVER
3 - 8861-2 RECEIVER

(8) Press out the old ball joint.

INSTALLATION

(1) Install special tools C-4212F (press), 8861-1 (receiver) and 8861-2 (driver) with the ball joint in place (Fig. 9).

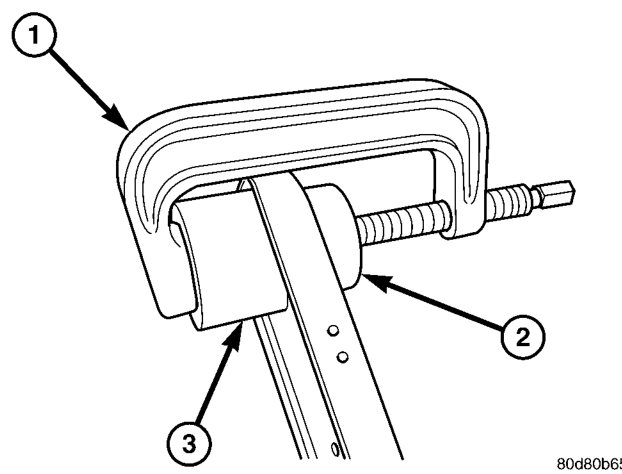


Fig. 9 UPPER BALL JOINT - INSTALLATION

1 - C-4212F PRESS
2 - 8861-1 RECEIVER
3 - 8861-2 DRIVER

(2) Press the ball joint in the upper suspension arm.

UPPER BALL JOINT (Continued)

(3) Remove the upper suspension arm from the vise.

(4) Reinstall the upper suspension arm (Refer to 2 - SUSPENSION/REAR/UPPER CONTROL ARM - INSTALLATION).

(5) Raise the rear axle with a hydraulic jack to align the ball joint with the differential housing bracket.

(6) Insert the ball joint into the differential housing bracket.

(7) Install the ball joint pinch bolt and tighten to 95 N·m (70 ft. lbs.). (Fig. 7).

(8) Remove the supports and lower the vehicle.

UPPER CONTROL ARM

DESCRIPTION - UPPER SUSPENSION ARM, BUSHINGS, AND BALL JOINT

The suspension arm uses vertical spool bushings to isolate road noise. The suspension arm is bolted through bushings to cage nuts in the body and a ball joint to the top of the differential housing.

OPERATION - UPPER SUSPENSION ARM, BUSHINGS, AND BALL JOINT

The upper suspension arm provides fore/aft and lateral location of the rear axle. The suspension arm travel is limited through the use of jounce bumpers in compression and shock absorbers in rebound.

REMOVAL

(1) Raise and support the vehicle.

(2) Support the rear axle with a hydraulic jack.

(3) Remove the ball joint pinch bolt from the top of the differential housing bracket (Fig. 7).

(4) Remove partial nuts from the heat shield in order to lower the shield down enough to get the proper clearence to remove the right side bolt from the body.

(5) Remove the upper suspension arm mounting bolts from the body and remove the arm (Fig. 10).

(6) Remove the support bracket mounting bolts if needed. (Fig. 11)

INSTALLATION

(1) Position the upper suspension arm in the frame rail brackets (Fig. 10).

(2) Install the mounting bolts and tighten to 100 N·m (74 ft. lbs.).

(3) Retighten the heat shield back into place.

(4) Pull the arm down on the differential housing bracket and install the pinch bolt and nut. Tighten the nut to 95 N·m (70 ft. lbs.) (Fig. 7).

(5) Remove the supports and lower the vehicle.

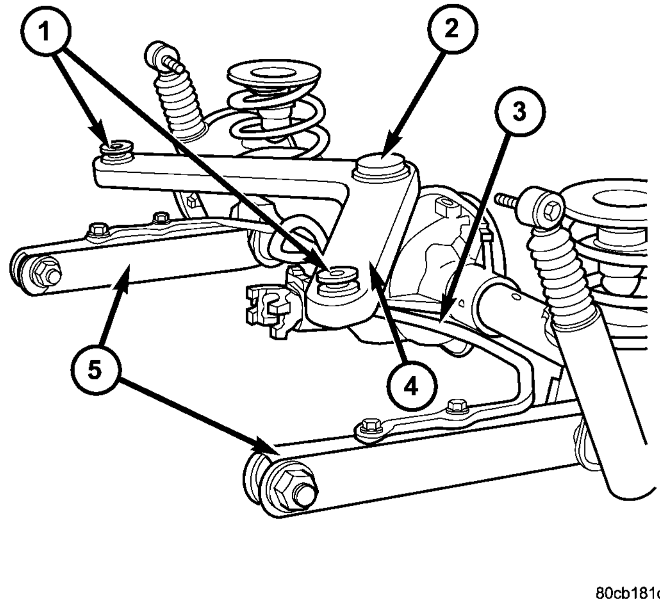


Fig. 10 UPPER CONTROL ARM

1 - BODY MOUNTS
2 - UPPER BALL JOINT
3 - STABILIZER BAR
4 - UPPER CONTROL ARM
5 - LOWER CONTROL ARM

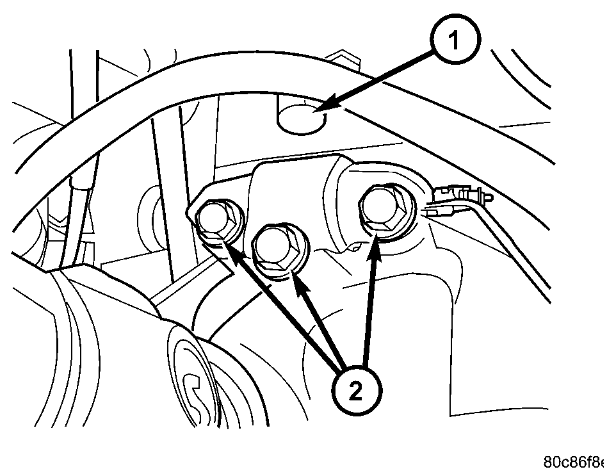


Fig. 11 BALL JOINT BRACKET

1 - UPPER BALL JOINT
2 - SUPPORT BRACKET BOLTS

LOWER CONTROL ARM

DESCRIPTION

The lower suspension arms are stamped steel and welded and use voided round bushings at the axle end and solid rubber at the body end of the arm.

OPERATION

The bushings provide isolation from the axle. The arms mount to the unibody frame rail bracket and the axle brackets. The arm and bushings provide location and react to loads.

REMOVAL

(1) Raise the vehicle and support the rear axle.

(2) Remove the stabilizer bar retaining bolts from the suspension arm.

(3) Remove the lower suspension arm nut and bolt from the axle bracket (Fig. 12).

NOTE: When removing the right side suspension arm from the frame rail it will be necessary to pry the exhaust over slightly to allow enough clearance to remove the bolt.

(4) Remove the nut and bolt (Fig. 12) from the frame rail and remove the lower suspension arm.

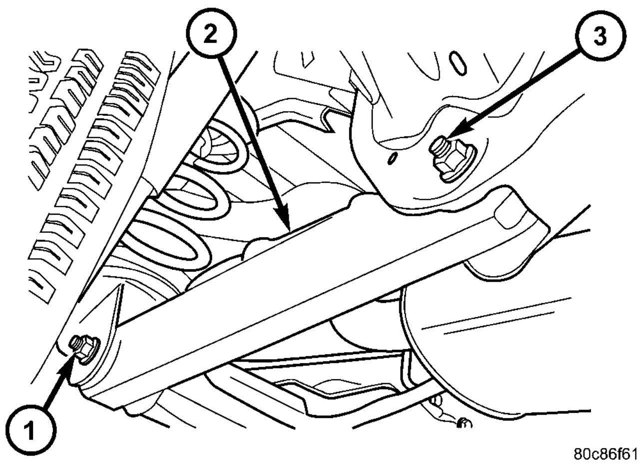


Fig. 12 LOWER SUSPENSION ARM

1 - AXLE BRACKET BOLT
2 - LOWER CONTROL ARM
3 - BODY BRACKET BOLT

INSTALLATION

(1) Position the lower suspension arm in the axle bracket and frame rail bracket.

NOTE: The end of the arm with the voided round bushing attaches to the axle bracket.

(2) Install the axle bracket bolt and nut finger tight (Fig. 12).

NOTE: When installing the right side suspension arm to the frame rail it will be necessary to pry the exhaust over slightly to allow enough clearance to install the bolt.

(3) Install the frame rail bracket bolt and nut finger tight.

(4) Install the stabilizer bar retaining bolts to the suspension arm.

(5) Remove the supports and lower the vehicle.

(6) With the vehicle on the ground tighten the nut at the frame to 163 N·m (120 ft. lbs.). Tighten the nut at the axle bracket to 163 N·m (120 ft. lbs.).

BUSHINGS

REMOVAL

REMOVAL - LOWER SUSPENSION ARM BUSHING

(1) Remove the lower suspension arm (Refer to 2 - SUSPENSION/REAR/LOWER CONTROL ARM - REMOVAL).

(2) Secure the suspension arm in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(3) Install special tools 8862-4 (receiver), 8862-5 (spacer) and 8862-1 or 8862- 2 (driver) with the threaded rod 8839 and the bearing as shown (Fig. 13)

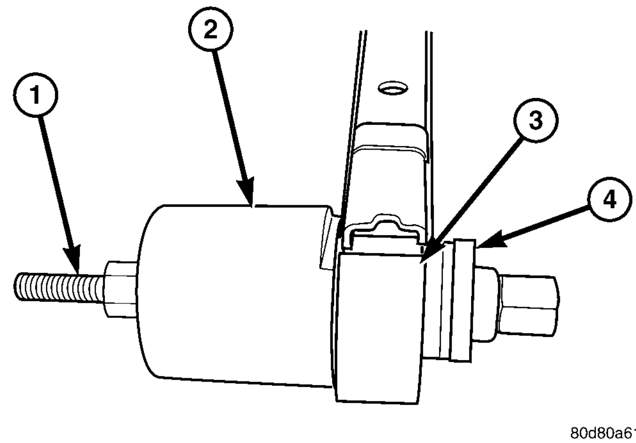


Fig. 13 LOWER SUSPENSION ARM BUSHING REMOVAL

1 - 8839 THREADED ROD
2 - 8862-4 RECEIVER
3 - 8862-5 SPACER
4 - 8862-1 OR 8862-2 DRIVERS

(4) Press out the bushing.

BUSHINGS (Continued)

REMOVAL - UPPER SUSPENSION ARM BUSHING

(1) Remove the upper suspension arm (Refer to 2 - SUSPENSION/REAR/UPPER CONTROL ARM - REMOVAL).

(2) Secure the suspension arm in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(3) Install special tools 8853-3 (driver), 8860-1 (receiver) and with the threaded rod 8838 and the bearing as shown (Fig. 14)

(4) Press out the bushing.

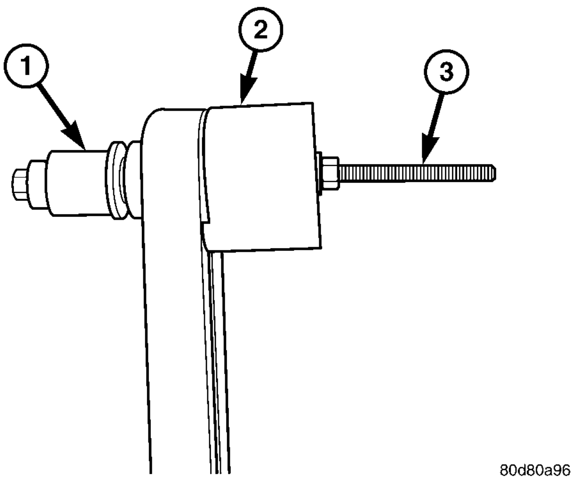


Fig. 14 UPPER SUSPENSION ARM BUSHING - REMOVAL

1 - 8853-3 DRIVER
2 - 8860-1 RECEIVER
3 - 8838 THREADED ROD

INSTALLATION

INSTALLATION - LOWER SUSPENSION ARM BUSHING

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(1) Install the new lower suspension arm bushings into the lower suspension arm using tools 8862-3 (driver), 8862-4 (receiver), 8862-5 (spacer) and the bearing with the threaded rod 8839 (Fig. 15) making sure to properly orient the bushing in the suspension arm.

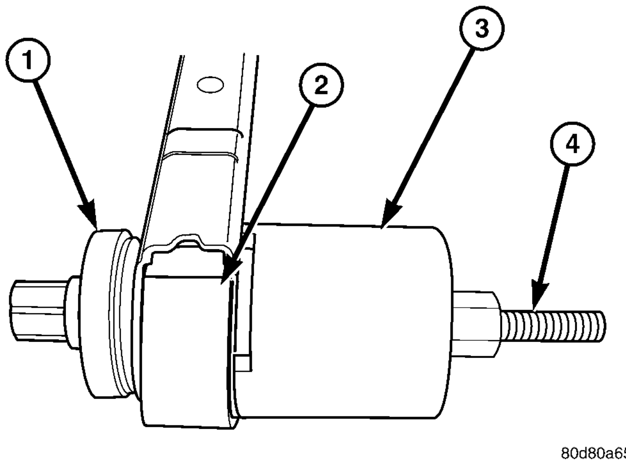


Fig. 15 LOWER SUSPENSION ARM BUSHING INSTALLATION

1 - 8862-3 DRIVER
2 - 8862-5 SPACER
3 - 8862-4 RECEIVER
4 - 8839 THREADED ROD

(2) Remove the suspension arm from the vise.

(3) Install the lower suspension arm (Refer to 2 - SUSPENSION/REAR/LOWER CONTROL ARM - INSTALLATION).

BUSHINGS (Continued)

INSTALLATION - UPPER SUSPENSION ARM BUSHING

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

(1) Install the new upper suspension arm bushings into the upper suspension arm using tools 8835-3 (receiver), 8860-2 (driver) and the bearing with the threaded rod 8838 (Fig. 16) making sure to properly orient the bushing in the suspension arm.

(2) Remove the suspension arm from the vise.

(3) Install the upper suspension arm (Refer to 2 - SUSPENSION/REAR/UPPER CONTROL ARM - INSTALLATION).

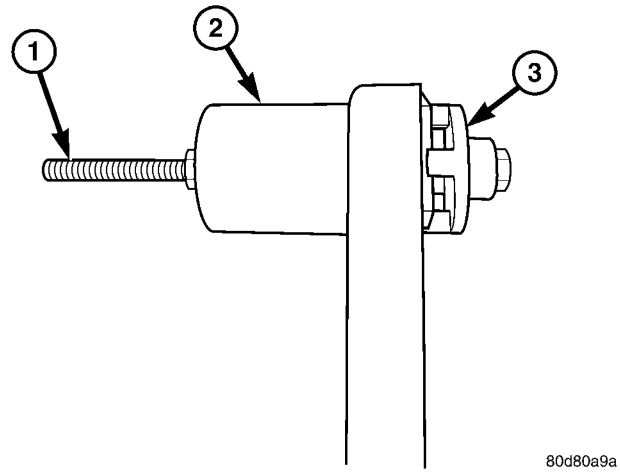


Fig. 16 UPPER SUSPENSION ARM BUSHING - INSTALLATION

1 - 8838 THREADED ROD
2 - 8835-3 RECEIVER
3 - 8860-2 DRIVER

DIFFERENTIAL & DRIVELINE

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PROPELLER SHAFT

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PROPELLER SHAFT

DIAGNOSIS AND TESTING

VIBRATION

Tires that are out-of-round, or wheels that are unbalanced, will cause a low frequency vibration.

Brake rotors that are unbalanced will cause a harsh, low frequency vibration.

Driveline vibration can also result from loose or damaged engine mounts.

Propeller shaft vibration increases as the vehicle speed is increased. A vibration that occurs within a specific speed range is not usually caused by a propeller shaft being unbalanced. Defective joints or an incorrect propeller shaft angle, are usually the cause of such a vibration.

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1. Undercoating or other foreign material on shaft.	1. Clean exterior of shaft and wash with solvent.
	2. Loose U-joint clamp screws.	2. Install new clamps and screws and tighten to proper torque.
	3. Loose or bent U-joint yoke or excessive runout.	3. Install new yoke.
	4. Incorrect driveline angularity.	4. Measure and correct driveline angles.
	5. Worn joint.	5. Install new joint.

PROPELLER SHAFT (Continued)

Drive Condition	Possible Cause	Correction
	6. Propeller shaft damaged or out of balance.	6. Installl new propeller shaft.
	7. Broken rear spring.	7. Install new rear spring.
	8. Excessive runout or unbalanced condition.	8. Re-index propeller shaft, test, and evaluate.
	9. Excessive drive pinion gear shaft runout.	9. Re-index propeller shaft and evaluate.
	10. Excessive axle yoke deflection.	10. Inspect and replace yoke if necessary.
	11. Excessive transfer case runout.	11. Inspect and repair as necessary.
Joint Noise	1. Loose U-joint clamp screws.	1. Install new clamps and screws and tighten to proper torque.
	2. Lack of lubrication.	2. Replace joints as necessary.

BALANCE

NOTE: Removing and re-indexing the propeller shaft 180° relative to the yoke may eliminate some vibrations.

If propeller shaft is suspected of being unbalanced, it can be verified with the following procedure:

(1) Raise the vehicle.

(2) Clean all the foreign material from the propeller shaft and the universal joints.

(3) Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**

(4) Inspect the universal joints to ensure that they are not worn, are properly installed, and are correctly aligned with the shaft.

(5) Check the universal joint clamp screws torque.

(6) Remove the wheels and tires. Install the wheel lug nuts to retain the brake drums or rotors.

(7) Mark and number the shaft six inches from the yoke end at four positions 90° apart.

(8) Run and accelerate the vehicle until vibration occurs. Note the intensity and speed the vibration occurred. Stop the engine.

(9) Install a screw clamp at position 1 (Fig. 1).

(10) Start the engine and re-check for vibration. If there is little or no change in vibration, move the clamp to one of the other three positions. Repeat the vibration test.

(11) If there is no difference in vibration at the other positions, the source of the vibration may not be propeller shaft.

(12) If the vibration decreased, install a second clamp (Fig. 2) and repeat the test.

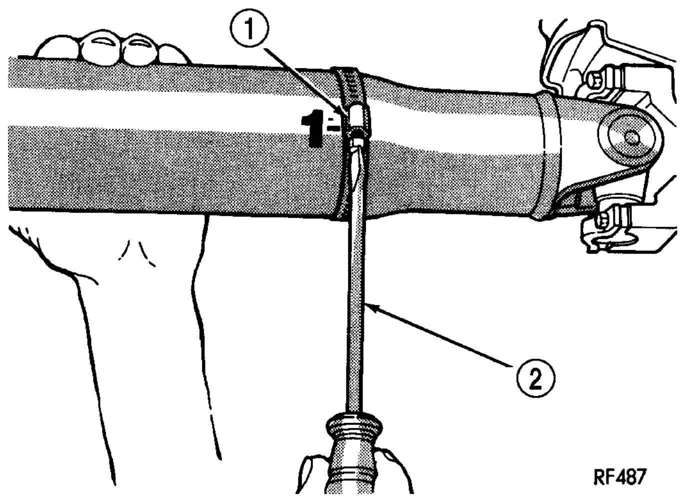


Fig. 1 CLAMP AT POSITION 1

1 - CLAMP
2 - SCREWDRIVER

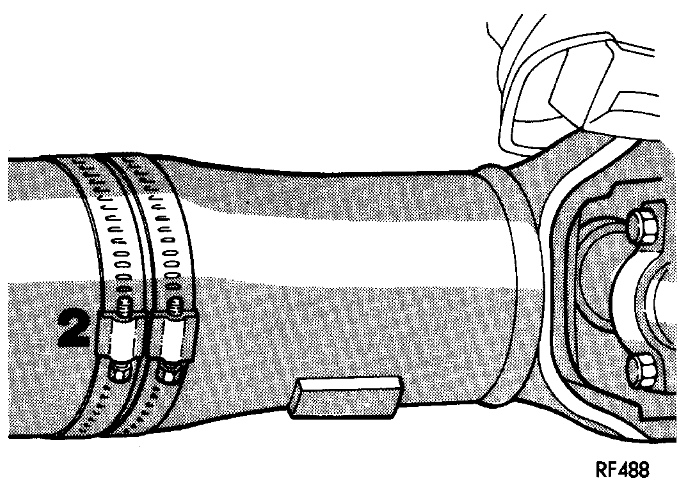


Fig. 2 TWO CLAMPS AT SAME POSITION

PROPELLER SHAFT (Continued)

(13) If the additional clamp causes an additional vibration, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 3).

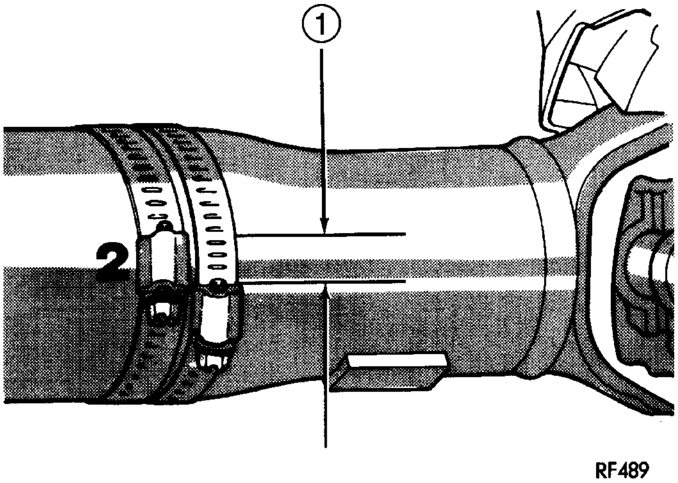


Fig. 3 CLAMPS SEPARATED

1 - ½ INCH

(14) Increase distance between the clamp screws and repeat the test until the amount of vibration is at the lowest level. Bend the slack end of the clamps so the screws will not loosen.

(15) If the vibration remains unacceptable, apply the same steps to the front end of the propeller shaft.

(16) Install the wheel and tires. Lower the vehicle.

RUNOUT

(1) Remove dirt, rust, paint and undercoating from the propeller shaft surface where the dial indicator will contact the shaft.

(2) The dial indicator must be installed perpendicular to the shaft surface.

(3) Measure runout at the center and ends of the shaft sufficiently far away from weld areas to ensure that the effects of the weld process will not enter into the measurements.

(4) Refer to Runout Specifications chart.

(5) If the propeller shaft runout is out of specification, remove the propeller shaft, index the shaft 180°, and re-install the propeller shaft. Measure shaft runout again.

(6) If the propeller shaft runout is now within specifications, mark the shaft and yokes for proper orientation.

(7) If the propeller shaft runout is not within specifications, verify that the runout of the transmission/transfer case and axle are within specifications. Correct as necessary and re-measure propeller shaft runout.

(8) Replace the propeller shaft if the runout still exceeds the limits.

RUNOUT SPECIFICATIONS

Front of Shaft	0.020 in. (0.50 mm)
Center of Shaft	0.025 in. (0.63 mm)
Rear of Shaft	0.020 in. (0.50 mm)
note: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. For tube lengths under 30 inches, the maximum allowed runout is 0.020 in. (0.50 mm) for the full length of the tube.	

STANDARD PROCEDURE

STANDARD PROCEDURES

This procedure applies to both the front propeller shafts and the rear propeller shaft. To obtain the front (output) angle on the C/V front propeller shaft, the inclinometer is placed on the machined ring of the pinion flange. To obtain the propeller shaft angle measurement on the C/V front propeller shaft, the inclinometer is placed on the propeller shaft tube.

PROPELLER SHAFT ANGLE

(1) Raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn.

(2) Remove any external bearing snap rings from universal joint if equipped, so the inclinometer base will sits flat.

(3) Rotate the shaft until transmission/transfer case output yoke bearing cap is facing downward, if necessary.

NOTE: Always make measurements from front to rear.

PROPELLER SHAFT (Continued)

(4) Place Inclinometer on yoke bearing cap, or the pinion flange ring, (A) parallel to the shaft (Fig. 4). Center bubble in sight glass and record measurement.

NOTE: This measurement will give you the transmission or Output Yoke Angle (A).

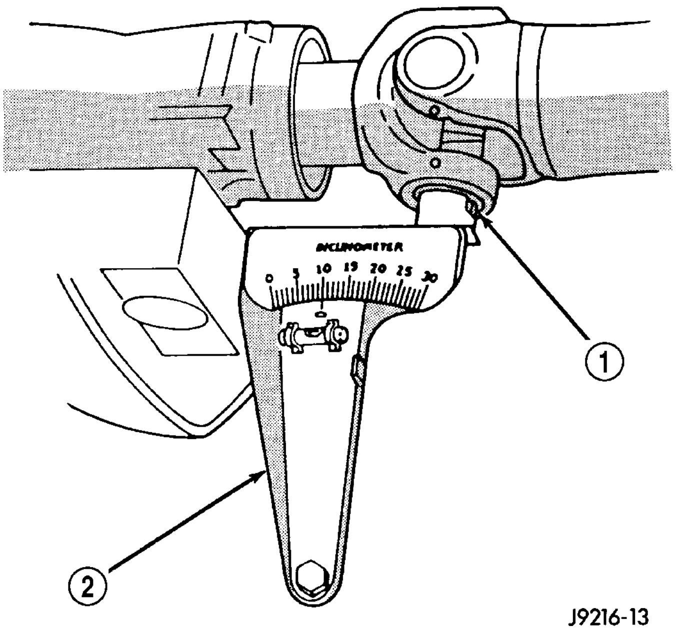


Fig. 4 OUTPUT YOKE ANGLE (A)

1 - SLIP YOKE BEARING CAP
2 - INCLINOMETER

(5) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap, or propeller shaft tube on C/V propeller shaft, parallel to the shaft (Fig. 5). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

NOTE: This measurement will give you the propeller shaft angle (C).

(6) Subtract smaller figure from larger (C minus A) to obtain transmission output operating angle.

(7) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing cap parallel to the shaft (Fig. 6). Center bubble in sight glass and record measurement.

NOTE: This measurement will give you the pinion shaft or input yoke angle (B).

(8) Subtract smaller figure from larger (C minus B) to obtain axle Input Operating Angle.

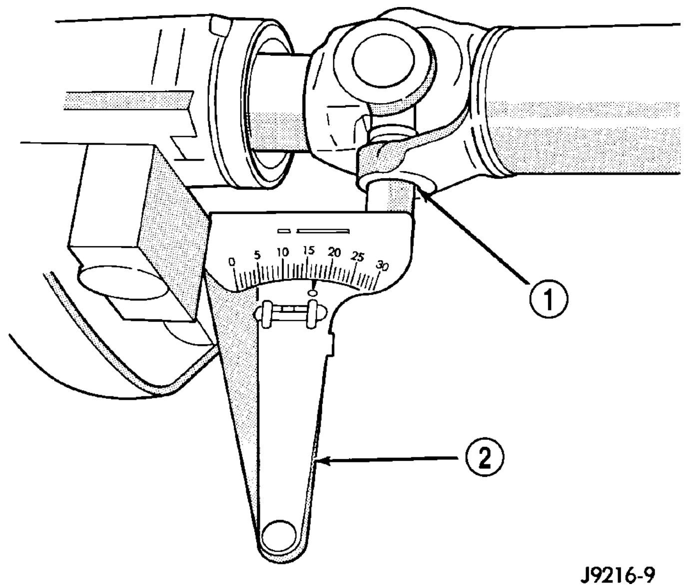


Fig. 5 PROPELLER SHAFT ANGLE (C)

1 - SHAFT YOKE BEARING CAP
2 - INCLINOMETER

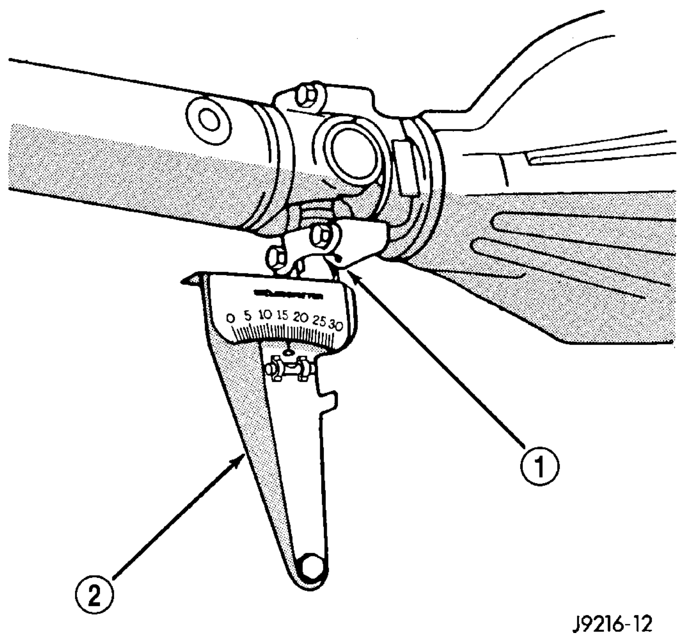


Fig. 6 INPUT YOKE ANGLE (B)

1 - PINION YOKE BEARING CAP
2 - INCLINOMETER

Refer to rules given below and the example in (Fig. 7) for additional information.

- Good cancellation of U-joint operating angles (within 1°).
- Operating angles less than 3°.
- Operating angles less than 10° for double cardan U-joint.
- At least 1/2 of one degree continuous operating (propeller shaft) angle.

PROPELLER SHAFT (Continued)

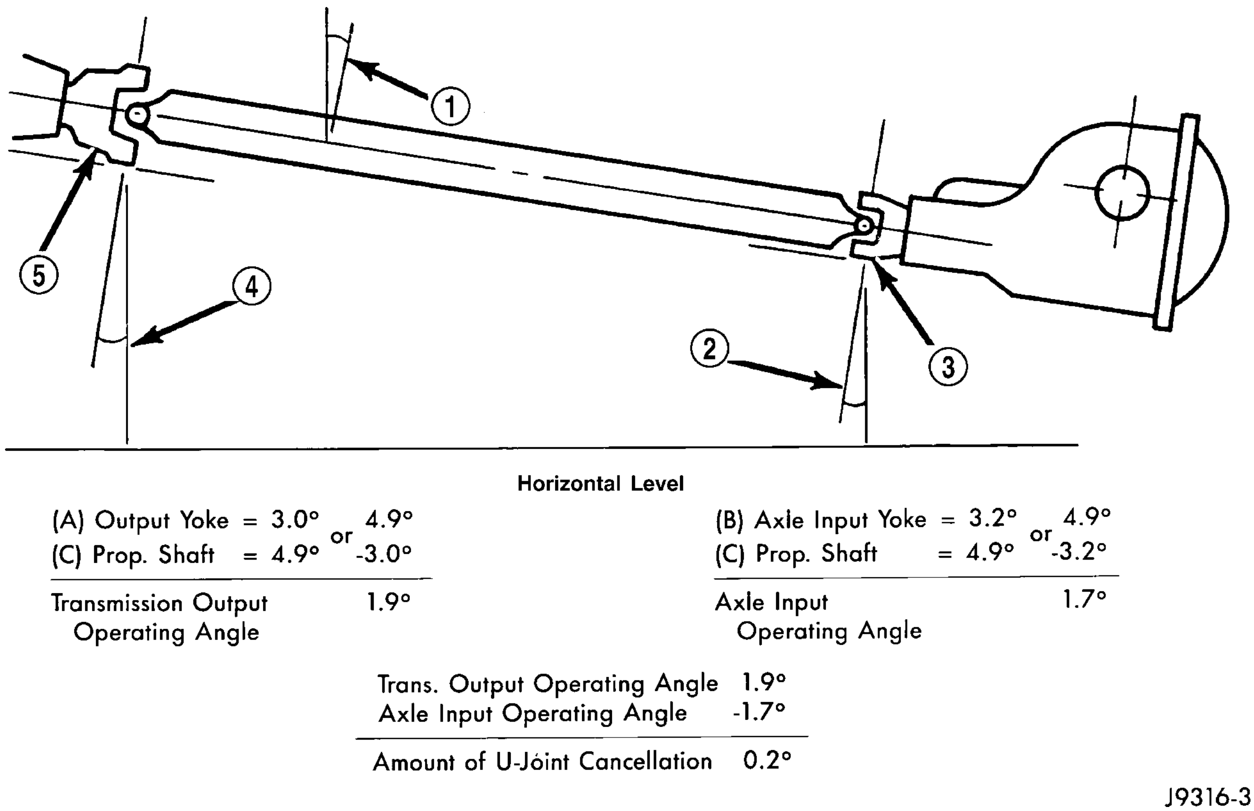


Fig. 7 U-JOINT ANGLE EXAMPLE

1 - 4.9° Angle (C)
2 - 3.2° Angle (B)
3 - Input Yoke
4 - 3.0° Angle (A)
5 - Output Yoke

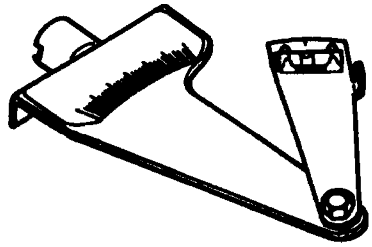
SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front Shaft - Companion Flange Bolts	30	22	-
Rear Shaft - Yoke Nuts	18	13	-

PROPELLER SHAFT (Continued)

SPECIAL TOOLS



INCLINOMETER 7663

PROPELLER SHAFT - FRONT

REMOVAL

REMOVAL - 2.5L DIESEL

(1) Shift transmission and transfer case into Neutral.

(2) Raise and support the vehicle.

(3) Remove left side exhaust flange bolts (Fig. 8).

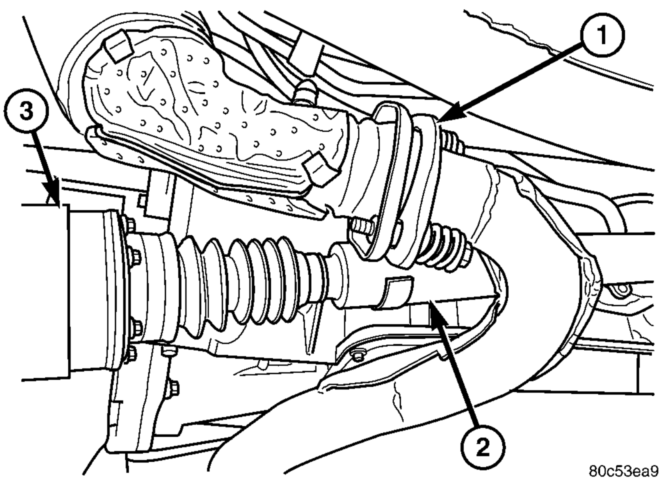


Fig. 8 LEFT EXHAUST FLANGE

1 - EXHAUST FLANGE
2 - FRONT PROPELLER SHAFT
3 - COMPANION FLANGE

(4) Mark companion flanges and C/V joints at the front and rear of the propeller shaft for installation reference.

(5) Remove bolts from the front and rear C/V joints.

(6) Push propeller shaft forward to clear transfer case companion flange (Fig. 9).

(7) Remove the shaft from the front axle companion flange.

(8) Pull down on the exhaust and tilt the front of the shaft down and pull shaft forward and remove from the vehicle.

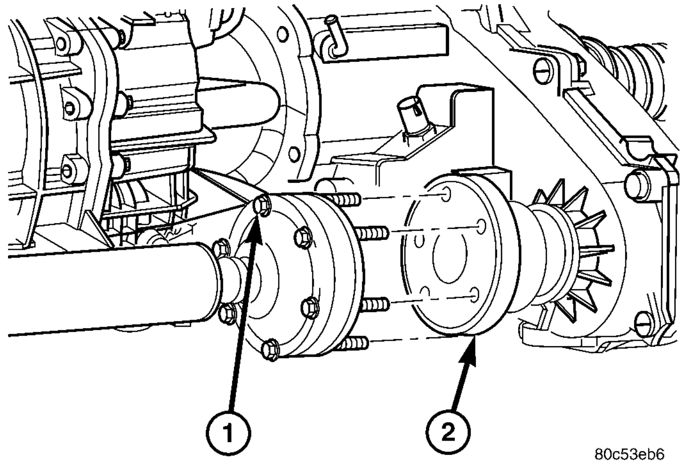


Fig. 9 TRANSFER CASE COMPANION FLANGE

1 - FLANGE BOLT
2 - COMPANION FLANGE

REMOVAL

(1) Shift transmission and transfer case into Neutral.

(2) Raise and support the vehicle.

(3) Mark companion flanges and C/V joints at the front and rear of the propeller shaft for installation reference.

(4) Remove bolts from the front and rear C/V joints.

(5) Push propeller shaft forward to clear transfer case companion flange (Fig. 10).

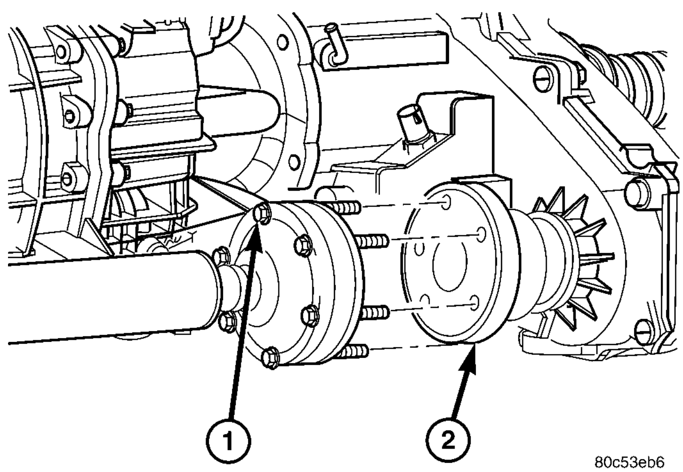


Fig. 10 TRANSFER CASE COMPANION FLANGE

1 - FLANGE BOLT
2 - COMPANION FLANGE

(6) Remove the shaft from the front axle companion flange.

(7) Tilt the front of the shaft down and pull shaft forward and remove from the vehicle.

PROPELLER SHAFT - FRONT (Continued)

INSTALLATION

INSTALLATION - 2.5L DIESEL

(1) Install propeller shaft between companion flanges.
(2) Align marks on the companion flanges with the marks on the C/V joints.
(3) Install front C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).
(4) Install rear C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).
(5) Install exhaust flange and bolts.
(6) Lower vehicle.

INSTALLATION

(1) Install propeller shaft between companion flanges.
(2) Align marks on the companion flanges with the marks on the C/V joints.
(3) Install front C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).
(4) Install rear C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).
(5) Lower vehicle.

PROPELLER SHAFT - REAR

REMOVAL

(1) Shift the transmission/transfer case into Neutral.
(2) Raise and support vehicle.
(3) Mark a reference line across the pinion yoke and propeller shaft for installation.
(4) Remove U-joint strap bolts at the pinion shaft yoke.
(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 11), if equipped.
(6) Slide slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 12).

INSTALLATION

(1) Slide slip yoke on the transmission/transfer case output shaft.
(2) Align reference marks on the pinion yoke and propeller shaft.
(3) Install U-joint straps and tighten strap bolts to 18 N·m (13 ft. lbs.).

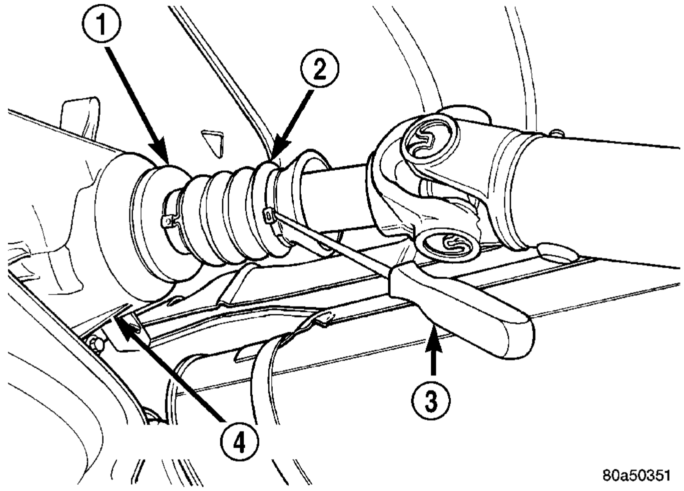


Fig. 11 DUST BOOT CLAMP

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

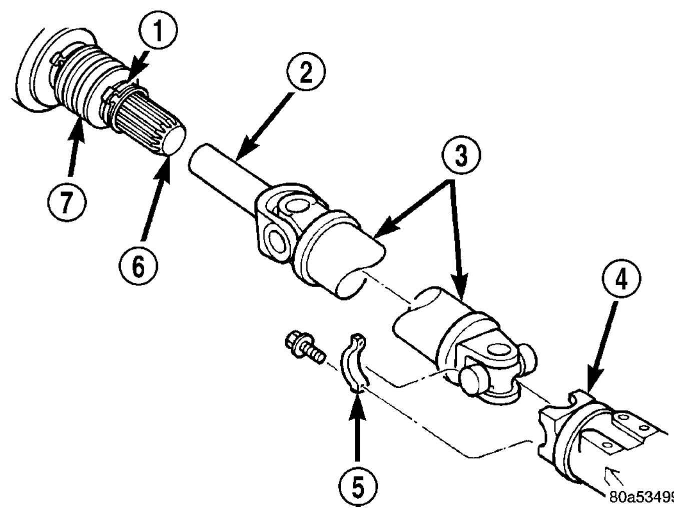


Fig. 12 REAR PROPELLER SHAFT

1 - CLAMP
2 - YOKE
3 - PROPELLER SHAFT
4 - AXLE YOKE
5 - CLAMP
6 - OUTPUT SHAFT
7 - BOOT

(4) Tighten dust boot clamp if equipped with Clamp C-4975A (Fig. 13).
(5) Remove support and lower the vehicle.

PROPELLER SHAFT - REAR (Continued)

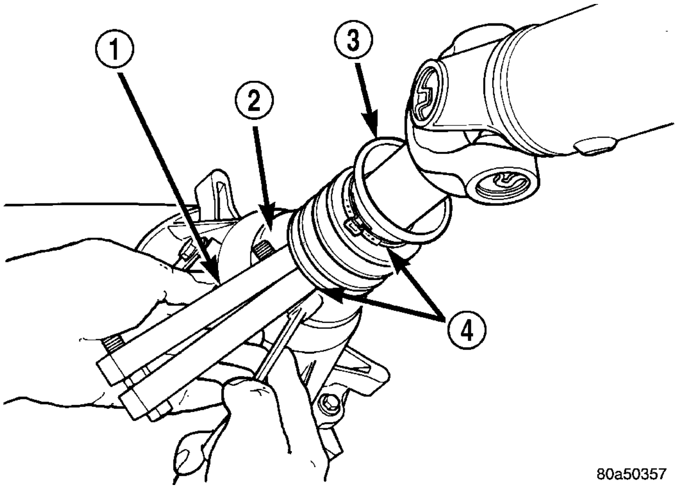


Fig. 13 CRIMPING BOOT CLAMP

1 - CLAMP TOOL
2 - SLINGER
3 - BOOT
4 - CLAMPS

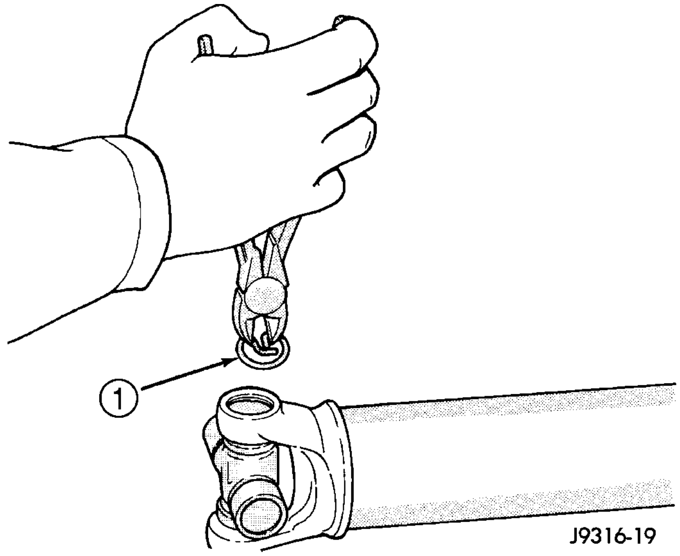


Fig. 14 REMOVE SNAP RING

1 - SNAP RING

SINGLE CARDAN UNIVERSAL JOINTS

DISASSEMBLY

NOTE: Individual components of cardan universal joints are not serviceable. If worn or leaking, they must be replaced as an assembly.

(1) Remove the propeller shaft.

(2) Tap the outside of the bearing cap assembly with a drift to loosen snap ring.

(3) Remove snap rings from both sides of yoke (Fig. 14).

(4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.

(5) Position the yoke with the grease fitting, if equipped, pointing up.

(6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 15).

(7) If the bearing cap will not pull out of the yoke by hand after pressing, tap the yoke ear near the bearing cap to dislodge the cap.

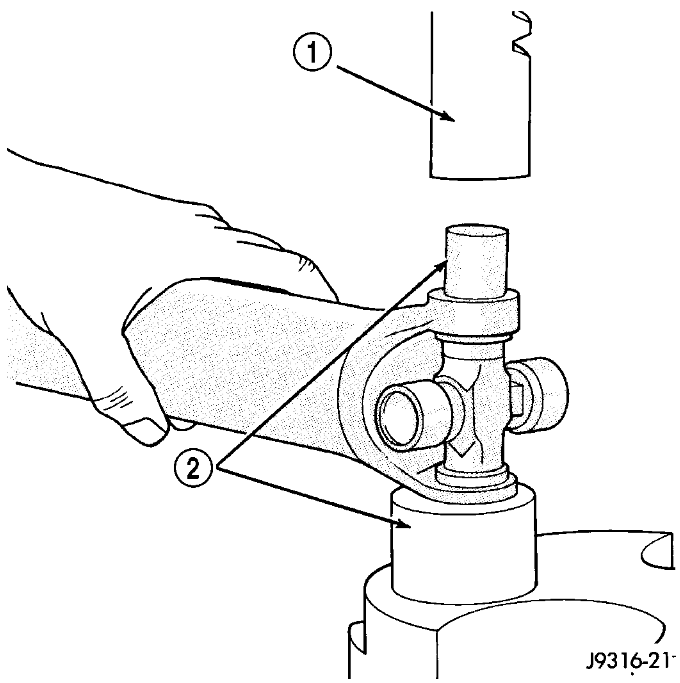


Fig. 15 PRESS OUT BEARING

1 - PRESS
2 - SOCKET

SINGLE CARDAN UNIVERSAL JOINTS (Continued)

(8) To remove the opposite bearing cap, turn the yoke over and straighten the cross in the open hole. Then, carefully press the end of the cross until the remaining bearing cap can be removed (Fig. 16).

CAUTION: If the cross or bearing cap are not straight during installation, the bearing cap will score the walls of the yoke bore and damage can occur.

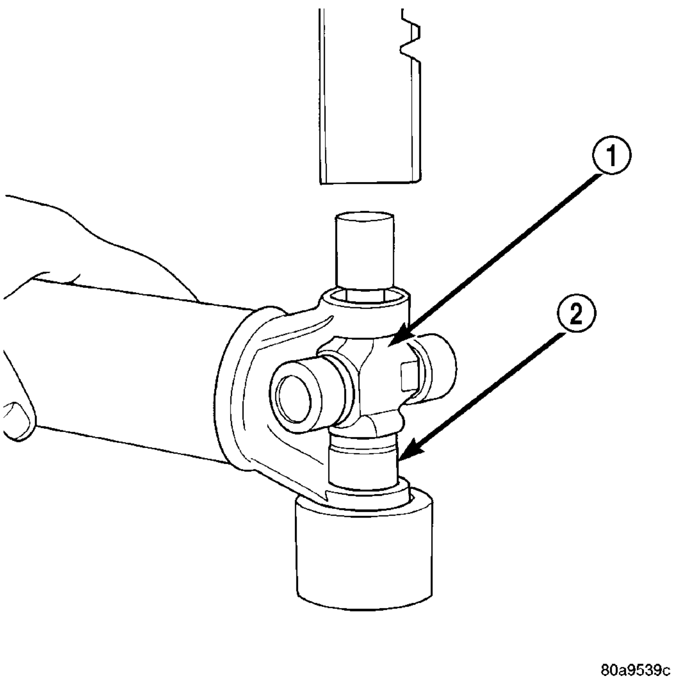


Fig. 16 PRESS OUT REMAINING BEARING

1 - CROSS
2 - BEARING CAP

ASSEMBLY

(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores.

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 17).

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 18). Keep the needle bearings upright in the bearing cap.

(4) Press the bearing cap into the yoke bore enough to clear snap ring groove.

(5) Install a snap ring.

(6) Repeat Step 3 and Step 4 to install the opposite bearing cap.

NOTE: If the joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

(7) Add grease to lube fitting, if equipped.

(8) Install the propeller shaft.

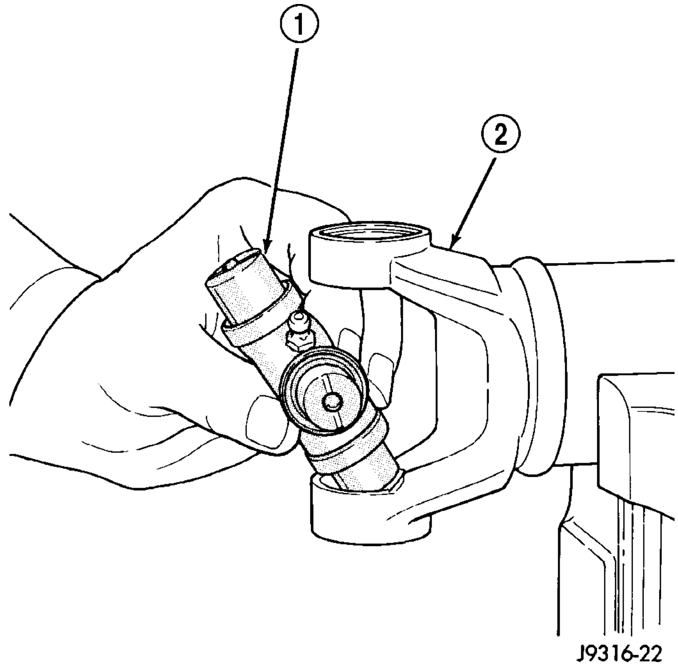


Fig. 17 CROSS IN YOKE

1 - CROSS
2 - YOKE

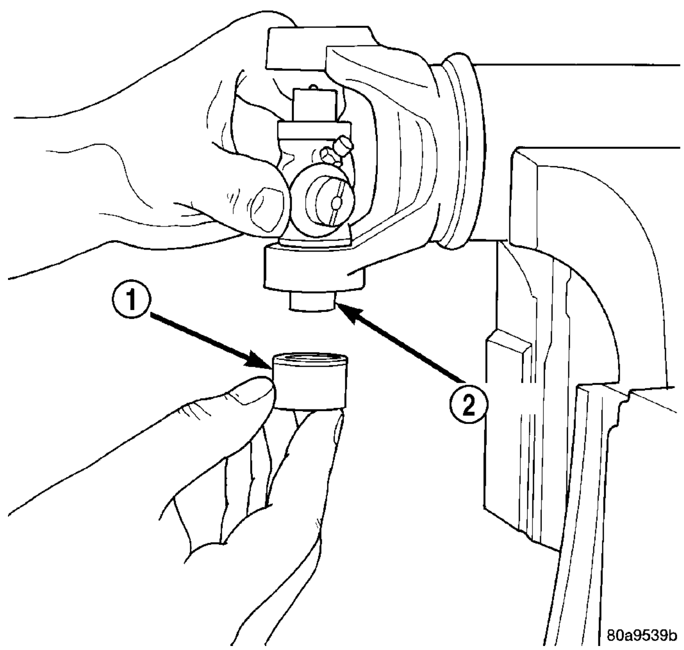


Fig. 18 INSTALL BEARING ON TRUNNION

1 - BEARING CAP
2 - TRUNNION

HALF SHAFT

TABLE OF CONTENTS

HALF SHAFT

CAUTION

CAUTION: Never grasp half shaft assembly by the boots. This may cause the boot to pucker or crease and reduce the service life of the boot.
Avoid over angulating or stroking the C/V joints when handling the half shaft.
Half shafts exposed to battery acid, transmission fluid, brake fluid, differential fluid or gasoline may cause the boots to deteriorate.

DIAGNOSIS AND TESTING

Check for grease at the inboard and outboard C/V joint. This is a sign of boot or boot clamp damage.

NOISE/VIBRATION IN TURNS

A clicking noise or a vibration in turns could be caused by a damaged outer C/V or inner tripod joint seal boot or seal boot clamps. This will result in the loss/contamination of the joint grease, resulting in inadequate lubrication of the joint. Noise could also be caused by another component of the vehicle coming in contact with the half shafts.

CLUNKING NOISE DURING ACCELERATION

This noise may be a result of a damaged or worn C/V joint. A torn boot or loose/missing clamp on the inner/outer joint which has allowed the grease to be lost will damage the C/V joint.

SHUDDER/VIBRATION DURING ACCELERATION

This problem could be a result of a worn/damaged inner tripod joint or a sticking tripod joint. Improper wheel alignment may also cause a shudder or vibration.

VIBRATION AT HIGHWAY SPEEDS

This problem could be a result of out of balance front tires or tire/wheel runout. Foreign material (mud, etc.) packed on the backside of the wheel(s) will also cause a vibration.

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove half shaft hub nut.
(4) Remove stabilizer link (Fig. 1).

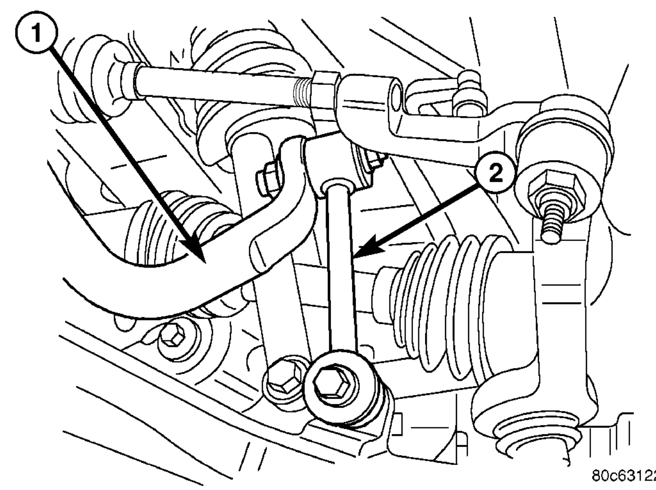


Fig. 1 STABILIZER BAR LINK

1 - STABILIZER BAR
2 - STABILIZER BAR LINK

(5) Remove lower clevis bolt (Fig. 2).
(6) Seperate lower ball joint from the lower control arm (Fig. 3).
(7) Pull out on the steering knuckle and push the half shaft out of the knuckle.
(8) With a pry bar remove the half shaft from the axle.

HALF SHAFT (Continued)

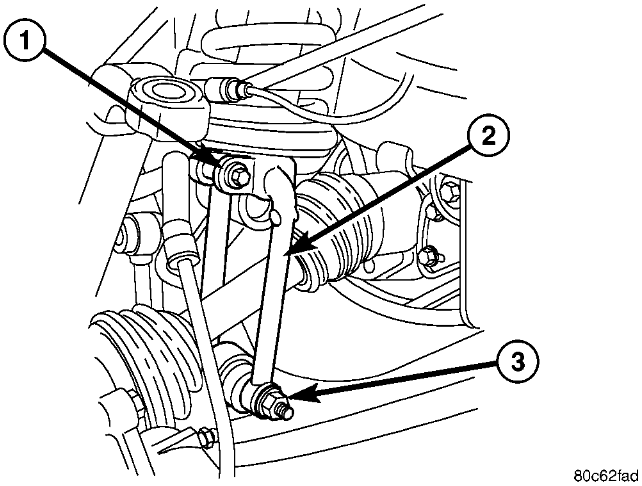


Fig. 2 CLEVIS BRACKET

1 - UPPER BOLT
2 - CLEVIS BRACKET
3 - LOWER BOLT

NOTE: Right side half shaft has an axle shaft that may come out of the axle.

INSTALLATION

NOTE: Seperate right half shaft from axle shaft in a vise if necessary and instal axle shaft in the axle.

(1) Apply a light coat of wheel bearing grease on the female splines of the inner C/V joint.

(2) Install half shaft on the axle shaft spline and push firmly to engage the snap ring. Pull on the half shaft to verify snap has engaged.

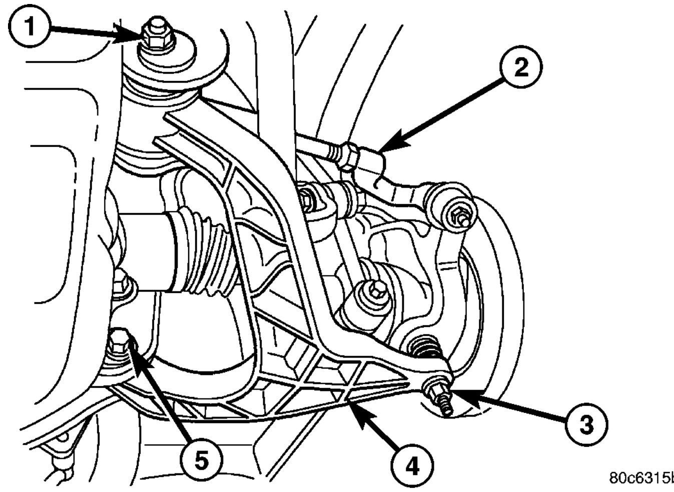


Fig. 3 LOWER CONTROL ARM

1 - FRONT CAM BOLT
2 - OUTER TIE ROD END
3 - LOWER BALL JOINT NUT
4 - LOWER CONTROL ARM
5 - REAR CAM BOLT

(3) Clean hub bearing bore and apply a light coat of wheel bearing grease.

(4) Pull out on the steering knuckle and push the half shaft through the knuckle.

(5) Install lower ball joint into the lower control arm and tighten pinch bolt.

(6) Align clevis with knuckle. Install and tighten lower clevis bolt.

(7) Install stabilizer link.

(8) Install half shaft hub nut.

(9) Install wheel and tire assembly.

(10) Remove support and lower vehicle.

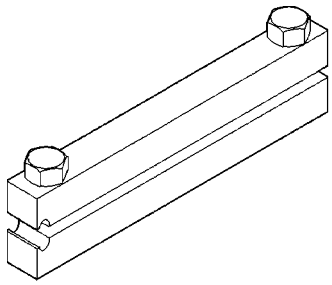
SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Half Shaft Nut	136	100	-

HALF SHAFT (Continued)

SPECIAL TOOLS



CLAMP INSTALLER C-4975A

CV JOINT/BOOT-OUTER

REMOVAL

(1) Clamp shaft in a vise (with soft jaws) and support C/V joint.

(2) Remove clamps with a cut-off wheel or grinder (Fig. 4).

CAUTION: Do not damage C/V housing or half shaft.

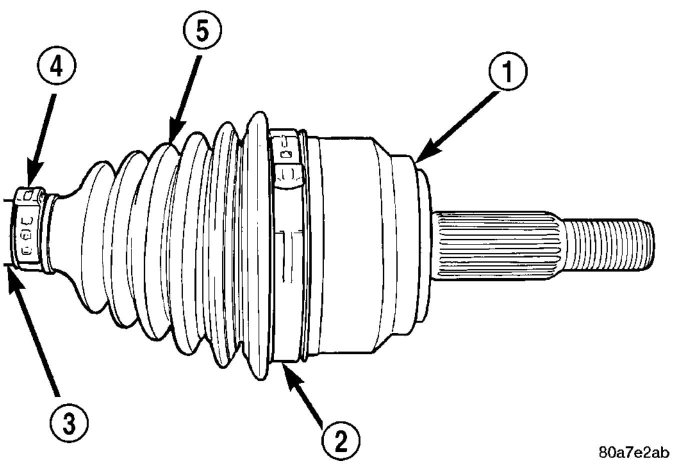


Fig. 4 BOOT CLAMP LOCATIONS

1 - C/V HOUSING
2 - CLAMP
3 - HALF SHAFT
4 - CLAMP
5 - C/V BOOT

(3) Slide the boot down the shaft.

(4) Remove lubricant to expose the C/V joint snap ring.

(5) Spread snap ring and slide the joint off the shaft (Fig. 5).

(6) Slide boot off the shaft and discard old boot.

(7) Mark alignment marks on the inner race/hub, bearing cage and housing with dabs of paint (Fig. 6).

(8) Clamp C/V joint in a vertical position in a soft jawed vise.

(9) Press down one side of the bearing cage to gain access to the ball at the opposite side.

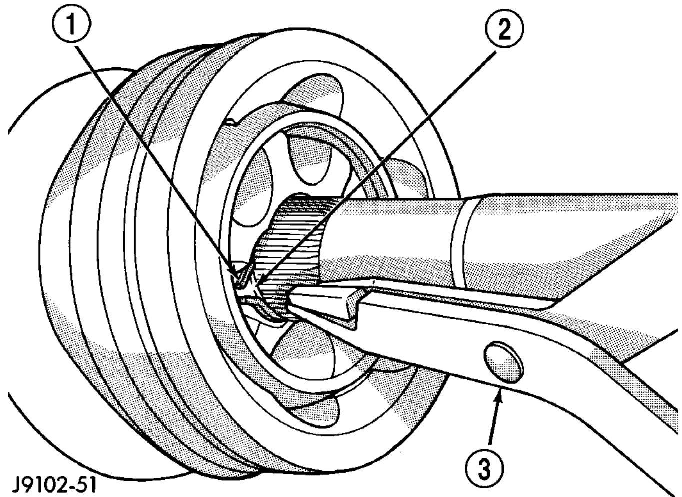


Fig. 5 OUTER C/V JOINT

1 - SNAP RING
2 - SNAP RING GROVE
3 - SNAP RING PLIERS

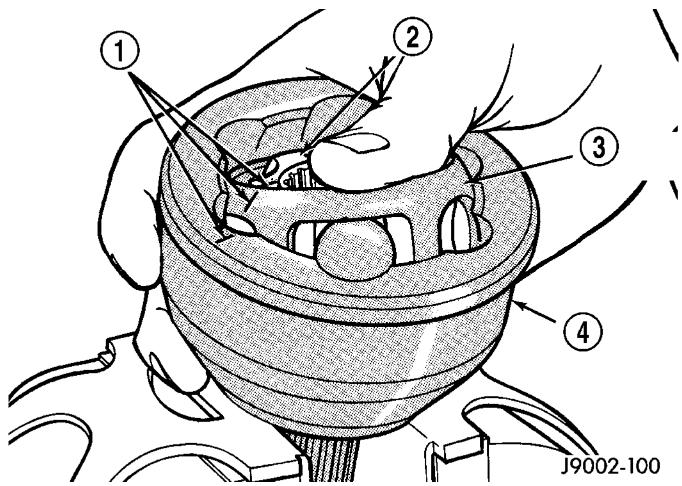


Fig. 6 BEARING ACCESS

1 - ALIGNMENT MARKS
2 - BEARING HUB
3 - BEARING CAGE
4 - HOUSING

NOTE: If joint is tight, use a hammer and brass drift to loosen the bearing hub. Do not contact the bearing cage with the drift.

(10) Remove ball from the bearing cage (Fig. 7).

(11) Repeat step above until all six balls are removed from the bearing cage.

(12) Lift cage and inner race upward and out from the housing (Fig. 8).

(13) Turn inner race 90° in the cage and rotate the inner race/hub out of the cage (Fig. 9).

CV JOINT/BOOT-OUTER (Continued)

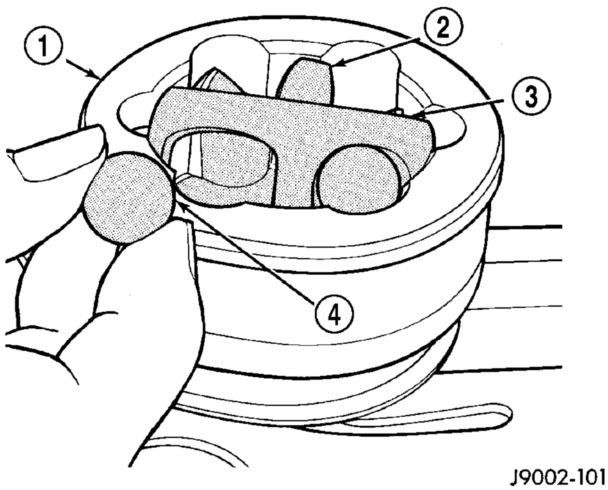


Fig. 7 BEARING

1 - HOUSING
2 - INNER RACE/HUB
3 - BEARING CAGE
4 - BALL

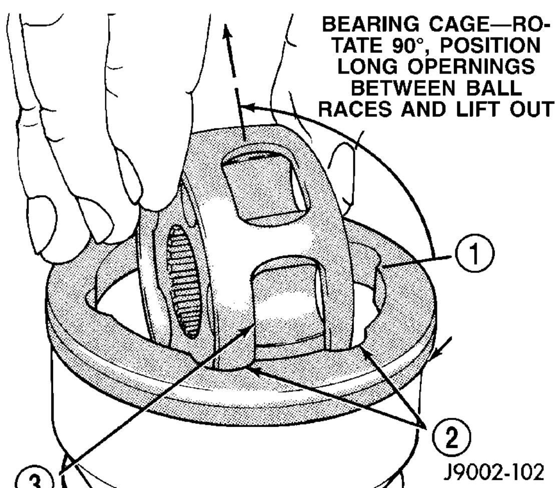


Fig. 8 CAGE AND INNER RACE/HUB

1 - HOUSING
2 - INNER RACE
3 - CAGE WINDOW

INSTALLATION

NOTE: If C/V joint is worn, replace entire C/V joint and boot.

(1) Apply a light coat of grease to the C/V joint components before assembling them.

(2) Align the inner race, cage and housing according to the alignment reference marks.

(3) Insert the inner race into the cage (Fig. 10) and rotate race into the cage.

(4) Rotate the inner race/hub in the cage (Fig. 11).

(5) Insert cage into the housing (Fig. 12). Rotate the cage 90° into the housing (Fig. 13).

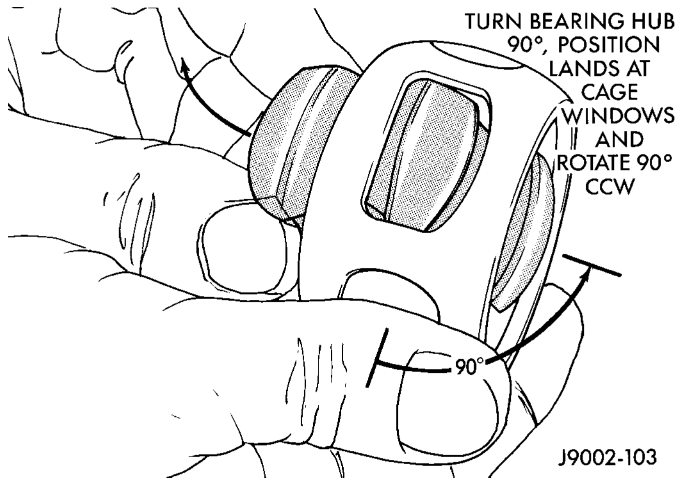


Fig. 9 INNER RACE/HUB

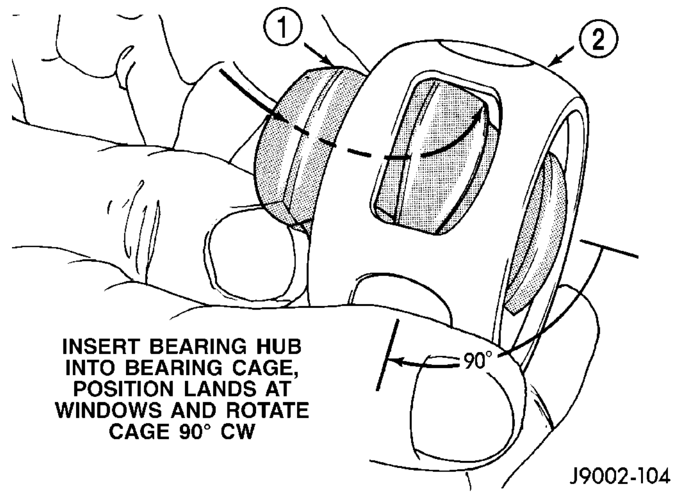


Fig. 10 INNER RACE/HUB

1 - INNER RACE/HUB
2 - BEARING CAGE

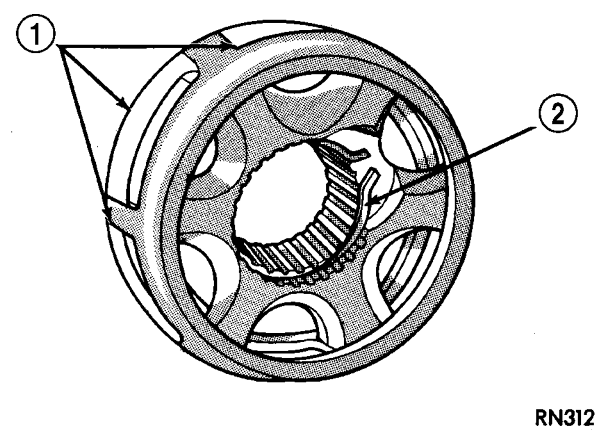


Fig. 11 CAGE AND INNER RACE/HUB

1 - CAGE WINDOWS
2 - SNAP RING

CV JOINT/BOOT-OUTER (Continued)

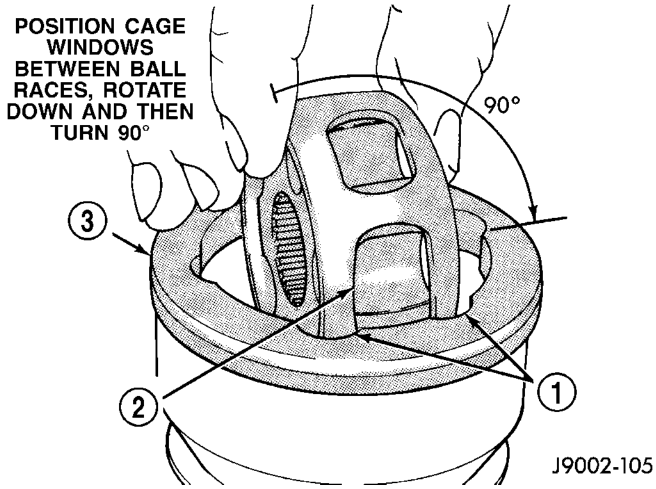


Fig. 12 BEARING CAGE AND HOUSING

1 - OUTER RACE
2 - BEARING CAGE WINDOW
3 - CV JOINT HOUSING

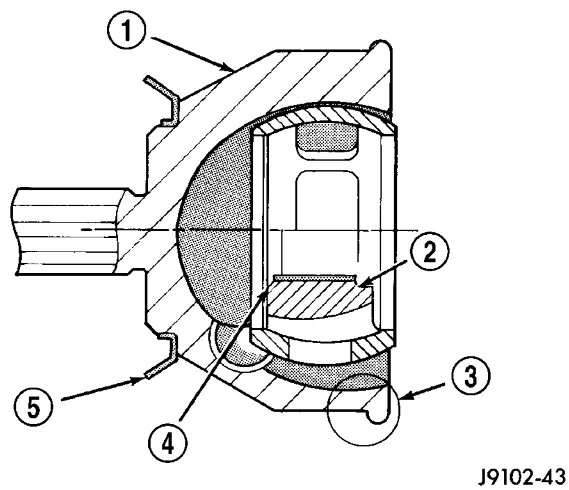


Fig. 13 CAGE AND INNER RACE/HUB

1 - C/V HOUSING
2 - BEARING HUB LARGE COUNTERBORE OUTWARD
3 - BOOT RETAINING SHOULDER
4 - BEARING HUB SMALL COUNTERBORE INWARD
5 - SLINGER

(6) Apply the lubricant included with the replacement boot to the ball races. Spread the lubricant equally between all the races.

(7) Tilt inner race/hub and cage and install the balls (Fig. 14).

(8) Place new clamps onto new boot and slide boot onto the shaft to it's original position.

(9) Apply the rest of lubricant to the C/V joint and boot.

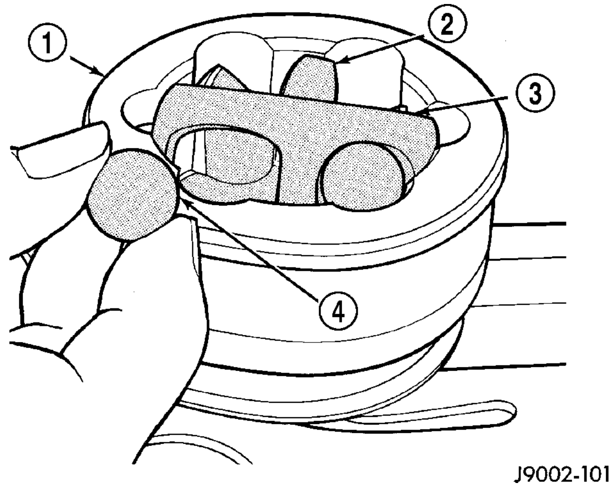


Fig. 14 BALL BEARING

1 - C/V HOUSING
2 - INNER RACE/HUB
3 - BEARING CAGE
4 - BEARING

(10) Install the joint onto the shaft. Push the joint onto the shaft until the snap ring seats in the groove (Fig. 15). Pull on the joint to verify the span ring has engaged.

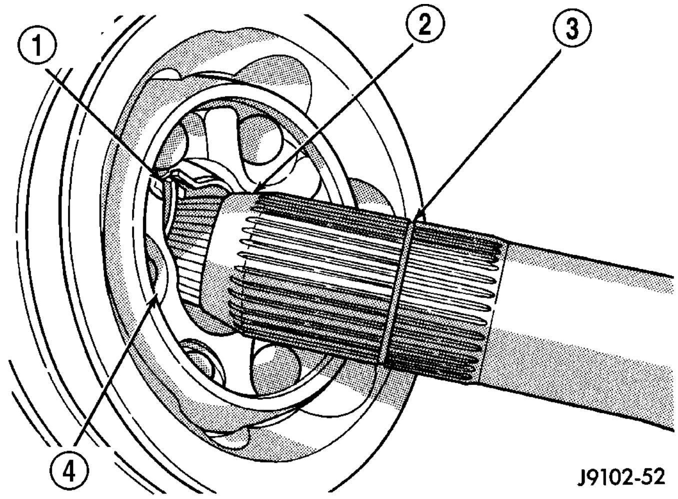


Fig. 15 OUTER C/V JOINT

1 - SNAP RING
2 - SHAFT TAPER
3 - SNAP RING GROVE
4 - BEARING HUB

(11) Position the boot on the joint in it's original position. Ensure that the boot is not twisted and remove any excess air.

(12) Secure both boot clamps (Fig. 16) with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the toll are closed.

CV JOINT/BOOT-OUTER (Continued)

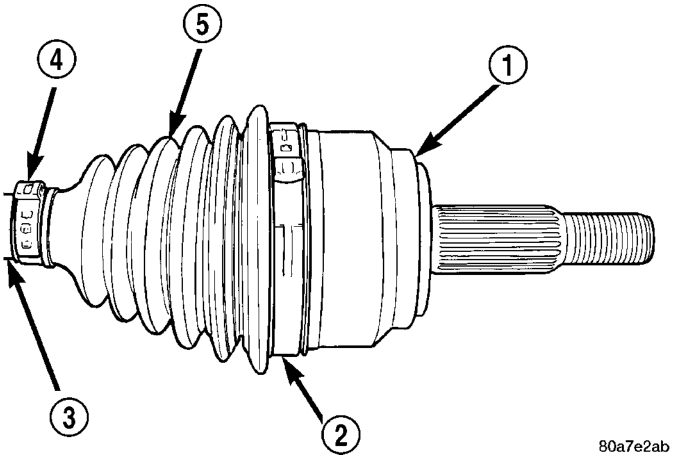


Fig. 16 BOOT CLAMP LOCATIONS

1 - C/V HOUSING
2 - CLAMP
3 - HALF SHAFT
4 - CLAMP
5 - C/V BOOT

CV JOINT/BOOT-INNER

REMOVAL

(1) Clamp shaft in a vise (with soft jaws) and support C/V joint.

(2) Remove clamps with a cut-off wheel or grinder.

CAUTION: Do not damage C/V housing or half shaft.

(3) Slide the boot down the shaft (Fig. 17).

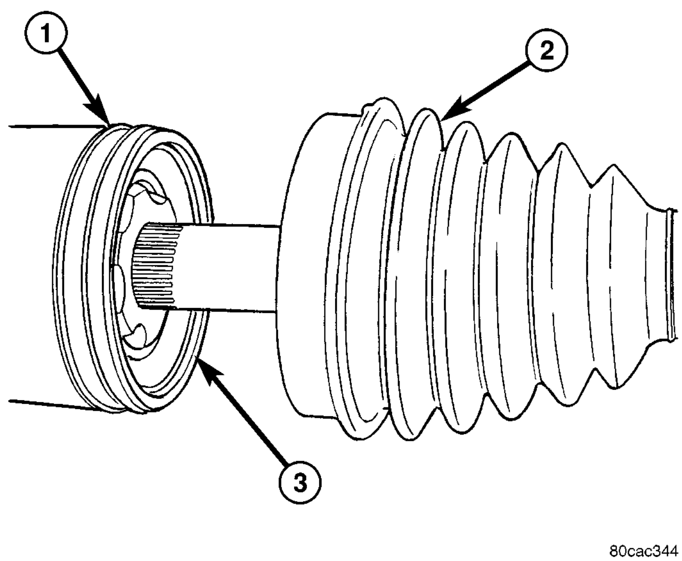


Fig. 17 INNER C/V BOOT

1 - HOUSING
2 - BOOT
3 - HOUSING SNAP RING

(4) Remove lubricant to expose the C/V housing snap ring and remove snap ring (Fig. 18).

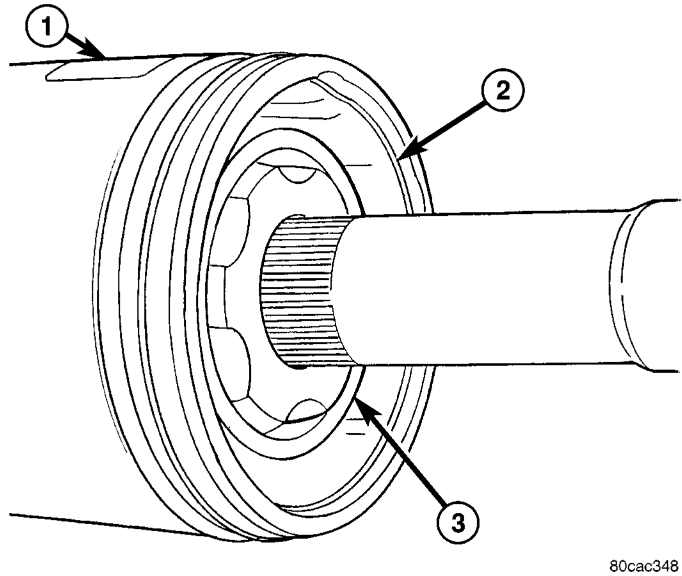


Fig. 18 HOUSING SNAP RING

1 - HOUSING
2 - SNAP RING
3 - CAGE/INNER RACE

(5) Remove bearings from the cage (Fig. 19).

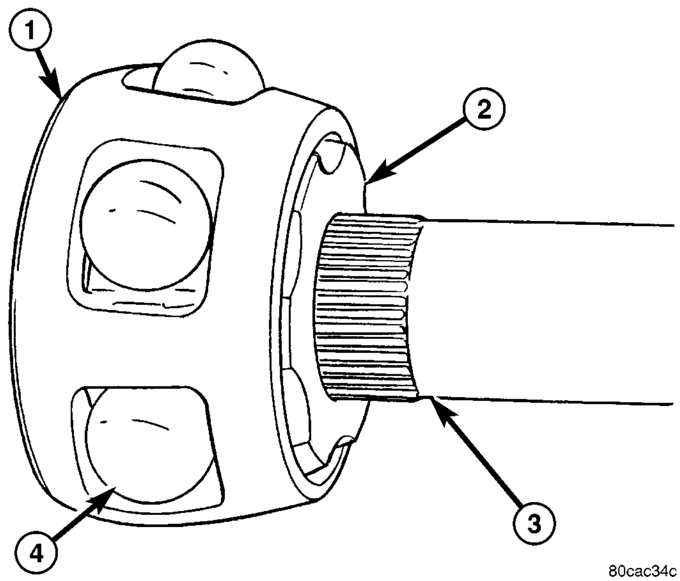


Fig. 19 C/V BEARINGS

1 - CAGE
2 - INNER RACE
3 - SHAFT
4 - BEARING

(6) Rotate cage 30° and slide cage off the inner race and down the shaft.

(7) Remove spread inner race snap ring (Fig. 20) and remove race from the shaft.

(8) Remove boot from the shaft and discard.

CV JOINT/BOOT-INNER (Continued)

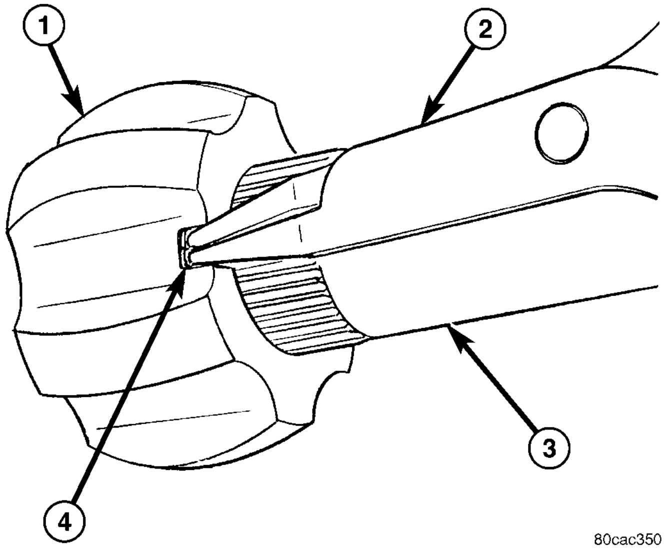


Fig. 20 INNER RACE

1 - INNER RACE
2 - PLIERS
3 - SHAFT
4 - SNAP RING ACCESS

(9) Clean and inspect all components for wear or damage (Fig. 21).

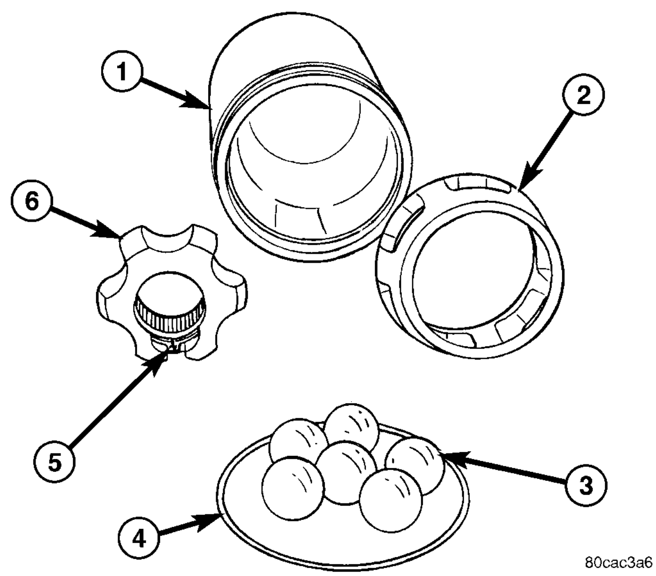


Fig. 21 INNER C/V JOINT

1 - HOUSING
2 - CAGE
3 - BEARINGS
4 - HOUSING SNAP RING
5 - INNER RACE SNAP RING
6 - INNER RACE

INSTALLATION

(1) Apply a coat of grease supplied with the joint/boot to the C/V joint components before assembling them.

(2) Place new clamps on the new boot and slide boot down the shaft.

(3) Slide cage onto the shaft (Fig. 22) with the small diameter end towards the boot.

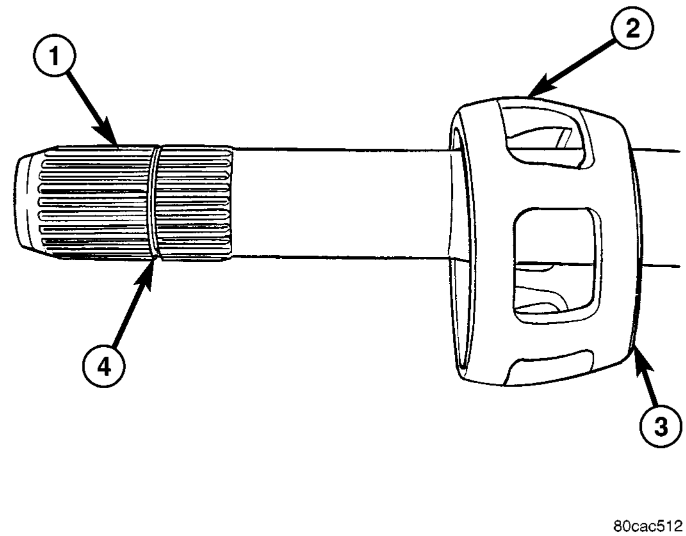


Fig. 22 BEARING CAGE

1 - SHAFT
2 - CAGE
3 - SMALL DIAMETER
4 - SNAP RING GROOVE

(4) Install the inner race onto the shaft (Fig. 23). Pull on the race to verify snap ring has engaged.

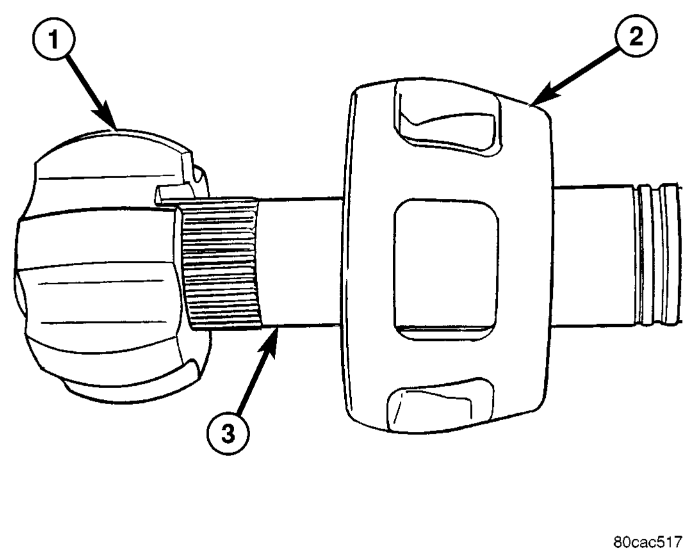


Fig. 23 INNER RACE

1 - INNER RACE
2 - CAGE
3 - SHAFT

(5) Align cage with the inner race and slide over the race.

CV JOINT/BOOT-INNER (Continued)

(6) Turn the cage 30° to align the cage windows with the race (Fig. 24).

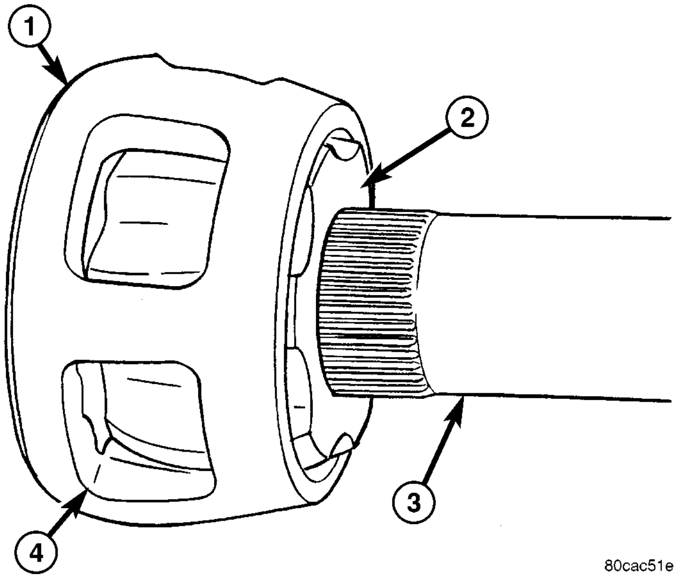


Fig. 24 CAGE/INNER RACE

1 - CAGE
2 - INNER RACE
3 - SHAFT
4 - CAGE WINDOW

(7) Apply grease to the inner race and bearings and install the bearings.

(8) Apply grease to the housing bore (Fig. 25) then install the bearing assmbly into the housing.

(9) Install the housing snap ring and verify it is seated in the groove.

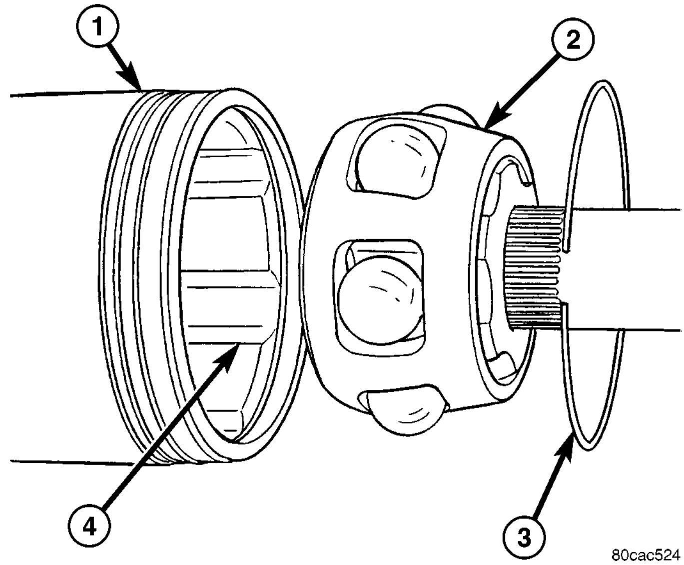


Fig. 25 C/V COMPONENTS

1 - HOUSING
2 - BEARING ASSEMBLY
3 - HOUSING SNAP RING
4 - HOUSING BORE

(10) Fill the housing and boot with the remaining grease.

(11) Slide the boot onto the C/V housing into it's original position. Ensure boot is not twisted and remove any excess air.

(12) Secure both boot clamps with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the tool are closed.

FRONT AXLE - 186FIA

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FRONT AXLE - 186FIA

DESCRIPTION

The 186FIA (Model 30) axle consists of an aluminum center section with an axle tube extending from one side. The tube is pressed into the differential housing. The integral type housing, hypoid gear design has the centerline of the pinion set below the centerline of the ring gear.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a roll-pin. Differential bearing preload and ring gear backlash is adjusted by the use of shims (select thickness). The shims are located between the differential bearing cups and the axle housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

The power is transferred from the axle through two constant velocity (C/V) drive shafts to the wheel hubs.

The differential cover provides a means for inspection and service without removing the axle from the vehicle. The cover has a vent tube used to relieve internal pressure caused by vaporization and internal expansion.

OPERATION

The axle receives power from the transfer case through the front propeller shaft. The front propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).

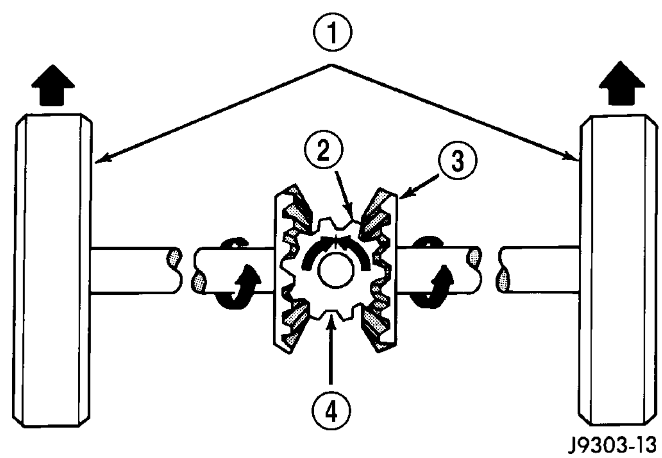


Fig. 1 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

1 - STRAIGHT AHEAD DRIVING
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

FRONT AXLE - 186FIA (Continued)

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

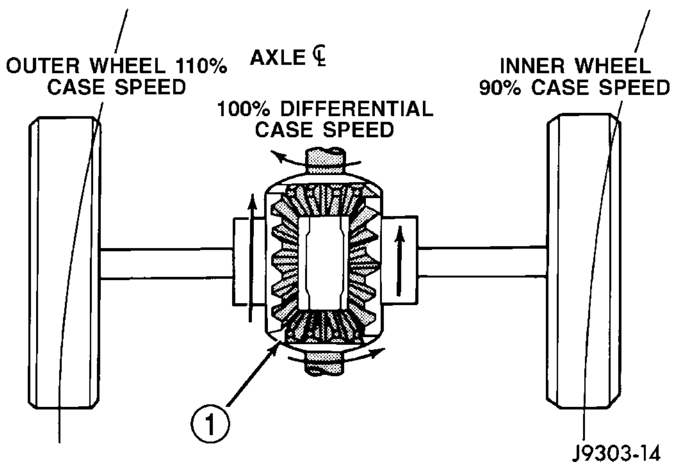


Fig. 2 DIFFERENTIAL-ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front end components or engine/transmission mounts. These components can contribute to what appears to be a rear end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged) can be caused by:

- High engine idle speed.
- Transmission shift operation.

FRONT AXLE - 186FIA (Continued)

- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.

FRONT AXLE - 186FIA (Continued)

Condition	Possible Causes	Correction
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.

FRONT AXLE - 186FIA (Continued)

Condition	Possible Causes	Correction
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove skid plate.
(4) Remove differential drain plug (Fig. 3) and drain fluid.
(5) Remove half shaft hub nuts.
(6) Remove stablizer bar links from the lower control arms.
(7) Remove tie rod end nuts and seperate ends from the knuckles.
(8) Remove lower ball joint nuts and seperate ball joints from the lower control arms.
(9) Remove lower shock clevis bolts.
(10) Pull out on the steering knuckles and push the half shaft out of the knuckles.
(11) With a pry bar remove the half shafts from the axle.

NOTE: Right half shaft has a splined axle that may come out with the half shaft.

(12) Remove differential vent hose (Fig. 4) from cover.
(13) Mark front propeller shaft and pinion flange. Remove propeller shaft from pinion flange.
(14) Support axle with a lift/jack.

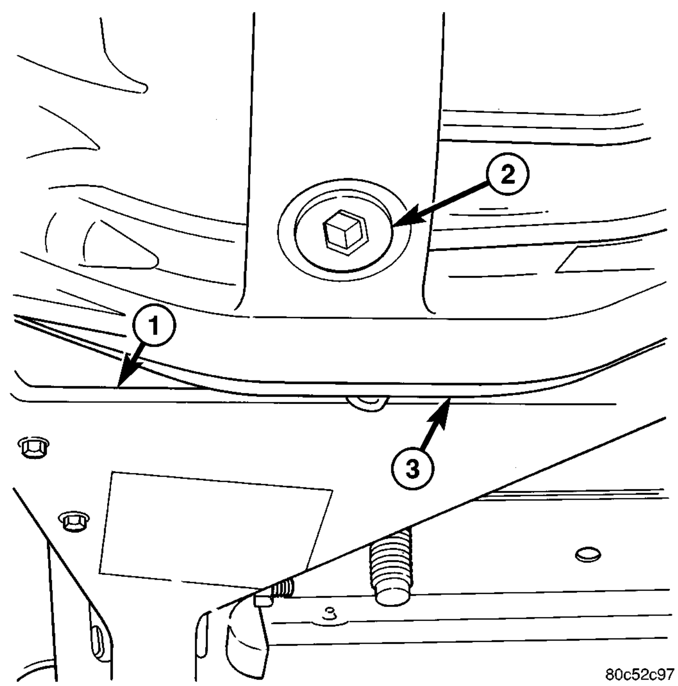


Fig. 3 DRAIN PLUG

1 - LEFT FRONT AXLE BRACKET
2 - DRAIN PLUG
3 - DIFFERENTIAL HOUSING

FRONT AXLE - 186FIA (Continued)

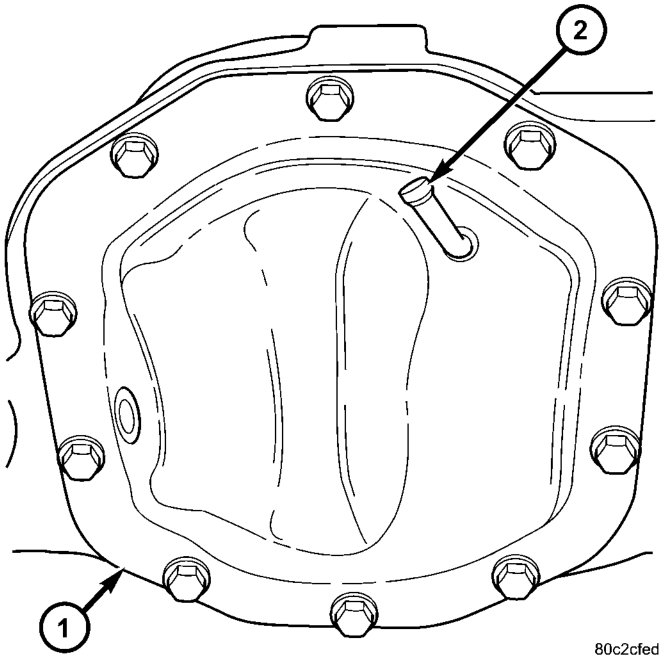


Fig. 4 DIFFERENTIAL COVER

1 - COVER
2 - VENT TUBE

(15) Remove bolts from left front axle bracket (Fig. 5).

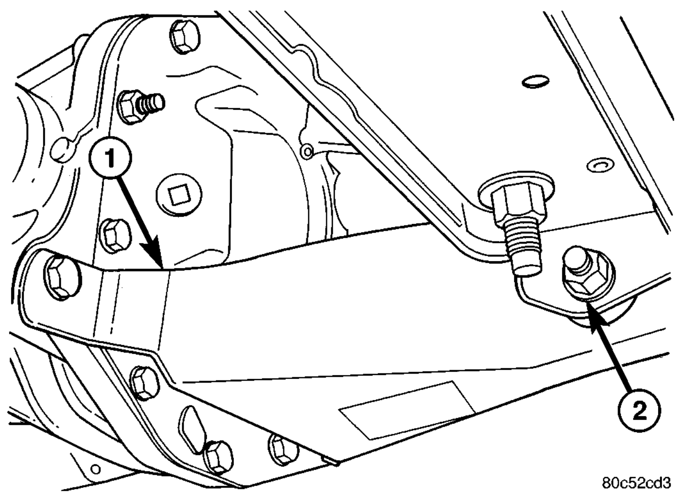


Fig. 5 LEFT FRONT AXLE BRACKET

1 - LEFT FRONT AXLE BRACKET
2 - BRACKET BOLT

(16) Remove oil filter drip tray.
(17) Mark and remove right control arm cam bolt.
(18) Remove bolts from right axle bracket frame mounts (Fig. 6).
(19) Remove bolt from left rear axle bracket frame mount (Fig. 7).
(20) Lower axle and from vehicle.

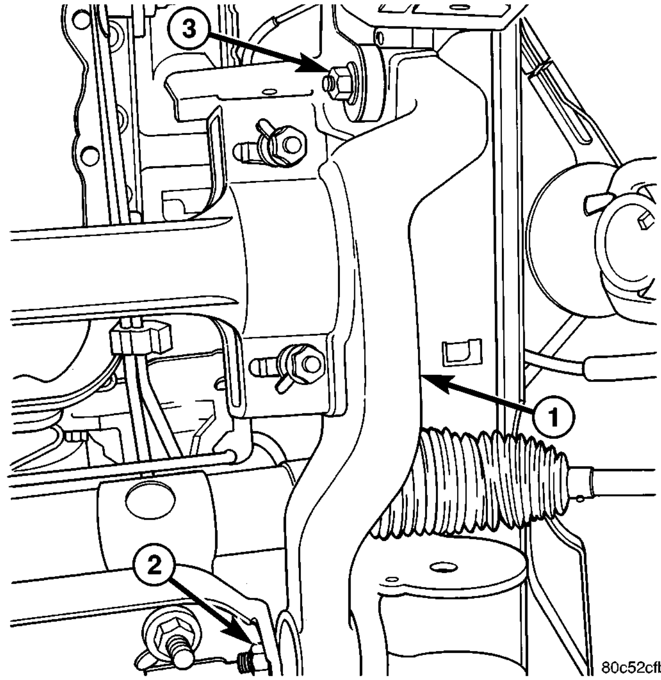


Fig. 6 RIGHT AXLE BRACKET

1 - RIGHT AXLE BRACKET
2 - FRONT BRACKET BOLT
3 - REAR BRACKET BOLT

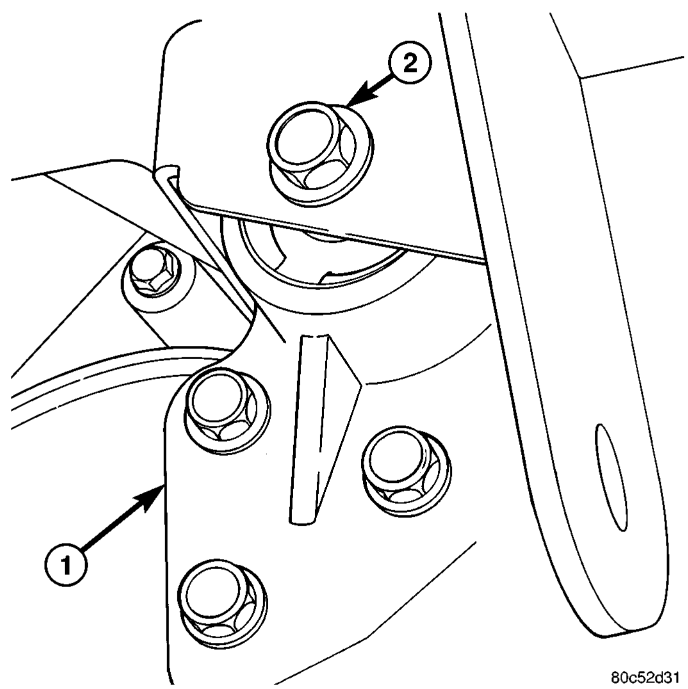


Fig. 7 LEFT REAR AXLE BRACKET

1 - LEFT REAR AXLE BRACKET
2 - BRACKET BOLT

FRONT AXLE - 186FIA (Continued)

INSTALLATION

NOTE: Seperate right axle shaft from the half shaft if necessary and install axle shaft in the axle.

(1) Install left rear bracket to axle and tighten to 61 N·m (45 ft. lbs.).
(2) Install right bracket to axle and tighten to 88 N·m (65 ft. lbs.).
(3) Install left front bracket to axle and tighten to 61 N·m (45 ft. lbs.).
(4) Raise axle up and align brackets with frame mounts.
(5) Install frame mount bolts and tighten to 88 N·m (65 ft. lbs.).
(6) Install half shafts.
(7) Install right front control arm cam bolt with marks aligned.
(8) Install lower ball joint into lower control arms and tighten pinch bolts.
(9) Align clevis with knuckles and install clevis bolts.
(10) Install stabilizer links to lower control arms and install bolts.
(11) Install oil filter drip tray.
(12) Install new half shaft hub nuts and tighten to 136 N·m (100 ft. lbs.).
(13) Install propeller shaft.
(14) Install axle vent hose.
(15) Fill differential with gear lubricant.
(16) Install skid plate.
(17) Install wheel and tire assemblies.
(18) Remove support and lower vehicle.
(19) Tighten clevis and stabilizer links bolts to specifications.
(20) Check vehicle alignment.

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched onto each gear (Fig. 8). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

Compensation for pinion depth variance is achieved with a select shim/oil slinger. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 9).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract this number from the thickness of the original depth shim/oil slinger to compensate for the difference in the depth variances. Refer to the Pinion Gear Depth Variance chart.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the etched number on the face of the pinion gear head (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

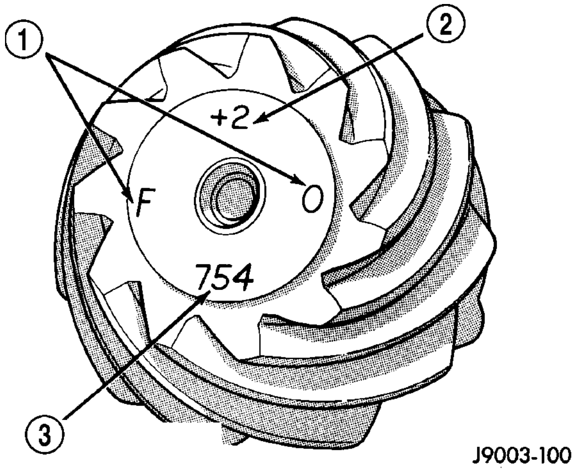


Fig. 8 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - DRIVE PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER

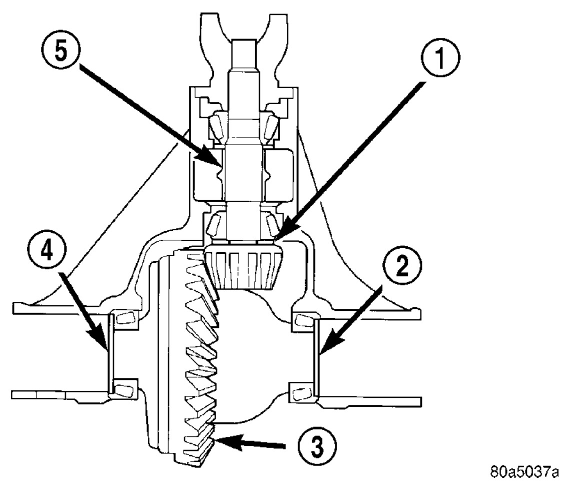


Fig. 9 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

FRONT AXLE - 186FIA (Continued)

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 10).

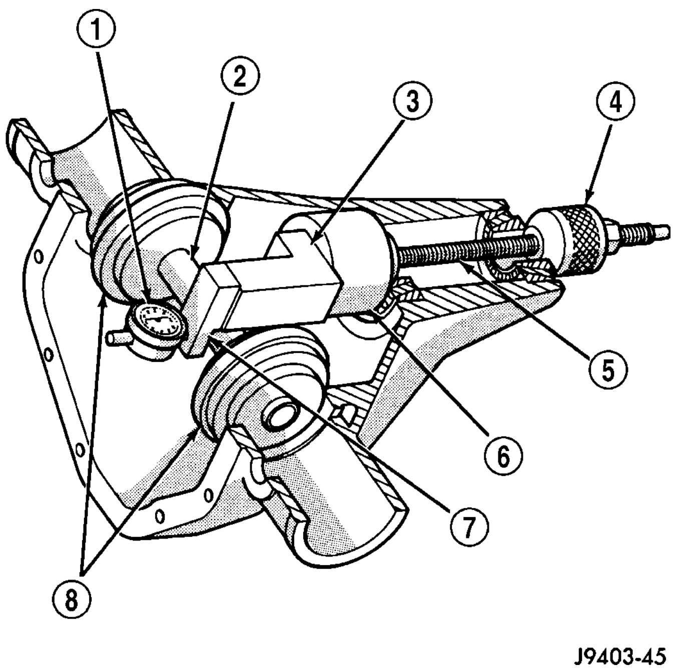


Fig. 10 PINION GEAR DEPTH TOOLS

1 - DIAL INDICATOR
2 - ARBOR
3 - PINION HEIGHT BLOCK
4 - CONE
5 - SCREW
6 - PINION BLOCK
7 - SCOOTER BLOCK
8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 8804 and rear pinion bearing onto Screw 6741 (Fig. 10).

(2) Insert height gauge components into the housing through pinion bearing cups.

(3) Install front pinion bearing and hand tight Cone-nut 6740 onto the screw.

(4) Position Arbor Disc 6732 and Arbor D-115-3 into the housing bearing cradles. Install differential bearing caps on Arbor Discs and tighten bolts to 41 N·m (30 ft. lbs.) (Fig. 11).

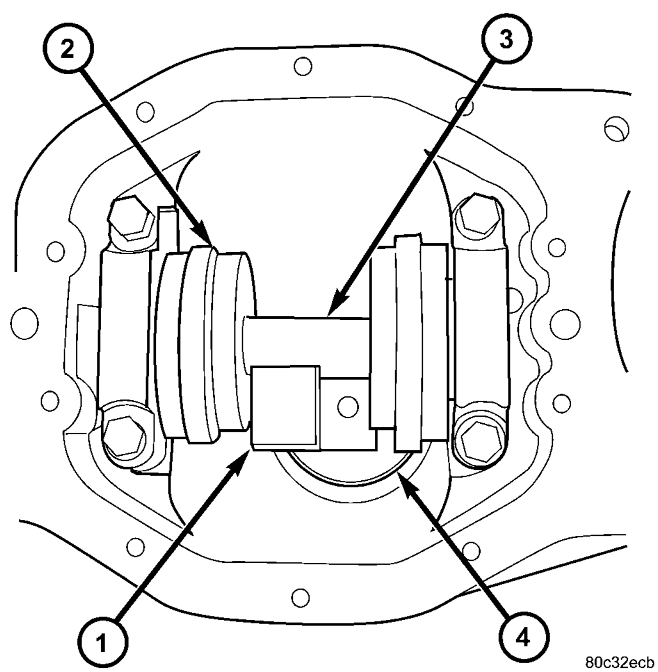


Fig. 11 DEPTH TOOLS IN HOUSING

1 - PINION HEIGHT BLOCK
2 - ARBOR DISC
3 - ARBOR
4 - PINION BLOCK

FRONT AXLE - 186FIA (Continued)

NOTE: Arbor Discs 6732 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Position Scooter Block/Dial Indicator flush on the pinion height block. Hold the scooter block and zero the dial indicator.

(7) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 12). Move the scooter block till the dial indicator probe crests the arbor and record the highest reading.

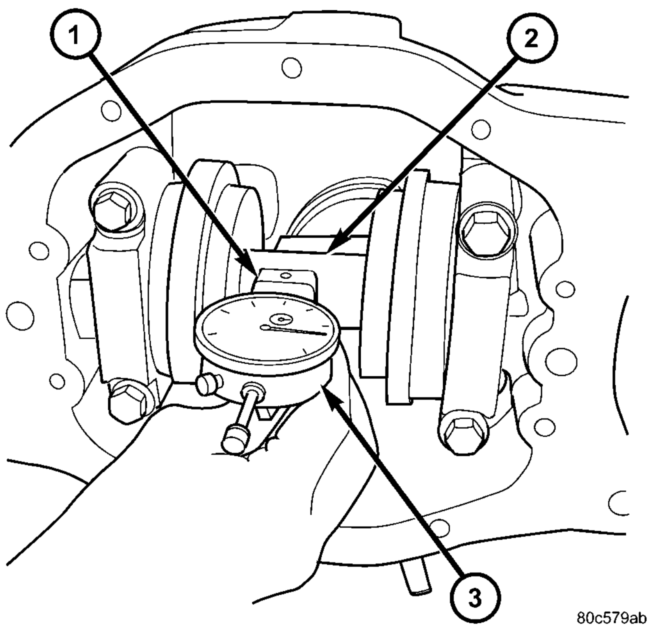


Fig. 12 PINION DEPTH MEASUREMENT

1 - SCOOTER BLOCK
2 - ARBOR
3 - DIAL INDICATOR

(8) Select a shim/oil slinger equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 8). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

DIFFERENTIAL

Differential bearing preload and gear backlash is adjusted by the use of selective shims. The shims are located between the differential bearing cups and the differential housing. The proper shim thickness can be determined using slip-fit Dummy Bearings D-348 in place of the differential side bearings and a Dial Indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 13). Differential shim measurements are performed with spreader W-129-B removed.

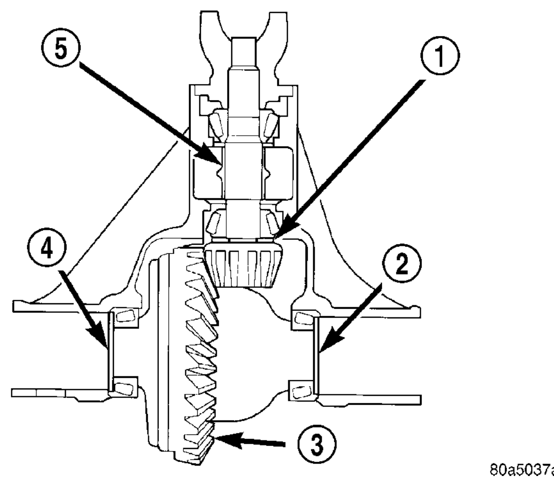


Fig. 13 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove differential side bearings from differential case.

(2) Install ring gear on differential case and tighten bolts to specification.

(3) Install Dummy Bearings D-348 on differential case.

(4) Install differential case in the housing.

FRONT AXLE - 186FIA (Continued)

(5) Record the thickness of Dummy Shims 8107. Insert the shims between the dummy bearings and the differential housing (Fig. 14).

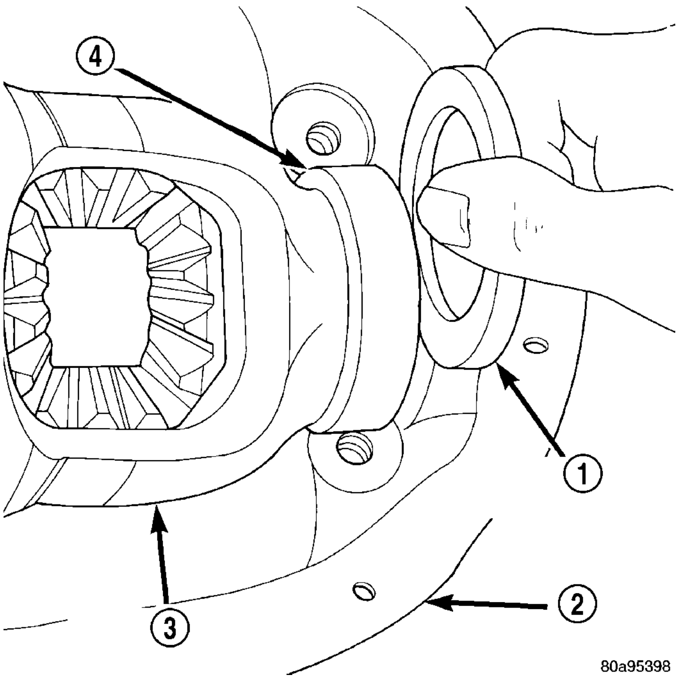


Fig. 14 DUMMY SHIMS

1 - DUMMY SHIM
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE
4 - DUMMY BEARINGS

(6) Install the bearing caps in their correct positions and snug the bolts (Fig. 15).

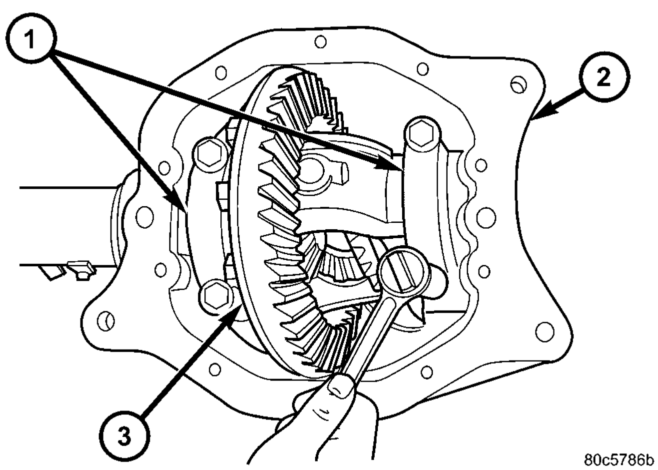


Fig. 15 BEARING CAP BOLTS

(7) With a dead-blow hammer, seat the differential dummy bearings to each side of the axle housing (Fig. 16) and (Fig. 17).

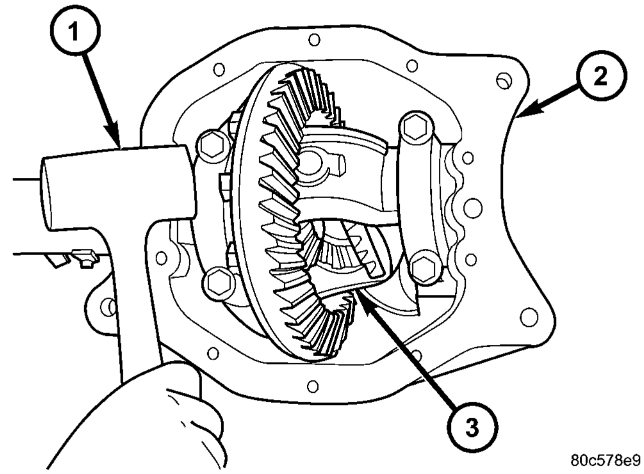


Fig. 16 SEAT DUMMY BEARINGS PINION SIDE

1 - HAMMER
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL

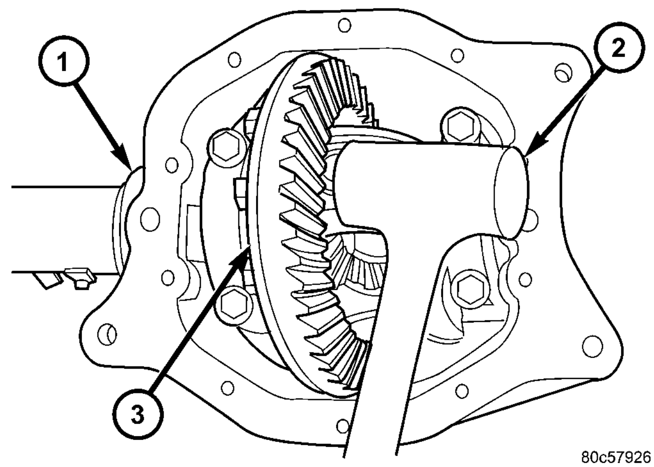


Fig. 17 SEAT DUMMY BEARING RING GEAR SIDE

1 - DIFFERENTAIL HOUSING
2 - HAMMER
3 - RING GEAR

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear.

(9) Attach a Dial Indicator C-3339 to the Pilot Stud. Position the dial indicator plunger on flat surface between the ring gear bolts.

(10) Push and hold differential case to pinion gear side of the housing and zero dial indicator (Fig. 18).

(11) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 19).

(12) Add 0.152 mm (0.006 in.) to the zero end play total. This new total represents the thickness of

FRONT AXLE - 186FIA (Continued)

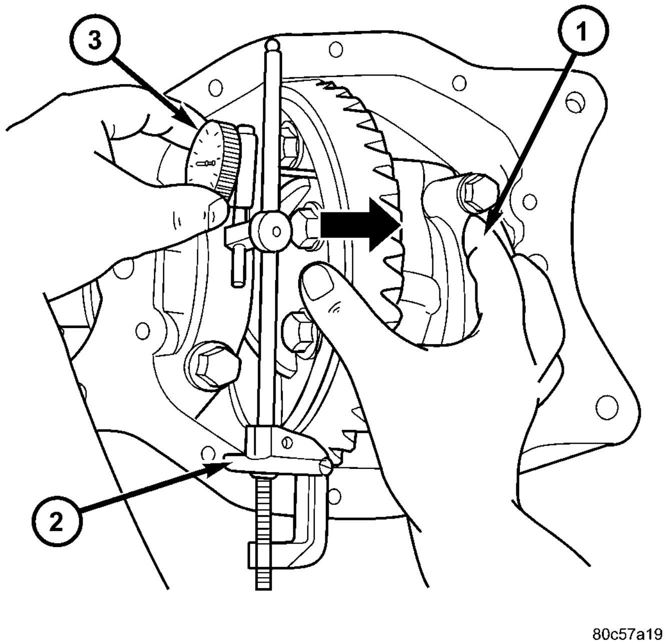


Fig. 18 DIFFERENTIAL PINION GEAR SIDE

1 - PINION SIDE
2 - PILOT STUD
3 - DIAL INDICATOR

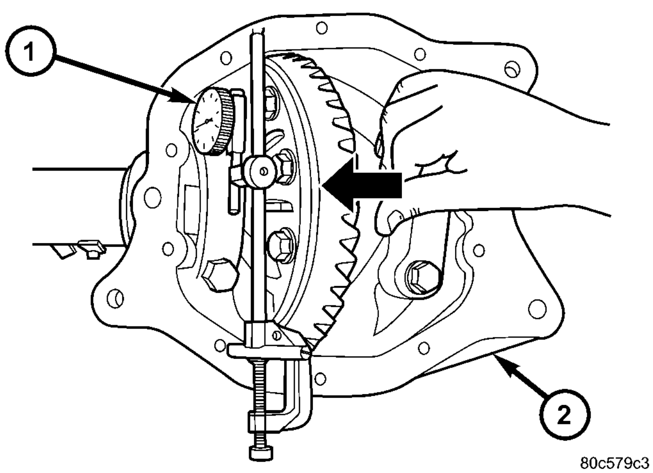


Fig. 19 DIFFERENTIAL RING GEAR SIDE

1 - DIAL INDICATOR
2 - DIFFERENTIAL HOUSING

shims to compress or preload the new bearings when the differential is installed.

(13) Rotate dial indicator out of the way on the pilot stud.

(14) Remove differential case and dummy bearings from the housing.

(15) Install the pinion gear in the housing. Install the pinion yoke and establish the correct pinion rotating torque.

(16) Install differential case and Dummy Bearings D-348 in the housing.

(17) Install a single dummy shim in the ring gear side. Install bearing caps and tighten bolts snug.

(18) Seat ring gear side dummy bearing (Fig. 17).

(19) Position the dial indicator plunger on a flat surface between the ring gear bolt heads.

(20) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 20).

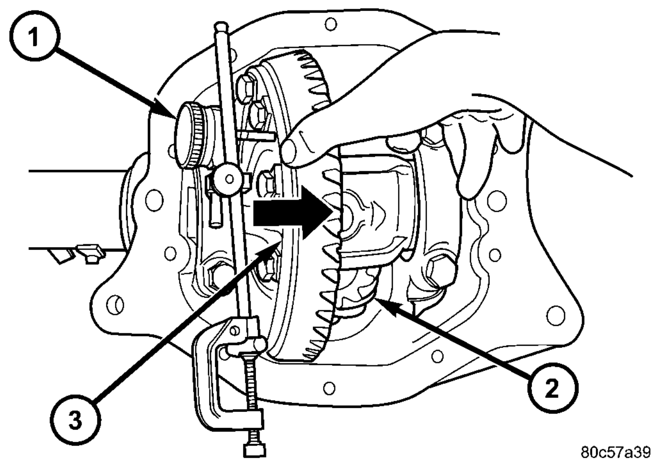


Fig. 20 DIFFERENTIAL PINION GEAR SIDE

1 - DIAL INDICATOR
2 - PINION GEAR
3 - RING GEAR

(21) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 21). Add dummy shim thickness to this reading. This will be the total shim thickness to achieve zero backlash.

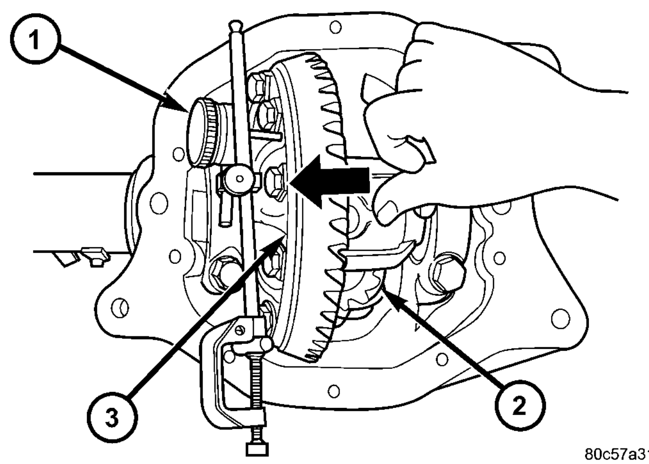


Fig. 21 DIFFERENTIAL RING GEAR SIDE

1 - DIAL INDICATOR
2 - PINION GEAR
3 - RING GEAR

(22) Subtract 0.076 mm (0.003 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

FRONT AXLE - 186FIA (Continued)

(23) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(24) Rotate dial indicator out of the way on pilot stud.

(25) Remove differential case and dummy bearings from the housing.

(26) Install side bearings and cups on differential case.

(27) Install spreader W-129-B with Adapter Set 6987 on the housing and spread axle opening enough to receive differential case.

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in.). If the housing is over-spread, it could be distorted or damaged.

(28) Place the bearing preload shims in the axle housing, against the axle tubes.

(29) Install differential case into the housing.

(30) Remove spreader from the housing.

(31) Rotate the differential case several times to seat the side bearings.

(32) Position the indicator plunger against a ring gear tooth (Fig. 22).

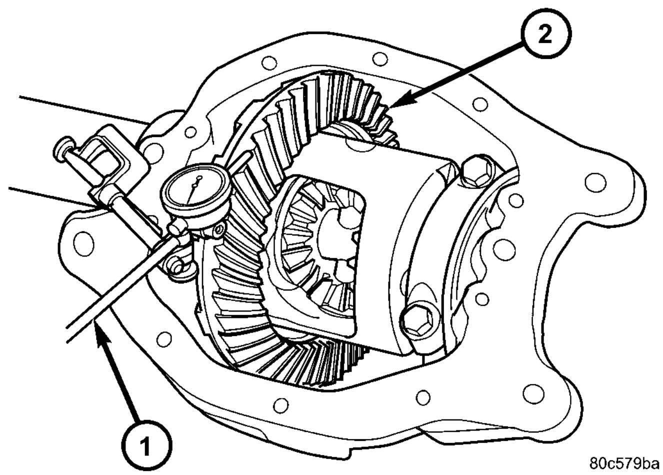


Fig. 22 RING GEAR BACKLASH

1 - DIAL INDICATOR
2 - RING GEAR

(33) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(34) Zero dial indicator face to pointer.

(35) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the housing to the other (Fig. 23).

(36) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

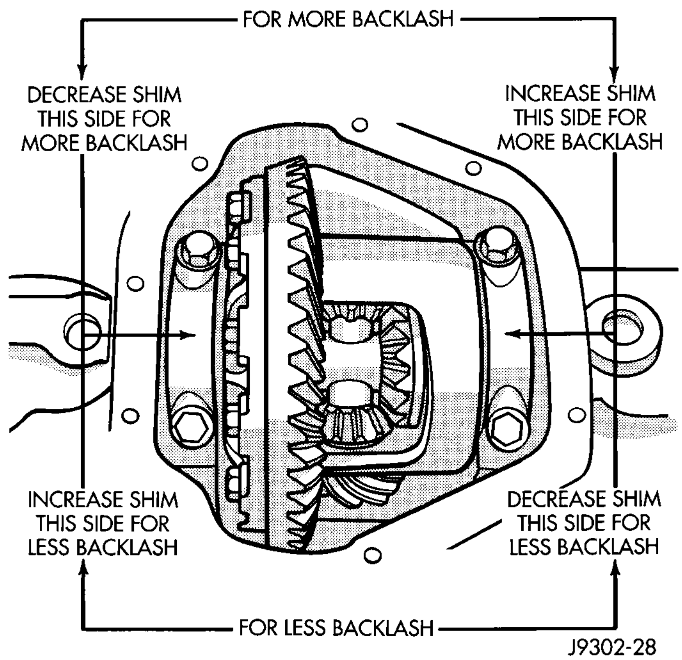


Fig. 23 BACKLASH SHIMS

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(2) Wrap, twist and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 24)and adjust pinion depth and gear backlash as necessary.

FRONT AXLE - 186FIA (Continued)

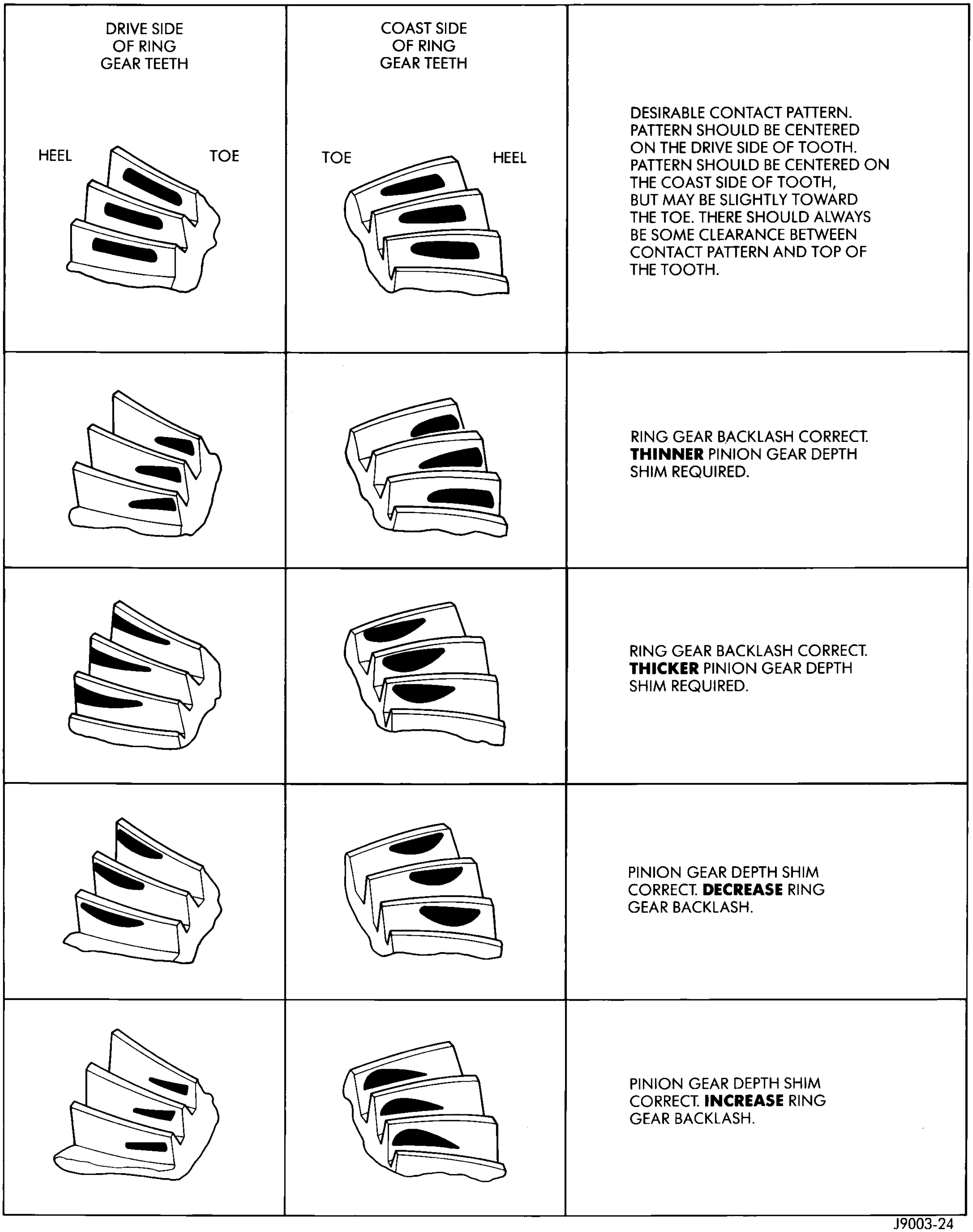


Fig. 24 GEAR TOOTH CONTACT PATTERNS

FRONT AXLE - 186FIA (Continued)

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles, is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion is the torque to rotate the pinion plus:

Gear Ratio 3.73 . . . . 0.45-0.75 N·m (3.9-6.6 in. lbs.)
Gear Ratio 4.10 . . . . 0.41-0.69 N·m (3.6-6.0 in. lbs.)

SPECIFICATIONS

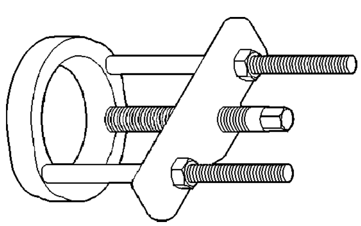
SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 4.10
Ring Gear Diameter	186 mm (7.33 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Pinion Bearing Preload	1.69-2.82 N·m (15-25 in. lbs.)
Differential Bearing Preload Added To Pinion Torque To Rotate	
Gear Ratio 3.73	0.45-0.75 N·m (3.9-6.6 in. lbs.)
Gear Ratio 4.10	0.41-0.69 N·m (3.6-6.0 in. lbs.)

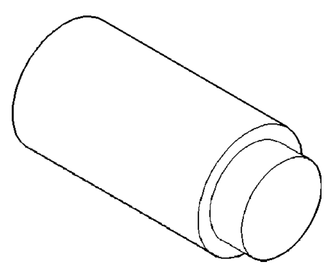
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Ring Gear Bolts	95-122	70-90	-
Differential Bearing Cap Bolts	54-67	39-50	-
Differential Cover Bolts	19-26	14-19	-
Pinion Nut	217-352	160-260	-
Left Axle Bracket Bolts	61	45	-
Front Axle Bracket Bolts	61	45	-
Right Axle Bracket Bolts	88	65	-
Axle Brackets To Frame Bolts	88	65	-

SPECIAL TOOLS

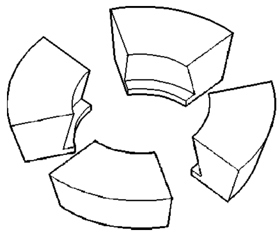


PULLER C-293-PA

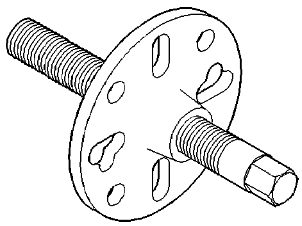


PLUG SP-3289

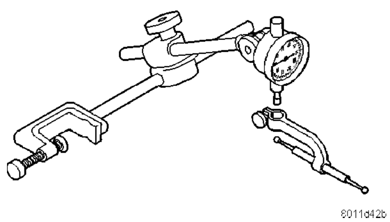
FRONT AXLE - 186FIA (Continued)



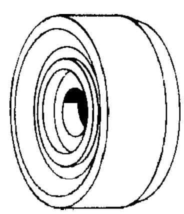
ADAPTER C-293-39



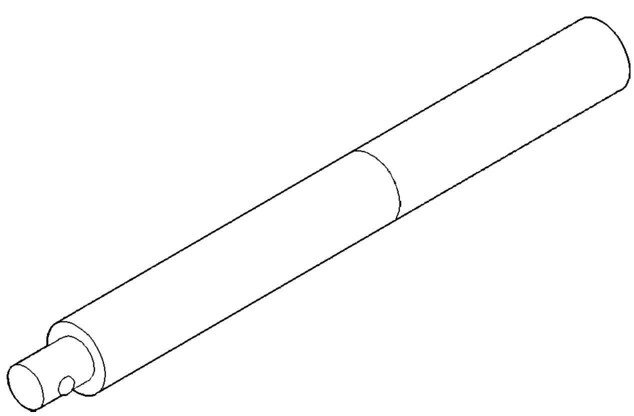
PULLER C-452



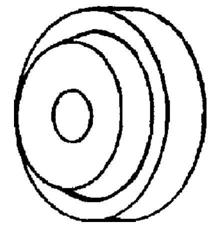
DIAL INDICATOR C-3339



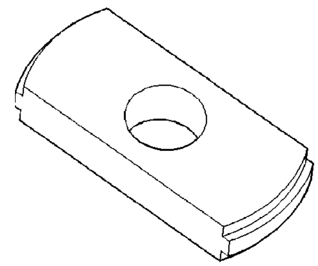
INSTALLER C-3716-A



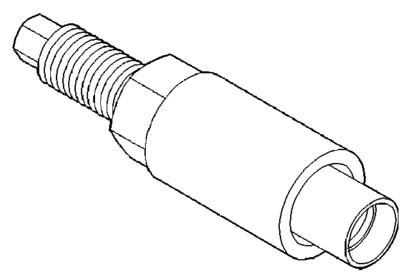
HANDLE C-4171



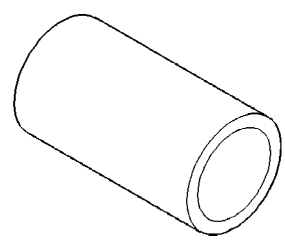
INSTALLER D-146



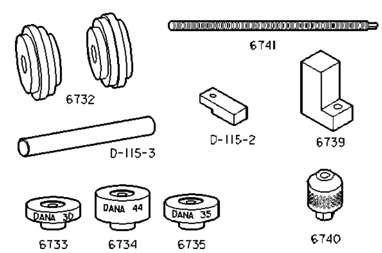
REMOVER D-149



INSTALLER W-162-D

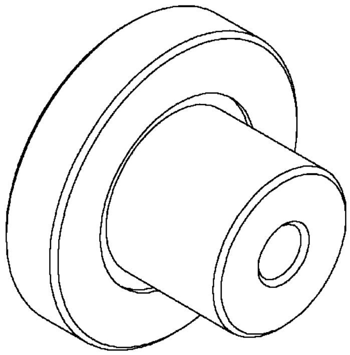


CUP 8109

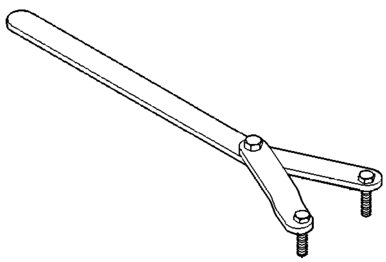


PINION DEPTH SET 6774

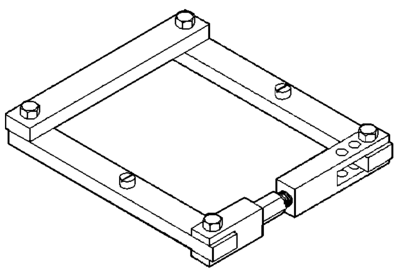
FRONT AXLE - 186FIA (Continued)



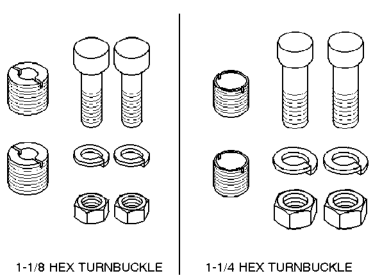
PINION BLOCK 8804



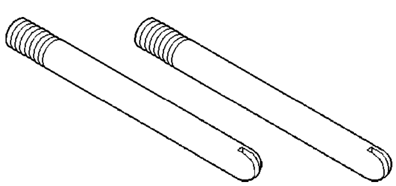
SPANNER WRENCH 6958



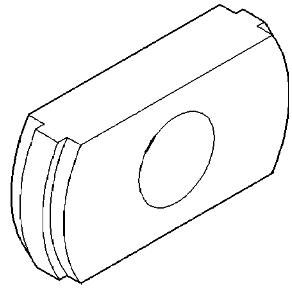
SPREADER W-129-B



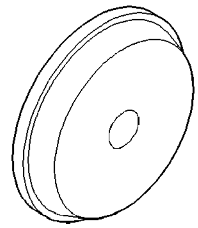
ADAPTER KIT 6987B



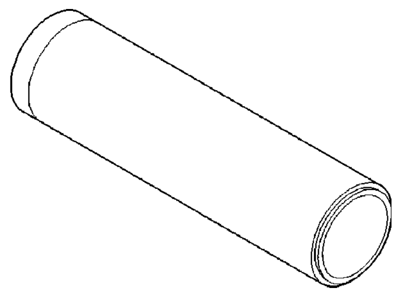
PILOT STUD C-3288-B



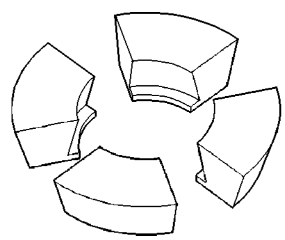
REMOVER C-4307



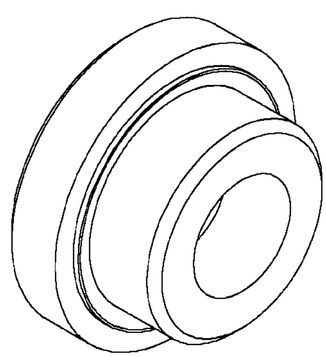
INSTALLER C-4308



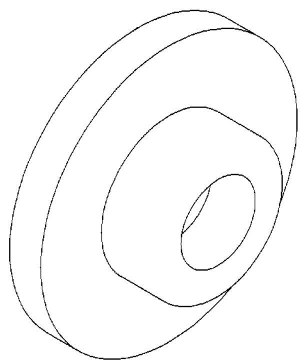
INSTALLER 6448



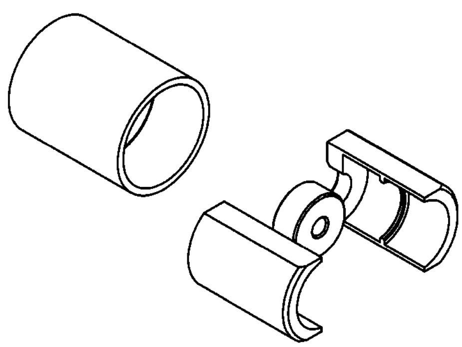
ADAPTER C-293-42



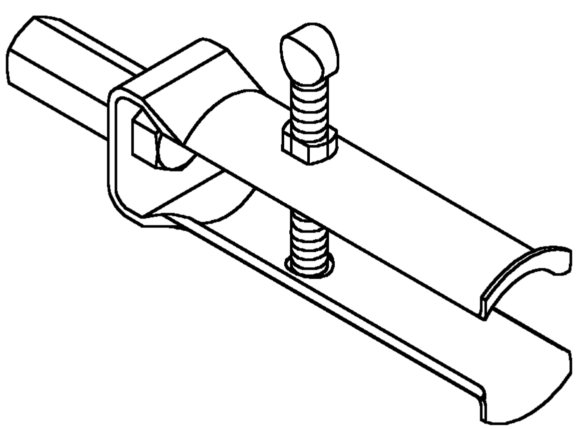
INSTALLER 8805



INSTALLER 8806



REMOVER 8420A



REMOVER 7794-A

AXLE SHAFTS

REMOVAL

(1) Place the transmission in Neutral.
(2) Raise and support vehicle.
(3) Remove right wheel and tire and assembly.
(4) Remove right half shaft from vehicle.
(5) Remove snap ring from axle shaft.
(6) Assemble Remover 8420A onto the shaft (Fig. 25). Thread slid hammer into remover and remove shaft.

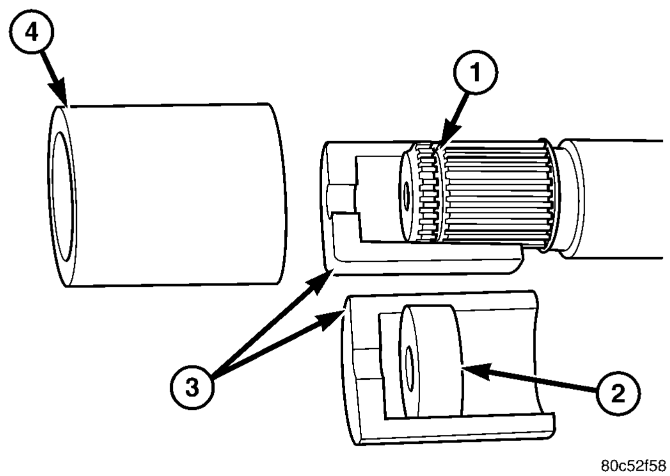


Fig. 25 AXLE SHAFT PULLER

1 - SNAP RING GROVE
2 - SLID HAMMER THREADS
3 - REMOVER BLOCKS
4 - REMOVER COLLAR

(7) Slide axle shaft out of the axle tube.

NOTE: Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube.

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing (Fig. 26) and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal.

(2) Push on the axle shaft until the axle shaft snap-ring passes through the side gear.
(3) Install right half shaft.
(4) Install right wheel and tire assembly.
(5) Check differential fluid level.
(6) Lower vehicle.

AXLE SHAFTS (Continued)

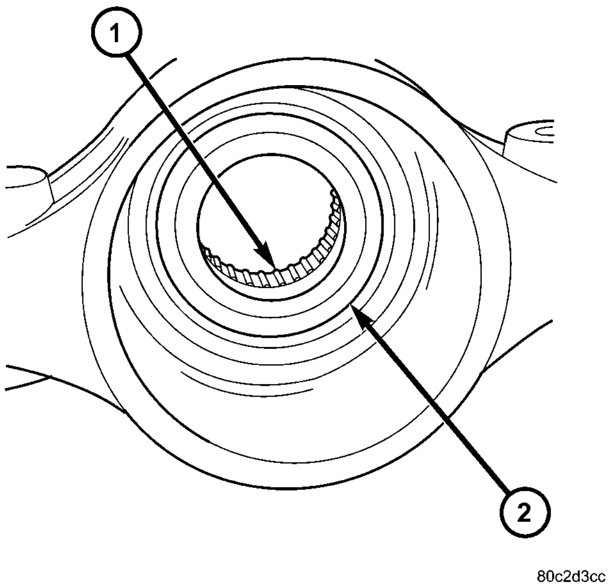


Fig. 26 AXLE SHAFT SEAL

1 - BEARING
2 - SEAL

AXLE SHAFT SEALS

REMOVAL

(1) Remove half shaft.

(2) Remove axle shaft for right side seal removal.

(3) Remove shaft seal with Remover 7794-A and a slide hammer (Fig. 27).

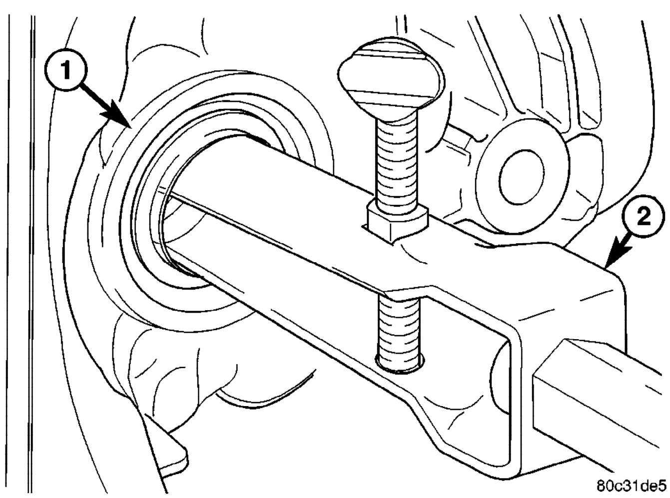


Fig. 27 SHAFT SEAL REMOVER

1 - SHAFT SEAL
2 - REMOVER

INSTALLATION

(1) Apply a light coat of lubricant on the lip of the shaft seal.

(2) Install **new** shaft seal with Installer 8806 and Handle C-4171 (Fig. 28).

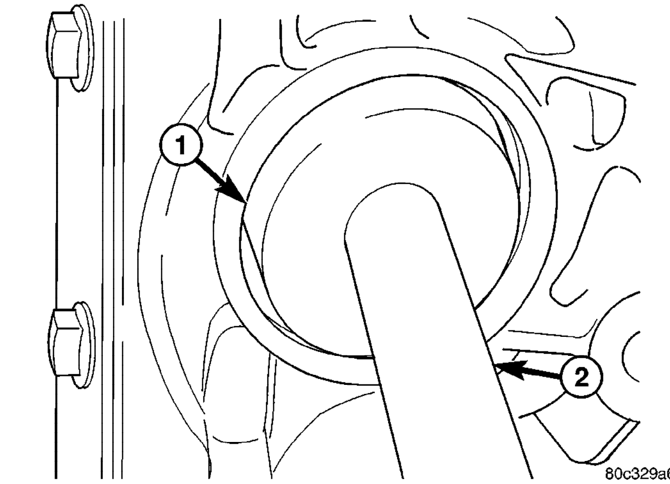


Fig. 28 SEAL INSTALLER

1 - SEAL BORE
2 - INSTALLER

(3) Install right axle shaft if removed.

(4) Install half shaft.

AXLE BEARINGS

REMOVAL

(1) Remove half shaft.

(2) Remove axle shaft for right side seal removal.

(3) Remove shaft seal with Remover 7794-A and a slide hammer.

(4) Remove shaft bearing with Remover 7794-A and a slide hammer (Fig. 29).

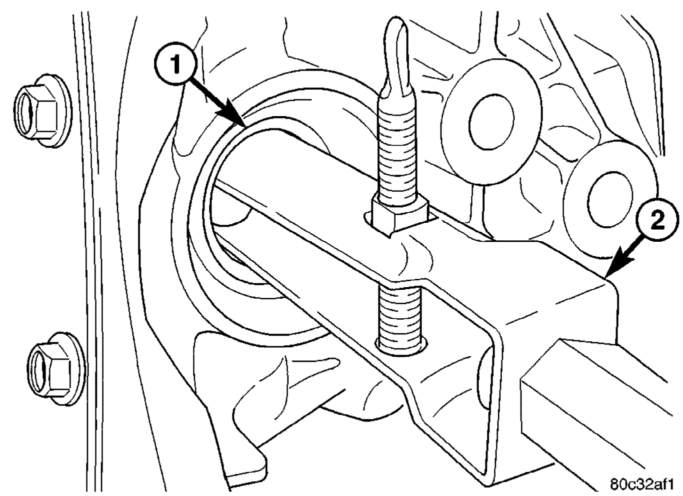


Fig. 29 SHAFT BEARING REMOVER

1 - SHAFT BEARING
2 - REMOVER

AXLE BEARINGS (Continued)

INSTALLATION

(1) Install **new** shaft bearing with Installer 8805 and Handle C-4171.

(2) Apply a light coat of lubricant on the lip of the shaft seal.

(3) Install **new** shaft seal with an appropriate installer.

(4) Install right axle shaft if removed.

(5) Install half shaft.

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake calipers and rotors, refer to 5 Brakes for procedures.

(4) Mark propeller shaft and pinion companion flange for installation reference.

(5) Remove propeller shaft from the pinion companion flange.

(6) Rotate pinion gear a minimum of ten times and verify the pinion rotates smoothly.

(7) Record the torque to rotate the pinion gear (Fig. 30) with a inch pound torque wrench.

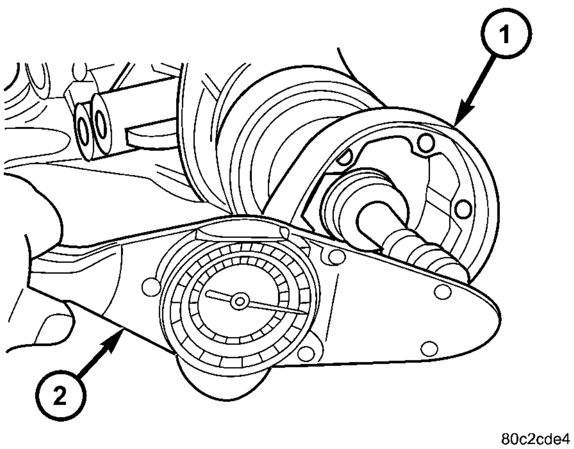


Fig. 30 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

(8) Using a short piece of pipe and Spanner Wrench 6958 to hold the pinion companion flange (Fig. 31) and remove the pinion nut.

(9) Remove pinion companion flange (Fig. 32) with Remover C-452 and Spanner Wrench 6958.

(10) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 33).

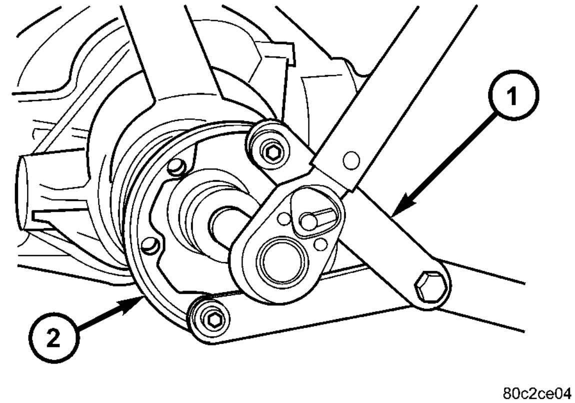


Fig. 31 PINION FLANGE NUT

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

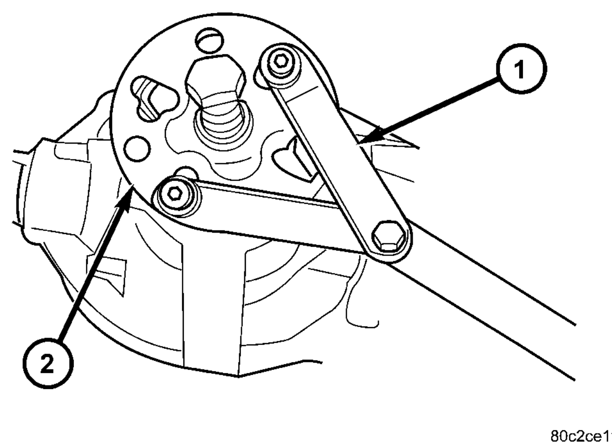


Fig. 32 PINION FLANGE REMOVER

1 - SPANNER WRENCH
2 - REMOVER

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer 8681.

(2) Install pinion companion flange on the pinion gear with Installer W-162-D, Cup 8109 and Wrench 6958.

CAUTION: Do not exceed the minimum tightening torque 216 N·m (160 ft. lbs.) while installing pinion nut at this point. Damage to collapsible spacer or bearings may result.

(3) Install a **new** nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

PINION SEAL (Continued)

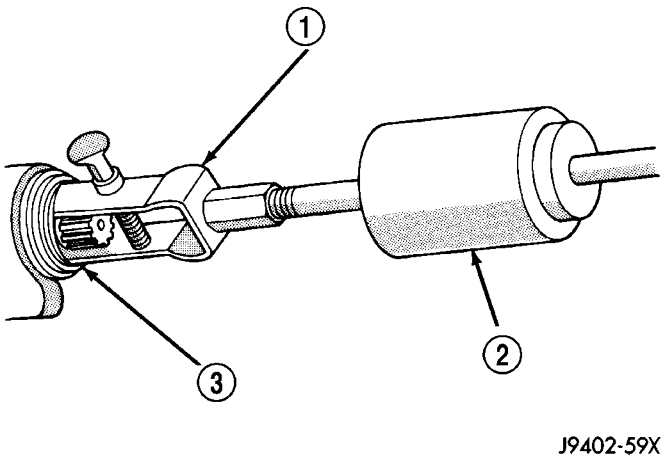


Fig. 33 PINION SEAL

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(4) Rotate pinion a minimum of ten time and verify pinion rotates smoothly. Rotate the pinion shaft with an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal plus 0.56 N·m (5 in. lbs.) (Fig. 34).

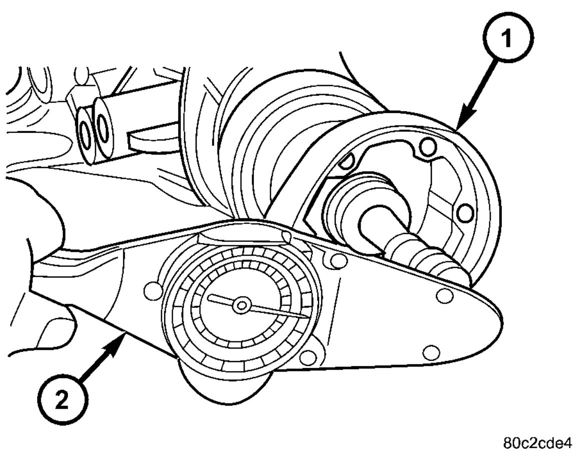


Fig. 34 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

(5) If the rotating torque is low, use Spanner Wrench 6958 to hold the pinion companion flange and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

CAUTION: If maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(6) Install propeller shaft with installation reference marks aligned.
(7) Fill differential with gear lubricant.
(8) Install brake rotors and calipers.
(9) Install wheel and tire assemblies.
(10) Lower the vehicle.

DIFFERENTIAL

REMOVAL

(1) Remove axle from the vehicle.
(2) Remove differential housing cover (Fig. 35).

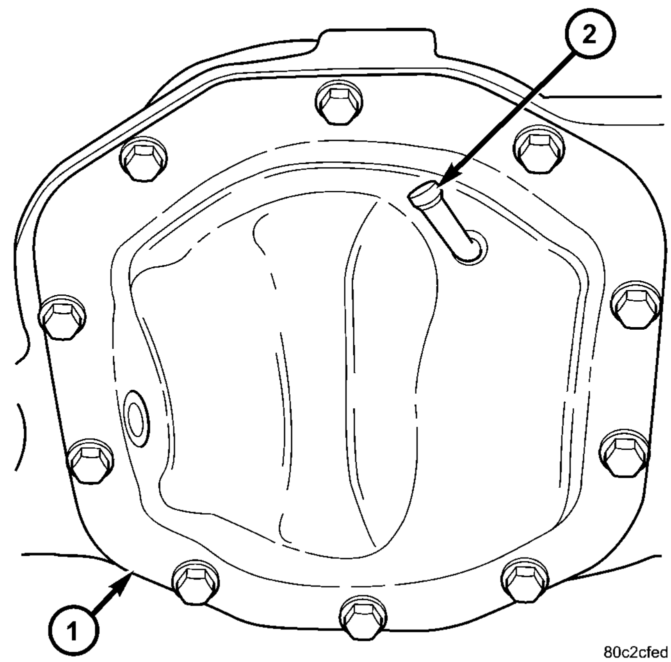


Fig. 35 DIFFERENTIAL COVER

1 - COVER
2 - VENT TUBE

(3) Push right axle shaft out of side gear (Fig. 36) and remove the shaft.
(4) Mark differential bearing caps for installation reference.
(5) Loosen the bearing cap bolts.
(6) Position Spreader W-129-B onto the differential locating holes and install the safety holddown clamps (Fig. 37). Tighten the tool turnbuckle finger-tight.
(7) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load indicator plunger against the opposite side of the housing and zero the indicator.

DIFFERENTIAL (Continued)

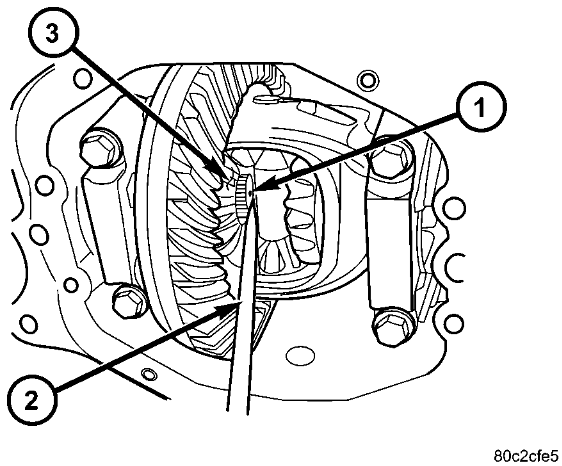


Fig. 36 RIGHT SHAFT IN SIDE GEAR

1 - AXLE SHAFT
2 - SCREWDRIVER
3 - SIDE GEAR

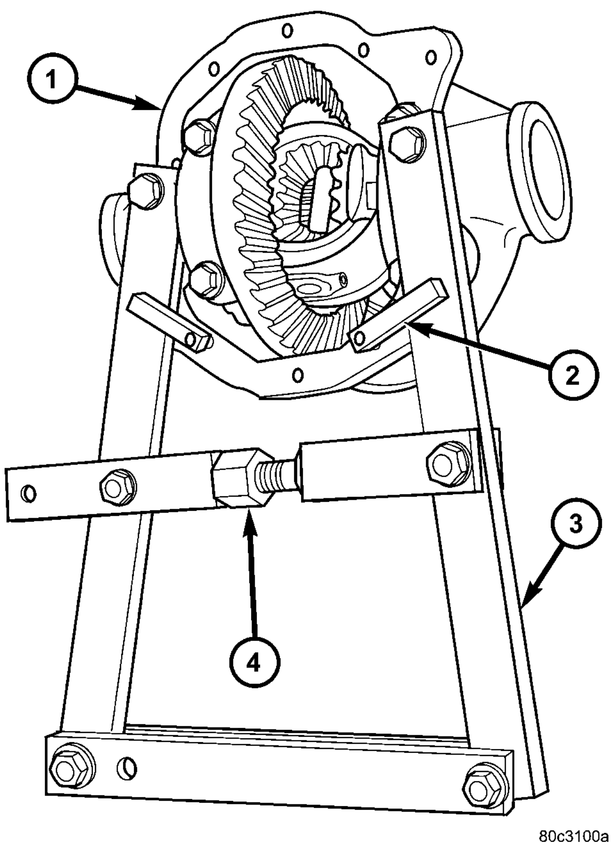


Fig. 37 DIFFERENTIAL SPREADER

1 - DIFFERENTIAL HOUSING
2 - SAFETY CLAMPS
3 - SPREADER
4 - TURNBUCKLE

(8) Spread the housing to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 38).

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in). If housing is over-spread, it could be distorted or damaged.

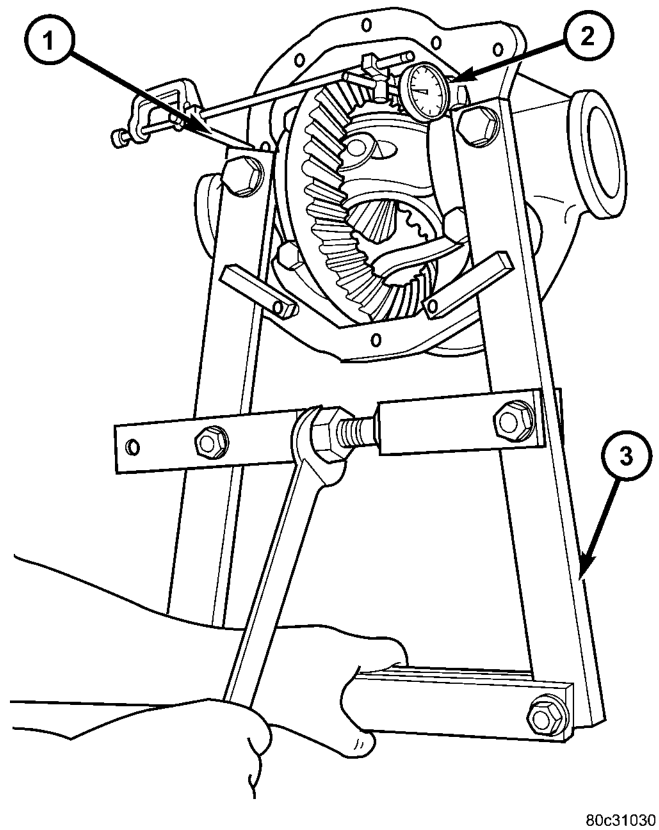


Fig. 38 SPREAD DIFFERENTIAL CASE

1 - PILOT STUD
2 - DIAL INDICATOR
3 - SPREADER

(9) Remove the dial indicator.

(10) Holding the differential case in position, and remove bearing cap bolts and caps.

(11) Remove the differential from the housing (Fig. 39). Ensure differential bearing cups and shims remain in position on the differential bearings.

(12) Tag differential bearing cups and shims to indicate their location.

(13) Remove spreader from housing.

DISASSEMBLY

(1) Remove ring gear.

(2) Remove roll-pin holding mate shaft in housing.

(3) Remove pinion gear mate shaft.

(4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 40).

(5) Remove differential side gears and thrust washers.

DIFFERENTIAL (Continued)

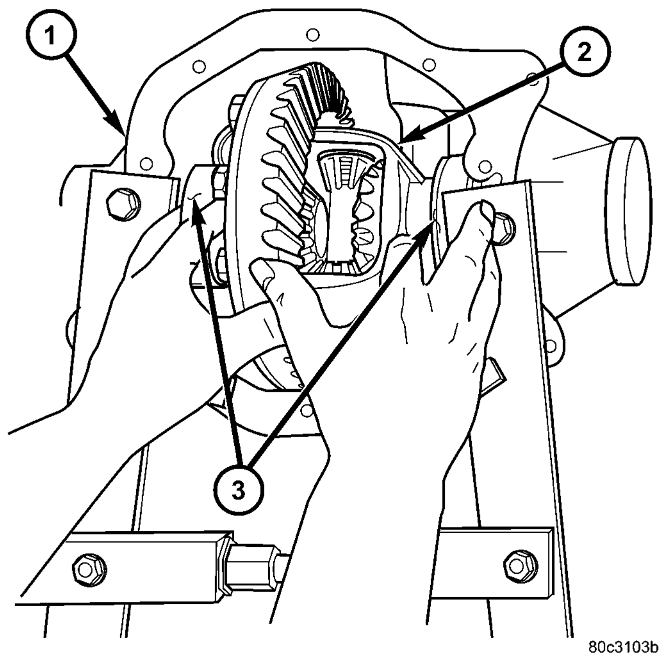


Fig. 39 DIFFERENTIAL CASE

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - DIFFERENTIAL BEARINGS

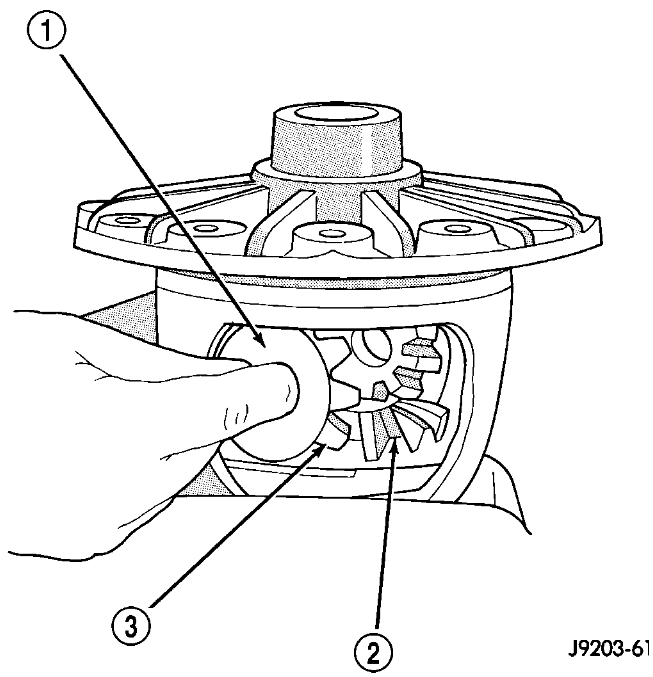


Fig. 40 PINION MATE GEAR

1 - THRUST WASHER
2 - SIDE GEAR
3 - PINION MATE GEAR

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install pinion mate gears and thrust washers.

(3) Install pinion gear mate shaft.

(4) Align hole in the pinion gear mate shaft with the hole in the differential case.

(5) Install the roll-pin in the differential case with a hammer and punch (Fig. 41). Peen the edge of the roll-pin hole in the differential case in two places 180° apart.

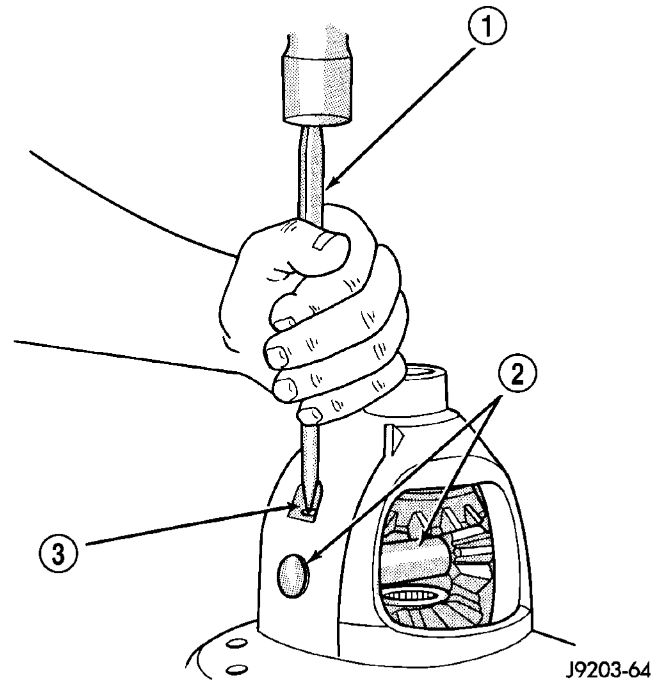


Fig. 41 PINION MATE SHAFT ROLL-PIN

1 - PUNCH
2 - PINION MATE SHAFT
3 - MATE SHAFT LOCKPIN

(6) Lubricate all differential components with hypoid gear lubricant.

(7) Install ring gear.

INSTALLATION

NOTE: If differential bearings or differential case are replaced, Refer to adjustments fore Differential Bearing Preload and Gear Backlash procedures.

(1) Position Spreader W-129-B on differential location holes and install safety holddown clamps. Tighten the tool turnbuckle finger-tight.

(2) Install Pilot Stud C-3288-B to the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.

(3) Spread the housing to install the differential case and preload shims in the housing. Measure the distance with the dial indicator.

DIFFERENTIAL (Continued)

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in). If housing is over-spread, it could be distorted or damaged.

(4) Remove the dial indicator.

(5) Install differential case in the housing. Ensure differential bearing cups remain on the bearings and preload shims are seated in the housing. Tap differential case to ensure bearings cups are seated in the housing.

(6) Install bearing caps to their original locations and loosely install cap bolts.

(7) Remove differential housing spreader (Fig. 42).

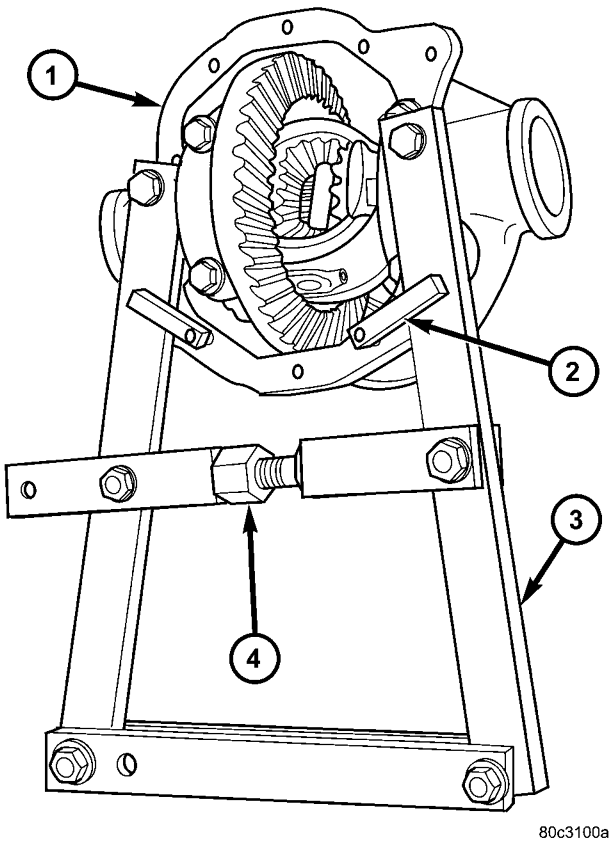


Fig. 42 DIFFERENTIAL SPREADER

1 - DIFFERENTIAL HOUSING
2 - SAFETY CLAMPS
3 - SPREADER
4 - TURNBUCKLE

(8) Tighten the bearing cap bolts in a criss-cross pattern to 54-68 N·m (39-50 ft. lbs.).

(9) Install the right axle shaft.

(10) Apply a 6.38mm (1/4 in.) bead of red Mopar Silicone Sealer or equivalent to the housing cover.

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(11) Install differential housing cover and tighten bolts in a criss-cross pattern to 19-26 N·m (14-19 ft. lbs.).

(12) Install axle assembly in vehicle.

(13) Fill differential with lubricant and install fill plug.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential from the housing.

(2) Remove bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-39 and Plug SP-3289 (Fig. 43).

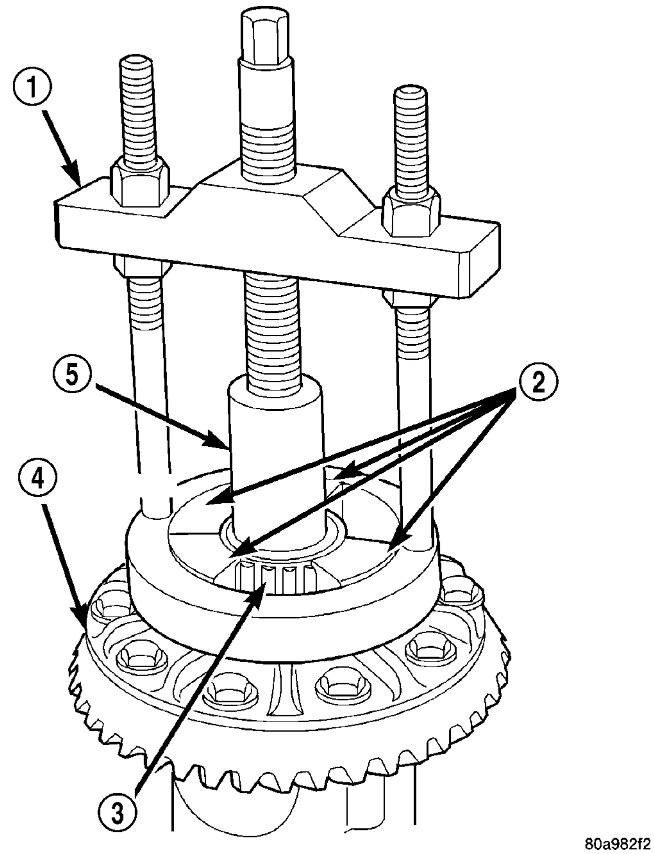


Fig. 43 DIFFERENTIAL BEARING PULLER

1 - PULLER
2 - ADAPTERS
3 - BEARING
4 - DIFFERENTIAL
5 - PLUG

INSTALLATION

(1) Install differential case bearings with Installer C-3716-A and Handle C-4171 (Fig. 44).

(2) Install differential into the housing.

DIFFERENTIAL CASE BEARINGS (Continued)

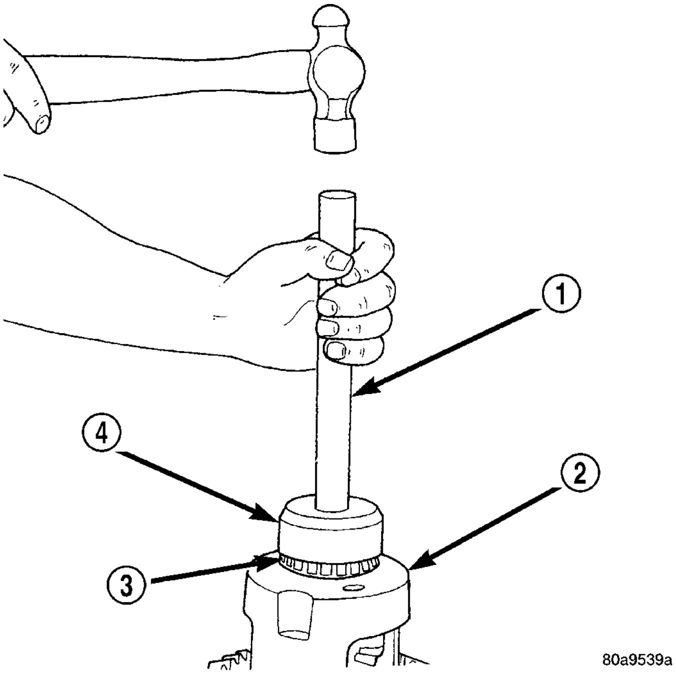


Fig. 44 DIFFERENTIAL CASE BEARINGS

1 - HANDLE
2 - DIFFERENTIAL
3 - BEARING
4 - INSTALLER

PINION GEAR/RING GEAR

REMOVAL

NOTE: The ring gear and pinion are serviced as a matched set. Never replace ring gear without replacing the matched pinion gear.

(1) Raise and support vehicle

(2) Mark pinion companion flange and propeller shaft for installation alignment.

(3) Remove propeller shaft from pinion companion flange and tie propeller shaft to underbody.

(4) Remove axle assembly from the vehicle.

(5) Remove differential from axle housing.

(6) Place differential case in a vise with soft metal jaw (Fig. 45).

(7) Remove bolts holding ring gear to differential case.

(8) Driver ring gear off the differential case with a rawhide hammer (Fig. 45).

(9) With Spanner Wrench 6958 and a short length of 1 in. pipe, hold pinion companion flange and remove pinion nut (Fig. 46).

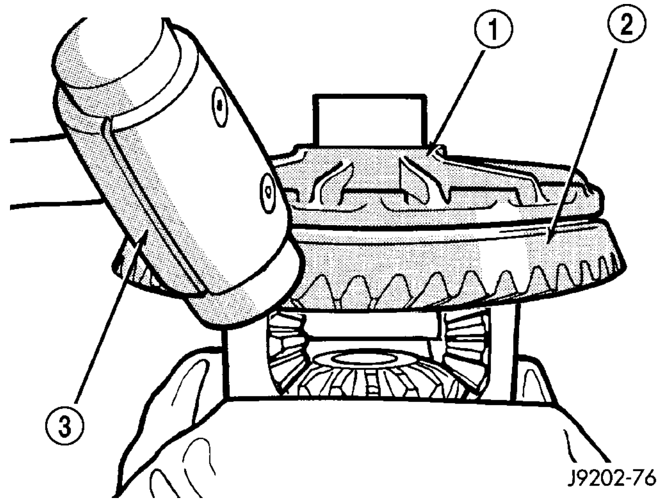


Fig. 45 RING GEAR

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - HAMMER

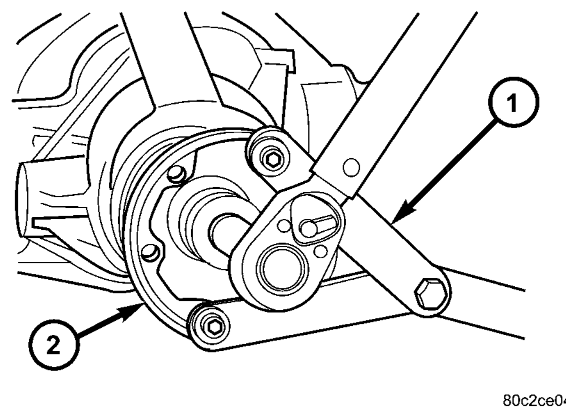


Fig. 46 PINION COMPANION FLANGE

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

(10) Remove pinion companion flange from pinion shaft with Remover C-452 and Flange Wrench C-3281 (Fig. 47).

(11) Remove pinion gear and collapsible spacer from housing (Fig. 48).

(12) Remove front pinion bearing cup, bearing, oil slinger and pinion seal with Remover C-149 and Handle C-4171 (Fig. 49).

(13) Remove rear pinion bearing cup (Fig. 50) with Remover C-4307 and Handle C-4171.

PINION GEAR/RING GEAR (Continued)

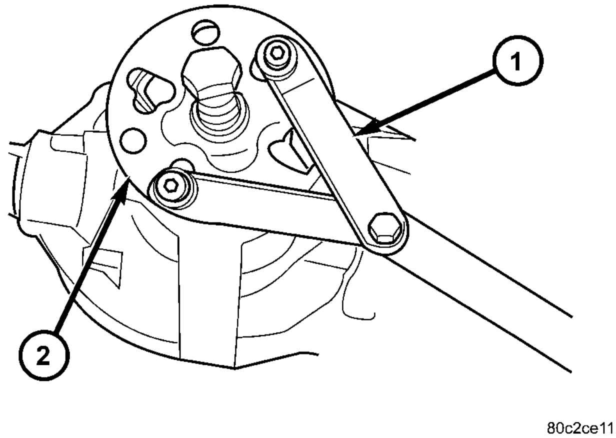


Fig. 47 PINION FLANGE REMOVER

1 - SPANNER WRENCH
2 - REMOVER

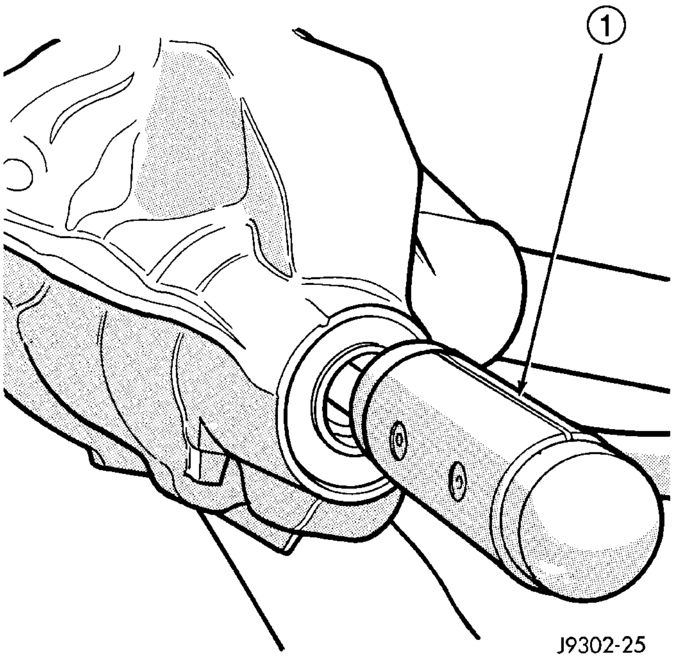


Fig. 48 PINION GEAR

1 - RAWHIDE HAMMER

(14) Remove collapsible preload spacer from pinion gear (Fig. 51).

(15) Remove rear pinion bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-39 (Fig. 52). Remove oil slinger/pinion depth shim from the pinion shaft and record thickness.

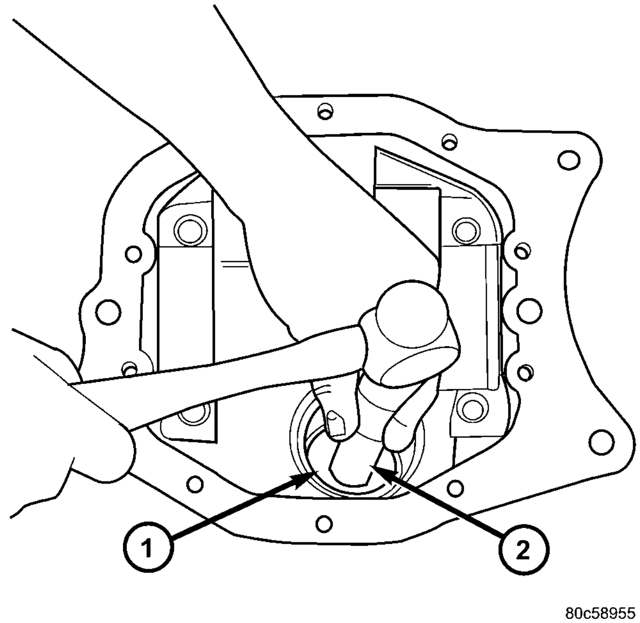


Fig. 49 FRONT BPINION BEARING CUP

1 - REMOVER
2 - HANDLE

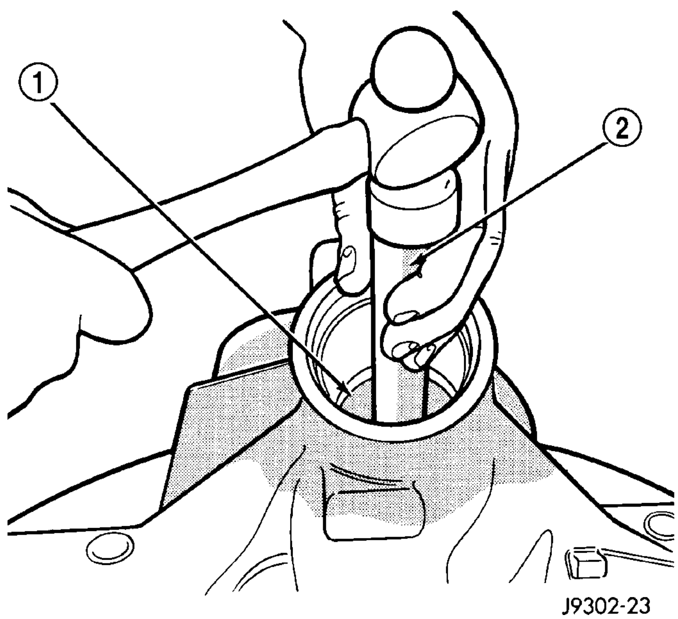


Fig. 50 REAR PINION BEARING CUP

1 - REMOVER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

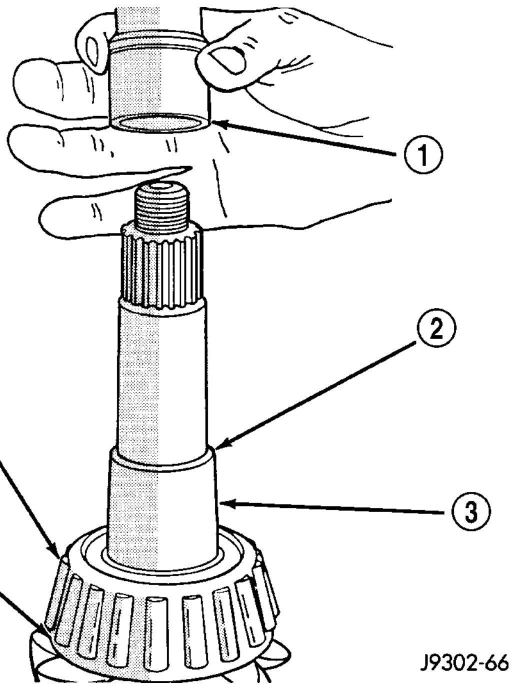


Fig. 51 COLLAPSIBLE PRELOAD SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - OIL SLINGER
5 - REAR BEARING

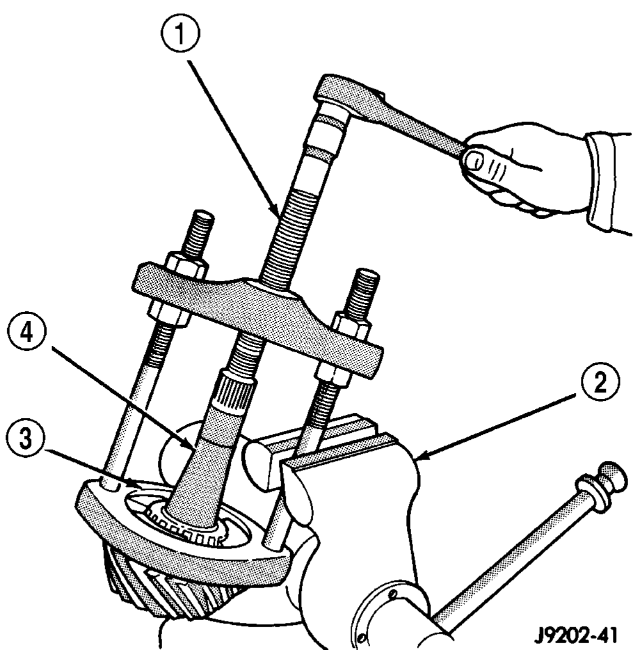


Fig. 52 REAR PINION BEARING

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

INSTALLATION

NOTE: Pinion depth shims are placed between the rear pinion bearing and the pinion gear head to achieve proper ring and pinion gear mesh. If ring and pinion gears are reused, the pinion oil slinger/ depth shim should not require replacement. Refer to Adujstments (Pinion Gear Depth) to select the proper thickness shim before installing pinion gear.

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of pinion bearing cups.

(2) Install rear bearing cup with Installer C-4308 and Handle C-4171 and verify cup is seated.

(3) Install front bearing cup with Installer D-146 and Handle C-4171 (Fig. 53) and verify cup is seated.

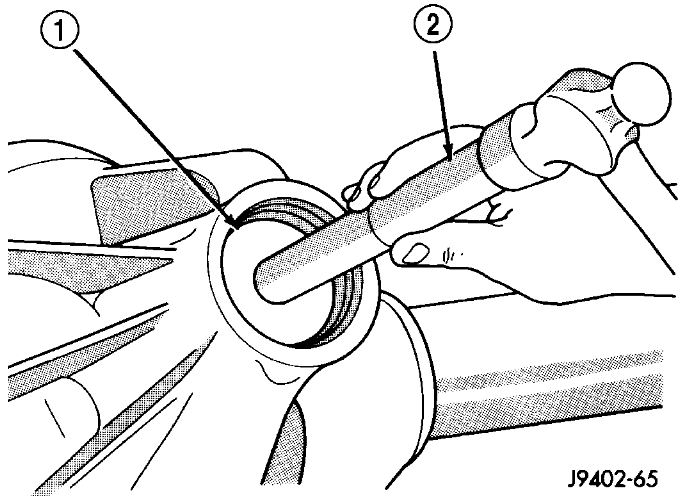


Fig. 53 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

(4) Install front pinion bearing, and oil slinger if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal and intall seal with Installer 8681.

(6) Install rear pinion bearing and oil slinger/depth shim onto the pinion shaft with Installer 6448 and a press (Fig. 54).

(7) Install a **new** collapsible spacer on pinion shaft and install the pinion into the housing (Fig. 55).

(8) Install pinion companion flange, with Installer W-162-D, Cup 8109 and Spanner Wrench 6958.

(9) Install pinion a **new** nut onto the pinion gear and tighten the nut to 216 N·m (160 ft. lbs.). **Do not over-tighten.**

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed.

PINION GEAR/RING GEAR (Continued)

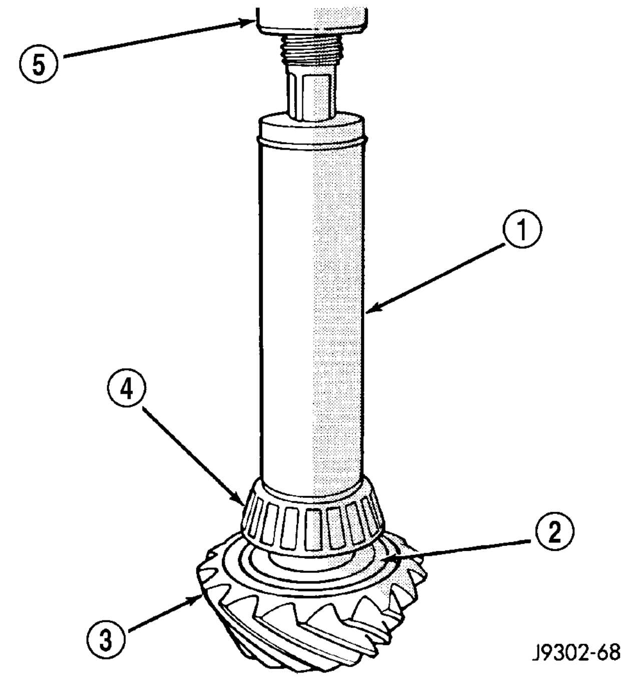


Fig. 54 REAR PINION BEARING

1 - INSTALLER
2 - OIL SLINGER
3 - PINION GEAR
4 - REAR PINION BEARING
5 - PRESS

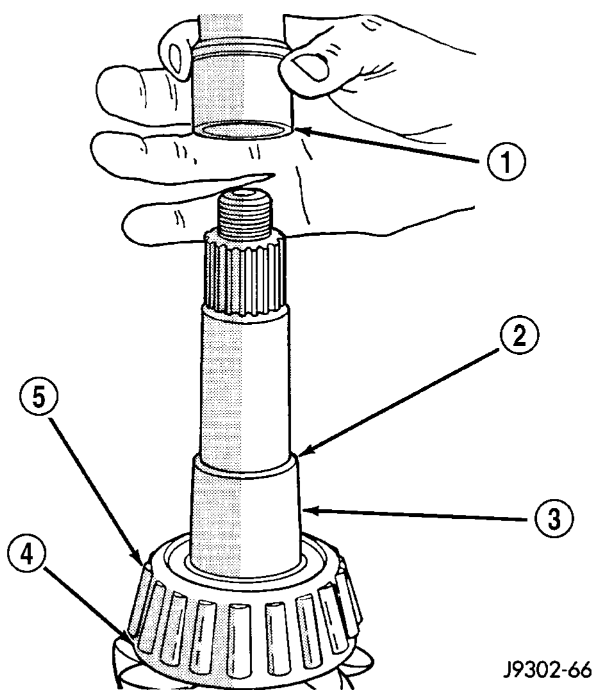


Fig. 55 COLLAPSIBLE PRELOAD SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - OIL SLINGER
5 - REAR BEARING

(10) Use Flange Wrench 6958, a length of 1 in. pipe and a torque wrench set at 678 N·m (500 ft. lbs.) and crush collapsible spacer until bearing end play is taken up (Fig. 56).

(11) Slowly tighten the nut in 6.8 N·m (5 ft. lb.) increments until the required rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 57).

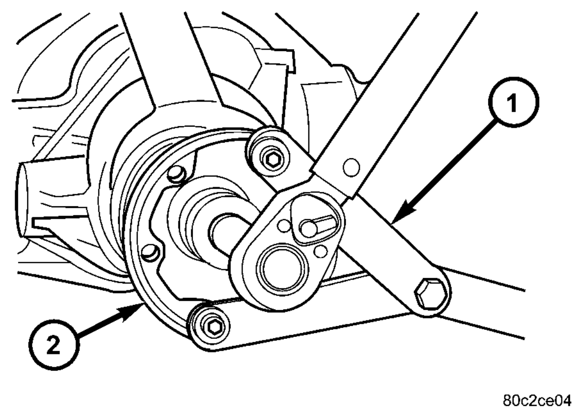


Fig. 56 PINION FLANGE NUT

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

(12) Rotate the pinion a minimum of ten times. Verify pinion rotates smoothly and check rotating torque with an inch pound torque wrench (Fig. 57). Pinion gear rotating torque is:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 1.69 to 2.82 N·m (15 to 25 in. lbs.).

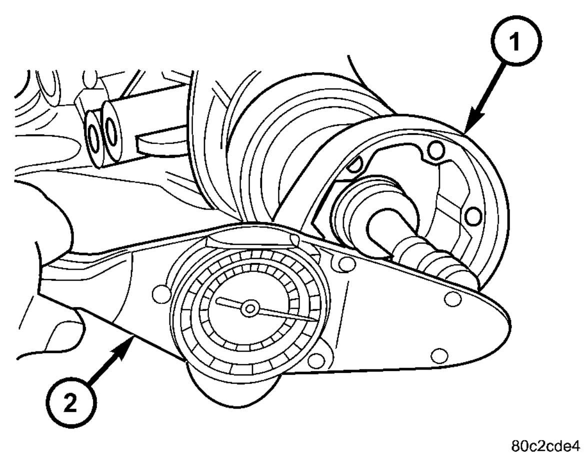


Fig. 57 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

PINION GEAR/RING GEAR (Continued)

(13) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(14) Invert the differential case in the vise. Install **new** ring gear bolts and alternately tighten to 108 N·m (80 ft. lbs.) (Fig. 58).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

(15) Install differential in housing and verify differential bearing preload, gear mesh and contact pattern. Refer to Adjustment for procedure.

(16) Install differential cover and fill with gear lubricant.

(17) Install propeller shaft with reference marks aligned.

(18) Remove supports and lower vehicle.

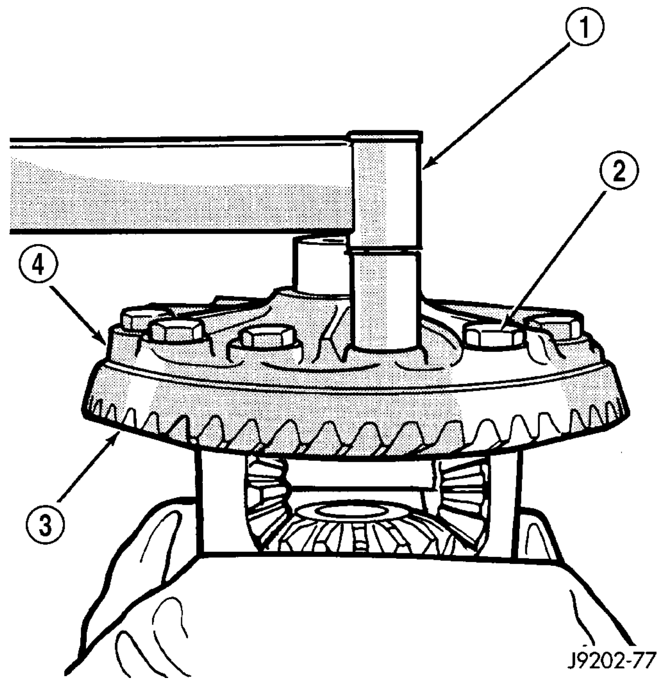


Fig. 58 RING GEAR BOLTS

1 - TORQUE WRENCH
2 - RING GEAR BOLTS
3 - RING GEAR
4 - DIFFERENTIAL CASE

REAR AXLE - 8 1/4

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REAR AXLE - 8 1/4

DESCRIPTION

The axle housings consist of a cast iron center section with axle tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing. The axles are equipped with semi-floating axle shafts, meaning vehicle loads are supported by the axle shaft and bearings. The axle shafts are retained by C-locks in the differential side gears.

OPERATION

The axle receives power from the transmission/transfer case through the rear propeller shaft. The rear propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing

REAR AXLE - 8 1/4 (Continued)

noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side–gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.

REAR AXLE - 8 1/4 (Continued)

Condition	Possible Causes	Correction
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.

REAR AXLE - 8 1/4 (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

REMOVAL

(1) Raise and support the vehicle.

(2) Position a lift/jack under the axle and secure axle to device.

(3) Remove wheels and tires.

(4) Mark propeller shaft and pinion yoke for installation reference.

(5) Remove propeller shaft and suspend under the vehicle.

(6) Remove disc brake and parking brake components.

(7) Disconnect the brake hose at the body junction block.

(8) Remove vent hose from the axle shaft tube.

(9) Remove the stabilizer bar (Fig. 1).

(10) Remove upper control arm ball joint pinch bolt from bracket (Fig. 2).

(11) Remove shock absorbers from axle brackets (Fig. 3).

(12) Loosen all lower control arms mounting bolts (Fig. 4).

(13) Lower axle enough to remove coil springs and spring insulators.

(14) Remove lower control arm bolts from the axle brackets.

(15) Lower and remove the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before the lower control arms are tightened. This must be done to maintain vehicle ride height and prevent premature bushing failure.

(1) Raise the axle under the vehicle.

REAR AXLE - 8 1/4 (Continued)

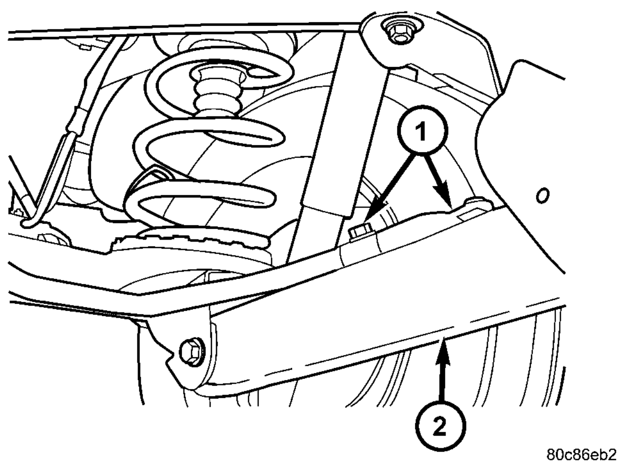


Fig. 1 STABILIZER BAR MOUNTS

1 - STABILIZER BAR MOUNTING BOLTS
2 - LOWER SUSPENSION ARM

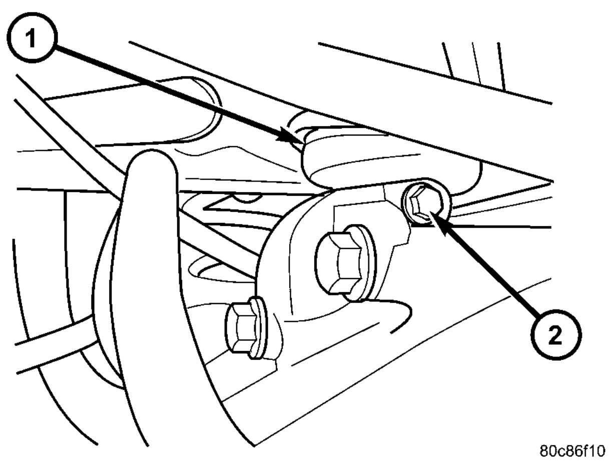


Fig. 2 BALL JOINT PINCH BOLT

1 - UPPER BALL JOINT
2 - PINCH BOLT

(2) Install lower control arms onto the axle brackets and loosely install the mounting bolts.

(3) Install coil spring isolators and spring.

(4) Raise axle up until springs are seated.

(5) Install upper control arm ball joint into axle bracket and tighten pinch bolt to torque specification.

(6) Install shock absorbers and tighten nuts to torque specification.

(7) Install stabilizer bar and tighten nuts to torque specification.

(8) Install disc brake and parking brake components.

(9) Install brake hose to the body junction block and bleed the brakes.

(10) Install axle vent hose.

(11) Install propeller shaft with reference marks.

(12) Install the wheels and tires.

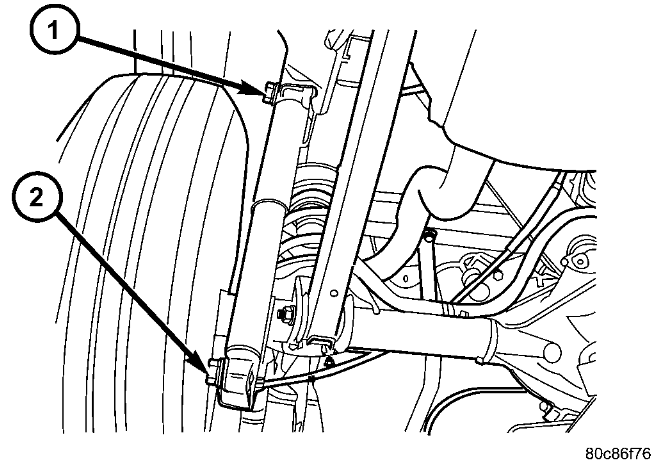


Fig. 3 SHOCK ABSORBER

1 - UPPER MOUNTING BOLT
2 - LOWER MOUNTING BOLT

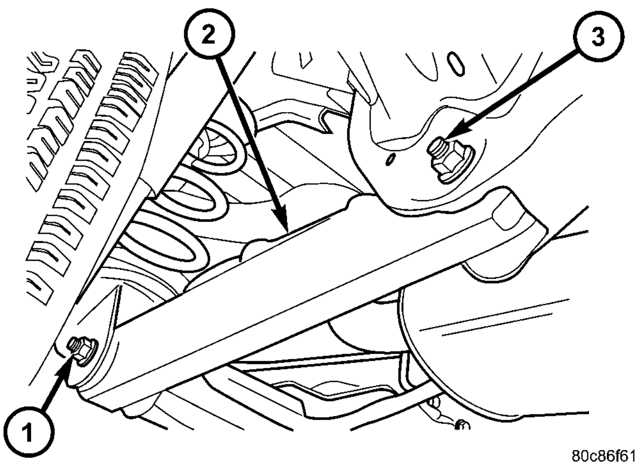


Fig. 4 LOWER SUSPENSION ARM

1 - AXLE BRACKET BOLT
2 - LOWER CONTROL ARM
3 - BODY BRACKET BOLT

(13) Add gear lubricant to specifications, if necessary.

(14) Remove lifting device from axle and lower the vehicle.

(15) Tighten the lower control arm bolts to torque specification.

ADJUSTMENTS

Ring gear and pinion are supplied as matched sets only. The identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft (Fig. 5) and the side of the ring gear. A plus (+) number, minus (–) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. This first number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a

REAR AXLE - 8 1/4 (Continued)

pinion marked with a (0). The next two numbers are the sequence number of the gear set. The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern in this section for additional information.

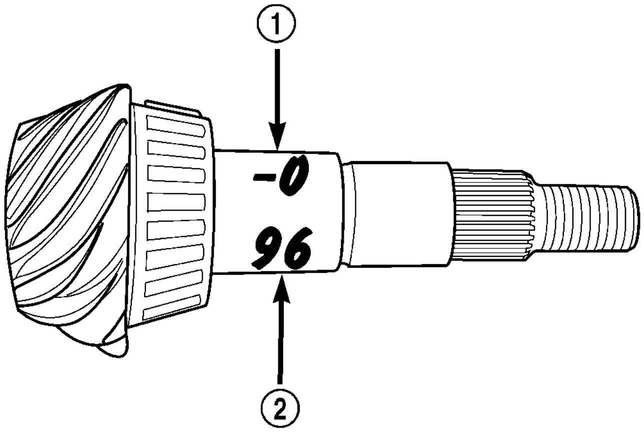


Fig. 5 PINION ID NUMBERS

1 - VARIANCE NUMBER
2 - SEQUENCE NUMBER

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing (Fig. 6).

If a new gear set is being installed, note the depth variance painted onto both the original and replacement pinion. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance chart.

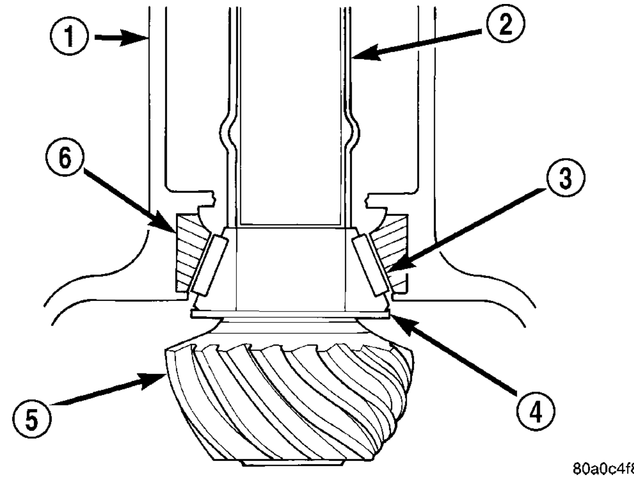


Fig. 6 ADJUSTMENT SHIM LOCATIONS

1 - AXLE HOUSING
2 - COLLAPSIBLE SPACER
3 - PINION BEARING
4 - PINION DEPTH SHIM
5 - PINION GEAR
6 - BEARING CUP

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the painted number on the shaft of the drive pinion (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

REAR AXLE - 8 1/4 (Continued)

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 7).

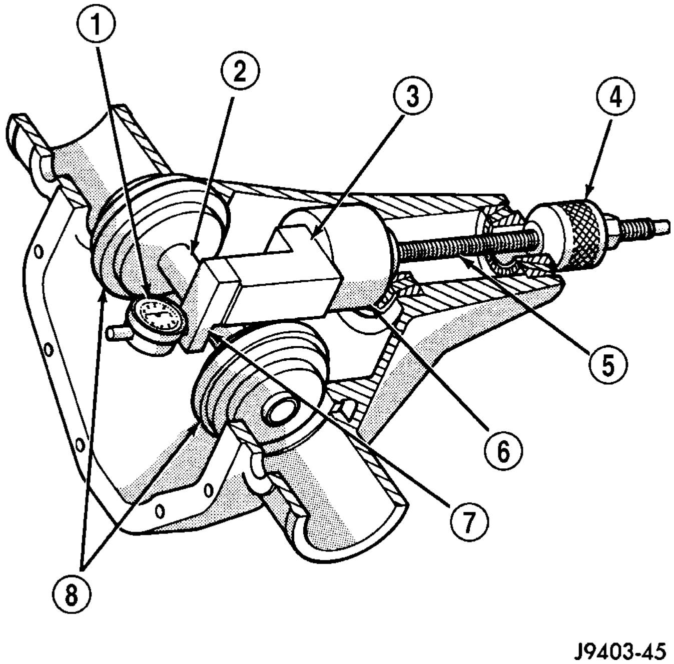


Fig. 7 PINION DEPTH GAUGE

1 - DIAL INDICATOR
2 - ARBOR
3 - PINION HEIGHT BLOCK
4 - CONE
5 - SCREW
6 - PINION BLOCK
7 - SCOOTER BLOCK
8 - ARBOR DISC

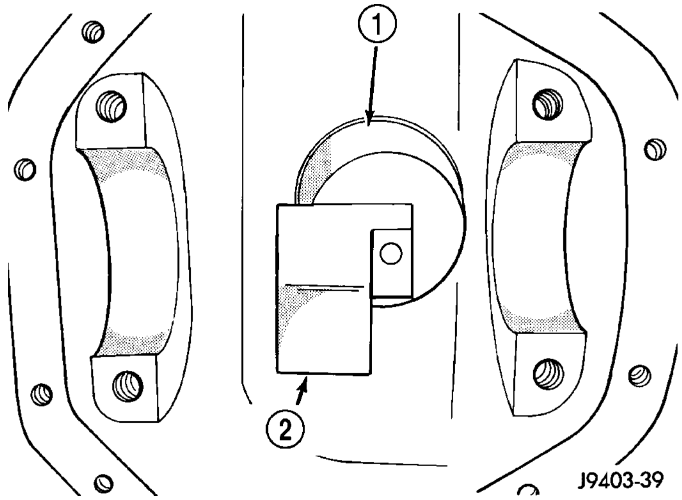


Fig. 8 PINION HEIGHT BLOCK

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

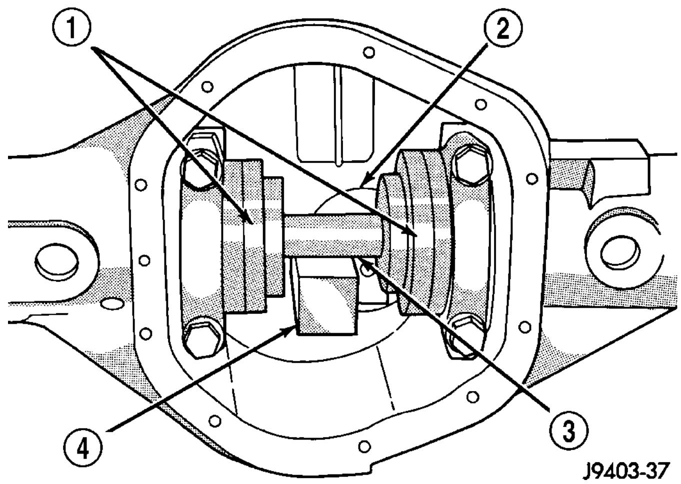


Fig. 9 GAUGE TOOLS IN HOUSING

1 - ARBOR DISC
2 - PINION BLOCK
3 - ARBOR
4 - PINION HEIGHT BLOCK

(1) Assemble Pinion Height Block 6739, Pinion Block 8540 and rear pinion bearing onto Screw 6741 (Fig. 7).

(2) Insert assembled height gauge components, rear bearing and screw into housing through pinion bearing cups (Fig. 8).

(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 7).

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 9). Install differential bearing caps on arbor discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 8541 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 7). Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.

(7) Slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 10). When dial probe contacts the arbor bar, the dial pointer will turn clockwise. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve a zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

REAR AXLE - 8 1/4 (Continued)

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

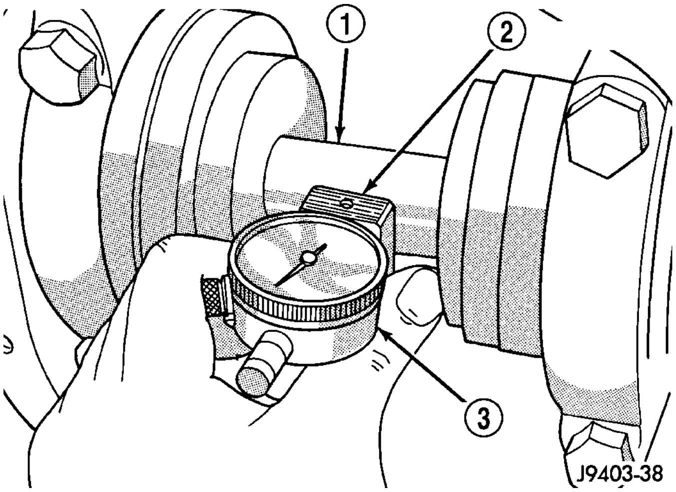


Fig. 10 PINION GEAR DEPTH

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

The following must be considered when adjusting bearing preload and gear backlash:

• The maximum ring gear backlash variation is 0.003 inch (0.076 mm).

• Mark the gears so the same teeth are meshed during all backlash measurements.

• Maintain the torque while adjusting the bearing preload and ring gear backlash.

• Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.

• Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.

NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

• Maintain the gear teeth engaged (meshed) as marked.

• The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.

• Do this five to ten times each time the threaded adjusters are adjusted.

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated. Allow some ring gear backlash (approximately 0.01 inch/0.25 mm) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 11). Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

(3) Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.

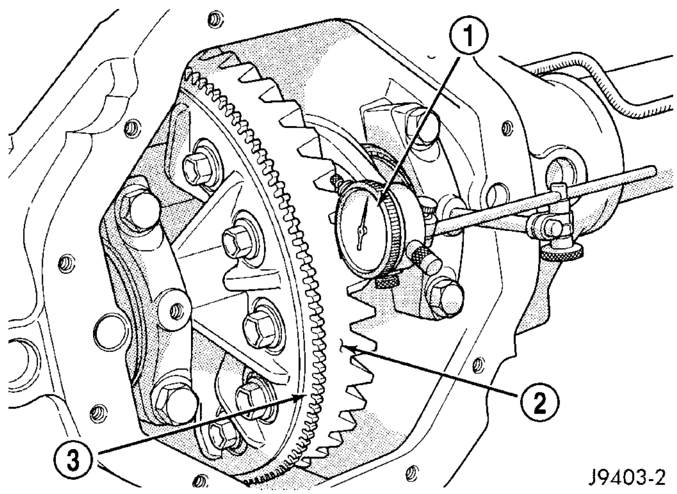


Fig. 11 RING GEAR BACKLASH

1 - DIAL INDICATOR
2 - RING GEAR
3 - EXCITER RING

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.003 to 0.004 inch (0.076 to 0.102 mm) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.

(5) Tighten the differential bearing cap bolts to 95 N·m (70 ft. lbs.).

(6) Tighten the right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the procedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.)

(7) Measure the ring gear backlash. The range of backlash is 0.006 to 0.008 inch (0.15 to 0.203 mm).

(8) Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

REAR AXLE - 8 1/4 (Continued)

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

(9) Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.

(10) Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

After the proper backlash is achieved, perform the Gear Contact procedure.

GEAR CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shorten gear life.

(1) Wipe clean each tooth of the ring gear.

(2) Apply gear marking compound to all of the ring gear teeth.

(3) Verify bearing cap bolts are torque specification.

(4) Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.

(5) Rotate the pinion/pinion yoke 4 full revolutions in each directions.

(6) Read gear tooth contact pattern.

- Gear contact pattern is correct (Fig. 12). Backlash and pinion depth is correct.

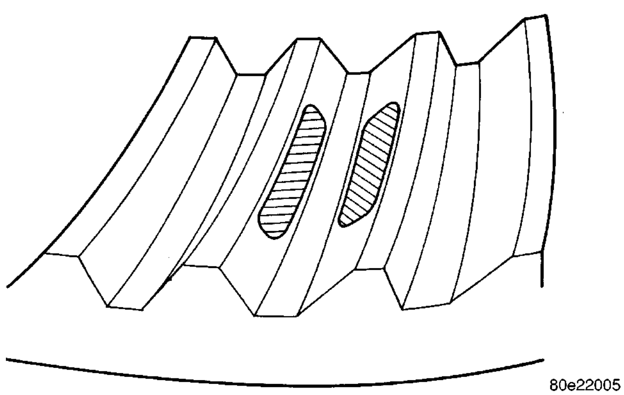


Fig. 12 CORRECT CONTACT PATTERN

- Ring gear is too far away from the pinion gear (Fig. 13). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.
- Ring gear is too close to the pinion gear (Fig. 14). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.
- Ring gear is too far away from the pinion gear (Fig. 15). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.

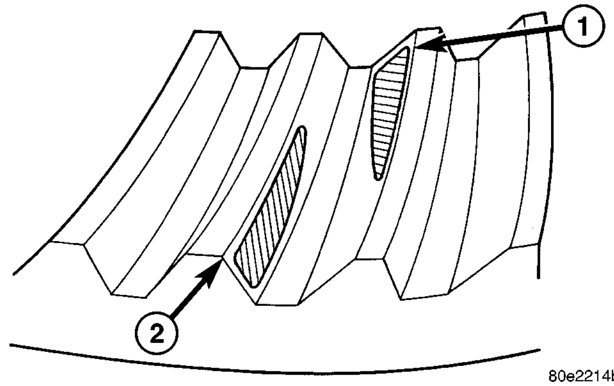


Fig. 13 INCORRECT BACKLASH

1 - COAST SIDE TOE
2 - DRIVE SIDE HEEL

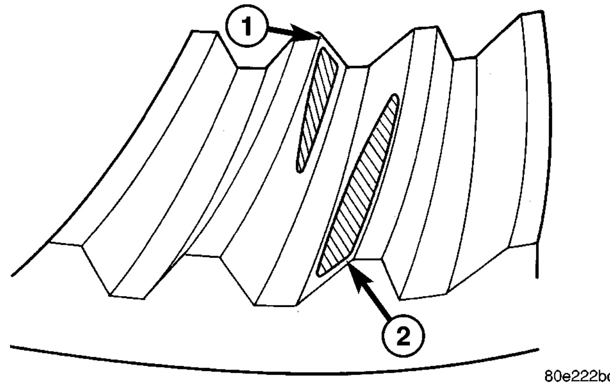


Fig. 14 INCORRECT BACKLASH

1 - DRIVE SIDE TOE
2 - COAST SIDE HEEL

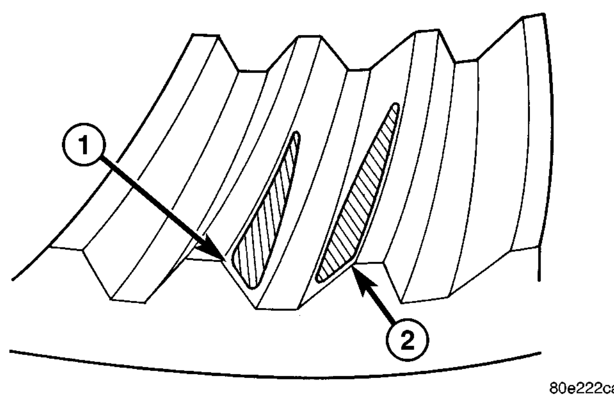


Fig. 15 INCORRECT BACKLASH

1 - DRIVE SIDE HEEL
2 - COAST SIDE HEEL

- Ring gear is too close to the pinion gear (Fig. 16). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.
- Pinion gear is set too low (Fig. 17). Increase the pinion gear height, by increasing the pinion depth shim thickness.

REAR AXLE - 8 1/4 (Continued)

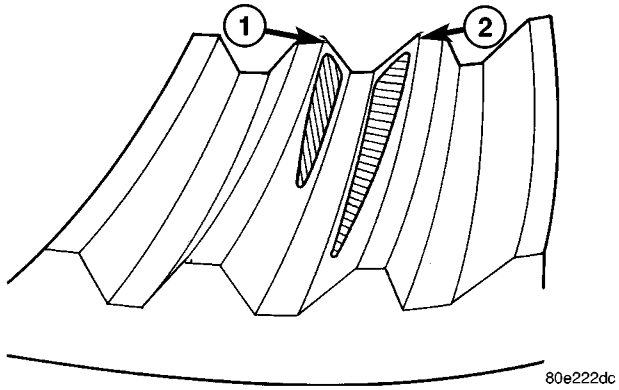


Fig. 16 INCORRECT BACKLASH

1 - DRIVE SIDE TOE
2 - COAST SIDE TOE

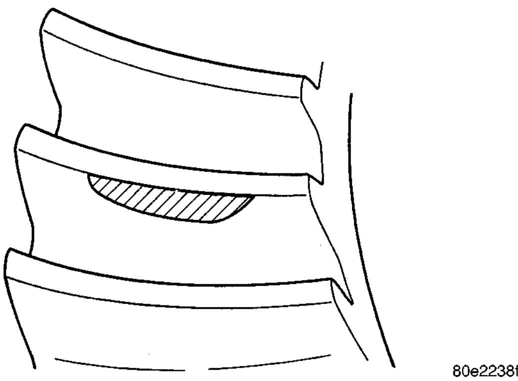


Fig. 17 LOW PINION HEIGHT

- Pinion gear is set too high (Fig. 18). Decrease the pinion depth, by decreasing the pinion depth shim thickness.

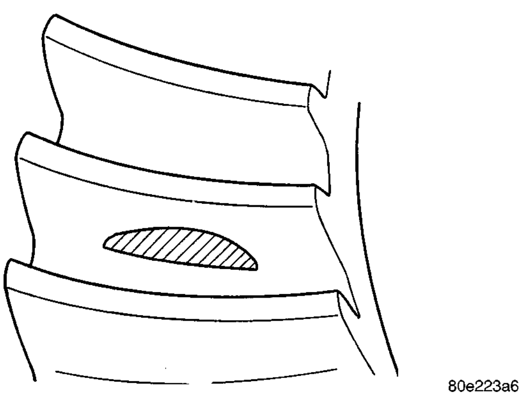


Fig. 18 HIGH PINION HEIGHT

SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

(1) Install the axle shafts and C-locks and pinion mate shaft.

(2) Measure each side gear clearance. Insert a matched pair of feeler gauge blades between the gear and differential housing on opposite sides of the hub (Fig. 19).

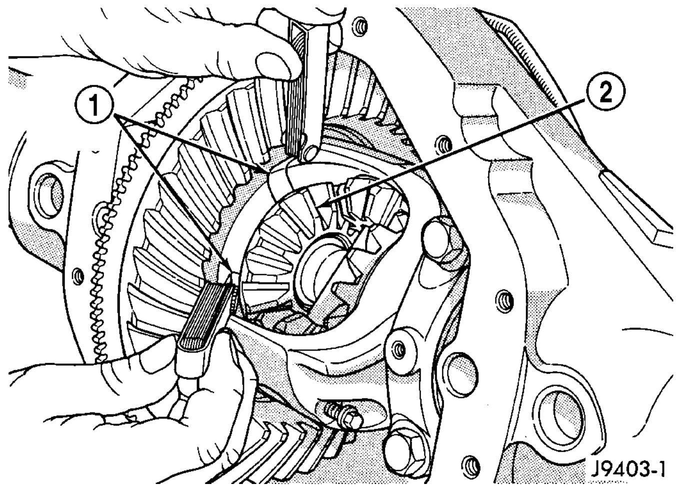


Fig. 19 SIDE GEAR CLEARANCE

1 - FEELER GAUGE
2 - SIDE GEARS

(3) If side gear clearances is no more than 0.005 inch. Determine if the axle shaft is contacting the pinion mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion mate shaft, the side gear clearance is acceptable.

(4) If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer (Fig. 20).

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	→ 0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003
	J9203-31

Fig. 20 SIDE GEAR CALCULATIONS

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-lock is preventing the side gear from sliding on the axle shaft.

(5) If there is no side gear clearance, remove the C-lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the

REAR AXLE - 8 1/4 (Continued)

differential case without the C-lock installed and re-measure the side gear clearance.

(6) Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

(7) If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.

(8) If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS

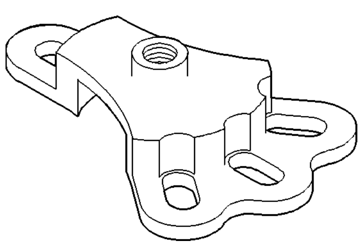
AXLE SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 4.10
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Case Clearance	0.12 mm (0.005 in.)
Ring Gear Diameter	209.5 mm (8.25 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1-3.4 N·m (10-30 in. lbs.)

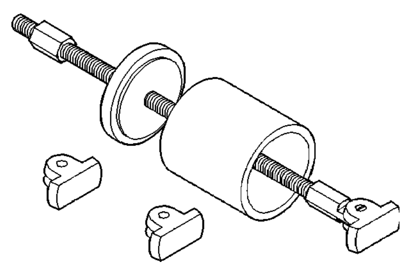
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	136	100	-
Ring Gear Bolts	95	70	-
Pinion Nut Minimum	285	210	-
Pinion Mate Shaft Screw	16.25	12	-

SPECIAL TOOLS

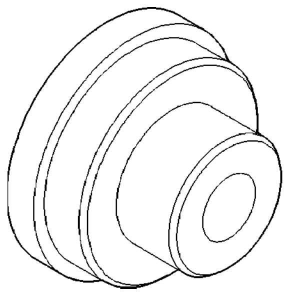


PULLER 6790

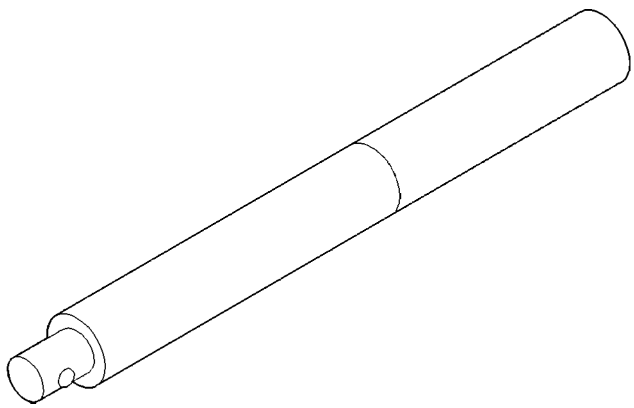


REMOVER 6310

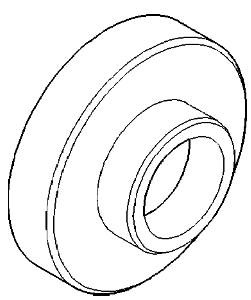
REAR AXLE - 8 1/4 (Continued)



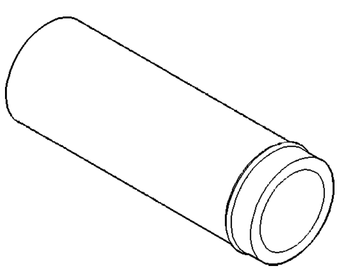
INSTALLER C-4198



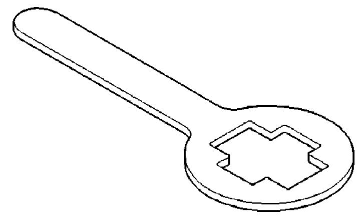
HANDLE C-4171



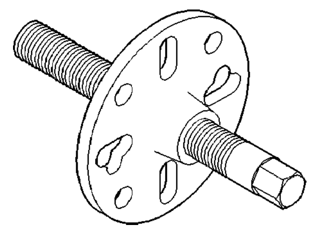
INSTALLER C-4076-B



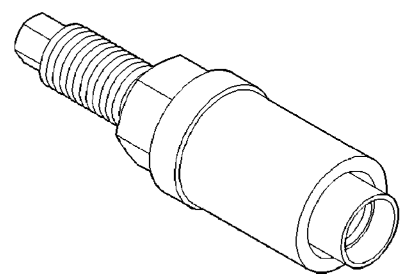
HANDLE C-4735-1



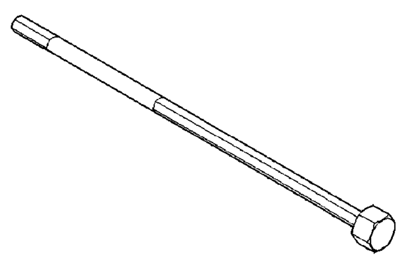
HOLDER 6719



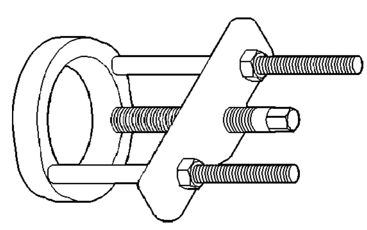
PULLER C-452



INSTALLER C-3718

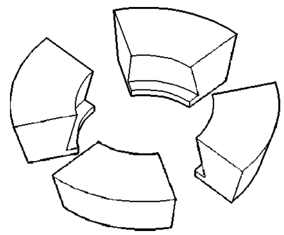


ADJUSTMENT WRENCH C-4164

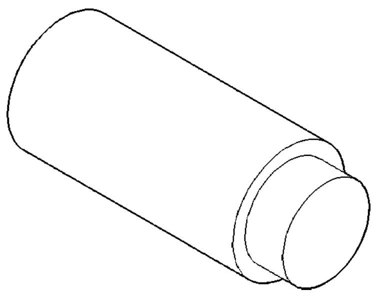


PULLER/PRESS C-293-PA

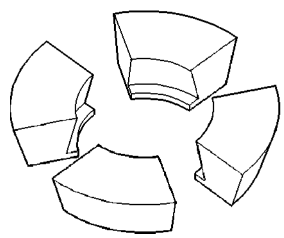
REAR AXLE - 8 1/4 (Continued)



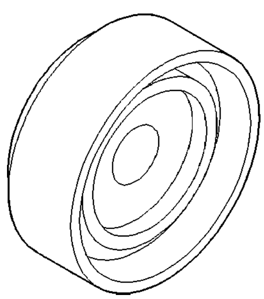
ADAPTERS C-293-48



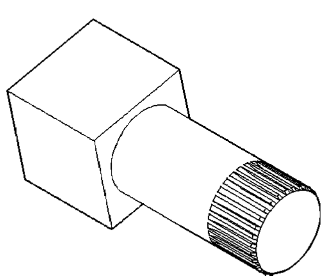
ADAPTER PLUG SP-3289



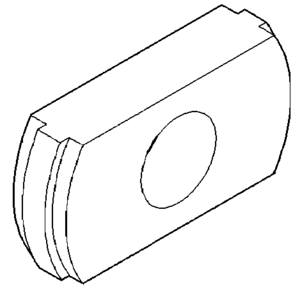
ADAPTERS C-293-47



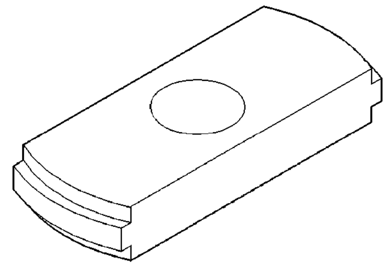
INSTALLER C-4340



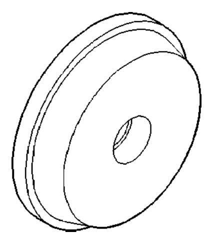
FIXTURE 8138



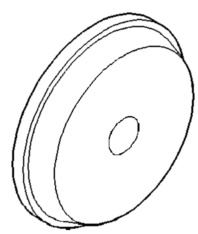
INSTALLER C-4345



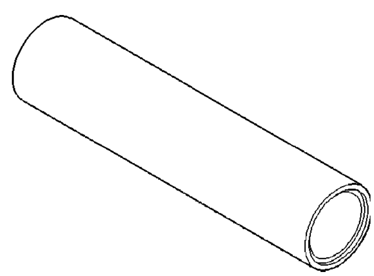
REMOVER C-4307



INSTALLER C-4308

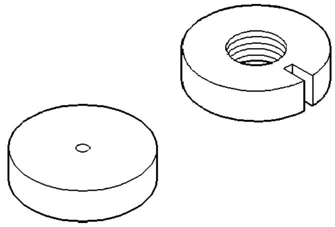


INSTALLER D-130

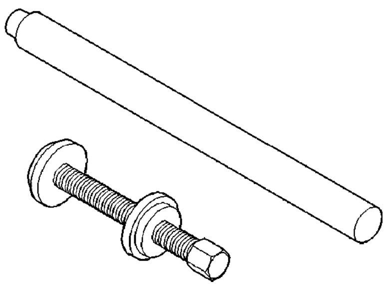


INSTALLER 6448

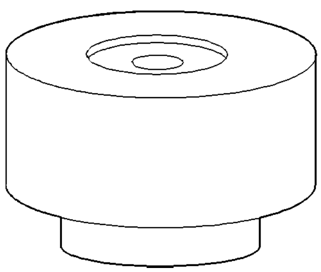
REAR AXLE - 8 1/4 (Continued)



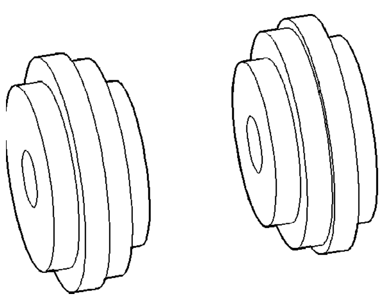
TRAC-LOK TOOLS 8140



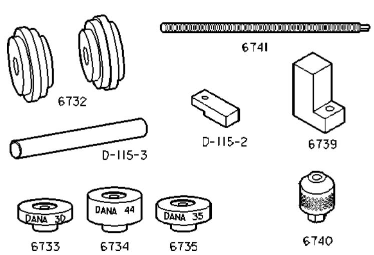
TRAC-LOK TOOLS 6960



PINION BLOCK 8540



ARBOR DISCS 8541



PINION GAUGE SET

AXLE SHAFTS

REMOVAL

(1) Place transmission in neutral and raise and support vehicle.

(2) Remove brake caliper, caliper adapter and rotor.

(3) Remove the housing cover and drain lubricant.

(4) Rotate differential case to access the pinion shaft lock screw. Remove lock screw and pinion shaft from differential case (Fig. 21).

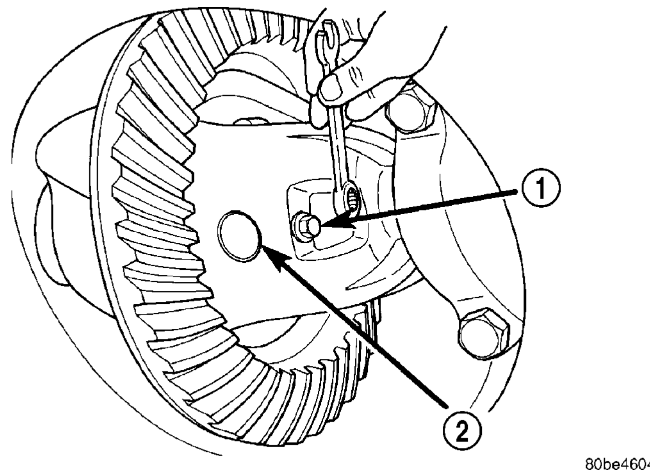


Fig. 21 PINION SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION SHAFT

(5) Push axle shaft inward then remove axle shaft C-lock (Fig. 22).

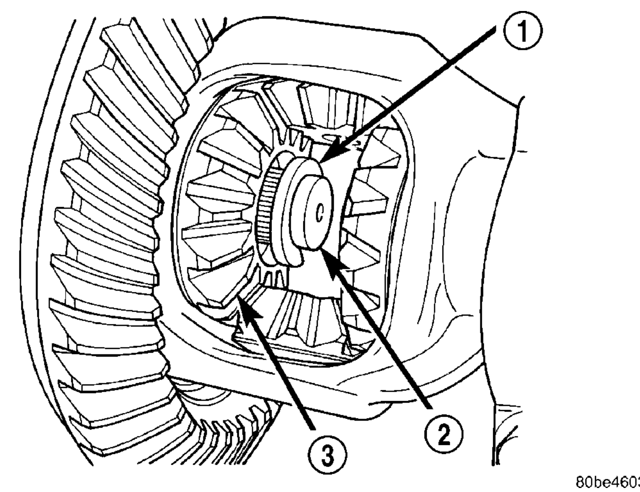


Fig. 22 AXLE SHAFT C-LOCK

1 - C-LOCK
2 - AXLE SHAFT
3 - SIDE GEAR

(6) Remove axle shaft being carefull not to damage shaft bearing and seal.

(7) Inspect axle shaft seal for leakage or damage.

AXLE SHAFTS (Continued)

(8) Inspect axle shaft bearing contact surface for signs of brinelling, galling and pitting.

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

(2) Insert C-lock in end of axle shaft. Push axle shaft outward to seat C-lock in side gear.
(3) Insert pinion shaft into differential case and through thrust washers and differential pinions.
(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 11 N·m (8 ft. lbs.).
(5) Apply a bead of red Mopar Silicone Rubber Sealant or equivalent to the housing cover.

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(6) Install cover and tighten bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).
(7) Fill differential with gear lubricant to the bottom of the fill plug hole and install fill plug.
(8) Install brake rotor, caliper adapter, and caliper.

AXLE SHAFT SEALS

REMOVAL

(1) Remove axle shaft.
(2) Remove axle shaft seal from the axle tube with a small pry bar.

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.
(2) Install a **new** axle seal with Installer C-4076-B and Handle C-4735-1. When the tool contacts the axle tube, the seal is installed to the correct depth.
(3) Coat the lip of the seal with axle lubricant for protection prior to installing the axle shaft.
(4) Install the axle shaft.
(5) Check and fill gear lubricant.

AXLE BEARINGS

REMOVAL

(1) Remove axle shaft.
(2) Remove axle shaft bearing and seal with Bearing Removal Tool Set 6310 and Adapter Foot 6310-9 (Fig. 23).

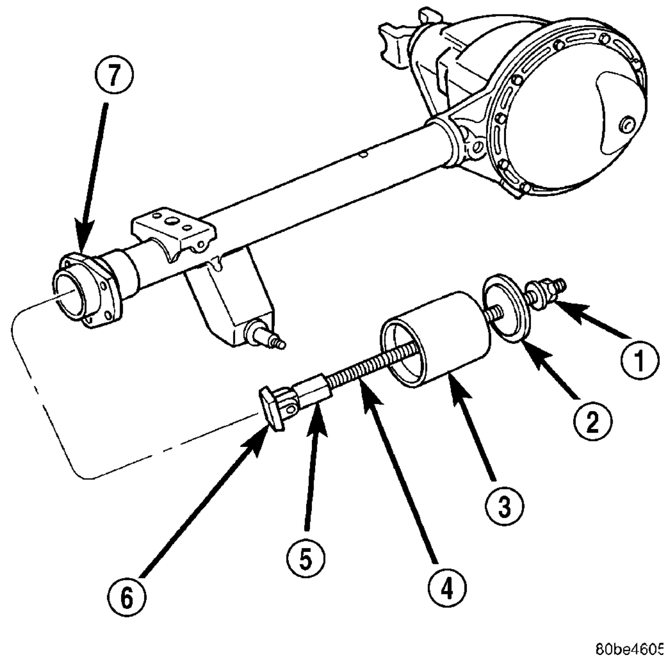


Fig. 23 AXLE SHAFT BEARING

1 - NUT
2 - GUIDE PLATE
3 - GUIDE
4 - THREADED ROD
5 - ADAPTER
6 - FOOT
7 - AXLE TUBE

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.
(2) Install axle shaft bearing with Installer C-4198 and Handle C-4171.

NOTE: Install bearing with part number against the installer.

(3) Install a **new** axle seal with Installer C-4198 and Handle C-4171. When the tool contacts the axle tube, the seal is installed to the correct depth.
(4) Coat the lip of the shaft seal with axle lubricant and install the axle shaft.
(5) Check and fill gear lubricant.

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.
(2) Mark the universal joint, pinion yoke and pinion shaft for installation reference.
(3) Remove propeller shaft from pinion yoke.

PINION SEAL (Continued)

(4) Remove the wheel and tire assemblies.

(5) Remove the brake drums.

(6) Rotate the pinion yoke three or four times.

(7) Measure rotating torque of the pinion gear with an inch pound torque wrench and record the reading for installation reference.

(8) Hold the pinion yoke with Holder 6719 and remove the pinion nut and washer.

(9) Remove yoke with Remover C-452 (Fig. 24).

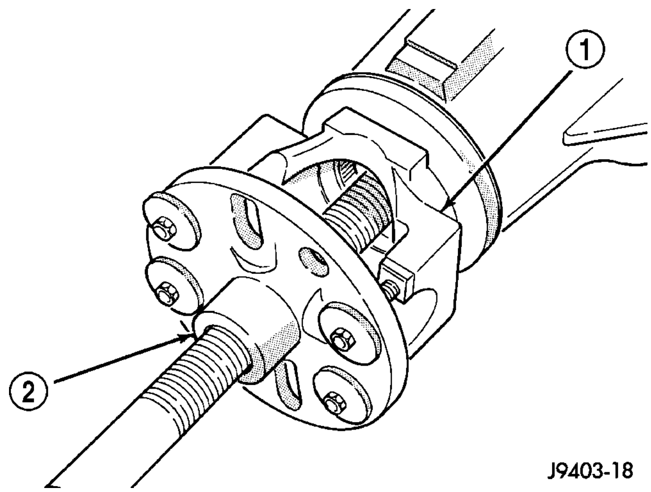


Fig. 24 Pinion Yoke

1 - PINION YOKE
2 - REMOVER

(10) Remove pinion seal with a pry tool or screw mounted to a slide-hammer mounted.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal.

NOTE: The outer perimeter of the seal is pre-coated with a special sealant. An additional application of sealant is not required.

(2) Install the **new** pinion seal (Fig. 25) with Installer C-4076-A and Handle C-4735.

(3) Install pinion yoke on the shaft with the reference marks aligned.

(4) Seat yoke on pinion shaft with Installer C-3718 and Holder 6719A.

(5) Remove the tools and install the pinion yoke washer. The convex side of the washer must face outward.

(6) Using yoke Holder 6719A tighten shaft nut to 285 N·m (210 ft. lbs.) (Fig. 26). Rotate the pinion several revolutions to ensure the bearing rollers are seated.

(7) Rotate the pinion using an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 27).

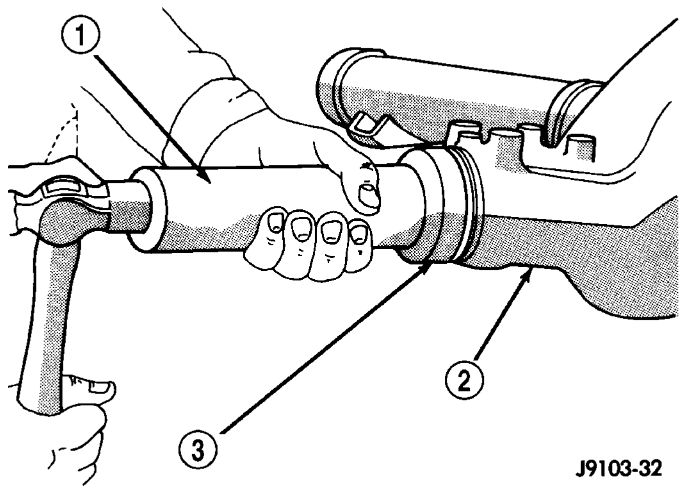


Fig. 25 Pinion Seal Installer

1 - HANDLE
2 - DIFFERENTIAL HOUSING
3 - INSTALLER

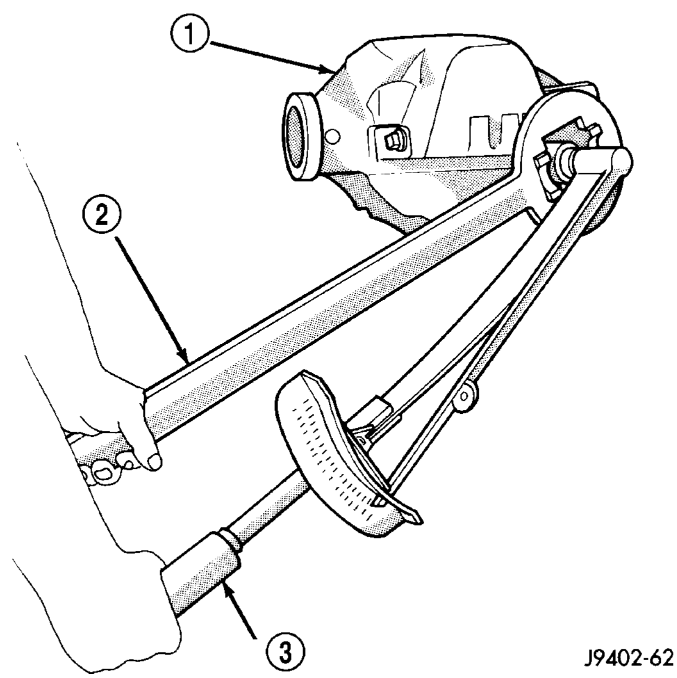


Fig. 26 Tightening Pinion Nut

1 - DIFFERENTIAL HOUSING
2 - YOKE HOLDER
3 - TORQUE WRENCH

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed.

(8) If the rotating torque is low, use Holder 6719A (Fig. 26) and tighten the pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

PINION SEAL (Continued)

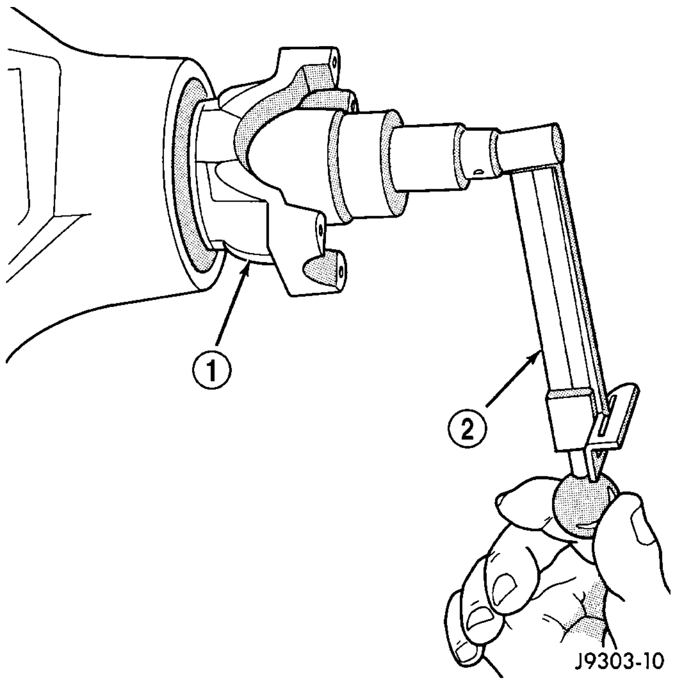


Fig. 27 Pinion Rotation Torque

1 - PINION YOKE
2 - INCH POUND TORQUE WRENCH

NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, it indicates a binding condition.

(9) The seal replacement is unacceptable if the final pinion nut torque is less than 285 N·m (210 ft. lbs.).

(10) Install the propeller shaft with the installation reference marks aligned.

(11) Install the brake drums.

(12) Check the differential housing lubricant level.

(13) Install wheel and tire assemblies and lower the vehicle.

DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The removable, stamped steel cover provides a means for inspection and service of the dufferential without removing the axle from the vehicle.

OPERATION

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 28).

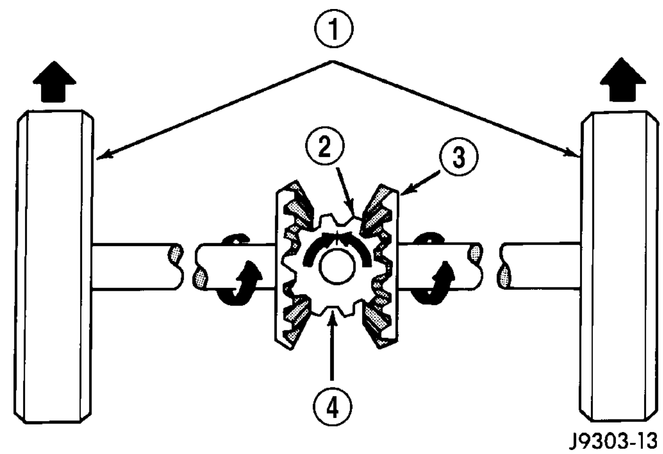


Fig. 28 STRAIGHT AHEAD DRIVING

1 - WHEELS ROTATE AT CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 29). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

REMOVAL

(1) Raise and support vehicle.

(2) Remove fill hole plug from the differential housing cover.

(3) Remove differential housing cover and drain housing.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**

(5) Remove the axle shafts.

NOTE: Side play resulting from bearing races being loose on case hubs requires replacement of the differential case.

DIFFERENTIAL (Continued)

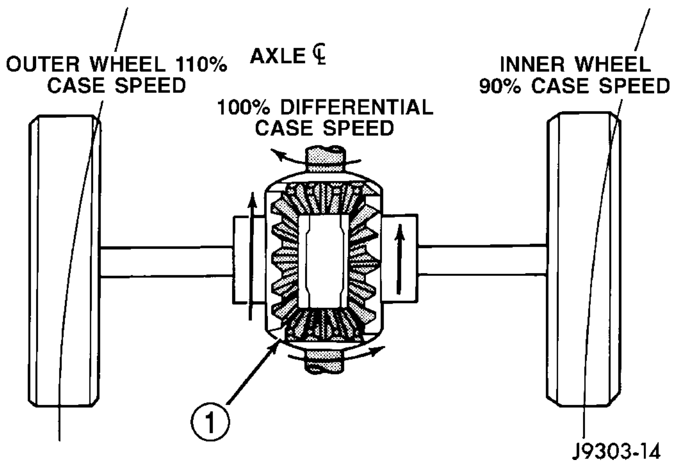


Fig. 29 DIFFERENTIAL ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

(6) Mark the differential housing and bearing caps for installation reference (Fig. 30).

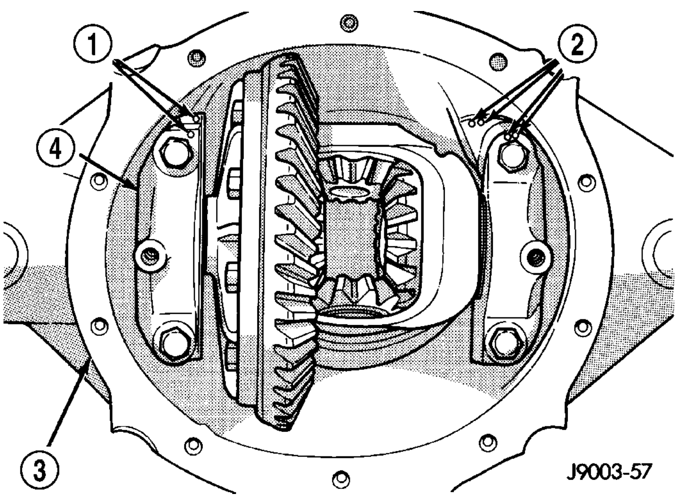


Fig. 30 Reference Mark

1 - REFERENCE MARKS
2 - REFERENCE MARKS
3 - DIFFERENTIAL HOUSING
4 - BEARING CAP

(7) Remove bearing threaded adjuster locks from each bearing cap.

(8) Loosen bearing cap bolts, them loosen the threaded adjusters with Wrench C-4164 (Fig. 31).

(9) Hold the differential case while removing bearing caps and adjusters.

(10) Remove the differential case.

NOTE: Tag bearing cups and threaded adjusters location, for installation reference.

DISASSEMBLY

(1) Remove pinion shaft lock screw (Fig. 32).

(2) Remove pinion shaft.

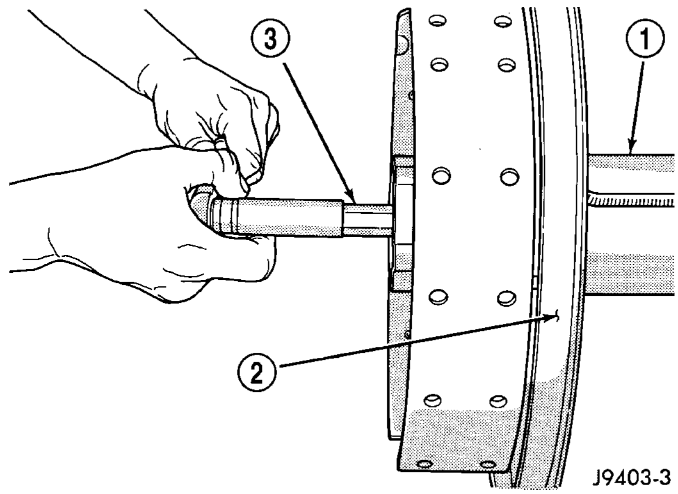


Fig. 31 Threaded Adjuster

1 - AXLE TUBE
2 - BACKING PLATE
3 - THREAD ADJUSTER WRENCH

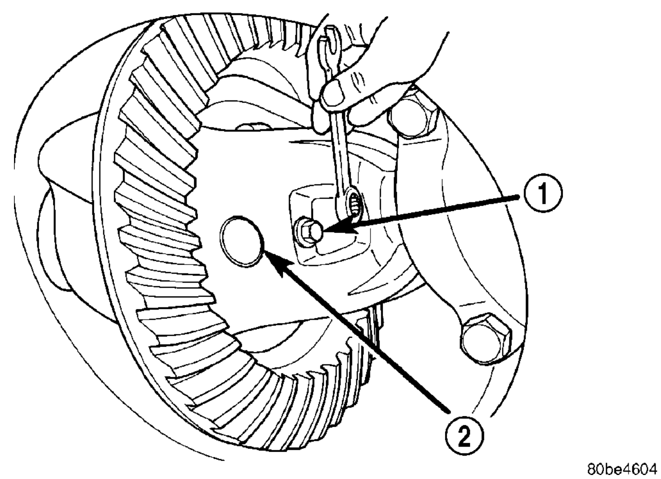


Fig. 32 Pinion Shaft Lock Screw

1 - LOCK SCREW
2 - PINION SHAFT

(3) Rotate differential side gears and remove differential pinions and thrust washers (Fig. 33).

(4) Remove differential side gears and thrust washers.

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install differential pinion and thrust washers.

(3) Install the pinion shaft.

(4) Align the hole in the pinion shaft with the hole in the differential case and install the pinion shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

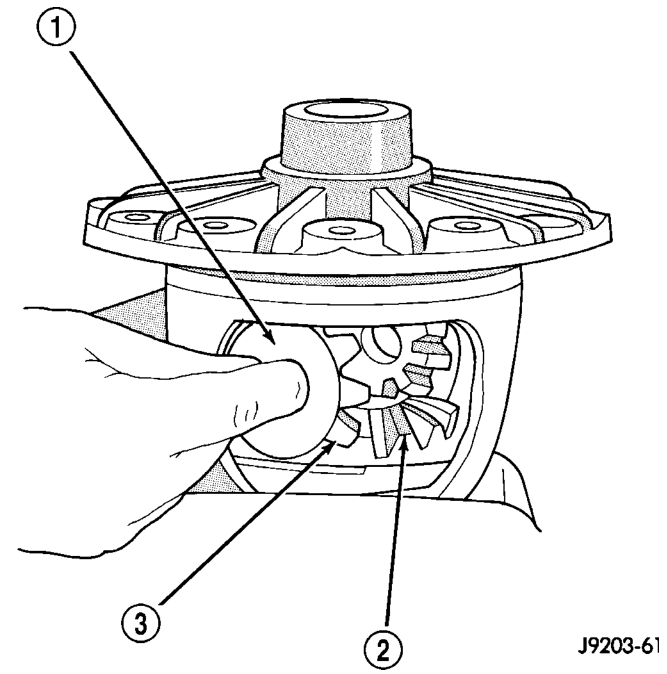


Fig. 33 Differential Case

1 - THRUST WASHER
2 - SIDE GEAR
3 - DIFFERENTIAL PINION

INSTALLATION

(1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups and threaded adjusters. A dab of grease can be used to keep the adjusters in position. Carefully position the assembled differential case in the housing.

(2) Install differential bearing caps in their original locations (Fig. 34).

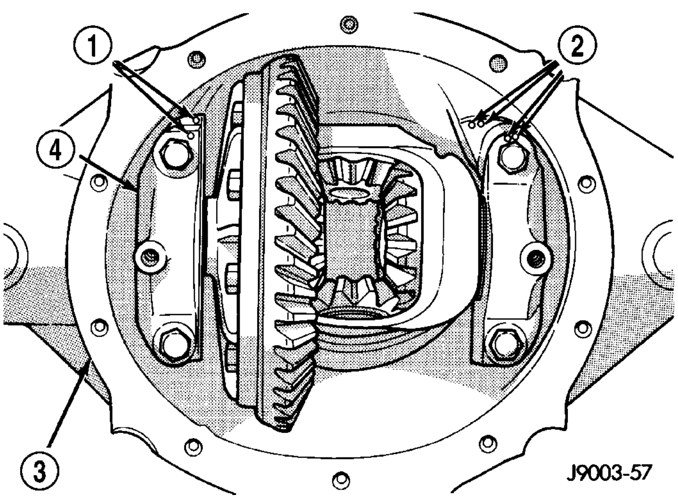


Fig. 34 Bearing Caps & Bolts

1 - REFERENCE MARKS
2 - REFERENCE MARKS
3 - DIFFERENTIAL HOUSING
4 - BEARING CAP

(3) Install bearing cap bolts and tighten the upper bolts to 14 N·m (10 ft. lbs.). Tighten the lower bolts finger-tight until the bolt head is seated.

(4) Perform the differential bearing preload and adjustment procedure.

(5) Tighten bearing cap bolts in a criss-cross pattern to 95 N·m (70 ft.lbs).

(6) Install adjuster locks on the bearing caps.

(7) Install axle shafts.

(8) Apply a bead of red Mopar silicone rubber axle sealant or equivalent to the housing cover (Fig. 35).

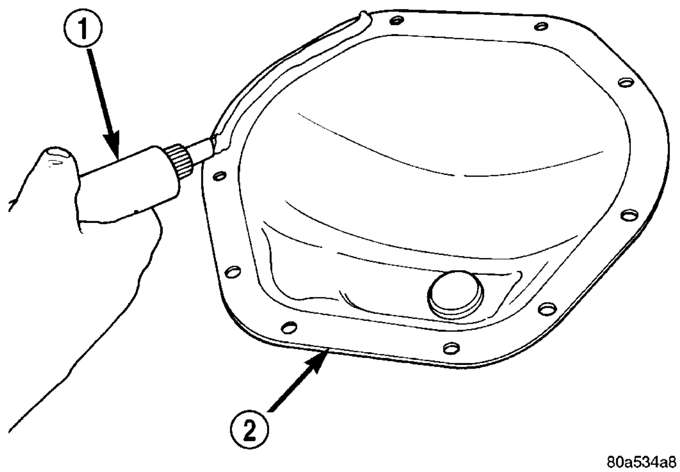


Fig. 35 Differential Cover Sealant

1 - SEALANT
2 - DIFFERNTIAL COVER

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(9) Install cover and tighten bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).

(10) Fill differential with gear lubricant to bottom of the fill plug hole.

(11) Install the fill hole plug.

(12) Install wheel and tire assemblies.

(13) Remove support and lower vehicle.

(14) Trac-lok® differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

DIFFERENTIAL - TRAC-LOK

DESCRIPTION

The Trac-Lok® differential has a one-piece differential case, and similar internal components as a standard differential, plus two clutch disc packs. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the

DIFFERENTIAL - TRAC-LOK (Continued)

outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

OPERATION

This differentials clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 36).

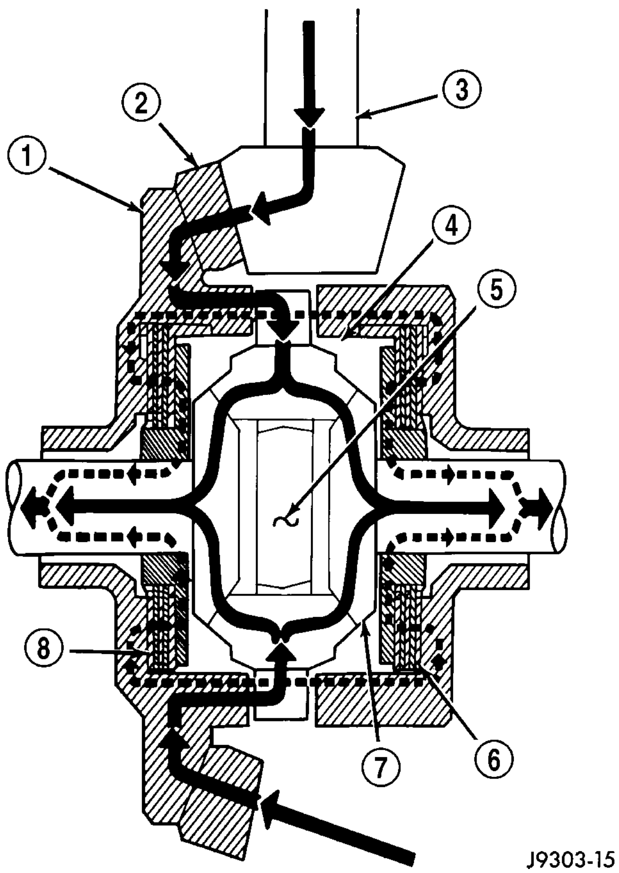


Fig. 36 TRAC-LOK LIMITED SLIP DIFFERENTIAL

1 - CASE
2 - RING GEAR
3 - DRIVE PINION
4 - PINION GEAR
5 - MATE SHAFT
6 - CLUTCH PACK
7 - SIDE GEAR
8 - CLUTCH PACK

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. This differential resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIFFERENTIAL TEST

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque.

(6) If rotating torque is less than 41 N·m (56 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DISASSEMBLY

(1) Clamp side gear Fixture 8138 in a vise and set differential case on the fixture (Fig. 37).

(2) Remove ring gear if the ring gear is to be replaced. The Trac-lok® differential can be serviced with the ring gear installed.

(3) Remove pinion gear mate shaft lock screw.

(4) Remove pinion gear mate shaft with a drift and hammer.

(5) Install Discs 8140 without threaded hole in the lower side gear (Fig. 38).

(6) Install Disc 8140 with threaded hole in the upper side gear. Thread Forcing Screw 6960-4 through the upper disc until it becomes centered in lower disc.

(7) Insert a screw driver in slot of upper disc (Fig. 39) to prevent disc from turning.

(8) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 40).

DIFFERENTIAL - TRAC-LOK (Continued)

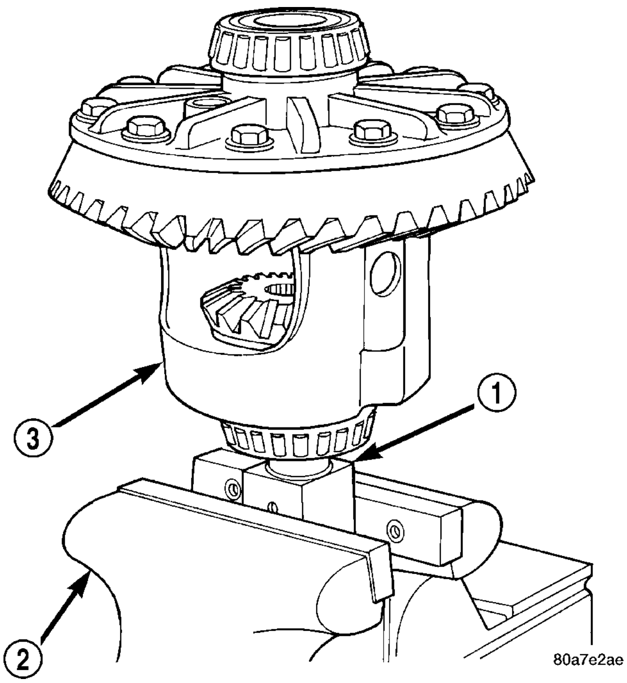


Fig. 37 DIFFERENTIAL CASE FIXTURE

1 - FIXTURE
2 - VISE
3 - DIFFERENTIAL

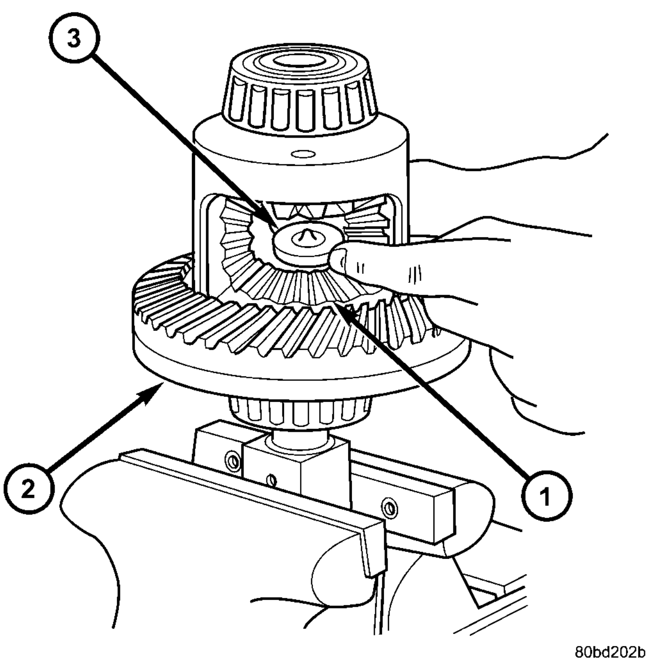


Fig. 38 LOWER DISC

1 - LOWER SIDE GEAR
2 - DIFFERENTIAL CASE
3 - DISC

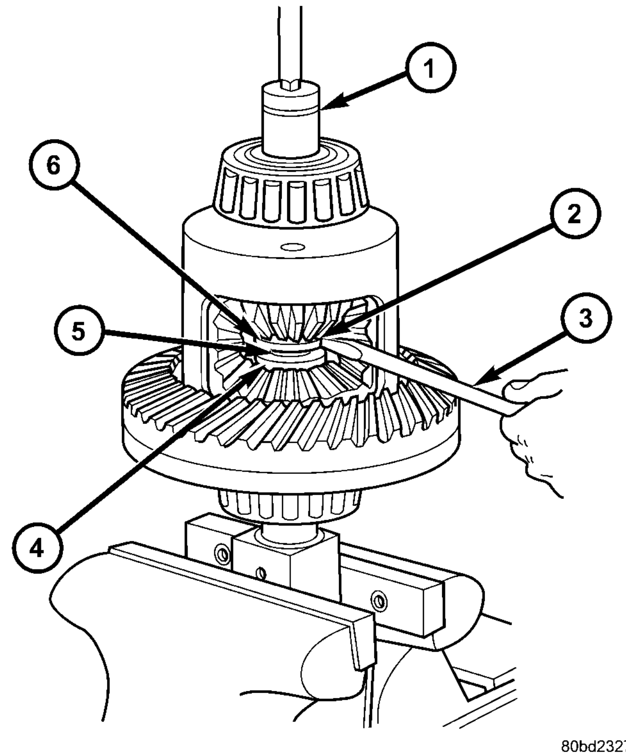


Fig. 39 TRAK-LOC® TOOLS

1 - SOCKET
2 - SLOT IN DISC
3 - SCREWDRIVER
4 - LOWER DISC
5 - THREADED ROD
6 - UPPER DISC

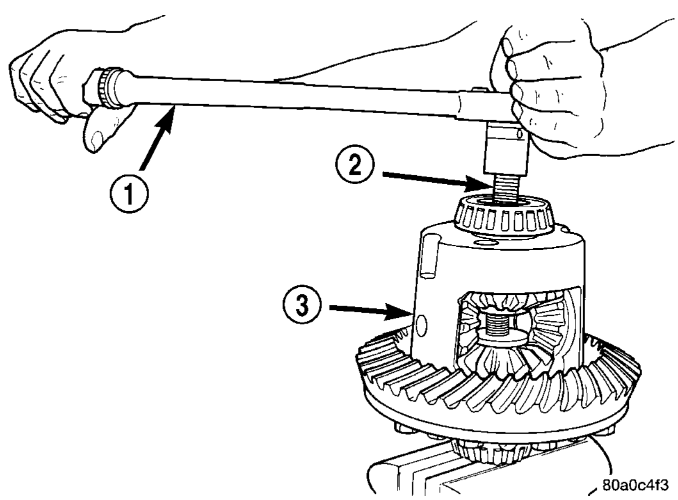


Fig. 40 COMPRESS BELLEVILLE SPRING

1 - TORQUE WRENCH
2 - FORCING SCREW
3 - DIFFERENTIAL CASE

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 41).

(10) Insert Turning Bar 6960-2 into the pinion mate shaft hole in the case (Fig. 42).

DIFFERENTIAL - TRAC-LOK (Continued)

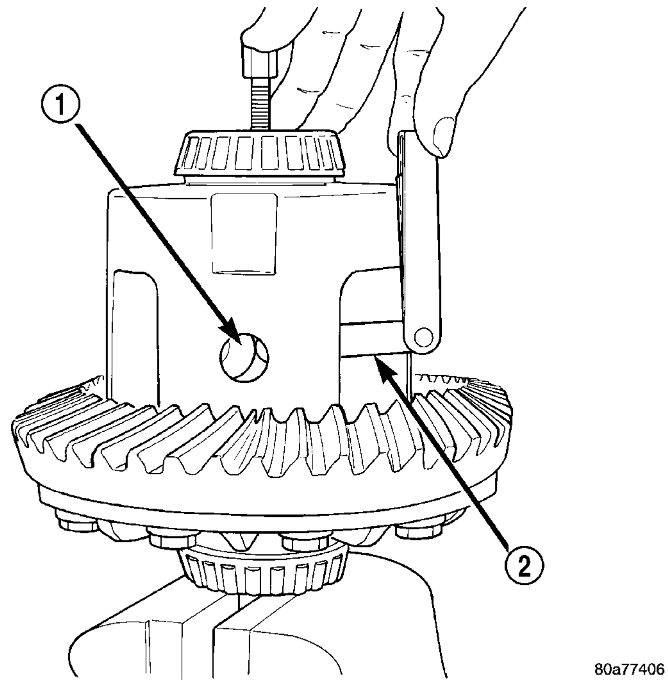


Fig. 41 PINION GEAR THRUST WASHER

1 - THRUST WASHER
2 - FEELER GAUGE

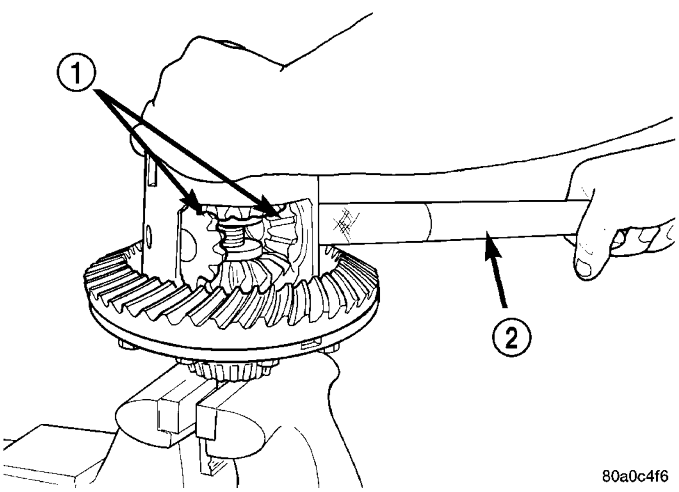


Fig. 42 PINION GEARS

1 - PINION GEARS
2 - TURNING BAR

(11) Loosen the Forcing Screw in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar.

(12) Rotate differential case until the pinion gears can be removed.

(13) Remove pinion gears from differential case.

(14) Remove Forcing Screw and discs.

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in order during removal (Fig. 43).

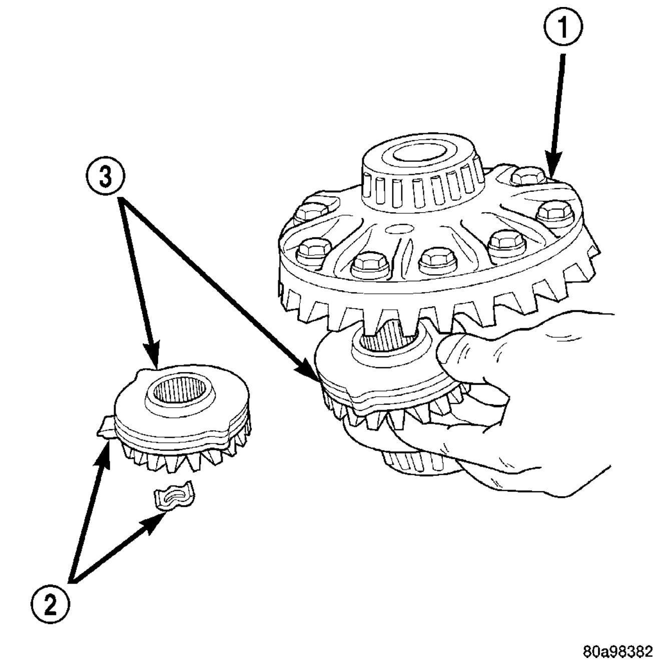


Fig. 43 SIDE GEARS AND CLUTCH DISCS

1 - DIFFERENTIAL CASE
2 - RETAINER
3 - SIDE GEAR AND CLUTCH DISC PACK

(16) Remove differential case from the fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in order during removal.

ASSEMBLY

Lubricate each component with gear lubricant before assembly.

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 44).

(2) Install assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 45).**Verify clutch pack retaining clips are in position and seated in the case pockets.**

(4) Set differential case on Fixture 8138.

(5) Install lubricated Disc 8140 without the hole in lower side gear (Fig. 46).

(6) Install the upper side gear and clutch disc pack (Fig. 46).

(7) Hold assembly in position. Insert Disc 8140 with threaded hole into top side gear.

(8) Install Forcing Screw 6960-4 and tighten screw to slightly compress clutch disc.

DIFFERENTIAL - TRAC-LOK (Continued)

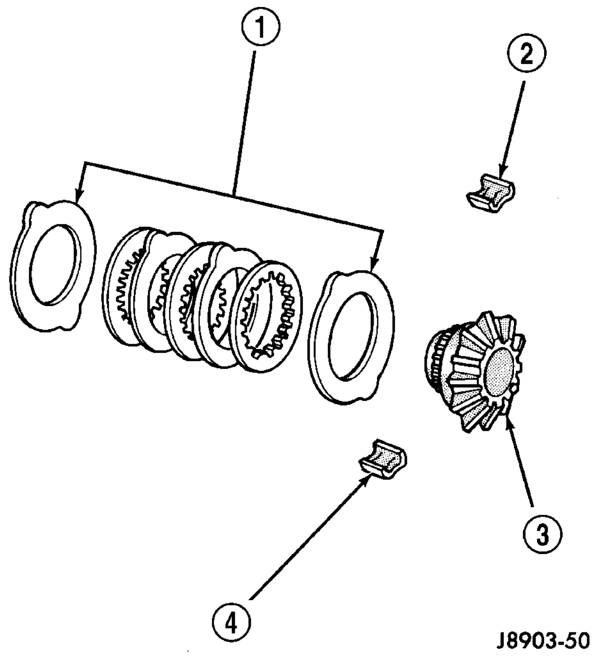


Fig. 44 CLUTCH DISC PACK

1 - CLUTCH PACK
2 - RETAINER
3 - SIDE GEAR
4 - RETAINER

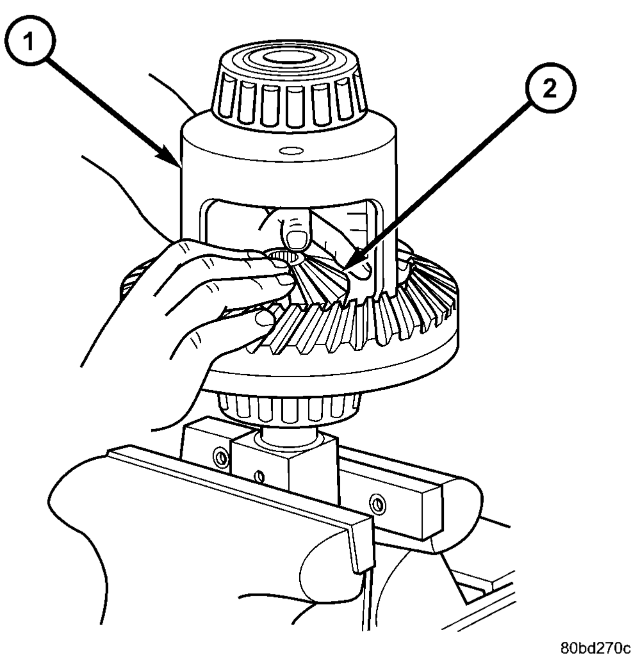


Fig. 45 CLUTCH PACK AND LOWER SIDE GEAR

1 - DIFFERENTIAL CASE
2 - LOWER SIDE GEAR AND CLUTCH PACK

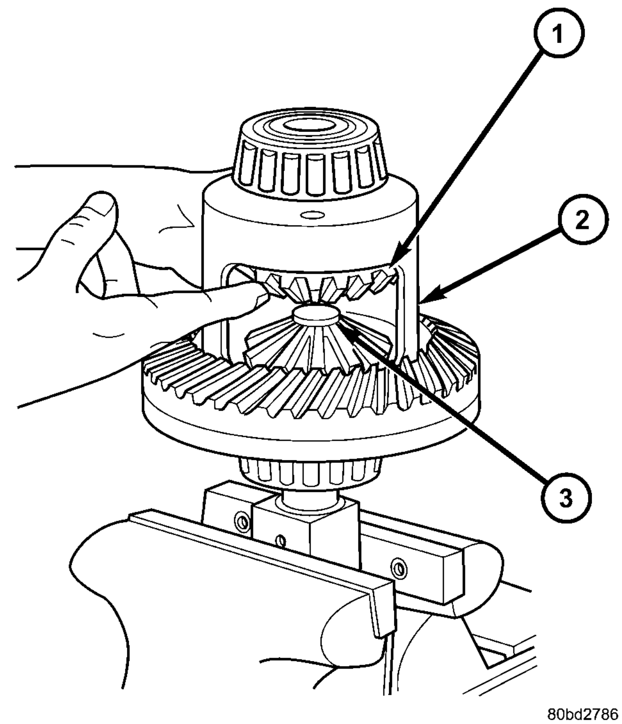


Fig. 46 CLUTCH PACK AND UPPER SIDE GEAR

1 - SIDE GEAR AND CLUTCH PACK
2 - DIFFERENTIAL CASE
3 - LOWER DISC

(9) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(10) Rotate case with Turning Bar 6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(11) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(12) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(13) Remove forcing screw and discs.

(14) Install pinion gear mate shaft and align holes in shaft and case.

(15) Install pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(16) Lubricate all differential components with hypoid gear lubricant.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential case from axle.

DIFFERENTIAL CASE BEARINGS (Continued)

(2) Remove differential bearings from the case with Puller/Press C-293-PA and Adapters C-293-48 and Plug SP-3289 (Fig. 47).

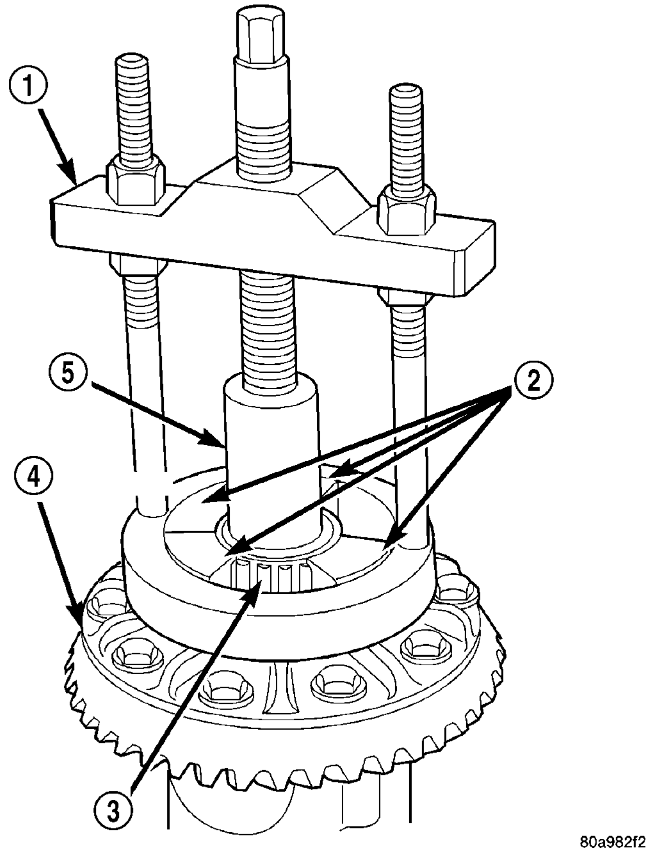


Fig. 47 Differential Bearing Puller

1 - PULLER
2 - ADAPTERS
3 - BEARING
4 - DIFFERENTIAL
5 - PLUG

INSTALLATION

(1) Install differential side bearings with Installer C-4340 and Handle C-4171 (Fig. 48).

(2) Install differential case in axle.

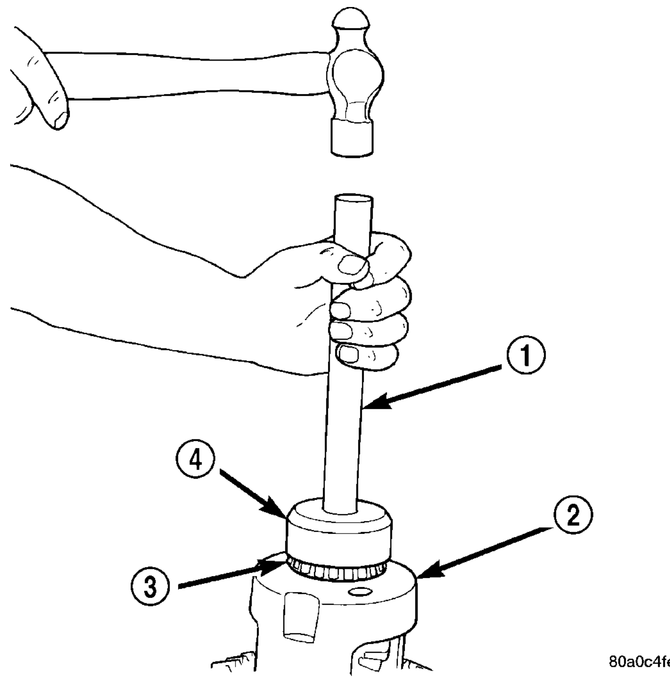


Fig. 48 Differential Bearing Installer

1 - HANDLE
2 - DIFFERENTIAL
3 - BEARING
4 - INSTALLER

(3) Remove differential from axle housing.

(4) Place differential case in a vise with soft metal jaw (Fig. 49).

(5) Remove bolts holding ring gear to differential case.

(6) Drive ring gear from the differential case with a rawhide hammer.

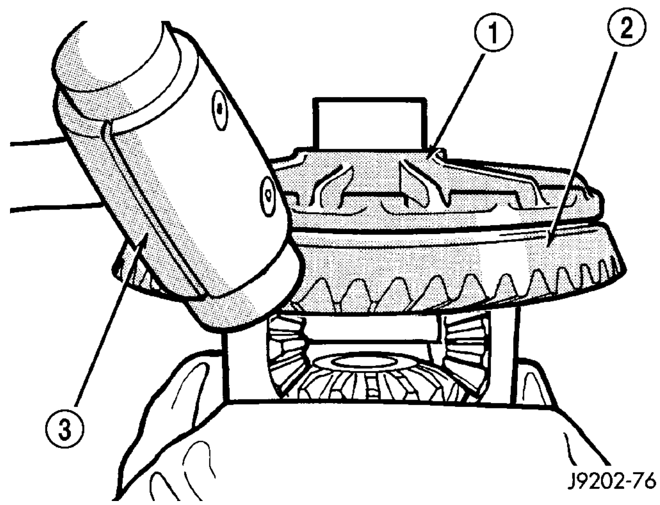


Fig. 49 Ring Gear

1 - CASE
2 - RING GEAR
3 - RAWHIDE HAMMER

PINION GEAR/RING GEAR/ TONE RING

REMOVAL

CAUTION: The ring and pinion gears are serviced in a matched set. Never replace one gear without replacing the other matched gear.

(1) Mark pinion yoke and propeller shaft for installation reference.

(2) Remove propeller shaft from pinion yoke and tie propeller shaft to underbody.

PINION GEAR/RING GEAR/TONE RING (Continued)

(7) Hold pinion yoke with Holder 6719A and remove pinion yoke nut and washer.

(8) Remove pinion yoke from pinion shaft with Remover C-452 (Fig. 50).

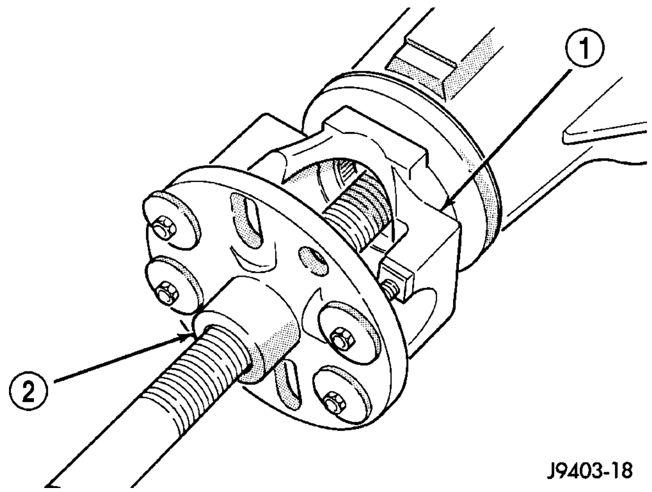


Fig. 50 Pinion Yoke

1 - PINION YOKE
2 - REMOVER

(9) Remove pinion from the housing (Fig. 51).

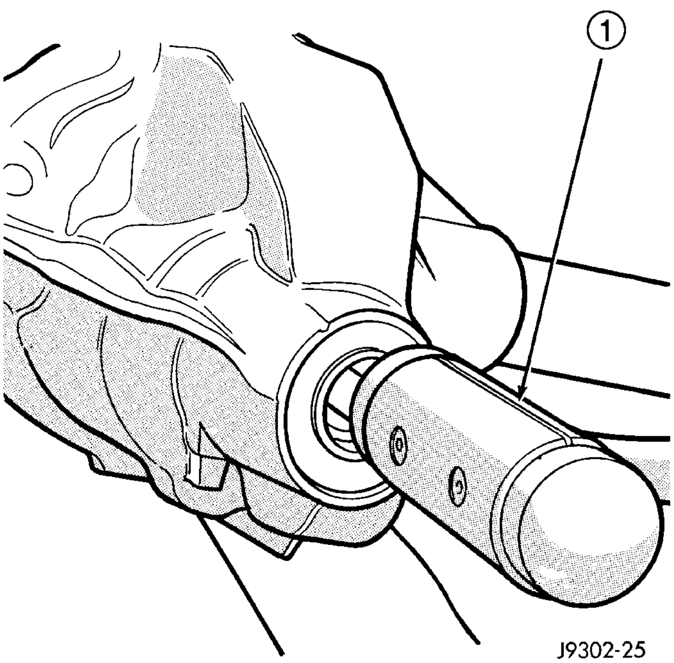


Fig. 51 Pinion Gear

1 - RAWHIDE HAMMER

(10) Remove pinion shaft seal with a pry tool or slide-hammer mounted screw.

(11) Remove oil slinger, if equipped, and front pinion bearing.

(12) Remove front pinion bearing cup with Remover C-4345 and Handle C-4171 (Fig. 52).

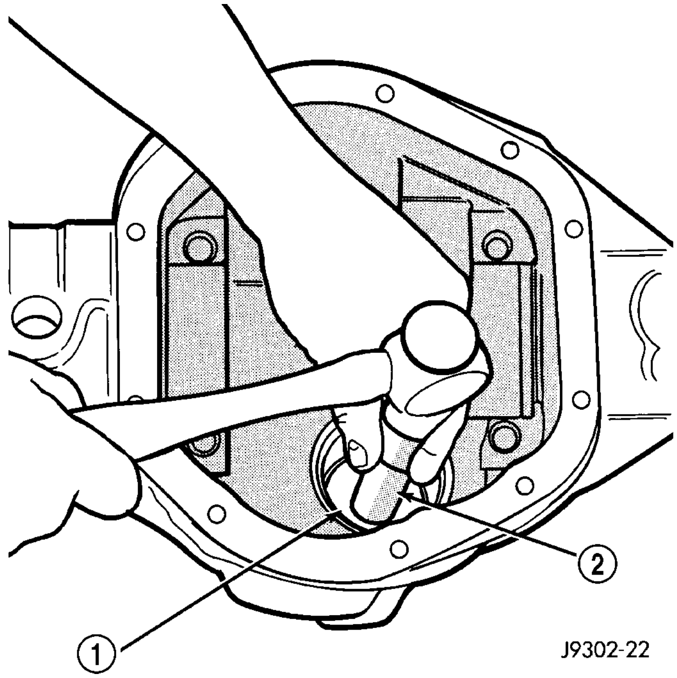


Fig. 52 Front Pinion Bearing Cup

1 - REMOVER
2 - HANDLE

(13) Remove rear bearing cup from housing (Fig. 53) with Remover C-4307 and Handle C-4171.

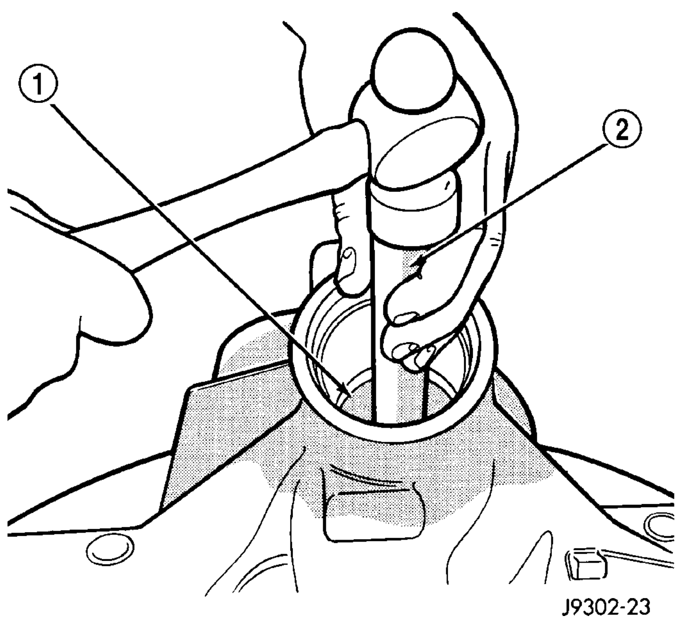


Fig. 53 Rear Pinion Bearing Cup

1 - DRIVER
2 - HANDLE

(14) Remove collapsible preload spacer (Fig. 54).

(15) Remove rear bearing from the pinion (Fig. 55) with Puller/Press C-293-PA and Adapters C-293-47.

(16) Remove depth shims from the pinion shaft and record the shims thickness.

PINION GEAR/RING GEAR/TONE RING (Continued)

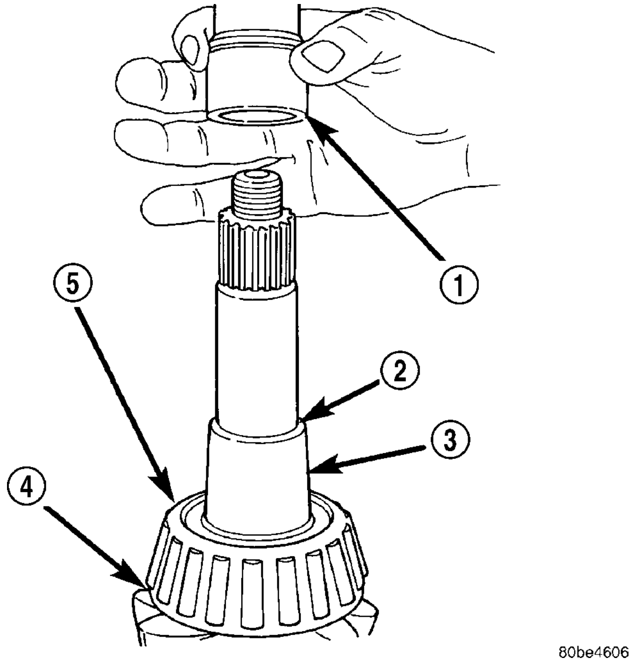


Fig. 54 Collapsible Spacer

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION
4 - PINION DEPTH SHIM
5 - REAR BEARING

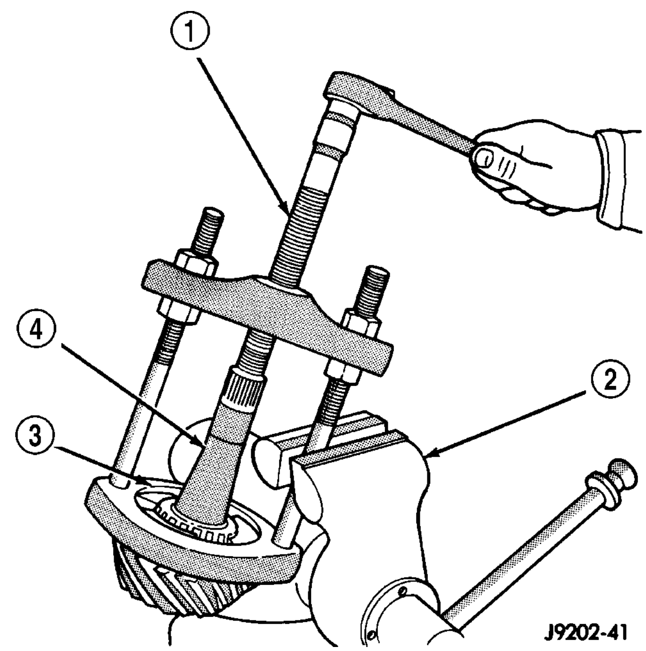


Fig. 55 Rear Pinion Bearing Puller

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

INSTALLATION

NOTE: A pinion depth shim/oil baffle is placed between the rear pinion bearing cone and pinion gear. If the ring and pinion gears are reused, the original pinion depth shim/oil baffle can be used. Refer to Adjustments (Pinion Gear Depth) to select the proper shim thickness if ring and pinion gear are replaced.

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of pinion bearing cups.

(2) Install rear pinion bearing cup (Fig. 56) with Installer C-4308 and Handle C-4171 and verify cup is seated.

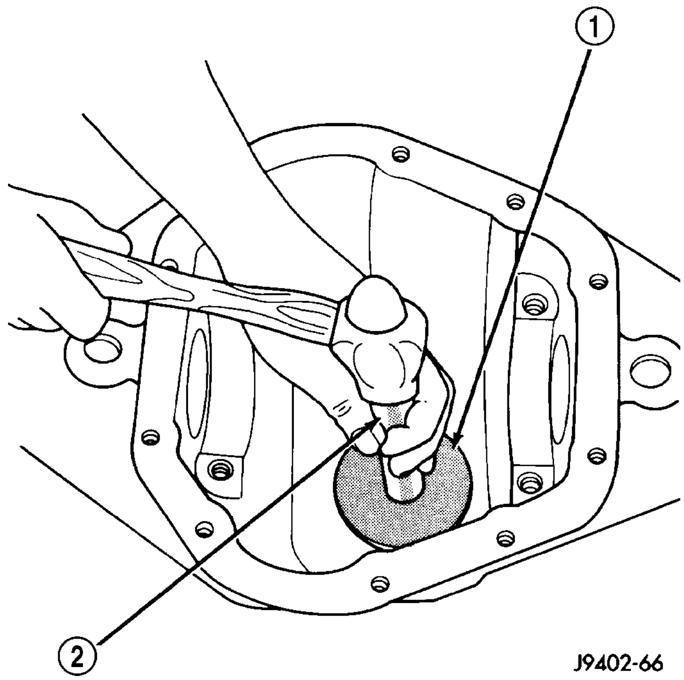


Fig. 56 Rear Pinion Bearing Cup

1 - INSTALLER
2 - HANDLE

(3) Install front pinion bearing cup (Fig. 57) with Installer D-130 and Handle C-4171 and verify cup is seated.

(4) Install pinion front bearing and oil slinger, if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with Installer C-4076-B and Handle C-4735 (Fig. 58).

(6) Place proper thickness depth shim on the pinion.

(7) Install rear bearing and slinger if equipped, on the pinion shaft (Fig. 59) with Installer 6448 and a press.

(8) Install a **new** collapsible preload spacer on pinion shaft and install pinion in housing (Fig. 60).

PINION GEAR/RING GEAR/TONE RING (Continued)

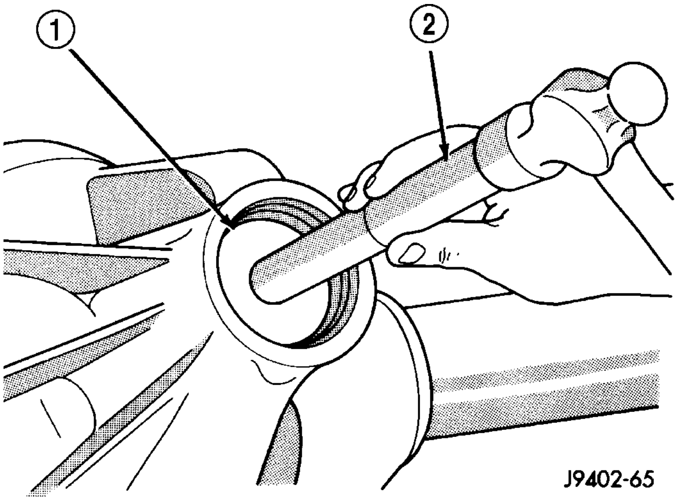


Fig. 57 Front Bearing Cup

1 - INSTALLER
2 - HANDLE

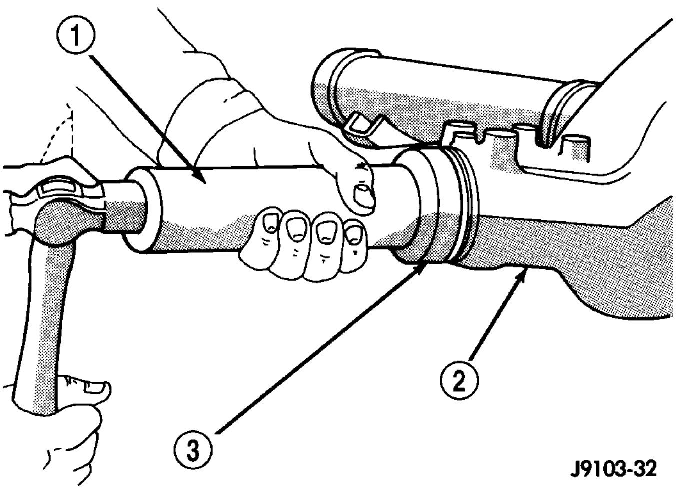


Fig. 58 Pinion Seal

1 - HANDLE
2 - DIFFERENTIAL HOUSING
3 - INSTALLER

(9) Install pinion in housing.

(10) Install yoke with Installer C-3718 and Yoke Holder 6719A.

(11) Install yoke washer and a new nut on the pinion. The convex side of the washer must face outward.

(12) Tighten the nut to 285 N·m (210 ft. lbs.).

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

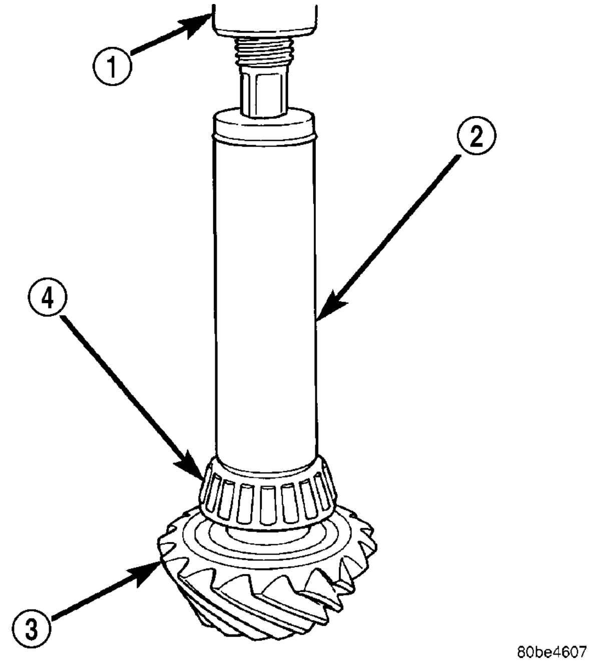


Fig. 59 Rear Pinion Bearing

1 - PRESS
2 - INSTALLATION
3 - PINION GEAR
4 - REAR PINION BEARING

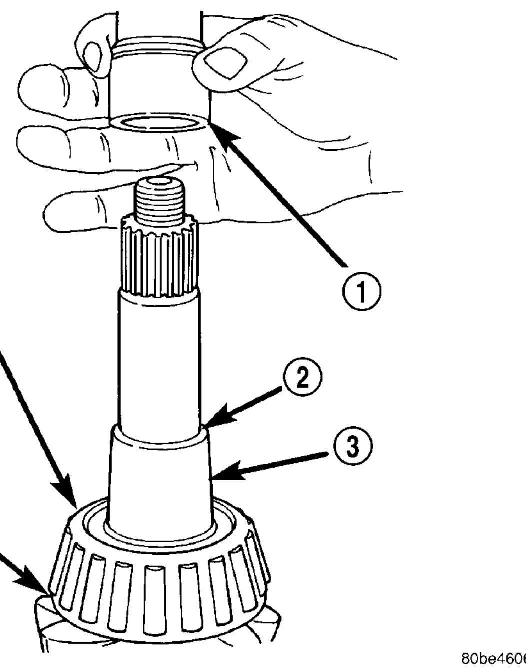


Fig. 60 Collapsible Preload Spacer

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION
4 - PINION DEPTH SHIM
5 - REAR BEARING

PINION GEAR/RING GEAR/TONE RING (Continued)

(13) Holding the yoke with Holder 6719A slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the spacer (Fig. 61).

(14) Check bearing rotating torque with an inch pound torque wrench (Fig. 61). The pinion gear rotating torque should be:

- Original Bearings: 1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings: 1 to 5 N·m (10 to 30 in. lbs.).

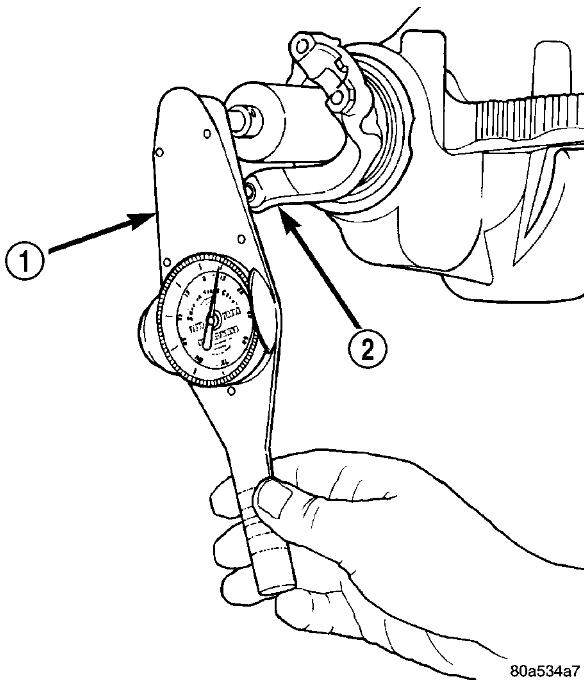


Fig. 61 Pinion Rotating Torque

1 - TORQUE WRENCH
2 - PINION YOKE

(15) Invert the differential case.

(16) Install ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(17) Invert the differential case in the vise.

(18) Install **new** ring gear bolts and alternately tighten to 102 N·m (75 ft. lbs.) (Fig. 62).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

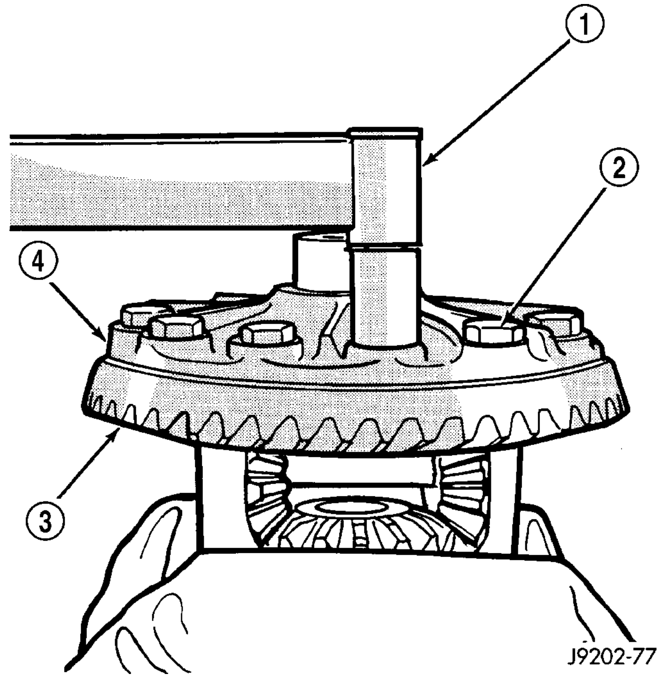


Fig. 62 Ring Gear

1 - TORQUE WRENCH
2 - BOLTS
3 - RING GEAR
4 - DIFFERENTIAL CASE

(19) Install differential in axle housing and verify gear mesh refer to Adjustments (Gear Contact Pattern).

(20) Install differential cover fill with gear lubricant.

(21) Install the propeller shaft with reference marks aligned.

(22) Install wheel and tire assemblies and lower the vehicle.

BRAKES

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BRAKES - BASE

DESCRIPTION

Power assist four wheel disc brakes are standard equipment. Disc brake components consist of single piston calipers and ventilated rotors. Rear disc brakes use a drum in hat design for the parking brake which is activated by brake shoes pressing against the inside of the drum in hat rotor (Fig. 1).

The parking brake mechanism is lever and cable operated. The cables are attached to equalizers on the rear disc brake support plate which moves the park brake shoes firmly against the drum in hat rotor. The parking brakes are operated by a hand lever.

A dual diaphragm vacuum power brake booster is used for all applications. All models have an aluminum master cylinder with plastic reservoir.

All non-ABS models are equipped with a junction block. The junction block contains a pressure differential valve and a fixed rate rear proportioning valve.

Factory brake lining on all models consists of an organic base material combined with metallic particles. The original equipment linings do not contain asbestos.

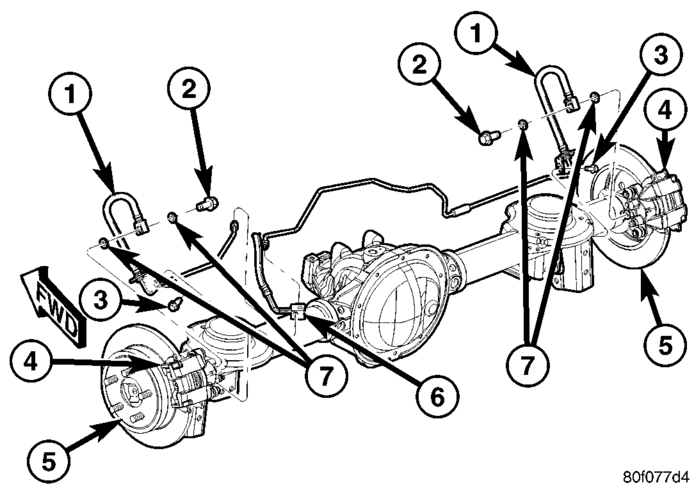


Fig. 1 REAR DISC BRAKES

1 - BRAKE HOSE
2 - BANJO BOLT
3 - MOUNTING BOLT
4 - CALIPER
5 - ROTOR
6 - BRAKE HOSE JUNCTION BLOCK
7 - BRAKE HOSE/BANJO BOLT WASHERS

BRAKES - BASE (Continued)

WARNING

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF ASBESTOS FIBERS FROM BRAKE COMPONENTS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WITH A WATER DAMPENED CLOTH. DO NOT SAND, OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DISPOSE OF ALL RESIDUE CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE EXPOSURE TO YOURSELF AND OTHERS. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Also check the reservoir cap seal for distortion. Drain and flush the system with new brake fluid if contamination is suspected.

CAUTION: Use Mopar brake fluid, or an equivalent quality fluid meeting SAE/DOT standards J1703 and DOT 3. Brake fluid must be clean and free of contaminants. Use fresh fluid from sealed containers only to ensure proper antilock component operation.

CAUTION: Use Mopar multi-mileage or high temperature grease to lubricate caliper slide surfaces, drum brake pivot pins, and shoe contact points on the backing plates. Use multi-mileage grease or GE 661 or Dow 111 silicone grease on caliper slide pins to ensure proper operation.

DIAGNOSIS AND TESTING - BASE BRAKE SYSTEM

Base brake components consist of the brake shoes, calipers, rotors, brake lines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

(1) Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.

(2) If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.

(3) Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**

(a) If fluid level is abnormally low, look for evidence of leaks at calipers, brake lines, and master cylinder.

(b) If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups will also have to be replaced after flushing. Use clean brake fluid to flush the system.

(4) Check parking brake operation. Verify free movement and full release of cables and hand lever. Also note if vehicle was being operated with parking brake partially applied.

(5) Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.

(6) Check booster vacuum check valve and hose.

(7) If components checked appear OK, road test the vehicle.

ROAD TESTING

(1) If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.

(2) Check brake pedal response with transmission in Neutral and engine running. Pedal should remain firm under constant foot pressure.

(3) During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake opera-

BRAKES - BASE (Continued)

tion such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.

(4) Attempt to stop the vehicle with the parking brake only and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brake line, fitting, hose, or caliper. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS or junction block may also be the problem with no physical evidence.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up worn linings or rotors are the most likely causes. The proper course of action is to inspect and replace all worn components.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, and replace substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster or check valve could also be faulty.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation. Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake shoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors and drums to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting.
- Drum parking brake shoes binding on worn/damaged support plates.
- Mis-assembled components.
- Long booster output rod.

If brake drag occurs at all wheels, the problem may be related to a blocked master cylinder return port, or faulty power booster (binds-does not release).

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake shoes
- Damaged rotor

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake

BRAKES - BASE (Continued)

unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or proportioning valve could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and/or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers, worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

BRAKE NOISES

Some brake noise is common with some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake shoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors and drums can become so scored that replacement is necessary.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components. However, calipers that bind on the slide surfaces can generate a thump or clunk noise.

STANDARD PROCEDURE

STANDARD PROCEDURE - PRESSURE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

Bleed only one brake component at a time in the following sequence:

- Master Cylinder
- Junction Block
- Right Rear Wheel
- Left Rear Wheel
- Right Front Wheel

BRAKES - BASE (Continued)

- Left Front Wheel

Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 15-20 psi is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system. Use adapter provided with the equipment or Adapter 6921.

STANDARD PROCEDURE - MANUAL BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

Bleed only one brake component at a time in the following sequence:

- Master Cylinder
- Junction Block
- Right Rear Wheel
- Left Rear Wheel
- Right Front Wheel
- Left Front Wheel

(1) Remove reservoir filler caps and fill reservoir.

(2) If calipers were overhauled, open all caliper bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.

(3) Attach one end of bleed hose to bleed screw and insert opposite end in glass container partially filled with brake fluid (Fig. 2). Be sure end of bleed hose is immersed in fluid.

(4) Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.

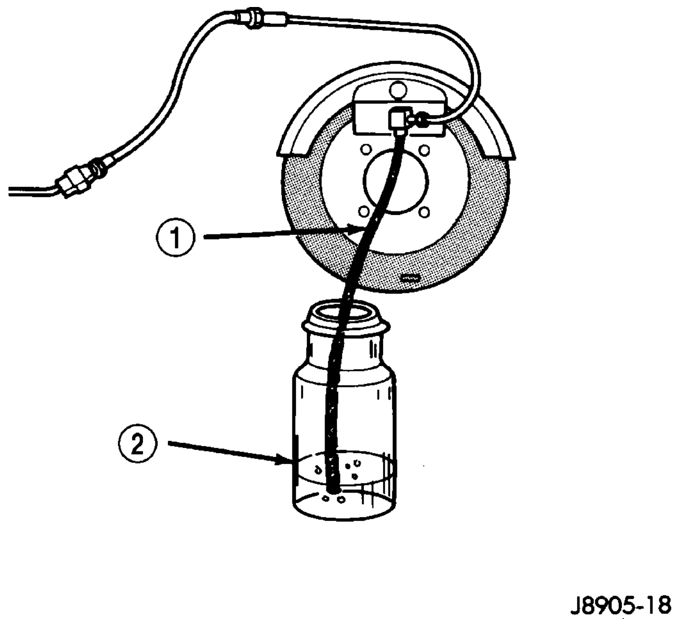


Fig. 2 Bleed Hose Setup

1 - BLEED HOSE
2 - FLUID CONTAINER PARTIALLY FILLED WITH FLUID

SPECIFICATIONS

BRAKE COMPONENTS

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Disc Brake Rotor Diameter Front	288 x 28 mm (11.3 x 1.102 in)
Disc Brake Rotor Diameter Rear	285 x 12 mm (11 x 0.472 in)
Disc Brake Rotor Ventilated Front	Max. Runout 0.102 mm (0.004 in.)
Disc Brake Rotor Solid Rear	Max. Runout 0.102 mm (0.004 in.)
Disc Brake Rotor Ventilated Front	Max. Thickness Variation 0.015 mm (0.0006 in.)
Disc Brake Rotor Solid Rear	Max. Thickness Variation 0.018 mm (0.0007 in.)
Disc Brake Rotor Ventilated Front	Min. Thickness 26.0 mm (1.0236 in.)
Disc Brake Rotor Solid Rear	Min. Thickness 11.0 mm (0.4331 in.)
Disc Brake Caliper	Sliding
Brake Booster	Dual Diaphragm

BRAKES - BASE (Continued)

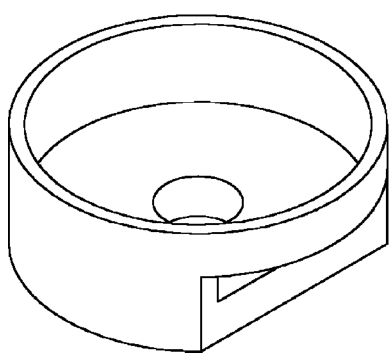
TORQUE

TORQUE SPECIFICATIONS

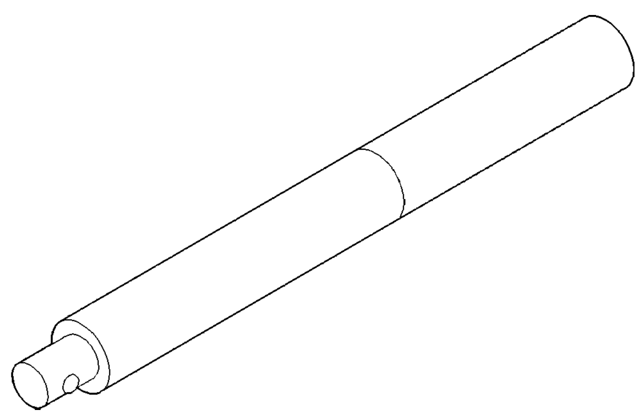
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Booster Mounting Nuts	25	—	220
Brake Pedal Shaft to Steering Column Support Bracket Nut & Washer Assembly	22.6	—	200
Master Cylinder Mounting Nuts	25	—	220
Master Cylinder Brake Lines	20	15	180
Junction Block Mounting Nuts	14.1	—	125
Junction Block Brake Lines	20	15	180
Caliper Mounting Bolts Front	15	11	—
Caliper Mounting Bolts Rear	25	—	220
Caliper Brake Hose Banjo Bolt Front	31	23	—
Caliper Brake Hose Banjo Bolt Rear	31	23	—
Parking Brake Lever Screws	10-14	7-10	—
Parking Brake Lever Bracket Screws	10-14	7-10	—

SPECIAL TOOLS

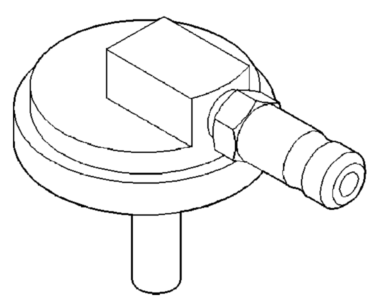
BASE BRAKES



Installer Caliper Dust Boot 8280



Handle C-4171



Adapter Pressure Bleeder 6921

BRAKE LINES

DESCRIPTION

Flexible rubber hose is used at both front and rear brakes and at the rear axle junction block. Double walled steel tubing is used to connect the master cylinder to the major hydraulic braking components and then to the flexible rubber hoses. Double inverted style and ISO style flares are used on the brake lines.

DIAGNOSIS AND TESTING - BRAKE LINE AND HOSES

Flexible rubber hose is used at both front and rear brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, at every engine oil change, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. All of these conditions can lead to scuffing, cracking and eventual failure.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper seal washers at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

STANDARD PROCEDURE - DOUBLE INVERTED FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

Special bending tools are needed to avoid kinking or twisting of metal brake tubes. Special flaring tools are needed to make a double inverted flare or ISO flare.

(1) Cut off damaged tube with Tubing Cutter.

(2) Ream cut edges of tubing to ensure proper flare.

(3) Install replacement tube nut on the tube.

(4) Insert tube in flaring tool.

(5) Place gauge form over the end of the tube.

(6) Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.

(7) Tighten the tool bar on the tube

(8) Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc (Fig. 3).

(9) Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.

(10) Remove the plug gauge and complete the inverted flare.

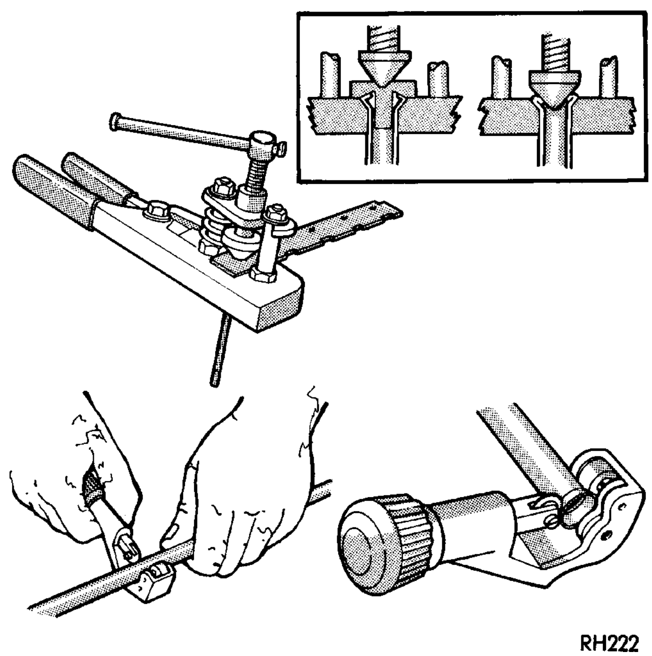


Fig. 3 Inverted

BRAKE LINES (Continued)

REMOVAL

REMOVAL - FRONT HOSE

(1) Install prop rod on the brake pedal to keep pressure on the brake system.

(2) Remove the brake line from the brake hose inside the engine compartment by the front control arm bolt (Fig. 4).

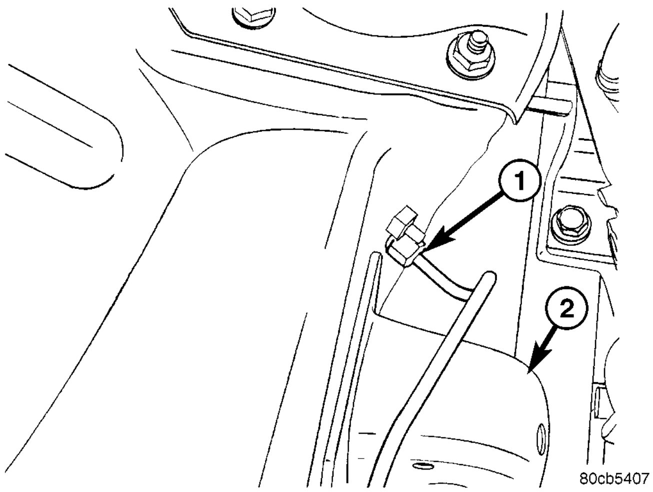


Fig. 4 INNER FENDER BRAKE LINE

1 - BRAKE LINE
2 - UPPER CONTROL ARM MOUNT

(3) Raise and support vehicle.

(4) Remove the brake hose banjo bolt at the caliper.

(5) Remove the mounting bolt for the top of the brake hose at the vehicle (Fig. 5).

(6) Remove the hose.

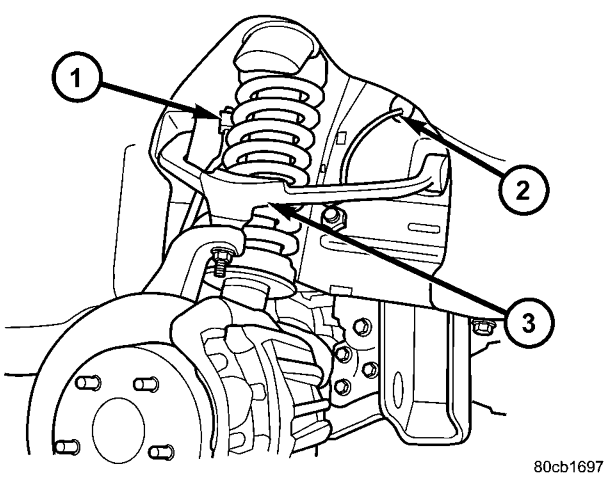


Fig. 5 FRONT BRAKE HOSE

1 - TOP OF FRONT BRAKE HOSE
2 - WHEEL SPEED SENSOR WIRE
3 - UPPER CONTROL ARM

REMOVAL - REAR BRAKE HOSE

(1) Install prop rod on the brake pedal to keep pressure on the brake system.

(2) Raise and support the vehicle.

(3) Remove the brake line from the hose at the body (Fig. 6).

(4) Remove the brake hose mounting bolt at the top of the hose located at the body (Fig. 6).

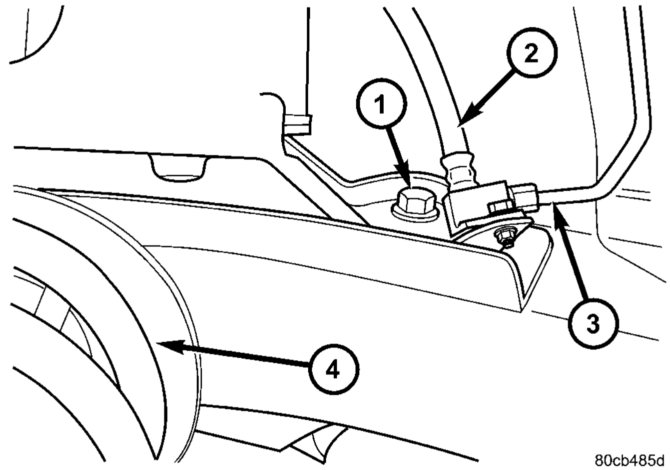


Fig. 6 BRAKE HOSE AT THE BODY

1 - MOUNTING BOLT
2 - BRAKE HOSE
3 - BRAKE LINE
4 - COIL SPRING

(5) Remove the vent tube (Fig. 7).

(6) Remove the two brake lines at the bottom of the hose located at the axle (Fig. 7).

(7) Remove the mounting bolt for the brake hose at the axle (Fig. 7).

(8) Remove the hose.

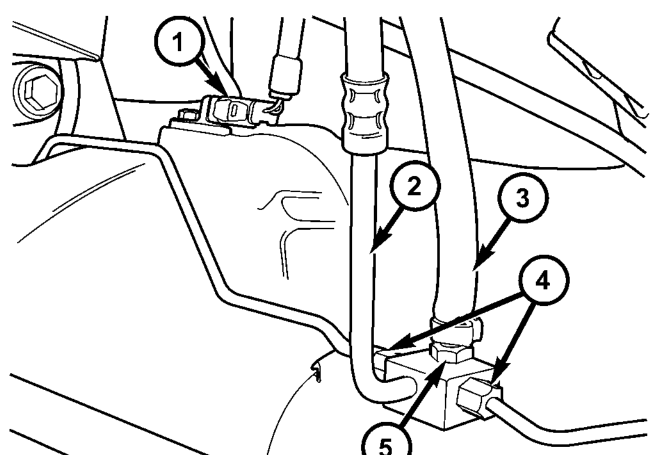


Fig. 7 BRAKE HOSE AT THE AXLE

1 - REAR WHEEL SPEED SENSOR
2 - BRAKE HOSE
3 - VENT HOSE
4 - BRAKE LINES
5 - MOUNTING BOLT

BRAKE LINES (Continued)

INSTALLATION

INSTALLATION - FRONT OR REAR BRAKE CALIPER HOSE

(1) Install the hose.

(2) Install the mounting bolt for the top of the brake hose at the vehicle (Fig. 8).

(3) Install the brake hose banjo bolt at the caliper.

(4) Lower the vehicle and remove the support.

(5) Install the brake line to the brake hose inside the engine compartment by the front control arm bolt.

(6) Remove the prop rod from the brake pedal.

(7) Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

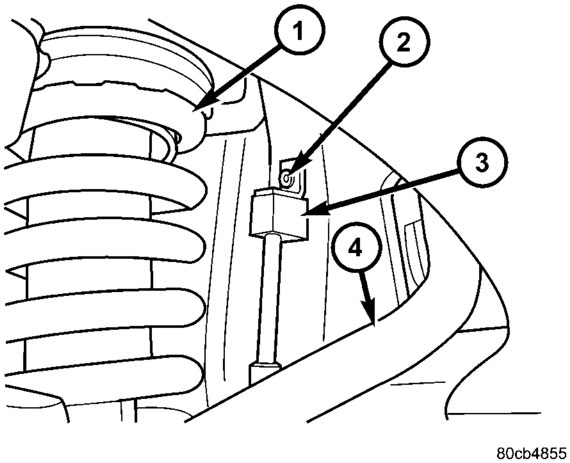


Fig. 8 BRAKE HOSE MOUNTED

1 - COIL SPRING
2 - MOUNTING BOLT
3 - BRAKE HOSE
4 - FRONT OF THE UPPER CONTROL ARM

INSTALLATION - REAR BRAKE HOSE

(1) Install the hose.

(2) Install the mounting bolt for the brake hose at the axle (Fig. 7).

(3) Install the two brake lines at the bottom of the hose located at the axle (Fig. 7).

(4) Install the vent tube (Fig. 7).

(5) Install the brake hose mounting bolt at the top of the hose located at the body (Fig. 6).

(6) Install the brake line to the hose at the body (Fig. 6).

(7) Lower the vehicle and remove the support.

(8) Remove the prop rod.

(9) Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

BRAKE PADS / SHOES

REMOVAL

REMOVAL - FRONT BRAKE PADS

(1) Raise and support the vehicle.

(2) Remove the front wheel and tire assembly.

(3) Drain a small amount of fluid from the master cylinder brake reservoir with a **clean** suction gun.

(4) Bottom the caliper pistons into the caliper by prying the caliper over.

(5) Remove the caliper mounting bolts.

(6) Remove the disc brake caliper from the mount.

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

(7) Remove the inboard and outboard pads.

REMOVAL - REAR DISC BRAKE PADS

(1) Raise and support vehicle.

(2) Remove the wheel and tire assemblies.

(3) Compress the caliper.

(4) Remove the caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).

(5) Remove the caliper by tilting the top up and off the caliper adapter.

NOTE: Do not allow brake hose to support caliper assembly.

(6) Support and hang the caliper.

(7) Remove the inboard brake pad from the caliper adapter.

(8) Remove the outboard brake pad from the caliper adapter.

INSTALLATION

INSTALLATION - FRONT BRAKE PADS

(1) Install the inboard and outboard pads.

(2) Install the caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

(3) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

INSTALLATION - REAR DISC BRAKE PADS

(1) Bottom pistons in caliper bore with C-clamp. Place an old brake shoe between a C-clamp and caliper piston.

BRAKE PADS / SHOES (Continued)

(2) Clean caliper mounting adapter and anti-rattle springs.

(3) Lubricate anti-rattle springs with Mopar brake grease.

(4) Install anti-rattle springs.

NOTE: Anti-rattle springs are not interchangeable.

(5) Install inboard brake pad in adapter.

(6) Install outboard brake pad in adapter.

(7) Tilt the top of the caliper over rotor and under adapter. Then push the bottom of the caliper down onto the adapter.

(8) Install caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

(9) Install wheel and tire assemblies and lower vehicle, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(10) Apply brakes several times to seat caliper pistons and brake shoes and obtain firm pedal.

(11) Top off master cylinder fluid level.

DISC BRAKE CALIPERS

DESCRIPTION

The calipers are a single piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

OPERATION

When the brakes are applied fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal (Fig. 9).

Fluid pressure applied to the piston is transmitted directly to the inboard brake shoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brake shoe lining into contact with the outer surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will attempt to stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

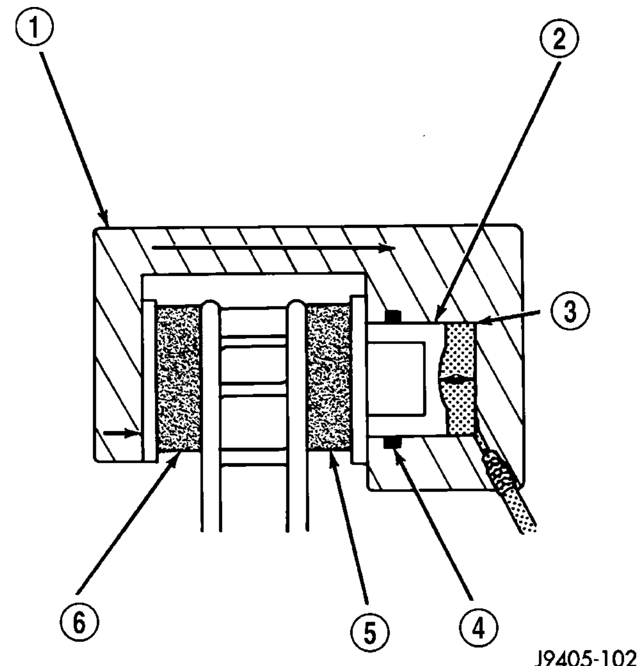


Fig. 9 Brake Caliper Operation

1 - CALIPER
2 - PISTON
3 - PISTON BORE
4 - SEAL
5 - INBOARD SHOE
6 - OUTBOARD SHOE

The caliper piston seal controls the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement (Fig. 10). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake shoe.

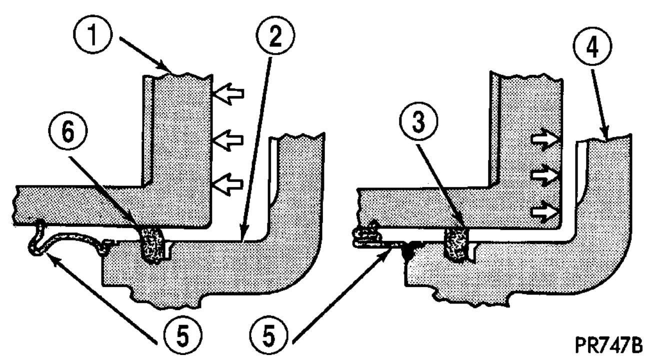


Fig. 10 Lining Wear Compensation By Piston Seal

1 - PISTON
2 - CYLINDER BORE
3 - PISTON SEAL BRAKE PRESSURE OFF
4 - CALIPER HOUSING
5 - DUST BOOT
6 - PISTON SEAL BRAKE PRESSURE ON

DISC BRAKE CALIPERS (Continued)

REMOVAL

REMOVAL - FRONT

(1) Install prop rod on the brake pedal to keep pressure on the brake system.
(2) Raise and support vehicle.
(3) Remove front wheel and tire assembly.
(4) Remove the brake hose banjo bolt if replacing caliper (Fig. 11).
(5) Remove the caliper mounting slide pin bolts (Fig. 11).
(6) Remove the caliper from vehicle.

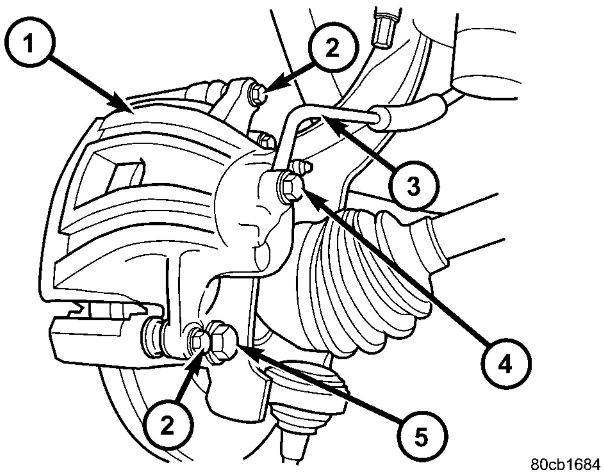


Fig. 11 DISC BRAKE CALIPER

1 - DISC BRAKE CALIPER
2 - CALIPER SLIDE MOUNTING BOLTS
3 - BRAKE HOSE
4 - BANJO BOLT
5 - CALIPER ADAPTER MOUNTING BOLT

REMOVAL - REAR

(1) Install prop rod on the brake pedal to keep pressure on the brake system.
(2) Raise and support vehicle.
(3) Remove the wheel and tire assembly.
(4) Remove the brake hose banjo bolt if replacing caliper.
(5) Remove the caliper mounting slide pin bolts (Fig. 12).
(6) Remove the caliper from vehicle.

DISASSEMBLY

(1) Remove brake shoes from caliper.
(2) Drain brake fluid out of caliper.
(3) Take a piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the piston. This will cushion and protect caliper piston during removal (Fig. 13).

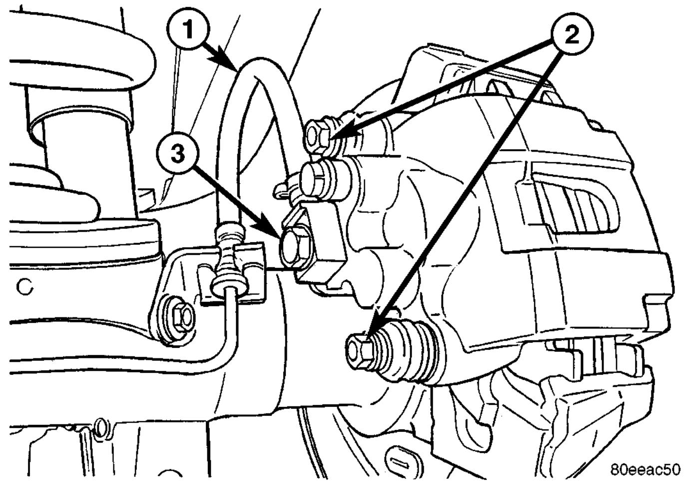


Fig. 12 CALIPER MOUNTING

1 - BRAKE HOSE
2 - CALIPER MOUNTING BOLTS
3 - BANJO BOLT

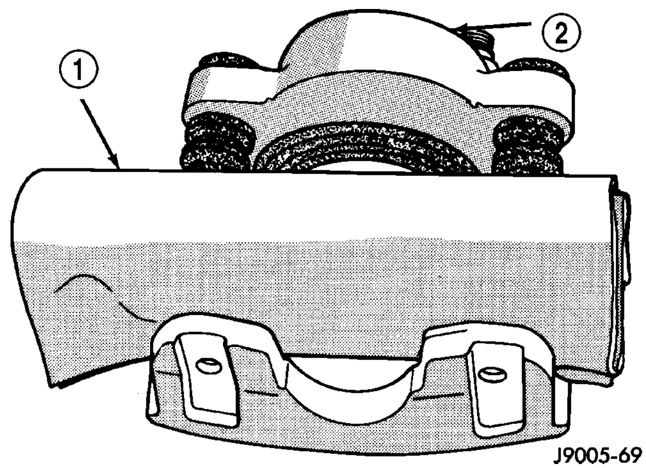


Fig. 13 PADDING CALIPER INTERIOR - TYPICAL

1 - SHOP TOWELS OR CLOTHS
2 - CALIPER

(4) Remove caliper piston with **short bursts** of low pressure compressed air. Direct air through fluid inlet port and ease piston out of bore (Fig. 14).

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston. Use only enough air pressure to ease the piston out.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS MAY RESULT IN PERSONAL INJURY.

(5) Remove caliper piston dust boot with suitable pry tool (Fig. 15).
(6) Remove caliper piston seal with wood or plastic tool (Fig. 16). Do not use metal tools as they will scratch piston bore.

DISC BRAKE CALIPERS (Continued)

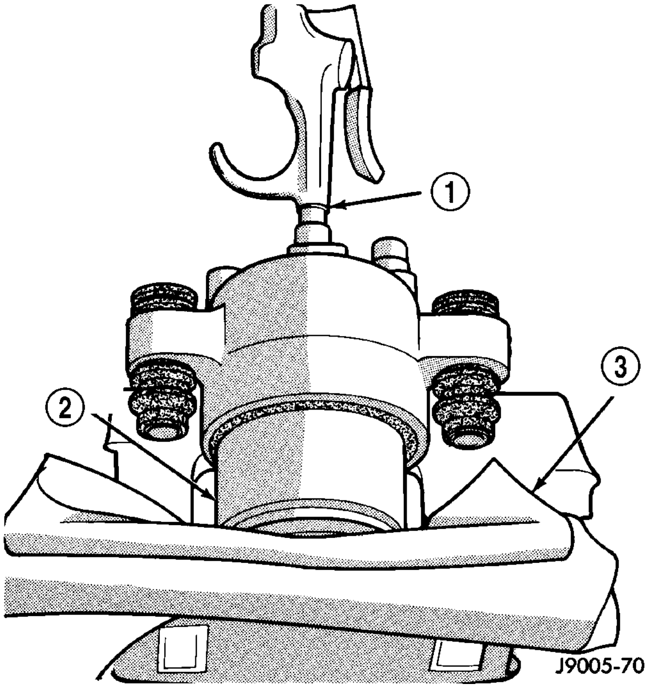


Fig. 14 CALIPER PISTON REMOVAL - TYPICAL

1 - AIR GUN
2 - CALIPER PISTON
3 - PADDING MATERIAL

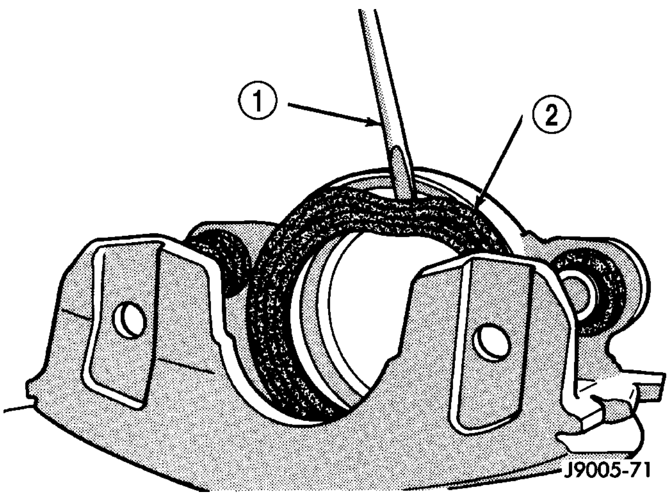


Fig. 15 CALIPER PISTON DUST BOOT REMOVAL - TYPICAL

1 - COLLAPSE BOOT WITH PUNCH OR SCREWDRIVER
2 - PISTON DUST BOOT

(7) Remove caliper mounting bolt bushings and boots (Fig. 17).

CLEANING

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

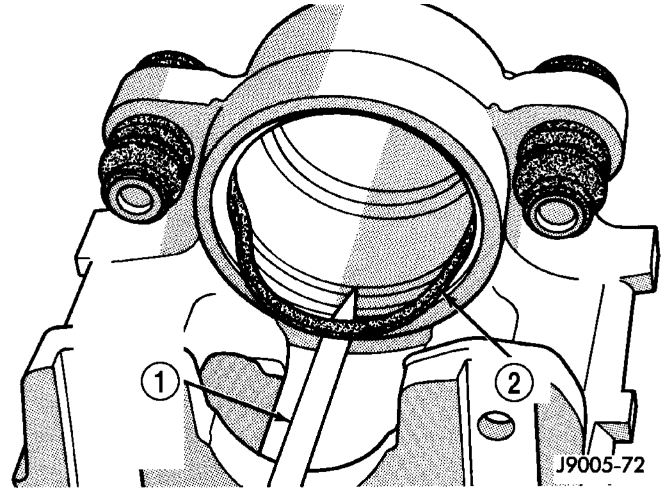


Fig. 16 PISTON SEAL REMOVAL - TYPICAL

1 - REMOVE SEAL WITH WOOD PENCIL OR SIMILAR TOOL
2 - PISTON SEAL

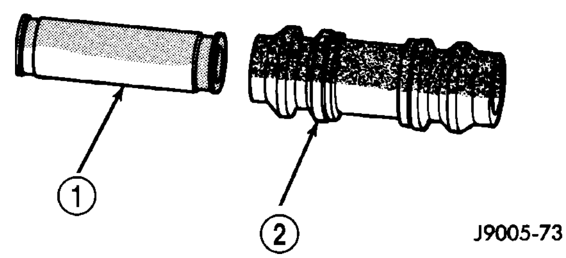


Fig. 17 MOUNTING BOLT BUSHING AND BOOT - TYPICAL

1 - CALIPER SLIDE BUSHING
2 - BOOT

CAUTION: Do not use gasoline, kerosene, thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone to remove very minor surface imperfections (Fig. 18). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

DISC BRAKE CALIPERS (Continued)

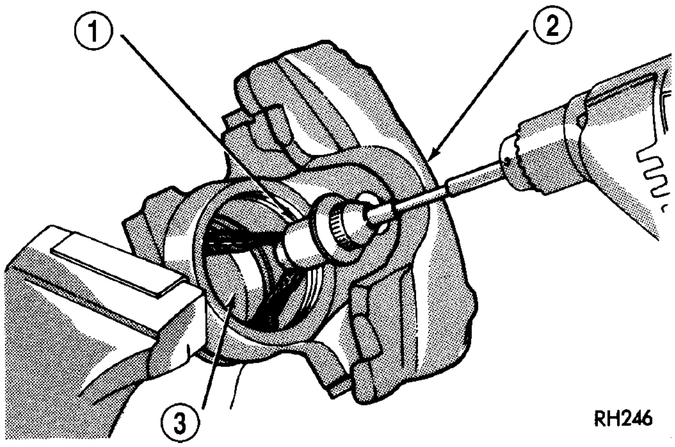


Fig. 18 POLISHING PISTON BORE - TYPICAL

1 - SPECIAL HONE
2 - CALIPER
3 - PISTON BORE

ASSEMBLY

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

(1) Lubricate caliper piston bore, new piston seal and piston with clean brake fluid.

(2) Lubricate caliper bushings and interior of bushing boots with silicone grease.

(3) Install bushing boots in caliper, then insert bushing into boot and push bushing into place (Fig. 19).

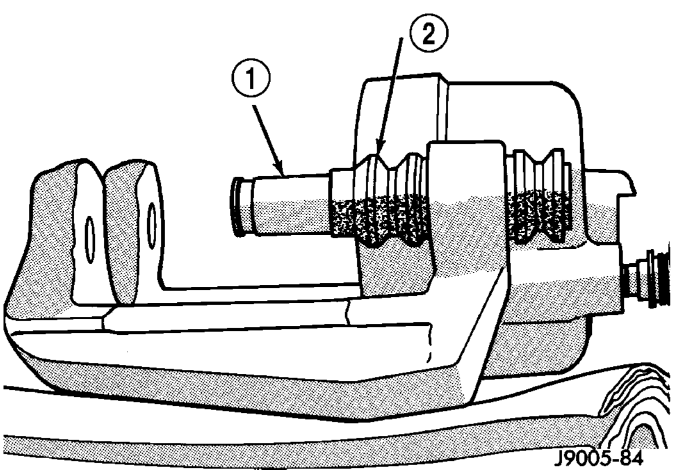


Fig. 19 BUSHINGS AND BOOTS INSTALLATION - TYPICAL

1 - BUSHING
2 - BOOT

(4) Install new piston seal into seal groove with finger (Fig. 20).

(5) Install new dust boot on caliper piston and seat boot in piston groove (Fig. 21).

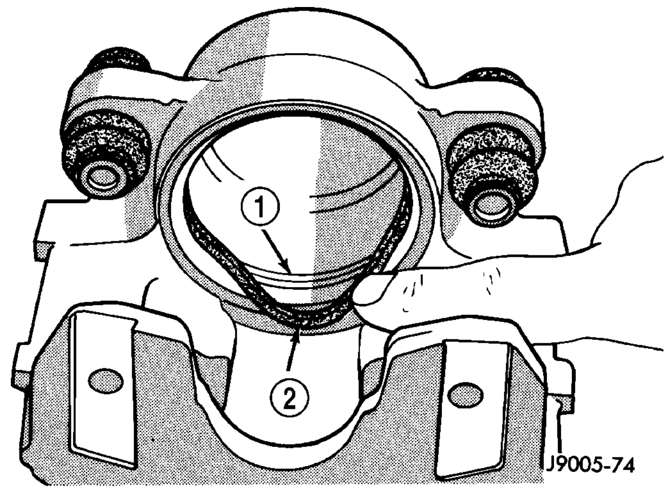


Fig. 20 PISTON SEAL INSTALLATION - TYPICAL

1 - SEAL GROOVE
2 - PISTON SEAL

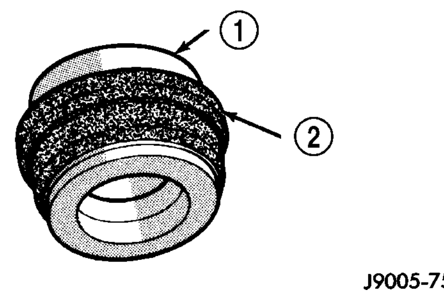


Fig. 21 DUST BOOT ON PISTON - TYPICAL

1 - PISTON
2 - DUST BOOT

(6) Press piston into caliper bore by hand, use a turn and push motion to work piston into seal (Fig. 22).

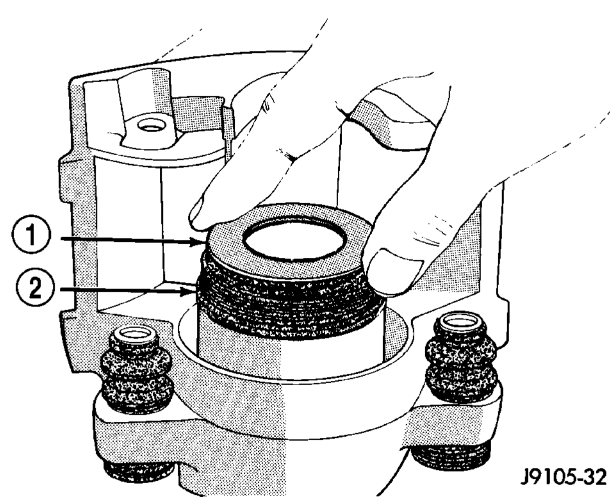


Fig. 22 CALIPER PISTON INSTALLATION - TYPICAL

1 - PISTON
2 - BOOT

DISC BRAKE CALIPERS (Continued)

(7) Press caliper piston to bottom of bore.

(8) Seat dust boot in caliper with Installer Tool C-4842 and Tool Handle C-4171 (Fig. 23).

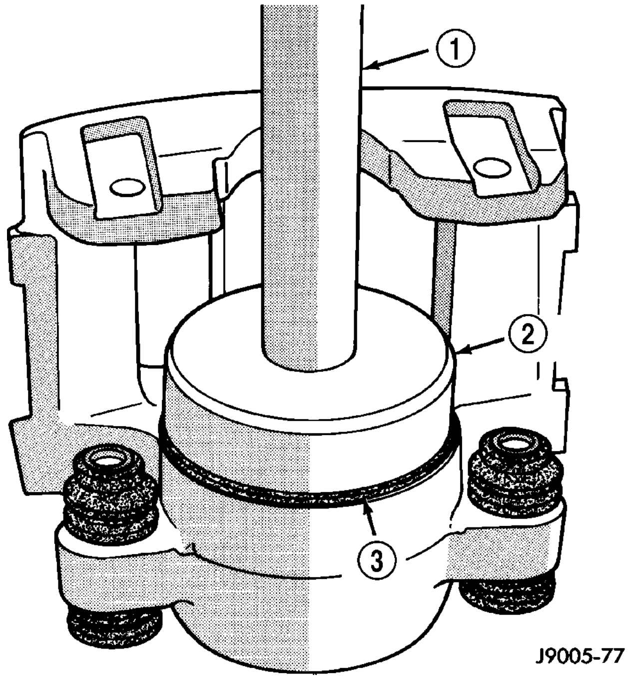


Fig. 23 PISTON DUST BOOT INSTALLATION - TYPICAL

1 - HANDLE C-4171
2 - INSTALLER C-4842
3 - DUST BOOT

(9) Replace caliper bleed screw if removed.

INSTALLATION

INSTALLATION - FRONT

(1) Install caliper to the caliper adapter.

(2) Coat the caliper mounting slide pin bolts with silicone grease. Begin with the bolt closet to the bleeder screws (top), Then install and tighten the bolts to 15 N·m (11 ft. lbs.).

(3) Install the brake hose banjo bolt if removed.

(4) Install the brake hose to the caliper with **new seal washers** and tighten fitting bolt to 31 N·m (23 ft. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

(5) Remove the prop rod from the vehicle.

(6) Bleed the base brake system,(Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(7) Install the wheel and tire assemblies (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(8) Remove the supports and lower the vehicle.

(9) Verify a firm pedal before moving the vehicle.

INSTALLATION - REAR

(1) Install the brake pads if removed.

(2) Lubricate ant-rattle clips for the disc brake pads (Fig. 24).

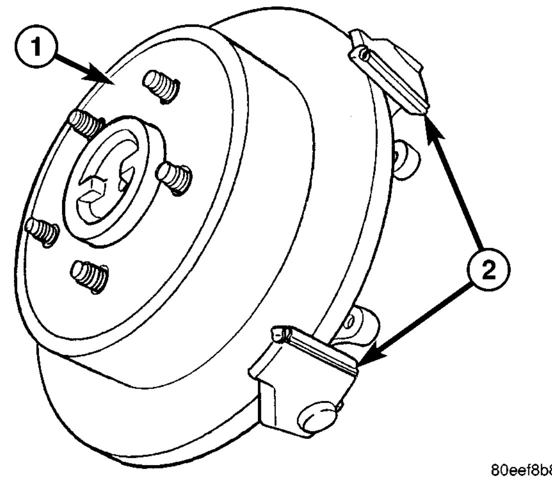


Fig. 24 ANTI-RATTLE CLIPS

1 - ROTOR
2 - ANTI-RATTLE CLIPS

(3) Install caliper to the caliper adapter.

(4) Coat the caliper mounting slide pin bolts with silicone grease. Then install and tighten the bolts to 15 N·m (11 ft. lbs.).

(5) Install the brake hose banjo bolt if removed (Fig. 25).

(6) Install the brake hose to the caliper with **new seal washers** and tighten fitting bolt to 31 N·m (23 ft. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

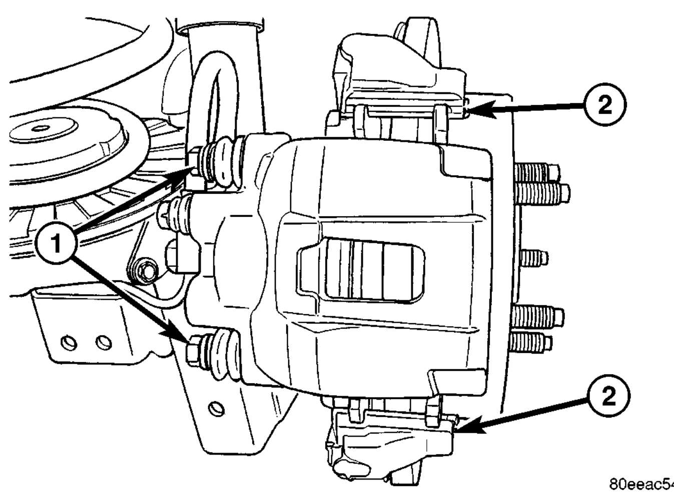


Fig. 25 CALIPER INSTALLED

1 - CALIPER MOUNTING BOLTS
2 - CALIPER SLIDES

DISC BRAKE CALIPERS (Continued)

(7) Remove the prop rod from the vehicle.
(8) Bleed the base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
(9) Install the wheel and tire assemblies (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
(10) Remove the supports and lower the vehicle.
(11) Verify a firm pedal before moving the vehicle.

DISC BRAKE CALIPER ADAPTER

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the front wheel and tire assembly.
(3) Drain a small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.
(4) Bottom the caliper pistons into the caliper by prying the caliper over.
(5) Remove the caliper mounting bolts (Fig. 11).
(6) Remove the disc brake caliper from the mount.

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

(7) Remove the inboard and outboard brake pads. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL).
(8) Remove the caliper adapter mounting bolts (Fig. 11).

INSTALLATION

(1) Install the caliper adapter mounting bolts. Tighten the mounting bolts to 135 N·m (100 ft.lbs).
(2) Install the inboard and outboard pads. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION).
(3) Install the caliper mounting bolts.
(4) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

ROTORS

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor surfaces can be restored by machining in a disc brake lathe if surface scoring and wear are light.

Replace the rotor under the following conditions:

- severely scored
- tapered
- hard spots
- cracked
- below minimum thickness

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if machining would reduce thickness below the allowable minimum.

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339 (Fig. 26). Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brake shoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge. The dial indicator should be positioned in the center of the rotor surface. Maximum allowable rotor runout is 0.102 mm (0.004 in.).

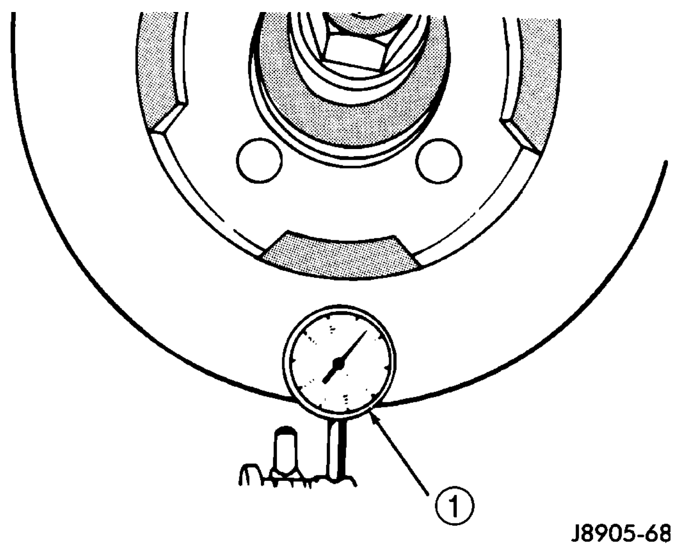


Fig. 26 Checking Rotor Runout And Thickness Variation

1 - DIAL INDICATOR

ROTORS (Continued)

ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at 6 to 12 points around the rotor face (Fig. 27).

Position the micrometer approximately 25.4 mm (1 in.) from the rotor outer circumference for each measurement.

Thickness should not **vary** by more than 0.013 mm (0.0005 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.

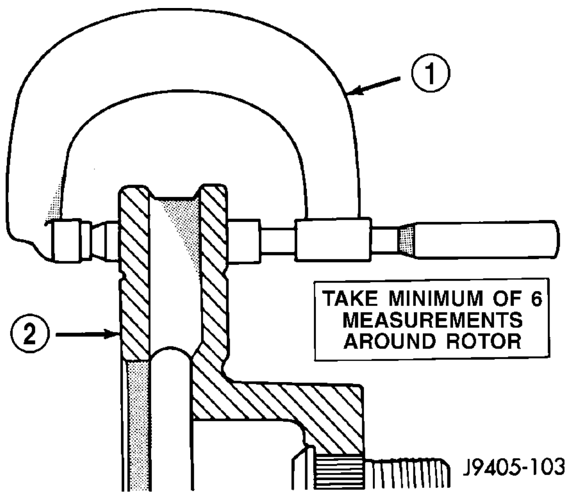


Fig. 27 Measuring Rotor Thickness

1 - MICROMETER
2 - ROTOR

DIAGNOSIS AND TESTING - BRAKE DRUM IN HAT ROTOR

The maximum allowable diameter of the drum braking surface is indicated on the drum outer edge. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum in hat.

BRAKE DRUM RUNOUT

Measure drum diameter and runout with an accurate gauge. The most accurate method of measurement involves mounting the drum in a brake lathe and checking variation and runout with a dial indicator.

Machine the drum if runout or variation exceed values. Replace the drum in hat rotor if machining causes the drum in hat rotor to exceed the maximum allowable diameter.

STANDARD PROCEDURE

STANDARD PROCEDURE - DISC BRAKE ROTOR

The disc brake rotor can be machined if scored or worn. The lathe must machine both sides of the rotor simultaneously with dual cutter heads. The rotor mounting surface must be clean before placing on the lathe. Equipment capable of machining only one side at a time may produce a tapered rotor. A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

CAUTION: Brake rotors that do not meet minimum thickness specifications before or after machining must be replaced.

STANDARD PROCEDURE - BRAKE DRUM IN HAT ROTOR MACHINING

The brake drum in hat rotor can be machined on a drum lathe when necessary. Initial machining cuts should be limited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.038 mm (0.001 to 0.0015 in.) are recommended and will generally provide the best surface finish.

Be sure the drum in hat rotor is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum in hat rotor.

CAUTION: Replace the drum in hat rotor if machining will cause the drum to exceed the maximum allowable diameter.

ROTORS (Continued)

REMOVAL

REMOVAL - FRONT

(1) Raise and support the vehicle.
(2) Remove the tire and wheel assembly.
(3) Remove the caliper adapter (Fig. 28). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

(4) Remove the disc brake rotor.

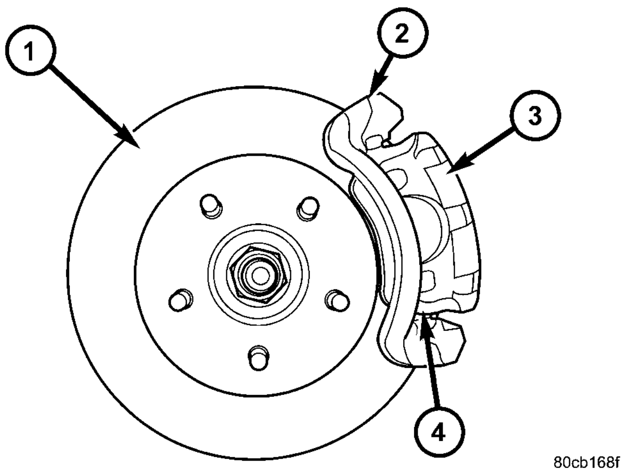


Fig. 28 DISC BRAKE ROTOR

1 - DISC BRAKE ROTOR
2 - CALIPER ADAPTER
3 - DISC BRAKE CALIPER
4 - SHOES

REMOVAL - REAR

(1) Raise and support the vehicle
(2) Remove the tire and wheel assembly (Fig. 29).
(3) Remove the disc brake caliper and pads, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) (Fig. 30).
(4) Remove the retianing clips and rotor assembly.

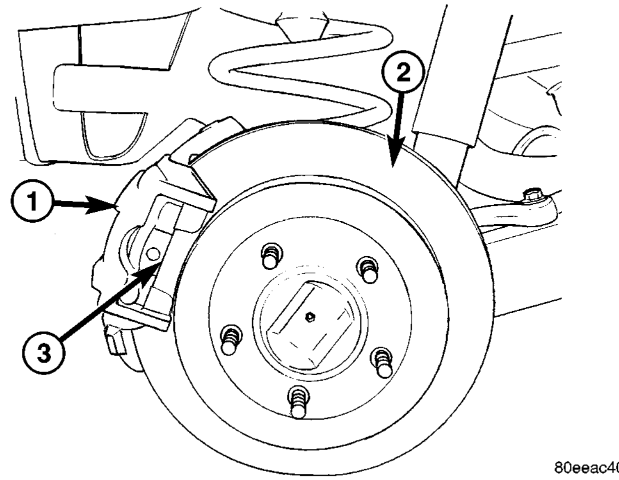


Fig. 29 ROTOR/CALIPER

1 - CALIPER
2 - ROTOR
3 - OUTBOARD DISC BRAKE PAD

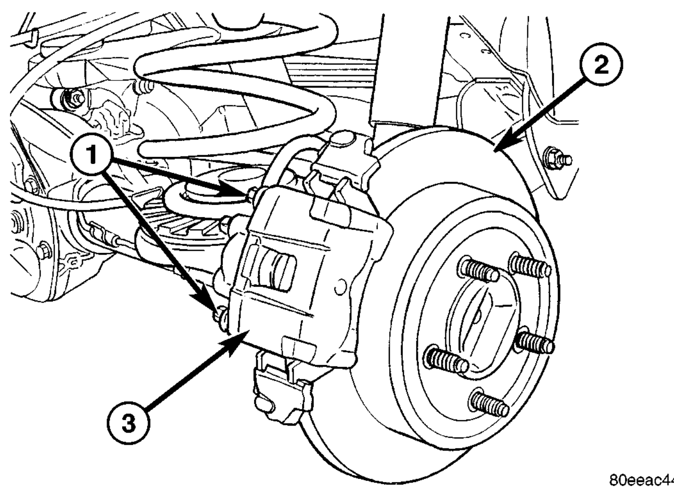


Fig. 30 ROTOR

1 - CALIPER MOUNTING BOLTS
2 - ROTOR
3 - CALIPER

INSTALLATION

INSTALLATION - FRONT

(1) Install the disc brake rotor to the hub.
(2) Install the caliper mounting adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
(3) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

INSTALLATION - REAR

(1) Install the rotor to the axleshaft.
(2) Install the disc brake caliper and pads (Fig. 30), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
(3) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
(4) Lower the vehicle.

BRAKE JUNCTION BLOCK

DESCRIPTION

The junction block contains a pressure differential valve and a rear brake proportioning valve. The valves are not repairable and must be replaced as an assembly if diagnosis indicates this is necessary.

OPERATION

PROPORTIONING VALVE

The proportioning valve is used to balance front-rear brake action at high decelerations. The valve allows normal fluid flow during moderate braking. The valve only controls fluid flow during high decelerations brake stops. If the primary brake hydraulic circuit cannot build pressure a by-pass feature is activated allowing full flow and pressure to the rear brakes.

DIAGNOSIS AND TESTING - PROPORTIONING VALVE

The valve controls fluid flow. If fluid enters the valve and does not exit the valve the combination valve must be replaced.

REMOVAL

(1) Install prop rod on the brake pedal to keep pressure on the brake system.

(2) Remove the brake lines from the junction block.

(3) Remove mounting nuts and bolt and remove the junction block (Fig. 31).

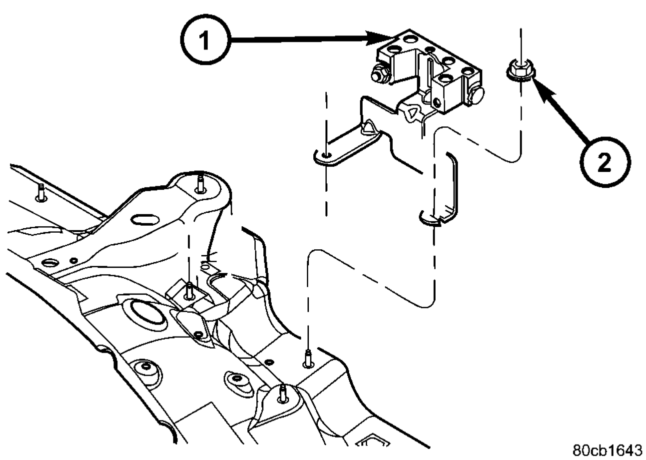


Fig. 31 JUNCTION BLOCK

1 - JUNCTION BLOCK
2 - MOUNTING NUT

INSTALLATION

(1) Install the junction block on the mounting studs.

(2) Install mounting nuts and bolt. Tighten to 14 N·m (125 in. lbs.).

(3) Install brake lines to the junction block and tighten to 20 N·m (180 in. lbs.).

(4) Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

PEDAL

DESCRIPTION

A suspended-type brake pedal is used, the pedal pivots on a shaft mounted in the steering coloumn support bracket. The bracket is attached to the dash panel. The unit is serviced as an assembly, except for the pedal pad.

OPERATION

The brake pedal is attached to the booster push rod. When the pedal is depressed, the primary booster push rod is depressed which move the booster secondary rod. The booster secondary rod depress the master cylinder piston.

REMOVAL

(1) Remove the knee blocker under the steering column, (Refer to 23 - BODY/INSTRUMENT PANEL/ KNEE BLOCKER - REMOVAL).

(2) Remove the retainer clip securing the booster push rod to pedal (Fig. 32).

(3) Remove the brake lamp switch, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL).

(4) Remove the nuts securing the pedal to the column bracket.

(5) Remove the pedal from the vehicle.

INSTALLATION

(1) Install the pedal into the vehicle.

(2) Install the nuts securing the pedal to the column bracket.

(3) Tighten the nuts to 22.6 N·m (200 in. lbs.).

(4) Lubricate the brake pedal pin and bushings with Mopar multi-mileage grease.

(5) Install the booster push rod on the pedal pin and install a new retainer clip (Fig. 32).

(6) Install the brake lamp switch, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - INSTALLATION).

PEDAL (Continued)

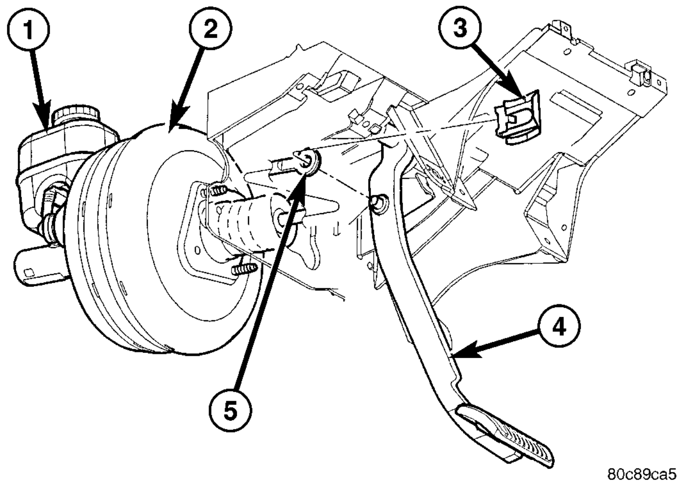


Fig. 32 BOOSTER PUSH ROD

1 - MASTER CYLINDER ASSEMBLY
2 - BRAKE BOOSTER
3 - CLIP
4 - BRAKE PEDAL
5 - BOOSTER ROD

(7) Install the knee blocker, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

POWER BRAKE BOOSTER

DESCRIPTION

The booster assembly consists of a housing divided into separate chambers by two internal diaphragms. The outer edge of each diaphragm is attached to the booster housing. The diaphragms are connected to the booster primary push rod.

Two push rods are used in the booster. The primary push rod connects the booster to the brake pedal. The secondary push rod connects the booster to the master cylinder to stroke the cylinder pistons.

The booster assembly is of the tie-bar design. This means the structural support of the assembly is through the tie-bars, whose ends protrude through the booster shell. One end is the master cylinder mounting stud and the other end is the booster mounting stud. The booster assembly (with properly functioning check valve installed) may not have a good vacuum seal unless the booster is installed on the dash panel mounting bracket with master cylinder and booster mounting nuts properly torqued.

OPERATION

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is through a hose attached to an intake manifold fitting at one end and to the booster check valve at the other. The vacuum check valve in the booster housing is a one-way device that prevents vacuum leak back.

Power assist is generated by utilizing the pressure differential between normal atmospheric pressure and a vacuum. The vacuum needed for booster operation is taken directly from the engine intake manifold. The entry point for atmospheric pressure is through a filter and inlet valve at the rear of the housing (Fig. 33).

The chamber areas forward of the booster diaphragms are exposed to vacuum from the intake manifold. The chamber areas to the rear of the diaphragms, are exposed to normal atmospheric pressure of 101.3 kilopascals (14.7 pounds/square in.).

Brake pedal application causes the primary push rod to open the atmospheric inlet valve. This exposes the area behind the diaphragms to atmospheric pressure. The resulting pressure differential provides the extra apply force for power assist.

The booster check valve, check valve grommet and booster seals are serviceable.

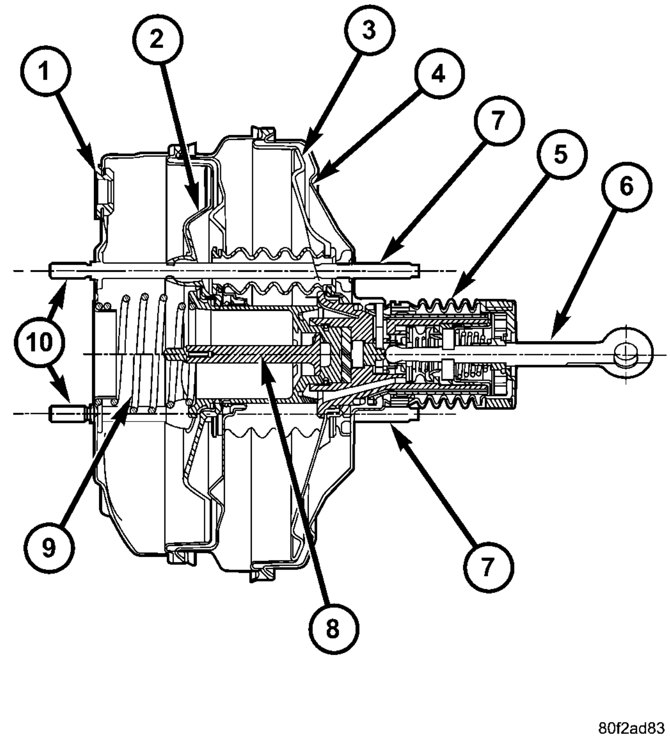


Fig. 33 POWER BRAKE BOOSTER CUT AWAY

1 - VACUUM CHECK VALVE
2 - FRONT DIAPHRAGM
3 - REAR DIAGHRAGM
4 - HOUSING
5 - SEAL
6 - PRIMARY PUSH ROD (TO BRAKE PEDAL)
7 - BOOSTER MOUNTING STUDS
8 - SECONDARY PUSH ROD (TO MASTER CYLINDER)
9 - SPRING
10 - MASTER CYLINDER MOUNTING STUDS

POWER BRAKE BOOSTER (Continued)

DIAGNOSIS AND TESTING - MASTER CYLINDER/POWER BOOSTER

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding, also ensure booster mounting nuts are torqued correctly.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).

(5) Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately turn off ignition to stop engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 34).

(2) Start and run engine at curb idle speed for one minute.

(3) Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.

(4) Clamp hose shut between vacuum source and check valve.

(5) Stop engine and observe vacuum gauge.

(6) If vacuum drops more than one inch Hg (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

(4) Apply 15-20 inches vacuum at large end of check valve (Fig. 35).

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

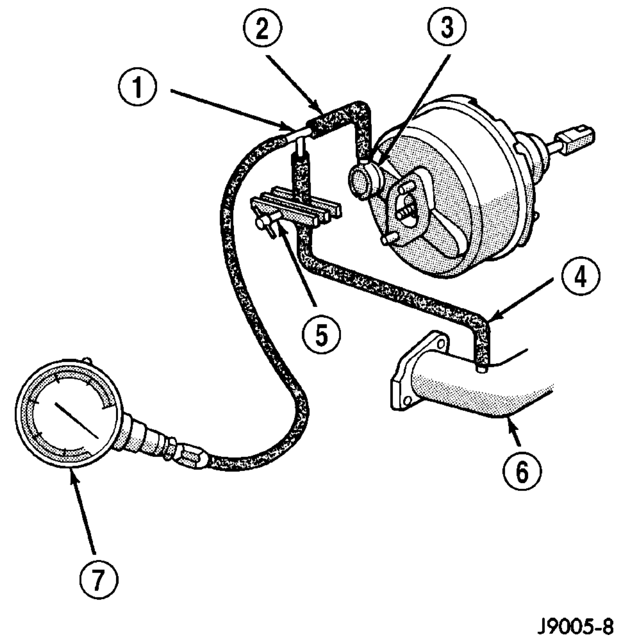


Fig. 34 Typical Booster Vacuum Test Connections

1 - TEE FITTING
2 - SHORT CONNECTING HOSE
3 - CHECK VALVE
4 - CHECK VALVE HOSE
5 - CLAMP TOOL
6 - INTAKE MANIFOLD
7 - VACUUM GAUGE

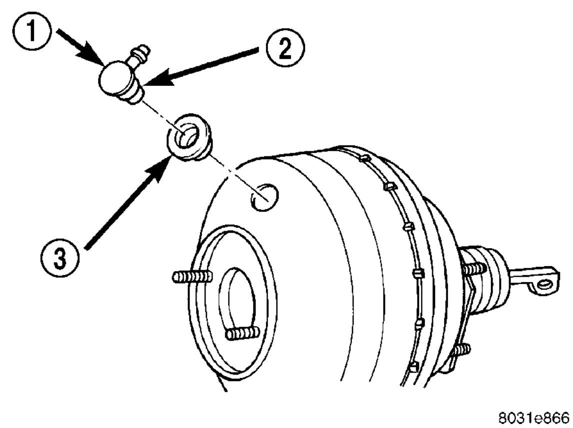


Fig. 35 TYPICAL - VACUUM CHECK VALVE AND SEAL

1 - BOOSTER CHECK VALVE
2 - APPLY TEST VACUUM HERE
3 - VALVE SEAL

POWER BRAKE BOOSTER (Continued)

REMOVAL

REMOVAL - LHD

(1) Disconnect the wire to the fluid level switch at the bottom of the reservoir.

(2) Remove the master cylinder (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL).

(3) Disconnect vacuum hoses from booster check valve.

(4) Remove the brake lines from the master cylinder and the HCU (abs vehicles only) or the junction block for clearance.

(5) Disconnect the HCU from the mounts and move to the side for clearance of the booster.

(6) Remove knee blocker under the steering column, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL).

(7) Remove retaining clip that secures booster push rod to brake pedal (Fig. 36).

(8) Remove nuts attaching booster to the dash panel (Fig. 37).

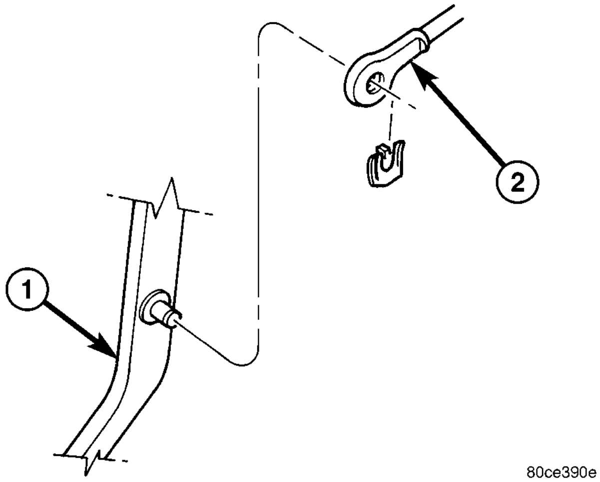


Fig. 36 BOOSTER PUSH ROD

1 - BRAKE PEDAL
2 - BOOSTER ROD

(9) In engine compartment, slide booster studs out of dash panel, tilt booster upward, and remove booster from engine compartment.

REMOVAL - RHD

(1) Remove the air box (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).

(2) Relocate the cruise control servo to gain access to the booster for removal.

(3) Remove the brake lines from the master cylinder.

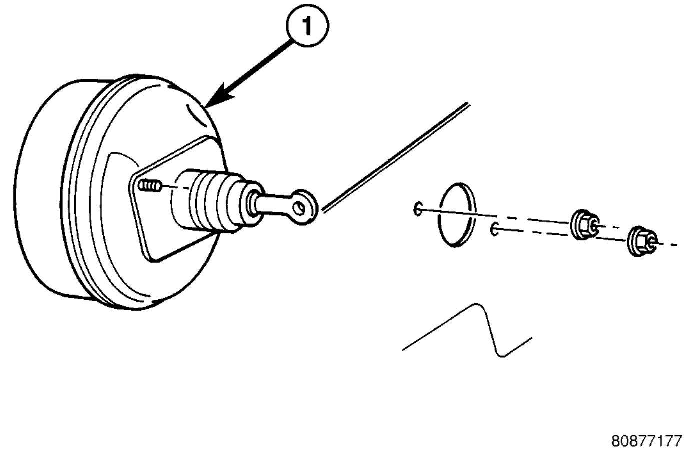


Fig. 37 BOOSTER MOUNTING

1 - BRAKE BOOSTER

(4) Remove the master cylinder (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL).

(5) Disconnect vacuum hose from booster check valve.

(6) Remove knee blocker under the steering column, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL).

(7) Remove the brake light switch, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL)

(8) Remove retaining clip that secures booster push rod to brake pedal (Fig. 38).

(9) Remove nuts attaching booster to the dash panel (Fig. 39).

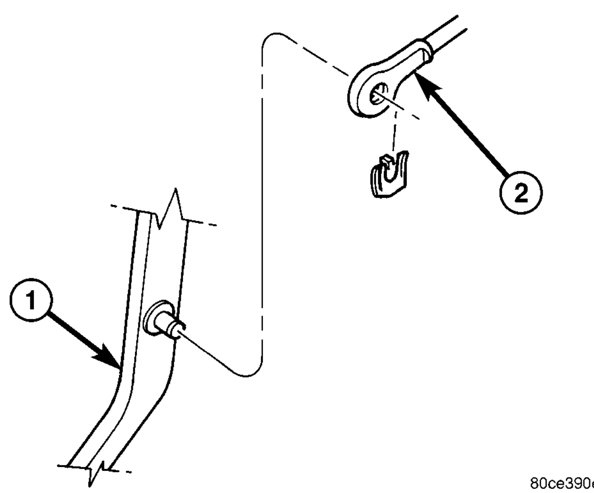


Fig. 38 BOOSTER PUSH ROD

1 - BRAKE PEDAL
2 - BOOSTER ROD

POWER BRAKE BOOSTER (Continued)

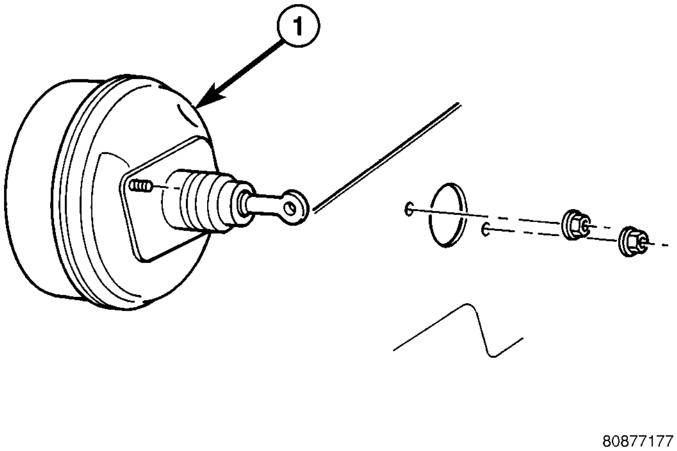


Fig. 39 BOOSTER MOUNTING

1 - BRAKE BOOSTER

(10) In engine compartment, slide booster studs out of dash panel, tilt booster upward, and remove booster from engine compartment.

INSTALLATION

INSTALLATION - LHD

(1) Align and position booster on the dash panel.

(2) Install booster mounting nuts. Tighten nuts just enough to hold booster in place.

(3) Slide booster push rod onto the brake pedal. Then secure push rod to pedal pin with retaining clip.

NOTE: Lubricate the pedal pin with Mopar multi-mileage grease before installation.

(4) Tighten booster mounting nuts to 25 N·m (220 in. lbs.).

(5) Install the knee blocker, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

(6) If original master cylinder is being installed, check condition of seal at rear of master cylinder. Replace seal if cut, or torn.

(7) Clean cylinder mounting surface of brake booster. Use shop towel wetted with brake cleaner for this purpose. Dirt, grease, or similar materials will prevent proper cylinder seating and could result in vacuum leak.

(8) Align and install master cylinder on the booster studs. Install mounting nuts and tighten to 25 N·m (220 in. lbs.).

(9) Connect vacuum hose to booster check valve.

(10) Remount the HCU. Tighten bracket mounting nuts to 14 N·m (125 in. lbs.).

(11) Connect and secure the brake lines to HCU or junction block and master cylinder. Start all brake line fittings by hand to avoid cross threading.

(12) Connect the wire to fluid level switch at the bottom of the reservoir.

(13) Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(14) Verify proper brake operation before moving vehicle.

INSTALLATION - RHD

(1) Align and position booster on the dash panel.

(2) Install booster mounting nuts. Tighten nuts just enough to hold booster in place.

(3) Slide booster push rod onto the brake pedal. Then secure push rod to pedal pin with retaining clip.

NOTE: Lubricate the pedal pin with Mopar multi-mileage grease before installation.

(4) Tighten booster mounting nuts to 39 N·m (29 ft. lbs.).

(5) Install the brake light switch.

(6) Install the knee blocker, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

(7) If original master cylinder is being installed, check condition of seal at rear of master cylinder. Replace seal if cut, or torn.

(8) Clean cylinder mounting surface of brake booster. Use shop towel wetted with brake cleaner for this purpose. Dirt, grease, or similar materials will prevent proper cylinder seating and could result in vacuum leak.

(9) Align and install master cylinder on the booster studs. Install mounting nuts and tighten to 17.5 N·m (155 in. lbs.).

(10) Connect vacuum hose to booster check valve.

(11) Remount the cruise control servo to the original location. Tighten bracket mounting nuts to 17.5 N·m (155 in. lbs.).

(12) Connect and secure the brake lines to HCU and master cylinder. Start all brake line fittings by hand to avoid cross threading.

(13) Connect the wire to fluid reservoir.

(14) Install the air box.

(15) Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(16) Verify proper brake operation before moving vehicle.

MASTER CYLINDER

DESCRIPTION

The master cylinder has a removable nylon reservoir. The cylinder body is made of aluminum and contains a primary and secondary piston assembly. The cylinder body including the piston assemblies are not serviceable. If diagnosis indicates an internal problem with the cylinder body, it must be replaced as an assembly. The reservoir and grommets are the only replaceable parts on the master cylinder.

OPERATION

The master cylinder bore contains a primary and secondary piston. The primary piston supplies hydraulic pressure to the front brakes. The secondary piston supplies hydraulic pressure to the rear brakes. The master cylinder reservoir stores reserve brake fluid for the hydraulic brake circuits.

DIAGNOSIS AND TESTING - MASTER CYLINDER/POWER BOOSTER

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding, also ensure booster & master cylinder mounting nuts are torqued correctly.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).

(5) Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately turn off ignition to stop engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 40).

(2) Start and run engine at curb idle speed for one minute.

(3) Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.

(4) Clamp hose shut between vacuum source and check valve.

(5) Stop engine and observe vacuum gauge.

(6) If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.

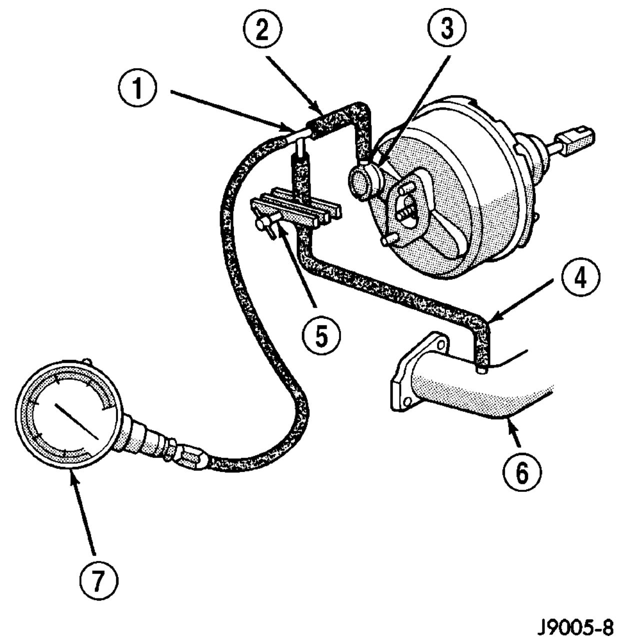


Fig. 40 Typical Booster Vacuum Test Connections

1 - TEE FITTING
2 - SHORT CONNECTING HOSE
3 - CHECK VALVE
4 - CHECK VALVE HOSE
5 - CLAMP TOOL
6 - INTAKE MANIFOLD
7 - VACUUM GAUGE

MASTER CYLINDER (Continued)

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

(4) Apply 15-20 inches vacuum at large end of check valve (Fig. 41).

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

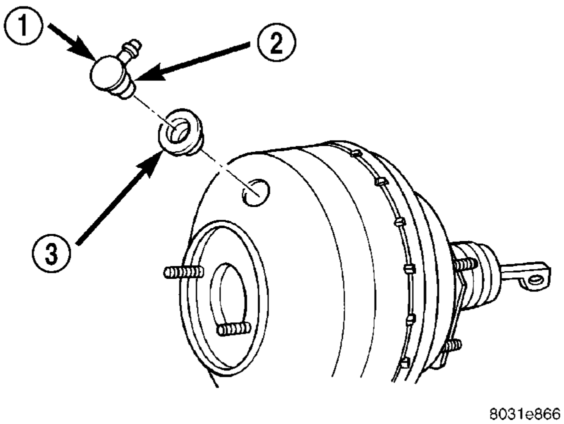


Fig. 41 TYPICAL - VACUUM CHECK VALVE AND SEAL

1 - BOOSTER CHECK VALVE
2 - APPLY TEST VACUUM HERE
3 - VALVE SEAL

STANDARD PROCEDURE - MASTER CYLINDER BLEEDING

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

(1) Mount master cylinder in vise.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end into reservoir (Fig. 42).

(3) Fill reservoir with fresh brake fluid.

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

REMOVAL

(1) Siphon and drain the fluid from the reservoir.

(2) Remove the brake lines at the master cylinder.

(3) Disconnect the fluid level electrical connector from the reservoir.

(4) Remove mounting nuts from the master cylinder.

(5) Remove master cylinder.

(6) Remove cylinder cover and drain the rest of the fluid.

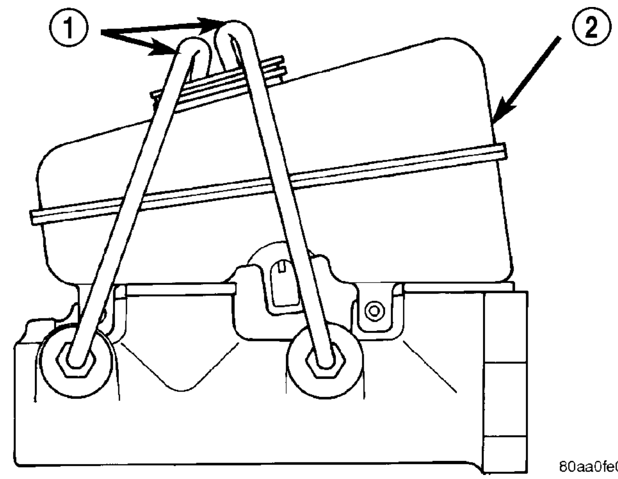


Fig. 42 MASTER - TYPICAL

1 - BLEEDING TUBES
2 - RESERVOIR

(7) If master cylinder reservoir requires service, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID RESERVOIR - REMOVAL). (Fig. 43)

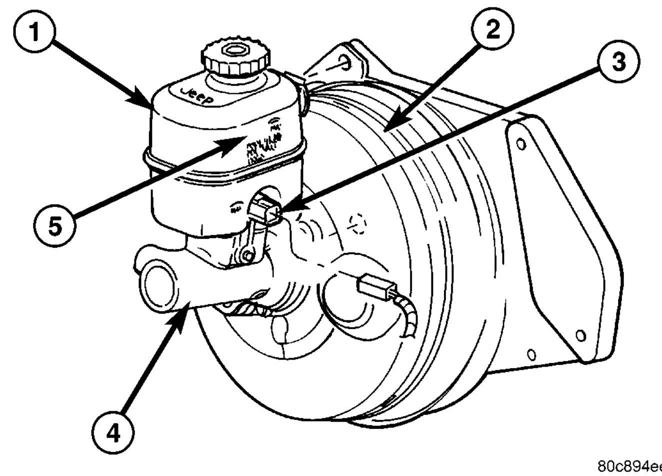


Fig. 43 MASTER CYLINDER

1 - FLUID RESERVOIR
2 - BOOSTER
3 - FLUID LEVEL SWITCH
4 - MASTER CYLINDER
5 - FLUID LEVEL MARKS

INSTALLATION

NOTE: If master cylinder is replaced, bleed cylinder before installation.

(1) Clean cylinder mounting surface of brake booster.

(2) Install master cylinder onto brake booster studs.

(3) Install mounting nuts and tighten to 25 N·m (220 in. lbs.).

MASTER CYLINDER (Continued)

(4) Connect the brake lines to the master cylinder and tighten to 20 N·m (180 in. lbs.).

(5) Connect fluid level electrical connector to the reservoir.

(6) Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).

FLUID RESERVOIR

REMOVAL

(1) Install prop rod on brake pedal to keep pressure on the brake system.

(2) Remove reservoir cap and siphon fluid into drain container.

(3) Remove the electrical connector from the fluid level switch in the reservoir.

(4) Remove the reservoir mounting bolt.

(5) Remove the reservoir from the master cylinder by pulling upwards.

(6) Remove old grommets from cylinder body.

INSTALLATION

(1) Fill and bleed master cylinder on bench before installation in vehicle.

CAUTION: Do not use any type of tool to install the grommets. Tools may cut, or tear the grommets creating a leak problem after installation. Install the grommets using finger pressure only.

(2) Lubricate new grommets with clean brake fluid and Install new grommets in cylinder body. Use finger pressure to install and seat grommets.

(3) Start reservoir in grommets. Then rock reservoir back and forth while pressing downward to seat it in grommets.

(4) Install the mounting bolt for the reservoir to the master cylinder.

(5) Reconnect the electrical connector to the fluid reservoir level switch.

(6) Remove the prop rod from the vehicle.

(7) Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).

FLUID

DIAGNOSIS AND TESTING - BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, Antilock Brakes hydraulic unit or Junction Block and all hydraulic fluid hoses.

STANDARD PROCEDURE - MASTER CYLINDER FLUID LEVEL

Always clean the master cylinder reservoir and cap before adding fluid. This will prevent dirt from falling in the reservoir and contaminating the brake fluid.

The reservoir has a ADD and a FULL mark on the side (Fig. 44) fill to the FULL mark.

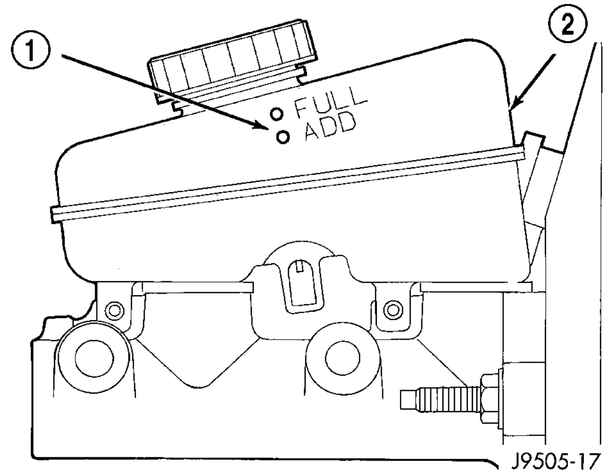


Fig. 44 TYPICAL - MASTER CYLINDER FLUID LEVEL

1 - FLUID LEVEL MARKS
2 - RESERVOIR

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container will absorb moisture from the air and contaminate the fluid.

FLUID (Continued)

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

SUPPORT PLATE

REMOVAL

(1) Remove wheel and tire assembly.

(2) Remove the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).

(3) Remove the rotor (Fig. 45), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

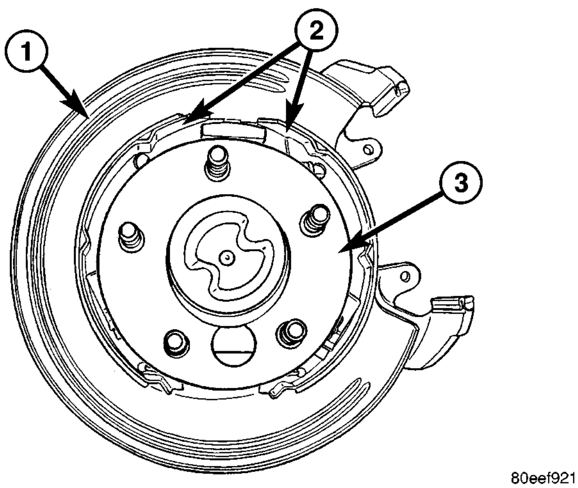


Fig. 45 PARK BRAKE SHOES INSTALLED

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - AXLE

(4) Remove the axle shaft (Fig. 46), (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - AXLE SHAFTS - REMOVAL).

(5) Remove the park brake shoes (Fig. 46), (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL).

(6) Remove the parking brake cable from the brake lever.

(7) Remove the bolts attaching the support plate to the axle and remove the support plate.

INSTALLATION

(1) Install support plate on axle flange. Tighten attaching bolts to 115 N·m (85 ft. lbs.).

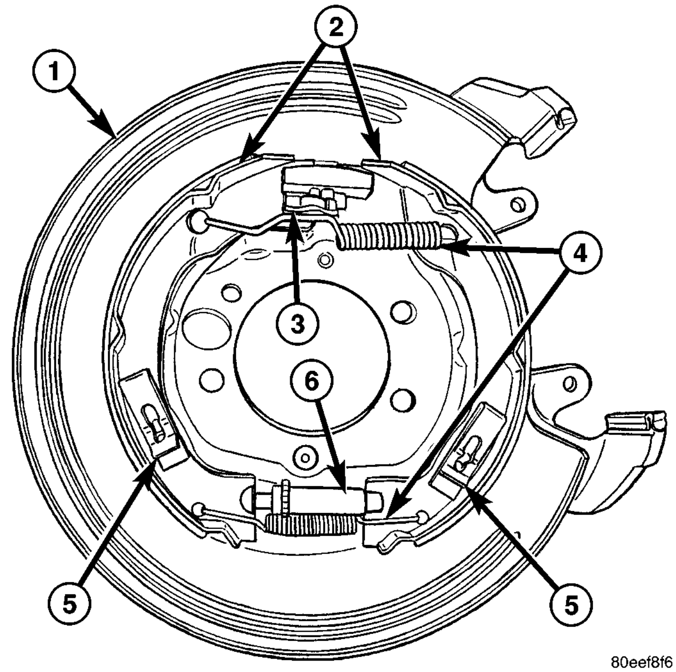


Fig. 46 BRAKE SHOES

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - EQUALIZER
4 - SPRINGS
5 - HOLD DOWN CLIPS
6 - ADJUSTER

(2) Install the park brake shoes (Fig. 46), (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION).

(3) Install parking brake cable in the brake lever.

(4) Install axle shaft, (Fig. 45), (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - AXLE SHAFTS - INSTALLATION).

(5) Adjust brake shoes to drum with brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).

(6) Install the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(7) Install the caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

(8) Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

PARKING BRAKE

DESCRIPTION

The parking brake is a hand lever and cable operated system used to apply the rear brakes.

PARKING BRAKE (Continued)

OPERATION

A hand operated lever in the passenger compartment is the main application device. The front cable is connected between the hand lever and the rear cables with an equalizer.

The rear cables are connected to the actuating lever on each primary brake shoe. The levers are attached to the brake shoes by a pin either pressed into, or welded to the lever. A clip is used to secure the pin in the brake shoe. The pin allows each lever to pivot independently of the brake shoe.

To apply the parking brakes, the hand lever is pulled upward. This pulls the rear brake shoe actuating levers forward, by means tensioner and cables. As the actuating lever is pulled forward, the parking brake strut (which is connected to both shoes), exerts a linear force against the secondary brake shoe. This action presses the secondary shoe into contact with the drum. Once the secondary shoe contacts the drum, force is exerted through the strut. This force is transferred through the strut to the primary brake shoe causing it to pivot into the drum as well.

A gear type ratcheting mechanism is used to hold the lever in an applied position. Parking brake release is accomplished by the hand lever release button.

A parking brake switch is mounted on the parking brake lever and is actuated by movement of the lever. The switch, which is in circuit with the red warning light in the dash, will illuminate the warning light whenever the parking brakes are applied.

Parking brake is self-adjusting when the lever is pulled. The cable tensioner, once adjusted at the factory, should not need further adjustment under normal circumstances.

ADJUSTMENTS

ADJUSTMENT - LOCK OUT

NOTE: The parking brake is self-adjusting, It can not be adjusted.

(1) Remove the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(2) Pull up on the spring until the tab on the lever passes the tab on the cable guide and install a punch in the hole on the side then release (Fig. 47).

(3) The park brake system is now locked out to perform necessary repairs.

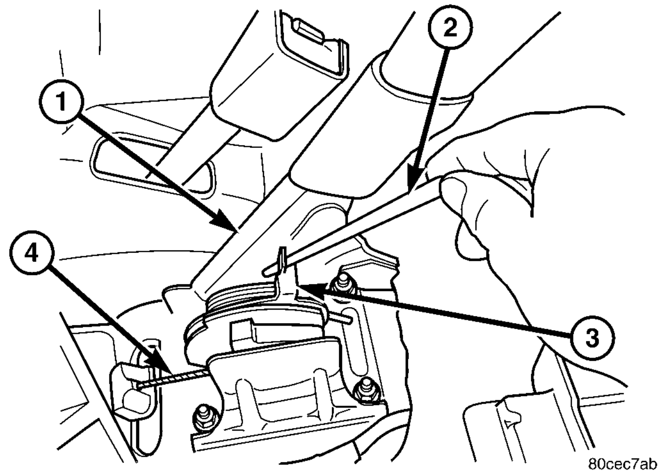


Fig. 47 LOCK OUT CABLES

1 - PARKING BRAKE HANDLE
2 - PUNCH
3 - CABLE GUIDE
4 - CABLE

CABLES

REMOVAL

(1) Lock out the parking brake cables (Refer to 5 - BRAKES/PARKING BRAKE - ADJUSTMENTS) (Fig. 47).

(2) Remove the rear seat (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).

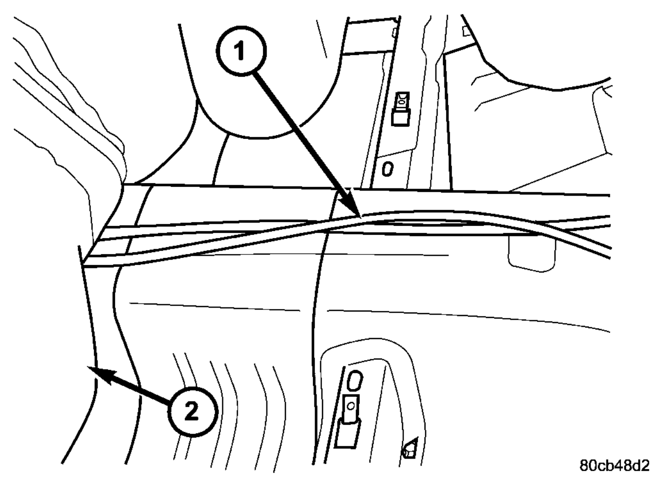


Fig. 48 MOUNTING BRACKETS

1 - PARK BRAKE CABLES
2 - CARPET

CABLES (Continued)

(3) Disconnect the two cables from the front mount (Fig. 49).

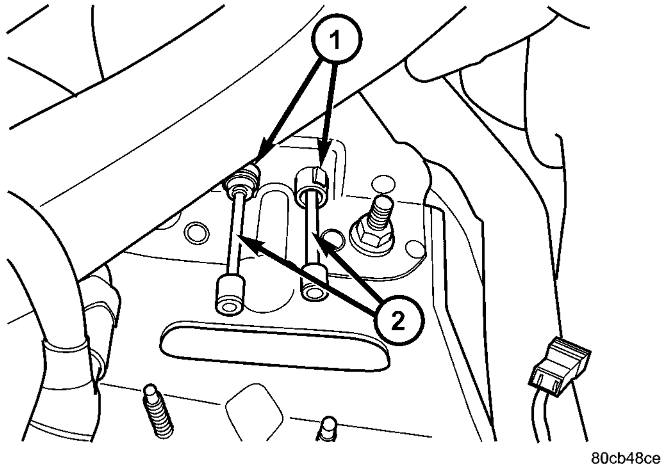


Fig. 49 CABLE FRONT MOUNT

1 - RETAINER CLIPS
2 - CABLES

(4) 2Pull the carpet forward far enough in the rear to gain access to the two parking brake cables thru the floor (Fig. 48).

(5) Push the cables thru the floor with the grommets.

(6) Remove the cable from the axle bracket with a proper sized box end wrench over the tangs.

(7) Remove the brake cable from the brake lever. (Fig. 50)

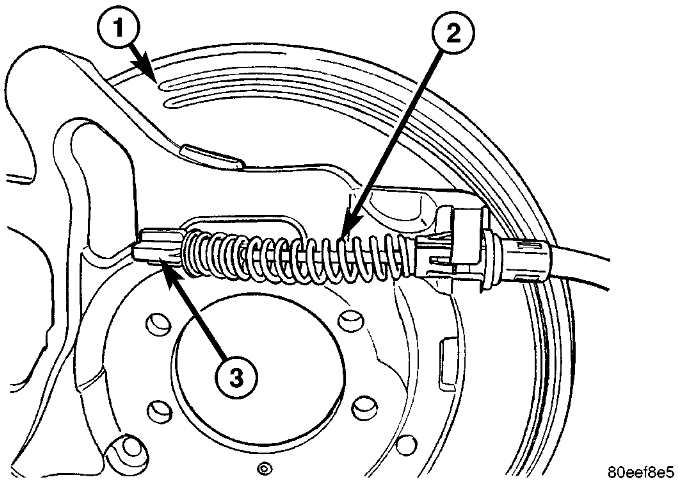


Fig. 50 CABLE REMOVAL/INSTALLATION

1 - SUPPORT PLATE
2 - PARK BRAKE CABLE
3 - ACTUATOR LEVER

INSTALLATION

(1) Install the cables into the axle bracket (Fig. 51).

(2) Reconnect the cable to the park brake lever (Fig. 51).

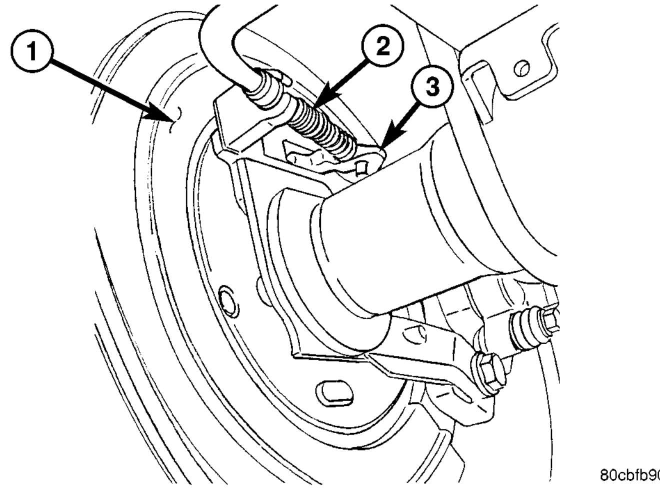


Fig. 51 PARKING BRAKE CABLE

1 - SUPPORT PLATE
2 - CABLE
3 - ACTUATOR LEVER

(3) Push the cables thru the floor and seat the grommets.

(4) Reconnect the two cables to the front mount.

(5) Lay the carpet back down in the rear.

(6) Install the rear seat (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

(7) Remove the lock out device on the lever.

(8) Adjust the park brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).

(9) Test the parking brake.

LEVER

REMOVAL

(1) Remove the center floor console, (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(2) Lock out the parking brakes (Refer to 5 - BRAKES/PARKING BRAKE - ADJUSTMENTS).

(3) Disengage the front cables from the equalizer (Fig. 52).

(4) Disconnect the parking brake lamp switch wire (Fig. 52).

(5) Remove the parking brake lever assembly mounting bolts (Fig. 53).

(6) Remove the lever assembly.

INSTALLATION

(1) Install the parking brake lever assembly.

(2) Install the parking brake lever assembly to the mounting bolts. Tighten (Fig. 53).

(3) Engage the front cables to the equalizer (Fig. 52).

(4) Reconnect the parking brake lamp switch wire (Fig. 52).

LEVER (Continued)

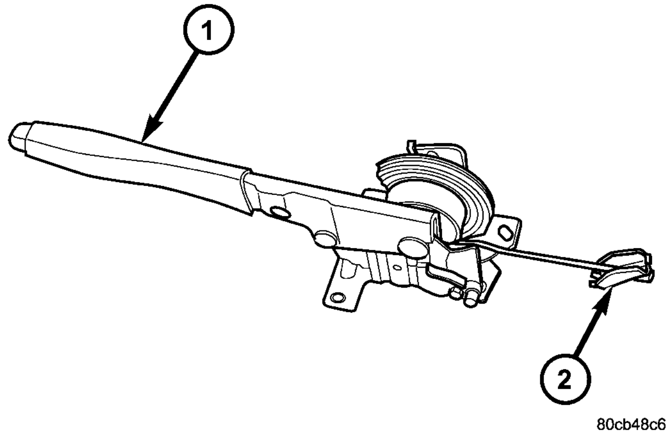


Fig. 52 PARKING BRAKE LEVER

1 - PARK BRAKE LEVER ASSEMBLY
2 - EQUALIZER

(5) If installing a new parking brake lever remove the pin that comes on the lever when shipped.

(6) If you are reinstalling the original park brake lever remove the lock out device at this time.

(7) Test the parking brake lever. (Fig. 53).

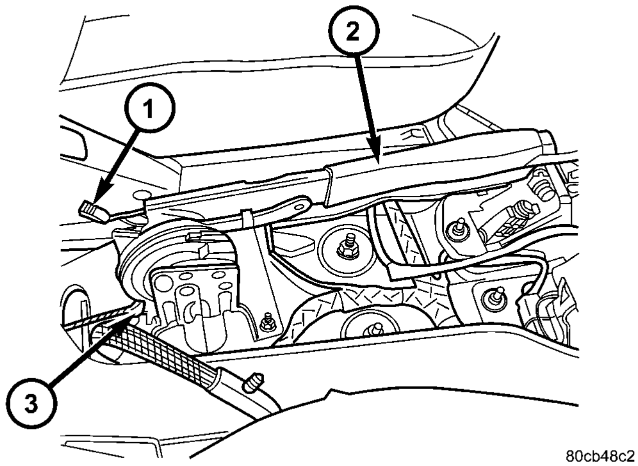


Fig. 53 LEVER MOUNT

1 - ELECTRICAL CONNECTOR
2 - PARK BRAKE LEVER ASSEMBLY
3 - CABLE

(8) Install the center floor console, (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

SHOES

DESCRIPTION

Drum in hat park brakes are dual shoe, internal expanding units with an automatic self adjusting mechanism (Fig. 54).

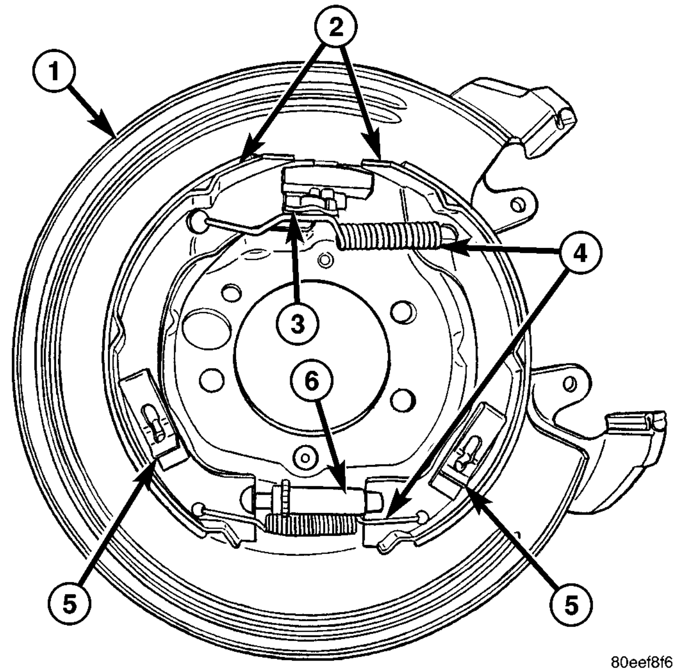


Fig. 54 BRAKE SHOES

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - EQUALIZER
4 - SPRINGS
5 - HOLD DOWN CLIPS
6 - ADJUSTER

OPERATION

When the parking brake pedal is depressed the brake cable pulls the brake shoes outward against the brake drum. When the brake pedal is released the return springs attached to the brake shoes pull the shoes back to there original position.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

(3) Remove the disc brake caliper, (Fig. 55), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).

(4) Remove the disc brake rotor, (Fig. 55), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

(5) Disassemble the rear park brake shoes (Fig. 56).

CLEANING - REAR DRUM IN HAT BRAKE

Clean the individual brake components, including the support plate exterior, with a water dampened cloth or with brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brake shoe contact pads on the support plate with fine sandpaper.

SHOES (Continued)

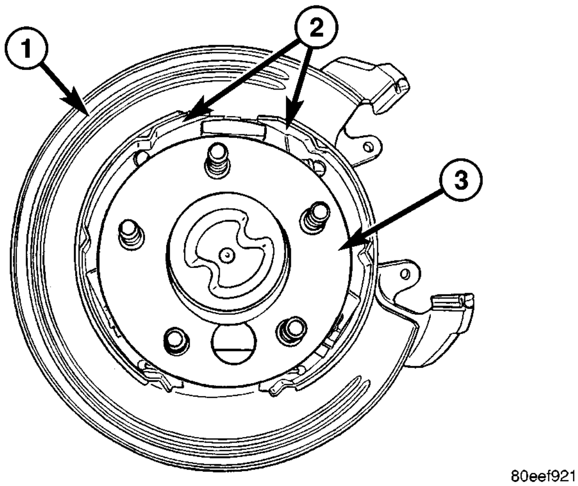


Fig. 55 PARK BRAKE SHOES INSTALLED

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - AXLE

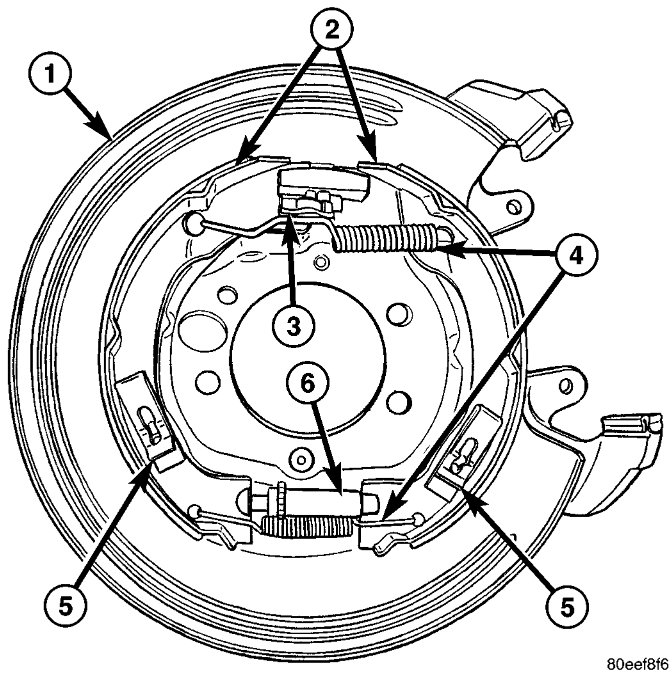


Fig. 56 BRAKE SHOES

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - EQUALIZER
4 - SPRINGS
5 - HOLD DOWN CLIPS
6 - ADJUSTER

INSPECTION - REAR DRUM IN HAT BRAKE

As a general rule, riveted brake shoes should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes exhibiting contact only on one side should be replaced and the drum checked for runout or taper (Fig. 57).

Inspect the adjuster screw assembly. Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded (Fig. 57).

Discard the brake springs and retainer components if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brake shoe contact pads on the support plate, replace the support plate if any of the pads are worn or rusted through. Also replace the plate if it is bent or distorted (Fig. 57).

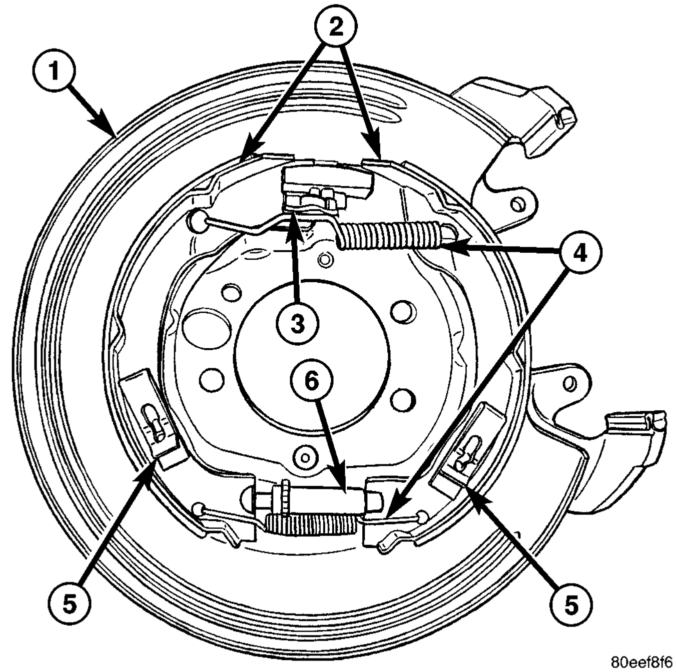


Fig. 57 BRAKE SHOES

1 - SUPPORT PLATE
2 - PARK BRAKE SHOES
3 - EQUALIZER
4 - SPRINGS
5 - HOLD DOWN CLIPS
6 - ADJUSTER

INSTALLATION

NOTE: On a new vehicle or after parking brake lining replacement, it is recommended that the parking brake system be conditioned prior to use. This is done by making one stop from 25 mph on dry pavement or concrete using light to moderate force on the parking brake lever.

(1) Reassemble the rear park brake shoes (Fig. 56).

SHOES (Continued)

(2) Adjust the rear brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).

(3) Install the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(4) Install the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

(5) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(6) Lower the vehicle.

ADJUSTMENTS

ADJUSTMENT - REAR DRUM IN HAT PARK BRAKE (ROTOR REMOVED)

Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both rotors are replaced.

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

CAUTION: Before adjusting the park brake shoes be sure that the park brake pedal is in the fully released position. If park brake pedal is not in the fully released position, the park brake shoes can not be accurately adjusted.

(1) Raise vehicle.

(2) Remove tire and wheel.

(3) Remove disc brake caliper from caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).

(4) Remove rotor from the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

NOTE: When measuring the brake drum diameter, the diameter should be measured in the center of the area in which the park brake shoes contact the surface of the brake drum.

(5) Using Brake Shoe Gauge, Special Tool C-3919, or equivalent, **accurately** measure the inside diameter of the park brake drum portion of the rotor (Fig. 58).

(6) Using a ruler that reads in 64th of an inch, accurately read the measurement of the inside diameter of the park brake drum from the special tool (Fig. 59).

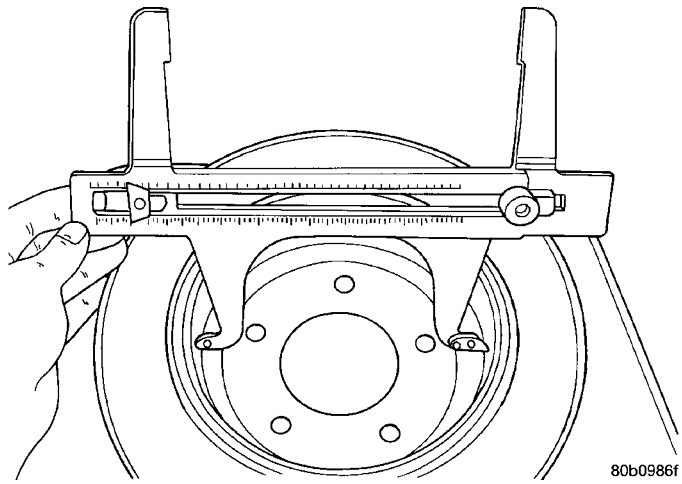


Fig. 58 MEASURING PARK BRAKE DRUM DIAMETER

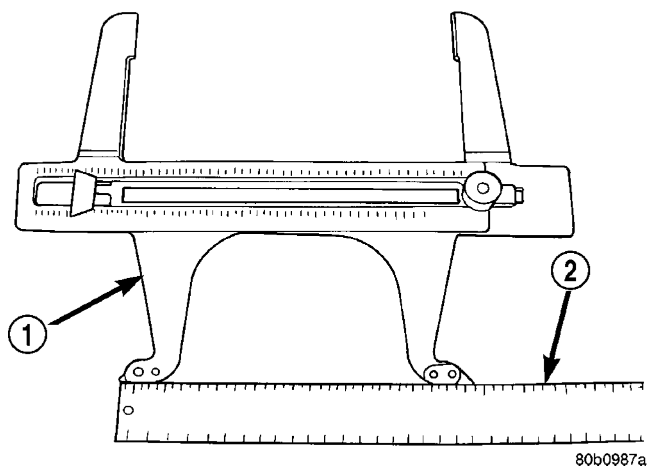


Fig. 59 READING PARK BRAKE DRUM DIAMETER

1 - SPECIAL TOOL C-3919
2 - RULER

(7) Reduce the inside diameter measurement of the brake drum that was taken using Special Tool C-3919 by 1/64 of an inch. Reset Gauge, Brake Shoe, Special Tool C-3919 or the equivalent used, so that the outside measurement jaws are set to the reduced measurement (Fig. 60).

(8) Place Gauge, Brake Shoe, Special Tool C-3919, or equivalent over the park brake shoes. The special tool must be located diagonally across at the top of one shoe and bottom of opposite shoe (widest point) of the park brake shoes.

(9) Using the star wheel adjuster, adjust the park brake shoes until the lining on the park brake shoes just touches the jaws on the special tool.

(10) Repeat step 8 above and measure shoes in both directions.

(11) Install brake rotor on the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

SHOES (Continued)

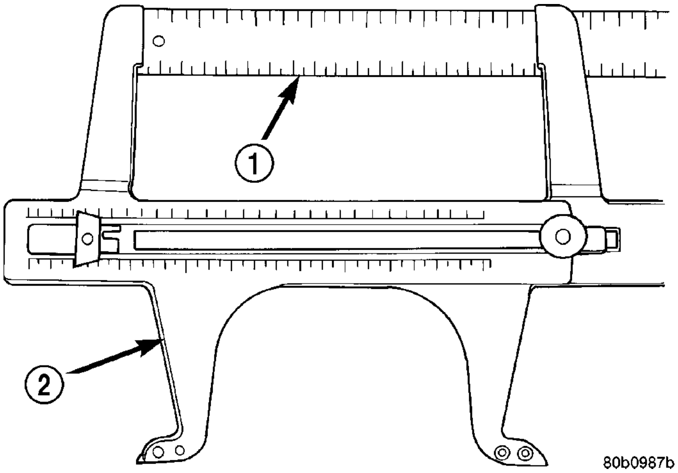


Fig. 60 SETTING GAUGE TO PARK BRAKE SHOE MEASUREMENT

1 - RULER
2 - SPECIAL TOOL C-3919

(12) Rotate rotor to verify that the park brake shoes are not dragging on the brake drum. If park brake shoes are dragging, remove rotor and back off star wheel adjuster one notch and recheck for brake shoe drag against drum. Continue with the previous step until brake shoes are not dragging on brake drum.

(13) Install disc brake caliper on caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ DISC BRAKE CALIPERS - INSTALLATION).

(14) Install wheel and tire.

(15) Tighten the wheel mounting nuts in the proper sequence until all nuts are torqued to half the specified torque. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

(16) Lower vehicle.

CAUTION: Before moving vehicle, pump brake pedal several times to ensure the vehicle has a firm enough pedal to stop the vehicle.

NOTE: After parking brake lining replacement, it is recommended that the parking brake system be conditioned prior to use. This is done by making one stop from 25 mph on dry pavement or concrete using light to moderate force on the parking brake hand lever.

(17) Road test the vehicle to ensure proper function of the vehicle's brake system.

ADJUSTMENT - WITH ADJUSTING TOOL

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

(1) Be sure parking brake lever is fully released.

(2) Raise vehicle so rear wheels can be rotated freely.

(3) Remove plug from each access hole in brake support plates.

(4) Loosen parking brake cable adjustment nut until there is slack in front cable.

(5) Insert adjusting tool through support plate access hole and engage tool in teeth of adjusting screw star wheel (Fig. 61).

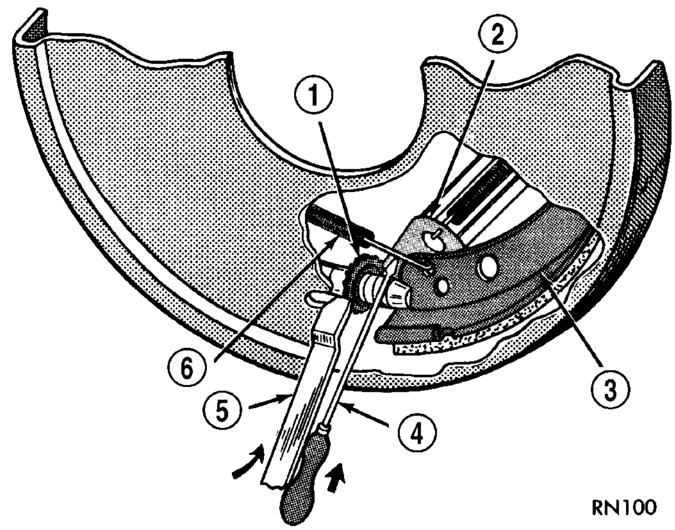


Fig. 61 Brake Adjustment

1 - STAR WHEEL
2 - LEVER
3 - BRAKE SHOE WEB
4 - SCREWDRIVER
5 - ADJUSTING TOOL
6 - ADJUSTER SPRING

(6) Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.

(7) Push and hold adjuster lever away from star wheel with thin screwdriver.

(8) Back off adjuster screw star wheel until brake drag is eliminated.

(9) Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.

(10) Install support plate access hole plugs.

(11) Adjust parking brake cable and lower vehicle.

(12) Apply park brake hand lever and make sure park brakes hold the vehicle staionary.

(13) Release park brake hand lever.

ADJUSTMENT - REAR DRUM IN HAT PARK BRAKE (ROTOR REMOVED)

Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both rotors are replaced.

SHOES (Continued)

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

CAUTION: Before adjusting the park brake shoes be sure that the park brake pedal is in the fully released position. If park brake pedal is not in the fully released position, the park brake shoes can not be accurately adjusted.

(1) Raise vehicle.
(2) Remove tire and wheel.
(3) Remove disc brake caliper from caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
(4) Remove rotor from the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

NOTE: When measuring the brake drum diameter, the diameter should be measured in the center of the area in which the park brake shoes contact the surface of the brake drum.

(5) Using Brake Shoe Gauge, Special Tool C-3919, or equivalent, **accurately** measure the inside diameter of the park brake drum portion of the rotor (Fig. 62).

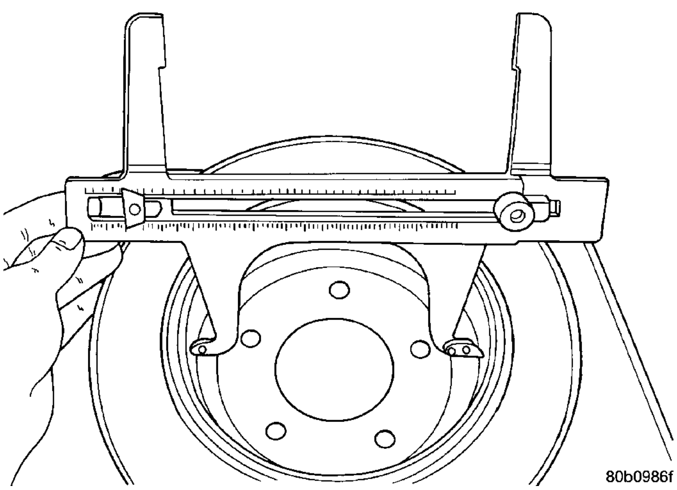


Fig. 62 MEASURING PARK BRAKE DRUM DIAMETER

(6) Using a ruler that reads in 64th of an inch, accurately read the measurement of the inside diameter of the park brake drum from the special tool (Fig. 63).
(7) Reduce the inside diameter measurement of the brake drum that was taken using Special Tool C-3919 by 1/64 of an inch. Reset Gauge, Brake Shoe, Special Tool C-3919 or the equivalent used, so that the outside measurement jaws are set to the reduced measurement (Fig. 64).

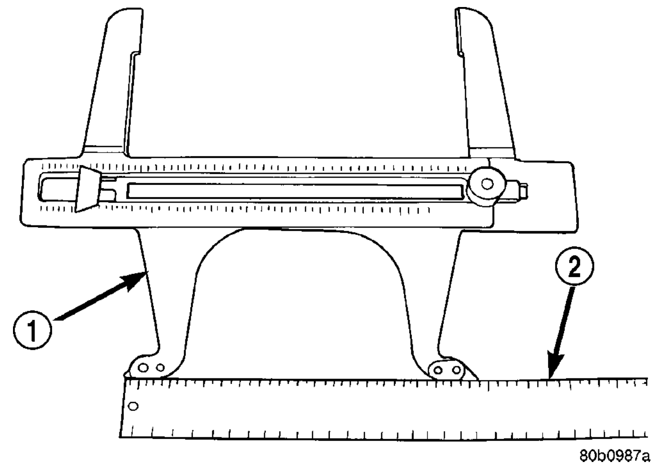


Fig. 63 READING PARK BRAKE DRUM DIAMETER

1 - SPECIAL TOOL C-3919
2 - RULER

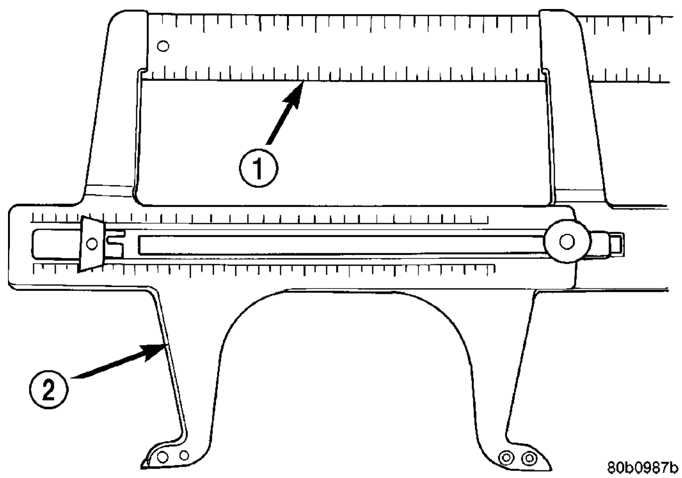


Fig. 64 SETTING GAUGE TO PARK BRAKE SHOE MEASUREMENT

1 - RULER
2 - SPECIAL TOOL C-3919

(8) Place Gauge, Brake Shoe, Special Tool C-3919, or equivalent over the park brake shoes. The special tool must be located diagonally across at the top of one shoe and bottom of opposite shoe (widest point) of the park brake shoes.
(9) Using the star wheel adjuster, adjust the park brake shoes until the lining on the park brake shoes just touches the jaws on the special tool.
(10) Repeat step 8 above and measure shoes in both directions.
(11) Install brake rotor on the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
(12) Rotate rotor to verify that the park brake shoes are not dragging on the brake drum. If park brake shoes are dragging, remove rotor and back off star wheel adjuster one notch and recheck for brake

SHOES (Continued)

shoe drag against drum. Continue with the previous step until brake shoes are not dragging on brake drum.

(13) Install disc brake caliper on caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).

(14) Install wheel and tire.

(15) Tighten the wheel mounting nuts in the proper sequence until all nuts are torqued to half the specified torque. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

(16) Lower vehicle.

CAUTION: Before moving vehicle, pump brake pedal several times to ensure the vehicle has a firm enough pedal to stop the vehicle.

NOTE: After parking brake lining replacement, it is recommended that the parking brake system be conditioned prior to use. This is done by making one stop from 25 mph on dry pavement or concrete using light to moderate force on the parking brake hand lever.

(17) Road test the vehicle to ensure proper function of the vehicle's brake system.

BRAKES - ABS

TABLE OF CONTENTS

BRAKES - ABS

DESCRIPTION

ANTILOCK BRAKING SYSTEM

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock CAB activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching 20 to 30 percent of actual vehicle speed during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

Battery voltage is supplied to the CAB ignition terminal when the ignition switch is turned to Run position. The CAB performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 30 kph (18 mph). During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning light and registers a fault code in the microprocessor memory.

ELECTRONIC BRAKE DISTRIBUTION

The electronic brake distribution (EBD) functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

OPERATION

ANTILOCK BRAKING SYSTEM

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

During antilock braking fluid pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a high slip condition activates the CAB antilock program. Two solenoid valves are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels. The solenoid valves are not static during antilock braking. They are cycled continuously to modulate pressure. Solenoid cycle time in antilock mode can be measured in milliseconds.

ELECTRONIC BRAKE DISTRIBUTION

Upon entry into EBD the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure the outlet valve for

BRAKES - ABS (Continued)

the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the HCU resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This will continue until the required slip difference is obtained. At the end of EBD braking (no brake application) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on to prevent a hydraulic short circiut in case of another brake application.

The EBD will remain functional during many ABS fault modes. If the red and amber warning lamps are illuminated the EBD may have a fault.

DIAGNOSIS AND TESTING - ANTILOCK BRAKING SYSTEM

The ABS brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the systems input and output circuits to verify the system is operating correctly. If the on board diagnostic system senses that a circuit is malfunctioning the system will set a trouble code in its memory.

NOTE: An audible noise may be heard during the self-test. This noise should be considered normal.

NOTE: The MDS or DRB III scan tool is used to diagnose the ABS system. For additional information refer to the Electrical, Electronic Control Modules section. For test procedures refer to the Chassis Diagnostic Manual.

STANDARD PROCEDURE - ABS BRAKE BLEEDING

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

(1) Perform base brake bleeding, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(2) Connect scan tool to the Data Link Connector.

(3) Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.

(4) Perform base brake bleeding a second time,(Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(5) Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Hydraulic Control Unit/Controller Antilock Brakes Mounting Nuts	14.1	—	125
Hydraulic Control Unit/Controller Antilock Brakes Brake Lines	20.3	—	180
Controller Antilock Brakes Mounting Screws	1.8	—	16
Wheel Speed Sensors Front Mounting Bolt	13.5	—	120
Wheel Speed Sensor Rear Mounting Bolt	9	—	80

ELECTRICAL

DESCRIPTION

Three wheel speed sensors are used. The front sensors are mounted to the steering knuckles. The rear sensor is mounted at the top of the rear axle differential carrier. Tone wheels are mounted to the outboard ends of the front axle shafts. The gear type tone wheel serves as the trigger mechanism for each sensor.

OPERATION

The sensors convert wheel speed into a small digital signal. The CAB sends 12 volts to the sensors. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when the toothed tone wheel passes the wheel speed sensor. This digital signal is sent to the CAB. The CAB measures the voltage and amperage of the digital signal for each wheel.

FRONT WHEEL SPEED SENSOR

REMOVAL

(1) Disconnect the front wheel speed sensor wire connector that is located on the inboard side of the respective wheel house.

(2) Raise and support the vehicle.

(3) Remove the tire and wheel assembly.

(4) Remove the caliper adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose with result. Provide a suitable support to hang the caliper securely.

(5) Remove the disc brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).

(6) Remove the wheel speed sensor mounting bolt to the hub (Fig. 1).

(7) Remove the wheel speed sensor wire from the hub/bearing (Fig. 1).

(8) Remove the wheel speed sensor wire hold down from the knuckle (Fig. 1).

(9) Remove the wheel speed sensor wire thru the wheel well.

(10) Remove the wheel speed sensor from the vehicle.

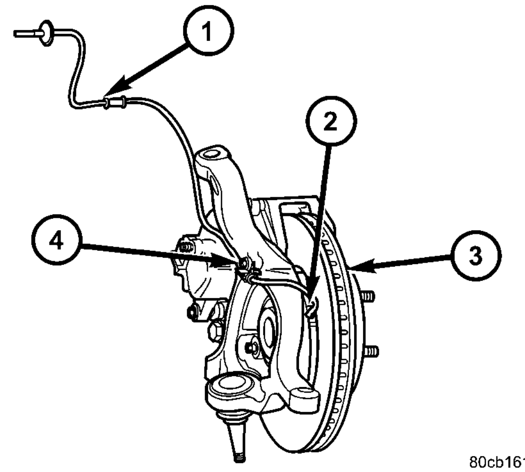


Fig. 1 FRONT WHEEL SPEED SENSOR

1 - WHEEL SPEED SENSOR WIRE
2 - WHEEL SPEED SENSOR
3 - ROTOR
4 - WHEEL SPEED SENSOR WIRE HOLD DOWN

INSTALLATION

(1) Install the wheel speed sensor to the vehicle.

(2) Install the wheel speed sensor wire thru the wheel well.

(3) Install the wheel speed sensor wire to the hub/bearing.

(4) Install the wheel speed sensor wire hold down to the knuckle.

(5) Install the wheel speed sensor mounting bolt to the hub. Tighten the mounting bolt to 13.5 N·m (120 in. lbs.).

(6) Install the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(7) Install the disc brake caliper adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).

(8) Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Reconnect the front wheel speed sensor wire connector to the inboard side of the wheel house being worked on.

REAR WHEEL SPEED SENSOR

REMOVAL

(1) Raise vehicle on hoist.
(2) Disconnect the sensor wire harness.
(3) Remove mounting stud from the sensor (Fig. 2).

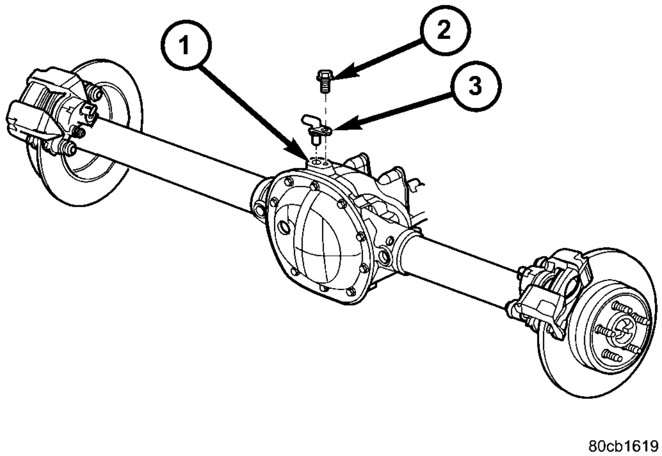


Fig. 2 REAR WHEEL SPEED SENSOR

1 - DIFFERENTIAL HOUSING
2 - MOUNTING BOLT
3 - WHEEL SPEED SENSOR

(4) Remove sensor.

INSTALLATION

(1) Connect harness to sensor. **Be sure seal is securely in place between sensor and wiring connector.**
(2) Install O-ring on sensor (if removed).
(3) Insert sensor in differential housing.
(4) Install the sensor mounting stud and tighten to 9 N·m (80 in. lbs.).
(5) Install the sensor electical connector.
(6) Lower vehicle.

HCU (HYDRAULIC CONTROL UNIT)

DESCRIPTION

The HCU consists of a valve body, pump motor, and wire harness.

OPERATION

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the CAB.

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

PRESSURE HOLD

Both solenoid valves are closed in the pressure hold cycle. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

REMOVAL

(1) Install prop rod on the brake pedal to keep pressure on the brake system.
(2) Remove negative battery cable from the battery.
(3) Pull up on the CAB harness connector release (Fig. 3)and remove connector.

HCU (HYDRAULIC CONTROL UNIT) (Continued)

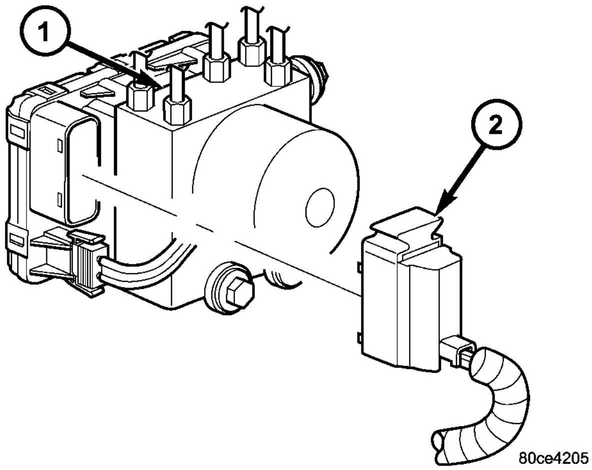


Fig. 3 CAB HARNESS CONNECTOR RELEASE

1 - ABS MODULE
2 - ELECTRICAL CONNECTOR

(4) Remove brake lines from the HCU.

(5) Remove HCU/CAB mounting nuts and bolt (Fig. 4) and remove HCU/CAB.

INSTALLATION

NOTE: If the CAB is being replaced with a new CAB is must be reprogrammed with the use of a DRB III.

(1) Install HCU/CAB on the mounting studs.

(2) Install mounting nuts. Tighten to 14.1 N·m (125 in. lbs.).

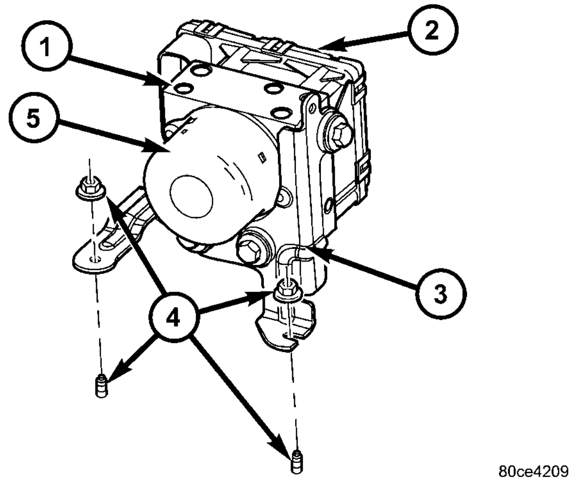


Fig. 4 HCU/CAB MOUNTING

1 - HCU
2 - CAB
3 - HCU/CAB BRACKET
4 - MOUNTING NUTS AND STUDS
5 - MOTOR

(3) Install brake lines to the HCU and tighten to 20 N·m (180 in. lbs.).

(4) Install wiring harness connector to the CAB and push down on the release to secure the connector.

(5) Install negative battery cable to the battery.

(6) Bleed ABS brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

CLUTCH

TABLE OF CONTENTS

CLUTCH

DESCRIPTION

The clutch mechanism consists of a flywheel, dry-type disc, diaphragm style pressure plate and hydraulic linkage. The flywheel is bolted to the rear flange of the crankshaft. The clutch pressure plate is bolted to the flywheel with the clutch disc between these two components. The clutch system provides the mechanical, link between the engine and the transmission. The system is designed to transfer the torque output of the engine, to the transmission while isolating the transmission from the engine firing pulses to minimize concerns such as gear rattle.

OPERATION

The clutch operates with leverage, clamping force and friction. The disc serves as the friction element, the diaphragm spring and pressure plate provide the clamping force. The clutch pedal, hydraulic linkage, release lever and bearing provide the leverage.

The clutch master cylinder push rod is connected to the clutch pedal. When the clutch pedal is depressed, the slave cylinder is operated by the clutch master cylinder mounted on the dash panel. The release fork is actuated by the hydraulic slave cylinder mounted on the transmission housing. The release bearing is operated by a release fork pivoting on a ball stud mounted in the transmission housing. The release bearing then depresses the pressure plate spring fingers, thereby releasing pressure on the clutch disc and allowing the engine crankshaft to spin independently of the transmission input shaft.

CLUTCH (Continued)

WARNING

WARNING: EXERCISE CARE WHEN SERVICING CLUTCH COMPONENTS. FACTORY INSTALLED CLUTCH DISCS DO NOT CONTAIN ASBESTOS FIBERS. DUST AND DIRT ON CLUTCH PARTS MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET COMPONENTS. BREATHING EXCESSIVE CONCENTRATIONS OF THESE FIBERS CAN CAUSE SERIOUS BODILY HARM. WEAR A RESPIRATOR DURING SERVICE AND NEVER CLEAN CLUTCH COMPONENTS WITH COMPRESSED AIR OR WITH A DRY BRUSH. EITHER CLEAN THE COMPONENTS WITH A WATER DAMPENED RAGS OR USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR REMOVING ASBESTOS FIBERS AND DUST. DO NOT CREATE DUST BY SANDING A CLUTCH DISC. REPLACE THE DISC IF THE FRICTION MATERIAL IS DAMAGED OR CONTAMINATED. DISPOSE OF ALL DUST AND DIRT CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS. THIS WILL HELP MINIMIZE EXPOSURE TO YOURSELF AND TO OTHERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL SAFETY AGENCY (EPA), FOR THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

DIAGNOSIS AND TESTING - CLUTCH

Drive the vehicle at normal speeds. Shift the transmission through all gear ranges and observe clutch action. If the clutch chatters, grabs, slips or does not release properly, remove and inspect the clutch components. If the problem is noise or hard shifting, further diagnosis may be needed as the transmission or another driveline component may be at fault.

NOTE: Vehicles equipped with a Dual Mass Flywheel may produce a rattle when the engine is shut off. This noise is considered normal.

CLUTCH CONTAMINATION

Fluid contamination is a frequent cause of clutch malfunctions. Oil, water or clutch fluid on the clutch disc and pressure plate surfaces will cause chatter, slip and grab. Inspect components for oil, hydraulic fluid or water/road splash contamination.

Oil contamination indicates a leak at either the rear main seal or transmission input shaft. Clutch fluid leaks are usually from damaged slave cylinder push rod seals. Heat buildup caused by slippage between the pressure plate, disc and flywheel can bake the oil residue onto the components. The glaze-like residue ranges in color from amber to black.

Road splash contamination is dirt/water entering the clutch housing due to loose bolts, housing cracks. Driving through deep water puddles can force water/road splash into the housing through such openings.

IMPROPER RELEASE OR CLUTCH ENGAGEMENT

Clutch release or engagement problems are caused by wear or damage clutch components. A visual inspection of the release components will usually reveal the problem part.

Release problems can result in hard shifting and noise. Look for leaks at the clutch cylinders and interconnecting line and loose slave cylinder bolts. Also worn/loose release fork, pivot stud, clutch disc, pressure plate or release bearing.

Engagement problems can result in slip, chatter/shudder and noisy operation. The causes may be clutch disc contamination, wear, distortion or flywheel damage. Visually inspect to determine the actual cause of the problem.

CLUTCH MISALIGNMENT

Clutch components must be in proper alignment with the crankshaft and transmission input shaft. Misalignment caused by excessive runout or warpage of any clutch component will cause grab, chatter and improper clutch release.

PRESSURE PLATE AND DISC RUNOUT

Check the clutch disc before installation. Axial (face) runout of a **new** disc should not exceed 0.50 mm (0.020 in.). Measure runout about 6 mm (1/4 in.) from the outer edge of the disc facing. Obtain another disc if runout is excessive.

Check condition of the clutch before installation. A warped cover or diaphragm spring will cause grab and incomplete release or engagement. Be careful when handling the cover and disc. Impact can distort the cover, diaphragm spring, release fingers and the hub of the clutch disc.

Use an alignment tool when positioning the disc on the flywheel. The tool prevents accidental misalignment which could result in cover distortion and disc damage.

A frequent cause of clutch cover distortion (and consequent misalignment) is improper bolt tightening.

FLYWHEEL RUNOUT

Check flywheel runout whenever misalignment is suspected. Flywheel runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the indicator on a stud installed in place of one of the flywheel bolts.

CLUTCH (Continued)

Common causes of runout are:
- heat warpage
- improper machining
- incorrect bolt tightening
- improper seating on crankshaft flange shoulder
- foreign material on crankshaft flange

Flywheel machining is not recommended. The flywheel clutch surface is machined to a unique contour and machining will negate this feature. Minor flywheel scoring can be cleaned up by hand with 180 grit emery or with surface grinding equipment. Remove only enough material to reduce scoring (approximately 0.001 - 0.003 in.). Heavy stock removal is **not recommended.** Replace the flywheel if scoring is severe and deeper than 0.076 mm (0.003 in.). Excessive stock removal can result in flywheel cracking or warpage after installation; it can also weaken the flywheel and interfere with proper clutch release.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout. Use new bolts when remounting a flywheel and secure the bolts with Mopar Lock And Seal or equivalent. Tighten flywheel bolts to specified torque only. Overtightening can distort the flywheel hub causing runout.

DIAGNOSIS CHART

The diagnosis charts Diagnosis Chart describe common clutch problems, causes and correction. Conditions, causes and corrective action are outlined in the indicated columns.

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
Disc facing worn out	1. Normal wear.	1. Replace cover and disc.
	2. Driver frequently rides (slips) the clutch. Results in rapid overheating and wear.	2. Replace cover and disc.
	3. Insufficient clutch cover diaphragm spring tension.	3. Replace cover and disc.
Clutch disc facing contaminated with oil, grease, or clutch fluid.	1. Leak at rear main engine seal or transmission input shaft seal.	1. Replace appropriate seal.
	2. Excessive amount of grease applied to the input shaft splines.	2. Remove grease and apply the correct amount of grease.
	3. Road splash, water entering housing.	3. Replace clutch disc. Clean clutch cover and reuse if in good condition.
	4. Slave cylinder leaking.	4. Replace hydraulic clutch linkage.
Clutch is running partially disengaged.	1. Release bearing sticking or binding and does not return to the normal running position.	1. Verify failure. Replace the release bearing and transmission front bearing retainer as necessary.
Flywheel below minimum thickness specification.	1. Improper flywheel machining. Flywheel has excessive taper or excessive material removal.	1. Replace flywheel.
Clutch disc, cover and/or diaphragm spring warped or distorted.	1. Rough handling. Impact bent cover, spring, or disc.	1. Replace disc or cover as necessary.
	2. Improper bolt tightening procedure.	2. Tighten clutch cover using proper procedure.

CLUTCH (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Facing on flywheel side of disc torn, gouged, or worn.	1. Flywheel surface scored or nicked.	1. Correct surface condition if possible. Replace flywheel and disc as necessary.
	2. Clutch disc sticking or binding on transmission input shaft.	2. Lubricate splines with high temperature graese.
Clutch disc facing burnt. Flywheel and cover pressure plate surfaces heavily glazed.	1. Frequent operation under high loads or hard acceleration conditions.	1. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
	2. Driver frequently rides (slips) clutch. Results in rapid wear and overheating of disc and cover.	2. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
Clutch disc binds on input shaft splines.	1. Clutch disc hub splines damaged during installation.	1. Clean, smooth, and lubricate hub splines if possible. Replace disc if necessary.
	2. Input shaft splines rough, damaged, or corroded.	2. Clean, smooth, and lubricate shaft splines if possible. Replace input shaft if necessary.
Clutch disc rusted to flywheel and/or pressure plate.	1. Clutch not used for and extended period of time (e.g. long term vehicle storage).	1. Sand rusted surfaces with 180 grit sanding paper. Replace clutch cover and flywheel if necessary.
Pilot bearing seized, loose, or rollers are worn.	1. Bearing cocked during installation.	1. Install and lubricate a new bearing.
	2. Bearing defective.	2. Install and lubricate a new bearing.
	3. Bearing not lubricated.	3. Install and lubricate a new bearing.
	4. Clutch misalignment.	4. Inspect clutch and correct as necessary. Install and lubricate a new bearing.
Clutch will not disengage properly.	1. Low clutch fluid level.	1. Replace hydraulic linkage assembly.
	2. Clutch cover loose.	2. Follow proper bolt tightening procedure.
	3. Clutch disc bent or distorted.	3. Replace clutch disc.
	4. Clutch cover diaphragm spring bent or warped.	4. Replace clutch cover.
	5. Clutch disc installed backwards.	5. Remove and install clutch disc correctly.
	6. Release fork bent or fork pivot loose or damaged.	6. Replace fork or pivot as necessary.
	7. Clutch master or slave cylinder failure.	7. Replace hydraulic linkage assembly.

CLUTCH (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Clutch pedal squeak.	1. Pivot pin loose. 2. Master cylinder bushing not lubricated. 3. Pedal bushings worn out or cracked.	1. Tighten pivot pin if possible. Replace clutch pedal if necessary. 2. Lubricate master cylinder bushing. 3. Replace and lubricate bushings.
Clutch master or slave cylinder plunger dragging andør binding	1. Master or slave cylinder components worn or corroded.	1. Replace clutch hydraulic linkage assembly.
Release bearing is noisy.	1. Release bearing defective or damaged.	1. Replace release bearing.
Contact surface of release bearing damaged.	1. Clutch cover incorrect or release fingers bent or distorted. 2. Release bearing defective or damaged. 3. Release bearing misaligned.	1. Replace clutch cover and release bearing. 2. Replace the release bearing. 3. Check and correct runout of clutch components. Check front bearing sleeve for damage/ alignment. Repair as necessary.
Partial engagement of clutch disc. One side of disc is worn and the other side is glazed and lightly worn.	1. Clutch pressure plate position incorrect. 2. Clutch cover, spring, or release fingers bent or distorted. 3. Clutch disc damaged or distorted. 4. Clutch misalignment.	1. Replace clutch disc and cover. 2. Replace clutch disc and cover. 3. Replace clutch disc. 4. Check alignment and runout of flywheel, disc, pressure plate, andør clutch housing. Correct as necessary.

SPECIFICATIONS

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Pressure Plate Bolts - 2.4L	31	23	-
Pressure Plate Bolts - 3.7L	50	37	-
Clutch Cylinder Bolts	23	-	200
Flywheel Bolts - 2.4L	81	60	-
Flywheel Bolts - 3.7L	81	60	-

CLUTCH (Continued)

SPECIFICATIONS - 2.5L DIESEL

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Pressure Plate Bolt	31	23	-
Clutch Cylinder	23	-	200
Flywheel Bolts	81-88	60-65	-

CLUTCH DISC

REMOVAL

(1) Remove transmission.

(2) Mark position of pressure plate on flywheel with paint or a scriber for assembly reference, if clutch is not being replaced.

(3) Loosen pressure plate bolts evenly and in rotation to relieve spring tension and avoid warping the plate.

(4) Remove pressure plate bolts and pressure plate and disc.

INSTALLATION

INSTALLATION

(1) Lightly scuff sand flywheel face with 180 grit emery cloth, then clean with a wax and grease remover.

(2) Lubricate pilot bearing with Mopar high temperature bearing grease or equivalent.

(3) Check runout and operation of **new** clutch disc.

NOTE: Disc must slide freely on transmission input shaft splines.

(4) With the disc on the input shaft, check face runout with dial indicator. Check runout at disc hub 6 mm (1/4 in.) from outer edge of facing. Obtain another clutch disc if runout exceed 0.5 mm (0.020 in.).

(5) Position clutch disc on flywheel with side marked flywheel against the flywheel.

NOTE: If not marked, the flat side of disc hub goes towards the flywheel on the 3.7L engine and towards the transmission on 2.4L engine.

(6) Insert clutch alignment tool through the clutch disc and into the pilot bearing (Fig. 1).

(7) Position clutch pressure plate over disc and on the flywheel (Fig. 1).

(8) Install pressure plate bolts finger tight.

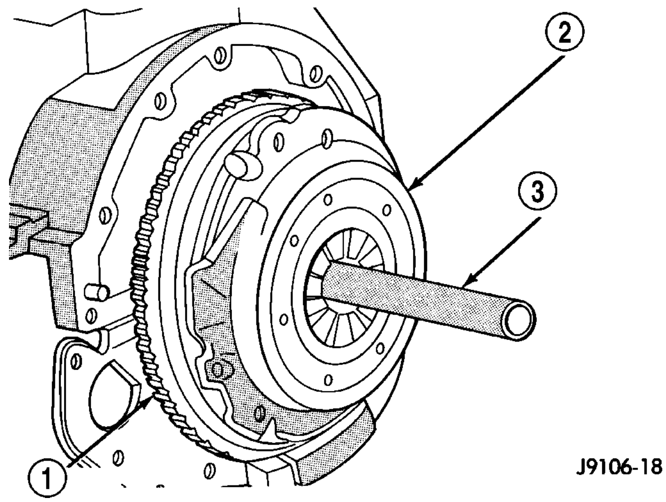


Fig. 1 ALIGNING CLUTCH DISC

1 - FLYWHEEL
2 - PRESSURE PLATE
3 - CLUTCH DISC ALIGNMENT TOOL

CAUTION: Use only the factory bolts to mount the pressure plate. The bolts must be the correct size. If bolts are too short, there isn't enough thread engagement, if too long bolts interfere with the Dual Mass Flywheel.

(9) Tighten pressure plate bolts evenly and in rotation a few threads at a time.

CAUTION: The bolts must be tightened evenly and to specified torque to avoid distorting the pressure plate.

(10) Tighten pressure plate bolts to 31 N·m (23 ft. lbs.) on 2.4L engines and 50 N·m (37ft. lbs.) on 3.7L engines.

(11) Apply light coat of Mopar high temperature bearing grease or equivalent to clutch disc hub and splines of transmission input shaft.

CAUTION: Do not over lubricate shaft splines. This will result in grease contamination of disc.

(12) Install transmission.

CLUTCH DISC (Continued)

INSTALLATION - 2.5L DIESEL

(1) Lightly scuff sand flywheel face with 180 grit emery cloth, then clean with a wax and grease remover.

(2) Lubricate pilot bearing with Mopar high temperature bearing grease or equivalent.

(3) Check runout and operation of **new** clutch disc.

NOTE: Disc must slide freely on transmission input shaft splines.

(4) With the disc on the input shaft, check face runout with dial indicator. Check runout at disc hub 6 mm (1/4 in.) from outer edge of facing. Obtain another clutch disc if runout exceed 0.5 mm (0.020 in.).

(5) Position clutch disc on flywheel with side marked flywheel against the flywheel.

NOTE: If not marked, the flat side of disc hub goes towards the flywheel.

(6) Insert clutch alignment tool through the clutch disc and into the pilot bearing (Fig. 2).

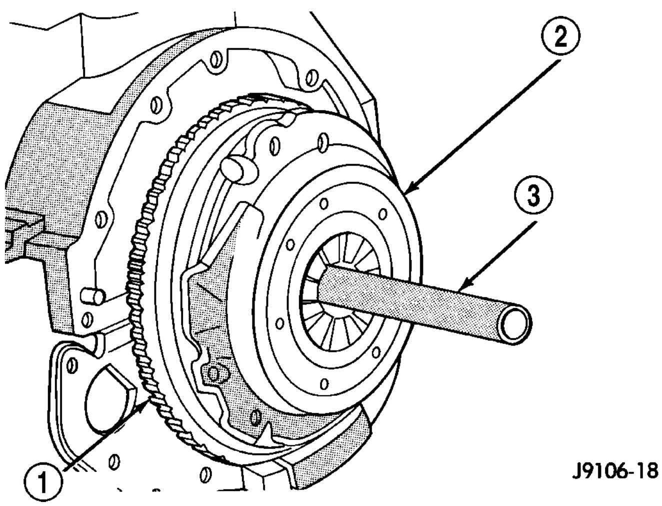


Fig. 2 ALIGNING CLUTCH DISC

1 - FLYWHEEL
2 - PRESSURE PLATE
3 - CLUTCH DISC ALIGNMENT TOOL

(7) Position clutch pressure plate over disc and on the flywheel (Fig. 2).

(8) Install pressure plate bolts finger tight.

(9) Tighten pressure plate bolts evenly and in rotation a few threads at a time.

NOTE: Three bolt holes are marked with an L and must be tighten first. Then tighten the remaining three bolts.

CAUTION: The bolts must be tightened evenly and to specified torque to avoid distorting the pressure plate.

(10) Tighten pressure plate bolts to 31 N·m (23 ft. lbs.).

(11) Apply light coat of Mopar high temperature bearing grease or equivalent to clutch disc hub and splines of transmission input shaft.

CAUTION: Do not over lubricate shaft splines. This will result in grease contamination of disc.

(12) Install transmission.

CLUTCH RELEASE BEARING

REMOVAL

(1) Remove transmission.

(2) Disconnect release bearing from release lever and remove the bearing (Fig. 3).

(3) Inspect bearing slide surface of transmission front bearing retainer. Replace retainer if slide surface is scored, worn, or cracked.

(4) Inspect release fork and fork pivot. Be sure pivot is secure and in good condition. Be sure fork is not distorted or worn. Replace release fork retainer spring if bent or damaged.

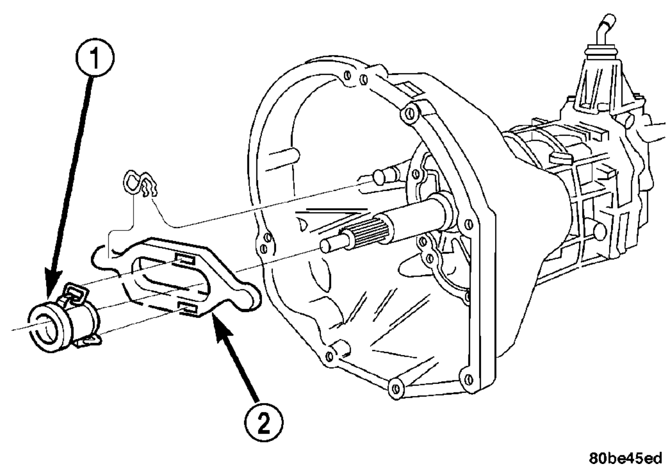


Fig. 3 CLUTCH RELEASE BEARING

1 - RELEASE BEARING
2 - RELEASE FORK

INSTALLATION

(1) Lubricate crankshaft pilot bearing with Mopar high temperature bearing grease or equivalent. Apply grease to end of long shank, small diameter flat blade screwdriver. Then insert tool through clutch disc hub to reach bearing.

CLUTCH RELEASE BEARING (Continued)

(2) Lubricate input shaft splines, bearing retainer slide surface, fork pivot and release fork pivot surface.

(3) Install new release bearing. Be sure bearing is properly secured to release fork.

(4) Install transmission.

FLYWHEEL

DESCRIPTION

STANDARD FLYWHEEL

The standard flywheel is used on the 3.7L engine. The flywheel (Fig. 4) is a heavy plate bolted to the rear of the crankshaft. The flywheel incorporates the ring gear around the outer circumference to mesh with the starter to permit engine cranking. The rear face of the flywheel serves as the driving member to the clutch disc.

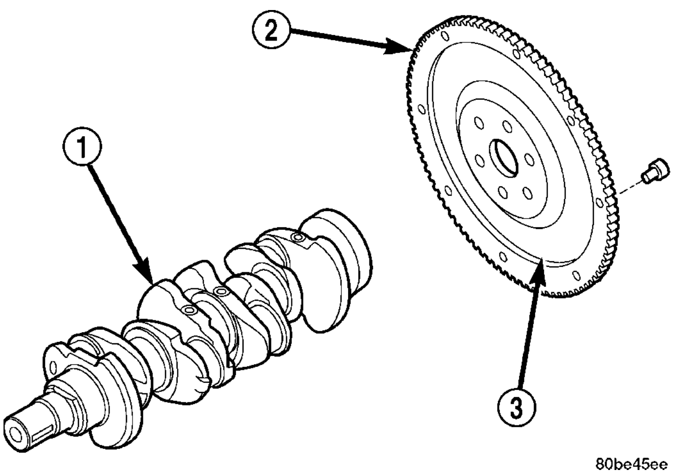


Fig. 4 FLYWHEEL

1 - CRANKSHAFT
2 - RING GEAR
3 - FLYWHEEL

DUAL MASS FLYWHEEL

The Dual Mass Flywheel is used on the 2.4L engine and 2.5L Diesel (Fig. 5). The flywheel incorporates the ring gear around the outer circumference to mesh with the starter to permit engine cranking. The primary flywheel side is bolted to the crankshaft. The secondary flywheel face serves as the driving member to the clutch disc. Internal springs between the flywheels are use to dampen energy.

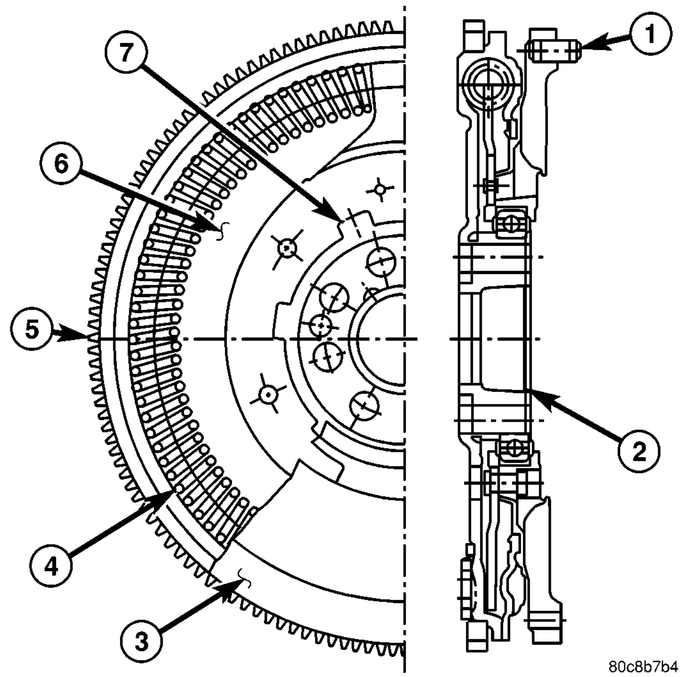


Fig. 5 DUAL MASS FLYWHEEL

1 - LOCATING STUD
2 - BEARING
3 - SECONDARY FLYWHEEL
4 - DAMPER SPRING
5 - RING GEAR
6 - PRIMARY FLYWHEEL
7 - FRICTION DISC

OPERATION

The flywheel serves to dampen the engine firing pulses. The heavy weight of the flywheel relative to the rotating mass of the engine components serves to stabilize the flow of power to the remainder of the drivetrain. The crankshaft has the tendency to attempt to speed up and slow down in response to the cylinder firing pulses. The flywheel dampens these impulses by absorbing energy when the crankshaft speeds and releasing the energy back into the system when the crankshaft slows down.

On a Dual Mass Flywheel the additional secondary mass coupled to the transmission lowers the natural frequency of the transmission rotating elements. This decreases the transmission gear rattle. The damper springs between the two flywheel masses replace the clutch disc damper springs and assist in a smooth transfer of torque to the transmission.

CAUTION: The Dual Mass Flywheel is serviced as an assembly only and should never be taken apart.

FLYWHEEL (Continued)

DIAGNOSIS AND TESTING - FLYWHEEL

Check flywheel runout whenever misalignment is suspected. Flywheel runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the indicator on a stud installed in place of one of the flywheel bolts.

Common causes of runout are:

- heat warpage
- improper machining
- incorrect bolt tightening
- improper seating on crankshaft flange shoulder
- foreign material on crankshaft flange

Flywheel machining is not recommended. The flywheel clutch surface is machined to a unique contour and machining will negate this feature. Minor flywheel scoring can be cleaned up by hand with 180 grit emery or with surface grinding equipment. Remove only enough material to reduce scoring (approximately 0.001 - 0.003 in.). Heavy stock removal is **not recommended.** Replace the flywheel if scoring is severe and deeper than 0.076 mm (0.003 in.). Excessive stock removal can result in flywheel cracking or warpage after installation; it can also weaken the flywheel and interfere with proper clutch release.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout. Use new bolts when remounting a flywheel and secure the bolts with Mopar Lock And Seal or equivalent. Tighten flywheel bolts to specified torque only. Over-tightening can distort the flywheel hub causing runout.

PILOT BEARING

REMOVAL

(1) Remove the transmission.

(2) Remove pressure plate and clutch disc.

(3) Remove pilot bearing with an internal (blind hole) puller.

INSTALLATION

(1) Lubricate new bearing with Mopar high temperature bearing grease or equivalent.

(2) Start new bearing into crankshaft by hand. Then seat bearing with clutch alignment tool (Fig. 6).

(3) Lightly scuff sand flywheel surface with 180 grit emery cloth. Then clean surface with wax and grease remover.

(4) Install clutch disc and pressure plate.

(5) Install the transmission.

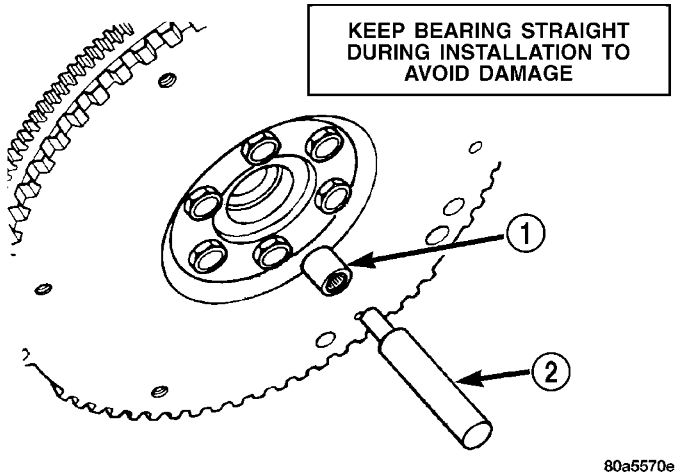


Fig. 6 Pilot Bearing Installer

1 - PILOT BEARING
2 - ALIGNMENT TOOL

LINKAGE

REMOVAL

NOTE: The clutch master cylinder, slave cylinder and connecting line are serviced as an assembly only. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting line are sealed units.

(1) Raise vehicle.

(2) Remove fasteners attaching slave cylinder to clutch housing.

(3) Remove slave cylinder from clutch housing (Fig. 7).

(4) Disengage clutch fluid line from body clips, if applicable.

(5) Lower vehicle.

(6) Verify cap on clutch master cylinder reservoir is tight to avoid spilling fluid during removal.

(7) Remove clutch master cylinder attaching nuts (Fig. 8).

(8) Disengage captured bushing on clutch master cylinder actuator from pivot pin on pedal arm.

(9) Slide actuator off pivot pin.

(10) Disconnect clutch interlock safety switch wires.

(11) Remove clutch hydraulic linkage through engine compartment.

LINKAGE (Continued)

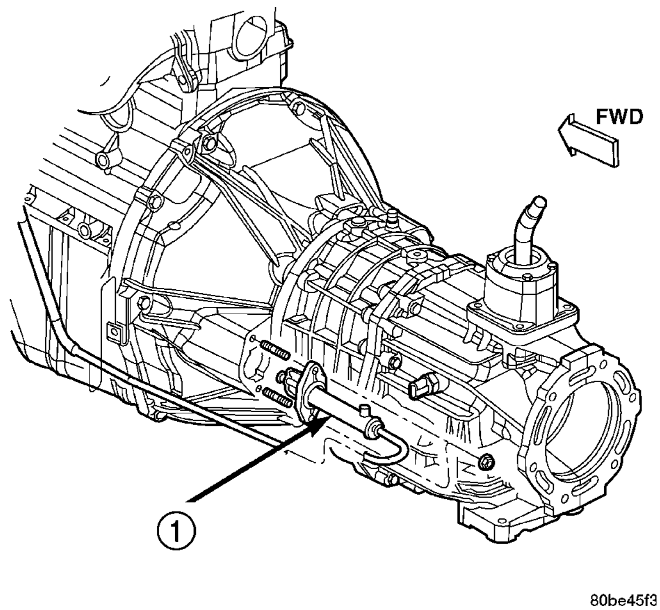


Fig. 7 SLAVE CYLINDER

1 - CLUTCH SLAVE CYLINDER

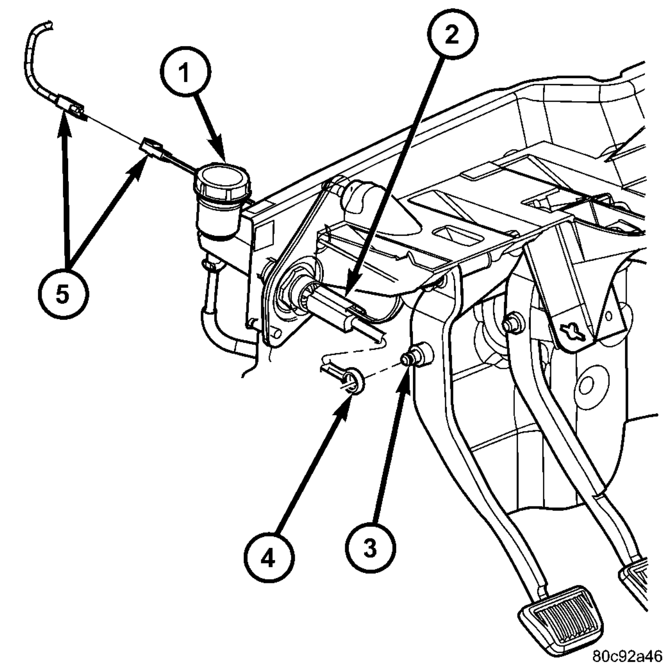


Fig. 8 CLUTCH PEDAL

1 - CYLINDER
2 - ACTUATOR SHAFT
3 - ACTUATOR EYE
4 - PEDAL PIN
5 - CONNECTOR

INSTALLATION

NOTE: The clutch master cylinder, slave cylinder and connecting line are serviced as an assembly only. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting line are sealed units.

(1) Be sure reservoir cover on clutch master cylinder is tight to avoid spills.
(2) Position clutch linkage components in vehicle. Work connecting line and slave cylinder downward past engine and adjacent to clutch housing.
(3) Position clutch master cylinder on dash panel.
(4) Attach clutch master cylinder actuator to pivot pin on clutch pedal.
(5) Install and tighten clutch master cylinder attaching nuts to 38 N·m (28 ft. lbs.).
(6) Raise vehicle.
(7) Insert slave cylinder push rod through clutch housing opening and into release lever. Be sure cap on end of rod is securely engaged in lever. Check this before installing cylinder attaching nuts.
(8) Install and tighten slave cylinder attaching nuts to 23 N·m (17 ft. lbs.).
(9) Secure clutch fluid line in body and transmission clips.
(10) Lower vehicle.
(11) Connect clutch interlock safety switch wires.

MASTER CYLINDER

INSPECTION

The clutch fluid reservoir, master cylinder, slave cylinder and fluid lines are pre-filled with fluid at the factory during assembly operations.

The hydraulic system should not require additional fluid under normal circumstances. **The reservoir fluid level will actually increase as normal clutch wear occurs. Avoid overfilling or removing fluid from the reservoir.**

Clutch fluid level is checked at the master cylinder reservoir. An indicator ring is provided on the outside of the reservoir. With the cap and diaphragm removed, fluid level should not be above indicator ring.

To avoid contaminating the hydraulic fluid during inspection, wipe reservoir and cover clean before removing the cap.

CLUTCH PEDAL

REMOVAL

(1) Remove steering column lower cover and knee blocker for access.

(2) Disconnect clutch pedal position switch wires.

(3) Disengage captured bushing lock tabs attaching clutch master cylinder actuator to pedal pivot.

(4) Remove nuts attaching pedal and bracket to dash panel and upper cowl support (Fig. 9).

(5) Separate pedal assemble from vehicle.

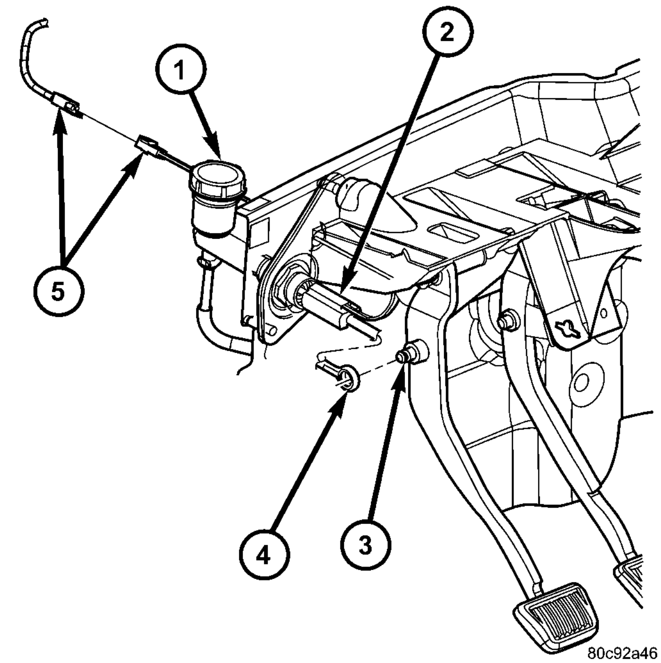


Fig. 9 CLUTCH PEDAL

1 - CYLINDER
2 - ACTUATOR SHAFT
3 - ACTUATOR EYE
4 - PEDAL PIN
5 - CONNECTOR

INSTALLATION

(1) Place clutch pedal and bracket over studs on dash panel and cowl support.

(2) Install nuts to attach pedal and bracket to dash panel and upper cowl support. Tighten nuts to 39 N·m (29 ft. lbs.) torque

(3) Engage captured bushing and actuator on brake pedal pivot.

(4) Connect clutch pedal position switch wires.

CLUTCH SWITCH OVERRIDE RELAY

DESCRIPTION

The clutch pedal position switch override relay is located in the Power Distribution Center (PDC). Refer to PDC cover label for location within PDC.

OPERATION

Refer to Clutch Pedal Position Switch Operation for information.

REMOVAL

The Clutch Switch Override Relay is located in the Power Distribution Center (PDC) (Fig. 10). Refer to label on PDC cover for relay location.

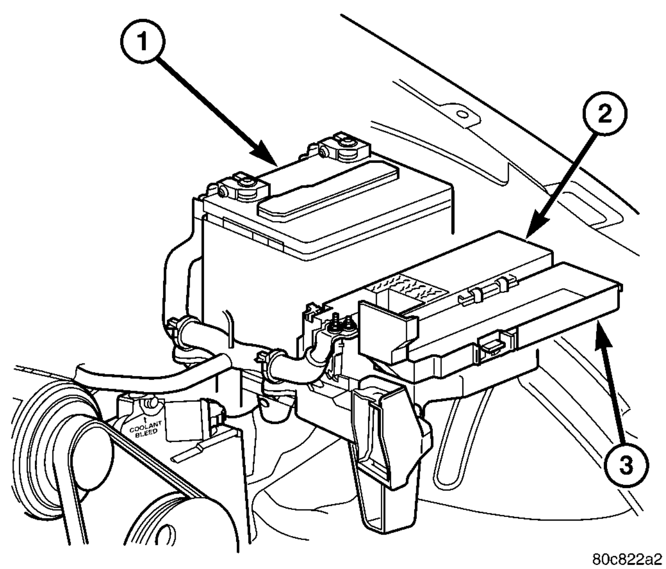


Fig. 10 POWER DISTRIBUTION CENTER (PDC)

1 - BATTERY
2 - PDC
3 - PDC COVER

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

The Clutch Switch Override Relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

(1) Install relay to PDC.

(2) Install cover to PDC.

CLUTCH PEDAL POSITION SWITCH

DESCRIPTION

The clutch pedal position switch is located under the instrument panel. It is attached to the clutch master cylinder push rod (Fig. 11). The wiring harness connection for the switch is made in the engine compartment (Fig. 11).

The clutch pedal position switch override relay is located in the Power Distribution Center (PDC). Refer to PDC cover label for location within PDC.

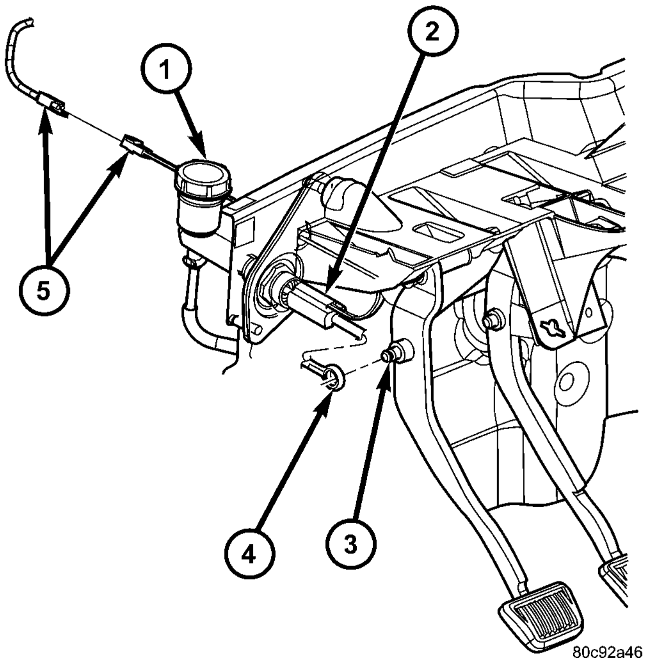


Fig. 11 CLUTCH PEDAL POSITION SWITCH

1 - CLUTCH MASTER CYLINDER
2 - CLUTCH PEDAL POSITION SWITCH
3 - CLUTCH PEDAL PIN
4 - MASTER CYLINDER PUSHROD
5 - ELECTRICAL CONNECTION (IN ENGINE COMPARTMENT)

OPERATION

The clutch pedal position switch is used to prevent starter motor engagement unless the clutch pedal is depressed.

4WD Feature: The clutch pedal position switch override relay will inhibit operation of the position switch when the vehicle transfer case is in the four–wheel–drive (4WD) low-range position (only). This feature will allow operation of the starter motor, without the need for depressing the clutch pedal, for certain off-road applications. If any Diagnostic Trouble Codes (DTC's) for either the override relay or transfer case switch are stored, the override relay feature will be inhibited.

An input from this switch is also used to either shut down and/or prevent operation of the speed control system when the clutch pedal is depressed.

DIAGNOSIS AND TESTING - CLUTCH PEDAL POSITION SWITCH

(1) Locate switch 2–wire electrical connector in engine compartment (Fig. 11). Disconnect wiring at this point.

(2) Check for switch continuity with an ohmmeter while operating clutch pedal up and down. Continuity should be broken and reapplied each time pedal is pressed.

(3) If continuity is not present, or is always present at any pedal position, replace switch. Switch is not serviced separately. Replace clutch master cylinder.

REMOVAL

Switch is not serviced separately. If switch replacement is necessary, replace clutch master cylinder.

INSTALLATION

Switch is not serviced separately. If switch replacement is necessary, replace clutch master cylinder.

COOLING

TABLE OF CONTENTS

COOLING

DESCRIPTION

DESCRIPTION - COOLING SYSTEM 2.4L ENGINE

The cooling system consists of the following items:
- Electric cooling fan - Standard.
- Radiator
- Hot bottle pressure cap
- Thermostat
- Coolant reserve/overflow system
- Radiator in-tank transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

DESCRIPTION - COOLING SYSTEM 3.7L ENGINE

The cooling system consists of the following items:
- Electric cooling fan - Standard.
- Electric cooling fan and mechanical thermal viscous fan with low disengaged - Heavy duty cooling only
- Radiator
- Hot bottle pressure cap
- Thermostat
- Coolant pressure bottle/overflow system
- Radiator in-tank transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

DESCRIPTION - COOLING SYSTEM ROUTING 3.7L ENGINE

For cooling system routing refer to (Fig. 1).

COOLING (Continued)

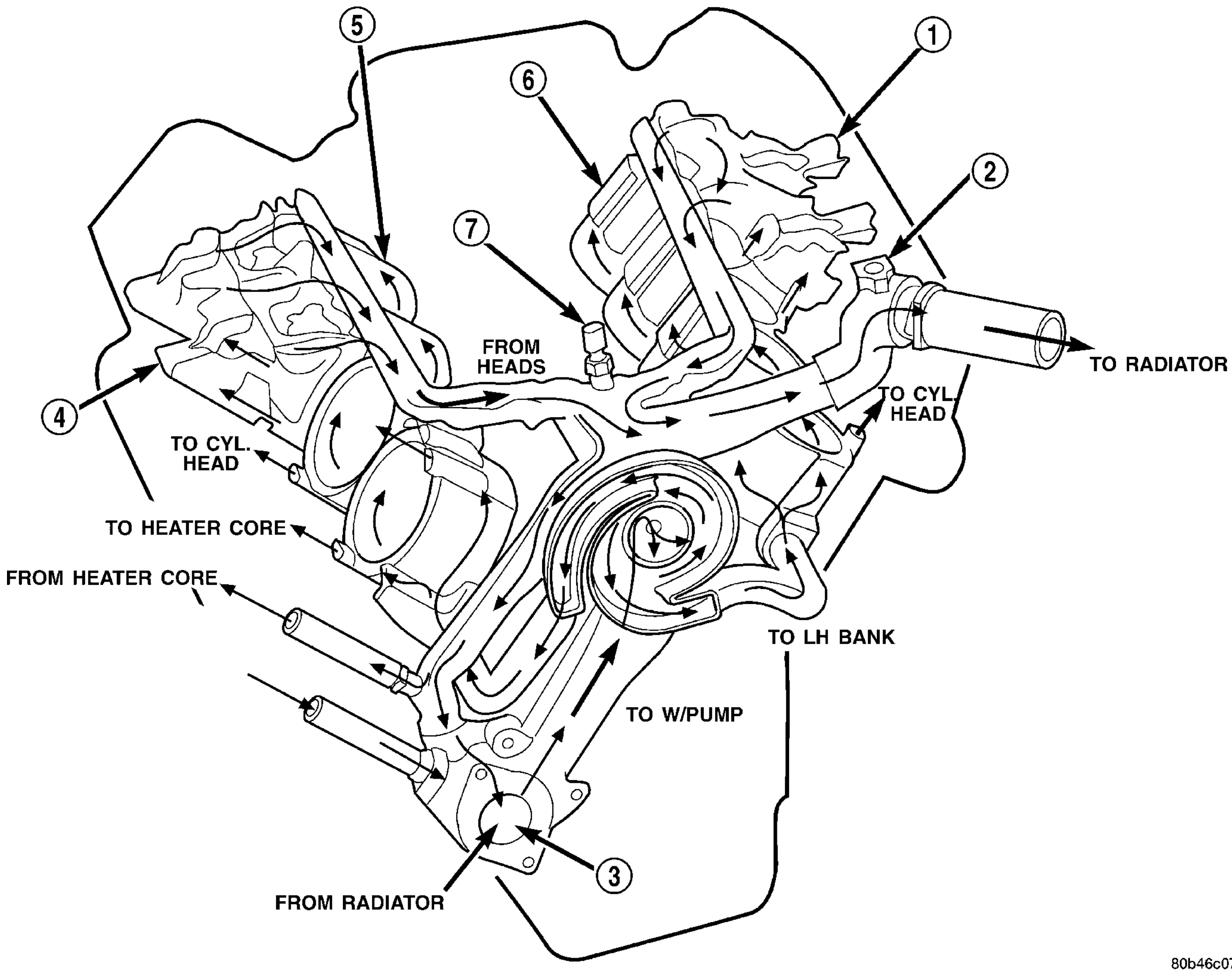


Fig. 1 Engine Cooling System 3.7L Engine

1 - LH CYL. HEAD
2 - AIR BLEED
3 - THERMOSTAT LOCATION
4 - RH CYL. HEAD
5 - RH BANK CYL. BLOCK
6 - LH BANK CYL. BLOCK
7 - COOLANT TEMP. SENSOR

DESCRIPTION - HOSE CLAMPS

The cooling system utilizes spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 2). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only a original equipment clamp with matching number or letter (Fig. 2).

COOLING (Continued)

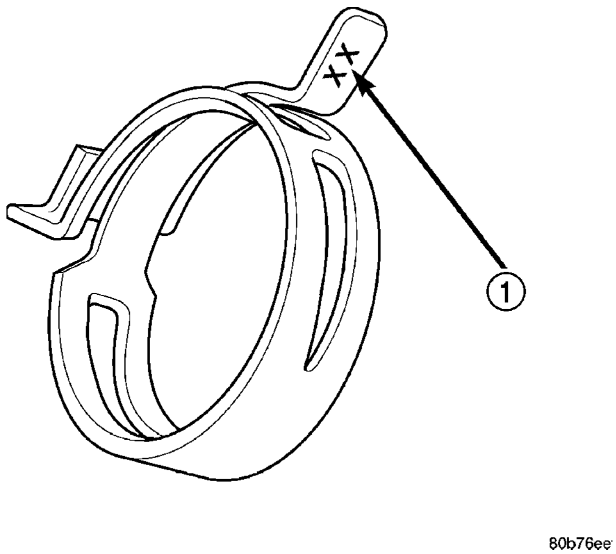


Fig. 2 Spring Clamp Size Location

1 - SPRING CLAMP SIZE LOCATION

OPERATION

OPERATION - COOLING SYSTEM

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

OPERATION - HOSE CLAMPS

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, only use constant tension clamp pliers designed to compress the hose clamp.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The powertrain control module (PCM) has been programmed to monitor certain cooling system components:

• If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.

• If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicated an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ERASING TROUBLE CODES

After the problem has been repaired, use the DRB scan tool to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service information for operation of the DRB scan tool.

DIAGNOSIS AND TESTING - PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

- PROLONGED IDLE
- VERY HIGH AMBIENT TEMPERATURE
- SLIGHT TAIL WIND AT IDLE
- SLOW TRAFFIC
- TRAFFIC JAMS
- HIGH SPEED
- STEEP GRADES

Driving techniques that avoid overheating are:

• Idle with A/C off when temperature gauge is at end of normal range.

(1) TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

(2) RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump, or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

COOLING (Continued)

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to following Cooling System Diagnosis charts.

These charts are to be used as a quick-reference only. Refer to the group text for information.

DIAGNOSIS AND TESTING - COOLING SYSTEM LEAKS

ULTRAVIOLET LIGHT METHOD

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate engine until radiator upper hose is warm to touch. Aim the commercially available black light tool at components to be checked. If leaks are present, black light will cause additive to glow a bright green color.

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist (Fig. 3).

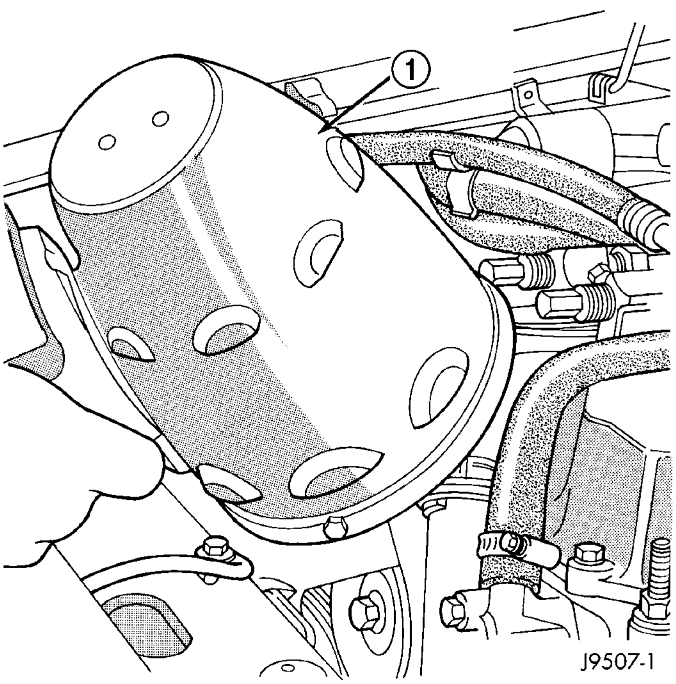


Fig. 3 Leak Detection Using Black Light - Typical

1 - TYPICAL BLACK LIGHT TOOL

PRESSURE TESTER METHOD

The engine should be at normal operating temperature. Recheck the system cold if cause of coolant loss is not located during the warm engine examination.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

Carefully remove radiator pressure cap from pressure bottle and check coolant level. Push down on cap to disengage it from stop tabs. Wipe inside of filler neck and examine lower inside sealing seat for nicks, cracks, paint, and dirt. Inspect radiator-to-reserve/overflow tank hose for internal obstructions. Insert a wire through the hose to be sure it is not obstructed.

Inspect cams on outside of filler neck. If cams are damaged, seating of pressure cap valve and tester seal will be affected.

Attach pressure tester (7700 or an equivalent) to radiator filler neck (Fig. 4).

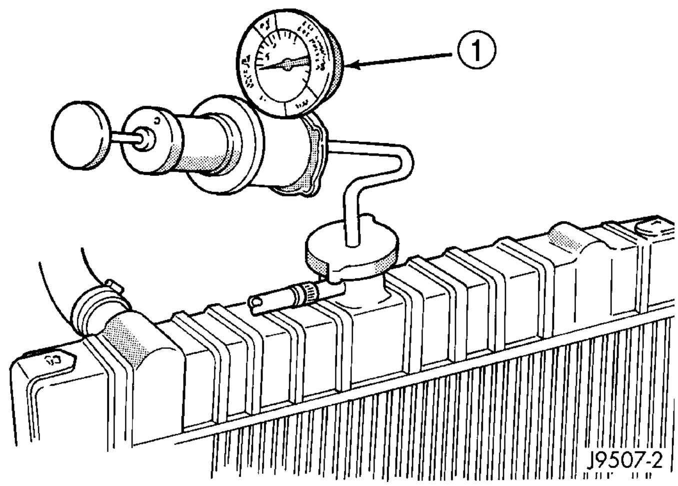


Fig. 4 Pressure Testing Cooling System - Typical

1 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate tester pump to apply 110 kPa (16 psi) pressure to system. If hoses enlarge excessively or bulges while testing, replace as necessary. Observe gauge pointer and determine condition of cooling system according to following criteria:

Holds Steady: If pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test.

Drops Slowly: Indicates a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect radiator, hoses, gasket edges and heater. Seal small leak holes with a Sealer Lubricant (or equivalent). Repair leak holes and inspect system again with pressure applied.

COOLING (Continued)

Drops Quickly: Indicates that serious leakage is occurring. Examine system for external leakage. If leaks are not visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove engine dipstick and inspect for water globules. Also inspect transmission dipstick for water globules and transmission fluid cooler for leakage.

WARNING: WITH RADIATOR PRESSURE TESTER TOOL INSTALLED ON RADIATOR, DO NOT ALLOW PRESSURE TO EXCEED 124 KPA (18 PSI). PRESSURE WILL BUILD UP QUICKLY IF A COMBUSTION LEAK IS PRESENT. TO RELEASE PRESSURE, ROCK TESTER FROM SIDE TO SIDE. WHEN REMOVING TESTER, DO NOT TURN TESTER MORE THAN 1/2 TURN IF SYSTEM IS UNDER PRESSURE.

Operate engine without pressure cap on radiator until thermostat opens. Attach a Pressure Tester to filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 110 kPa (16 psi). Fluctuation of gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** remove spark plug cables or short out cylinders to isolate compression leak.

If the needle on dial of pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

A convenient check for exhaust gas leakage into cooling system is provided by a commercially available Block Leak Check tool. Follow manufacturers instructions when using this product.

COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow thermostat removal. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

Add coolant to radiator to bring level to within 6.3 mm (1/4 in) of top of thermostat housing.

CAUTION: Avoid overheating. Do not operate engine for an excessive period of time. Open draincock immediately after test to eliminate boil over.

Start engine and accelerate rapidly three times, to approximately 3000 rpm while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

COOLING (Continued)

DIAGNOSIS AND TESTING - COOLING SYSTEM DIAGNOSIS CHART

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?	1. Refer to (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for On-Board Diagnostics and DTC information. Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. (Refer to 7 - COOLING/ ENGINE/ENGINE COOLANT TEMP SENSOR - DESCRIPTION). Repair connector if necessary.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant pressure botttle and the radiator. Inspect system for leaks. Repair leaks as necessary.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING)
	6. Electric fan functioning when not required.	6. Inspect electric fan for proper operation. Refer to Electric Cooling Fan in this section. Refer to group 8W for electric cooling fan and relay circuit schematic data.
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM.	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause for overheating and repair.
	2. Is the temperature gauge reading correctly?	2. Check gauge. (Refer to Group 8J - INSTRUMENT CLUSTER). Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. Check warning lamp operation. (Refer to Group 8J - INSTRUMENT CLUSTER).Repair as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Coolant low in coolant pressure bottle and radiator?	4. Check for coolant leaks and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following Step 6.	5. Tighten cap
	6. Poor seals at the radiator cap.	6. (a) Check condition of cap and cap seals. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING).
		(b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.
	7. Coolant not flowing through system.	7. (a) Check condition of pressure bottle cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING).
		(b) Check condition of radiator vent nipple. If neck is damaged, replace radiator.
		(c) Check condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary.
		(d) Check pressure bottle/overflow tank and tanks hoses for blockage. Repair as necessary.
	8. Incorrect coolant concentration	8. Check coolant. (Refer to 7 - COOLING/ENGINE/COOLANT - DESCRIPTION) for correct coolant/water mixture ratio.
	9. Fan installed backwards on viscous drive.	9. Mount fan on drive correctly.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Remove insects and debris. (Refer to 7 - COOLING/ENGINE/ RADIATOR - CLEANING).
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	12. Fuel or ignition system problems.	12. Refer to FUEL and /or IGNITION CONTROL for diagnosis.
	13. Dragging brakes.	13. Check and correct as necessary. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) for correct procedures.
	14. Bug screen or cardboard is being used, reducing airflow.	14. Remove bug screen or cardboard.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	15. Thermostat partially or completely shut.	15. Check thermostat operation and replaces necessary. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - DIAGNOSIS AND TESTING).
	16. Viscous fan drive not operating properly.	16. Check fan drive operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - DIAGNOSIS AND TESTING).
	17. Cylinder head gasket leaking.	17. Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). For repair, (Refer to 9 - ENGINE/ CYLINDER HEAD - REMOVAL).
	18. Heater core leaking.	18. Check heater core for leaks. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ HEATER CORE - REMOVAL). Repair as necessary.
	19. Electric fan not functioning.	19. Inspect electric fan for proper operation. Refer to Electric Cooling Fan in this section. Refer to Group 8W for electric cooling fan and relay circuit schematic data.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.	1. A normal condition. No correction is necessary.
	2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	2. Check operation of gauge and repair if necessary. Refer to Group 8J, Instrument cluster.
	3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running)	3. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.
	4. Gauge reading high after re-starting a warmed up (hot) engine.	4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	5. Coolant level low in cooling system (air will build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.	6. (a) Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
		(b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.
	7. Water pump impeller loose on shaft.	7. Check water pump and replace as necessary. (Refer to 7 - COOLING/ENGINE/WATER PUMP - DIAGNOSIS AND TESTING).
	8. Loose accessory drive belt. (water pump slipping)	8. (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING). Check and correct as necessary.
	9. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	1. Pressure relief valve in pressure bottle cap is defective.	1. Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating.	1. Check reason for overheating and repair as necessary.
	2. Freeze point of coolant not correct. Mixture is too rich or too lean.	2. Check coolant concentration. (Refer to 7 - COOLING/ENGINE/ COOLANT - DESCRIPTION) and adjust ratio as required.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace if necessary
		(b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary.
		(c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary.
		(d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.
NOISY VISCOUS FAN/DRIVE	1. Fan blades loose.	1. Replace fan blade assembly. (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - REMOVAL)
	2. Fan blades striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or air conditioning condenser.	3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser.
	4. Thermal viscous fan drive has defective bearing.	4. Replace fan drive. Bearing is not serviceable. (Refer to 7 - COOLING/ ENGINE/RADIATOR FAN - REMOVAL).
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	1. Has a Diagnostic trouble Code (DTC) been set?	1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for correct procedures and replace thermostat if necessary
	2. Coolant level low	2. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	3. Obstructions in heater hose/ fittings	3. Remove heater hoses at both ends and check for obstructions
	4. Heater hose kinked	4. Locate kinked area and repair as necessary
	5. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.	5. (Refer to 7 - COOLING/ENGINE/ WATER PUMP - DIAGNOSIS AND TESTING). If a slipping belt is detected, (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - REMOVAL). If heater core obstruction is detected, (Refer to 7 - COOLING - STANDARD PROCEDURE) for cooling system reverse flushing.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator or condensor will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator or condensor, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. (Refer to 7 - COOLING/ENGINE/ COOLANT - DESCRIPTION) for coolant concentration information. Adjust coolant mixture as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.
FAN RUNS ALL THE TIME	1. Fan control sensors inoperative.	1. Check for DTC's. Verify sensor readings.
	2. Fan control solenoid stuck ″on″.	2. Check fan operation speeds. Refer to fan speed operation table.
	3. Fan control solenoid harness damaged.	3. Check for DTC 1499. Repair as required.
	4. Transmission temperature too high.	4. Check for transmission over temp. DTC.
	5. Engine coolant temperature too high.	5. (a) Check coolant level. Correct level as required.
		(b) Thermostat stuck. Replace thermostat.
		(c) Water pump failed. Replace water pump.
		(d) Coolant flow restricted. Clean radiator.
		(e) Air flow over radiator obstructed.Remove obstruction.

COOLING (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - DRAINING COOLING SYSTEM

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS (Fig. 5) OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) DO NOT remove radiator cap first. With engine cold, raise vehicle on a hoist and locate radiator draincock.

NOTE: Radiator draincock is located on the left/ lower side of radiator facing to rear of vehicle.

(2) Attach one end of a hose to the draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator. This will empty the coolant reserve/overflow tank. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture. When tank is empty, remove radiator cap and continue draining cooling system.

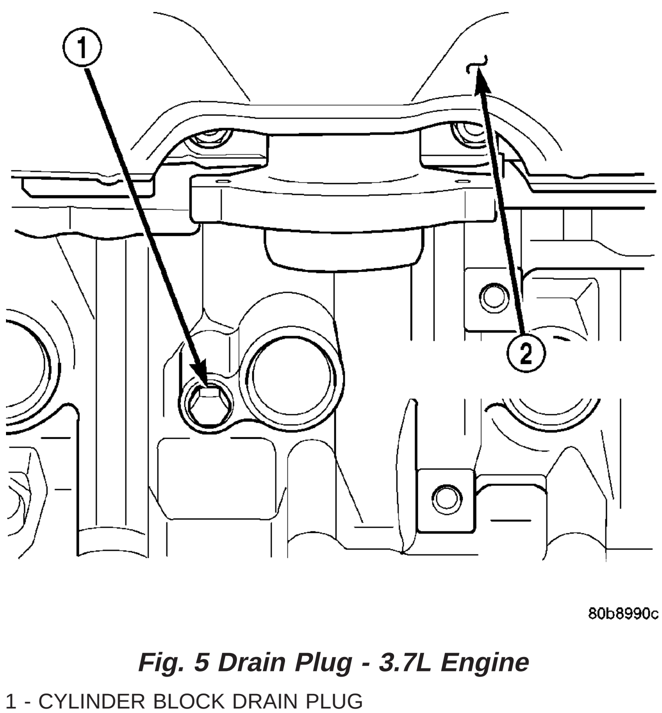


Fig. 5 Drain Plug - 3.7L Engine

1 - CYLINDER BLOCK DRAIN PLUG
2 - EXHAUST MANIFOLD AND HEAT SHIELD

STANDARD PROCEDURE - REFILLING COOLING SYSTEM

(1) Tighten the radiator draincock and the cylinder block drain plug(s) (if removed).

CAUTION: Failure to purge air from the cooling system can result in an overheating condition and severe engine damage.

(2) .Fill system using a 50/50 mixture of ethylene-glycol antifreeze and low mineral content water.Fill pressure bottle to service line.and install cap.

NOTE: The engine cooling system will push any remaining air into the coolant bottle within about an hour of normal driving. As a result, a drop in coolant level in the pressure bottle may occur. If the engine cooling system overheats and pushes coolant into the overflow side of the coolant bottle, this coolant will be sucked back into the cooling system ONLY IF THE PRESSURE CAP IS LEFT ON THE BOTTLE. Removing the pressure cap breaks the vacuum path between the two bottle sections and the coolant will not return to cooling system.

(3) With heater control unit in the HEAT position, operate engine with pressure bottle cap in place.

(4) Add coolant to pressure bottle as necessary. **Only add coolant to the pressure bottle when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

NOTE: The coolant bottle has two chambers. Coolant will normally only be in the outboard (larger) of the two. The inboard chamber is only to recover coolant in the event of an overheat or after a recent service fill. The inboard chamber should normally be empty. If there is coolant in the overflow side of the coolant bottle (after several warm/cold cycles of the engine) and coolant level is above cold full when cold, disconnect the end of the overflow hose at the fill neck and lower it into a clean container. Allow coolant to drain into the container until emptied. Reconnect overflow hose to fill neck.

STANDARD PROCEDURE - COOLING SYSTEM - REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97-110 kPa (14-16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

COOLING (Continued)

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

CHEMICAL CLEANING

If visual inspection indicates the formation of sludge or scaly deposits, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97-110 kPa (14 -16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equipment. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE). Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Install the thermostat and housing with a replacement gasket (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION). Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture (Refer to 7 - COOLING - STANDARD PROCEDURE).

SPECIFICATIONS

TORQUE

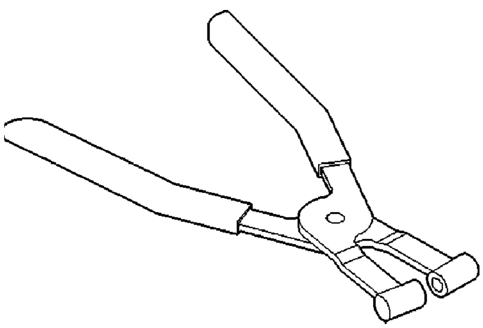
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Automatic Belt Tensioner to Mounting Bracket			
2.4L	41	30	-
3.7L	41	30	—
Automatic Belt Tensioner Pulley—Bolt			
(2.4L)	61	45	—
(3.7L)	61	45	—
Block Heater—Bolt			
2.4L	2	—	17
3.7L	2	—	17
Condenser to Radiator Bolts	8		70
Coolant Overflow Bottle to Plenum mounting bolts - 2.4L only	8.5		75
Coolant Pressure Bottle to Plenum mounting bolts -3.7L only	8.5		75
Electric Fan to Fan Shroud bolts	5.5		50
Fan Blade Assy. to Viscous Drive Bolts 3.7L	23	—	210

COOLING (Continued)

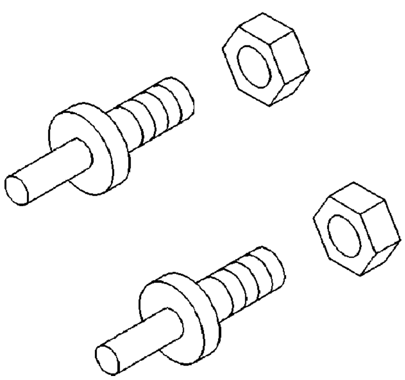
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fan Shroud to Radiator Mounting Bolts	8	—	70
Radiator Upper Isolator to Crossmember - Bolts	9.5	—	85
Thermostat Housing—Bolts			
2.4L	28	-	250
4.7L	13	—	115
Water Pump—Bolts			
2.4L	12	—	105
4.7L	54	40	—

SPECIAL TOOLS

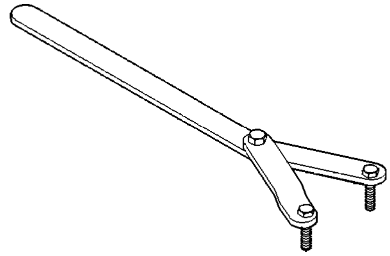
COOLING



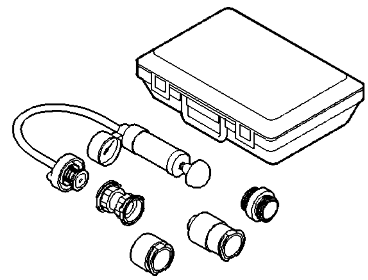
Pliers 6094



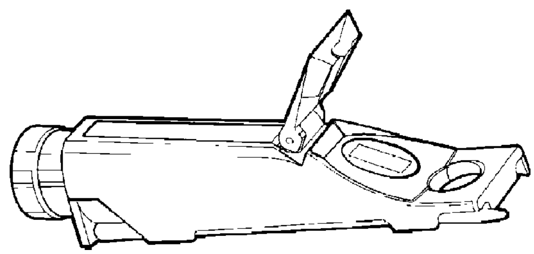
Adapter Pins 8346



Spanner Wrench 6958 with 8346 adapter pins



Pressure Tester 7700–A



Coolant Refractometer 8286

ACCESSORY DRIVE

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ACCESSORY DRIVE

DIAGNOSIS AND TESTING - SERPENTINE DRIVE BELT DIAGNOSIS

When diagnosing serpentine drive belts, small cracks that run across ribbed surface of belt from rib to rib (Fig. 1), are considered normal. These are not a reason to replace belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 1). Also replace belt if it has excessive wear, frayed cords or severe glazing.

Refer to SERPENTINE DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

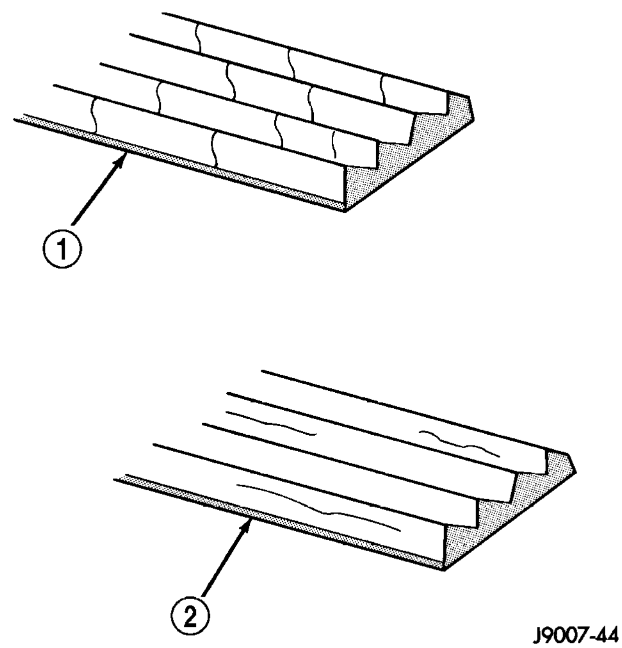

Fig. 1 Serpentine Accessory Drive Belt Wear Patterns

1 - NORMAL CRACKS BELT OK
2 - NOT NORMAL CRACKS REPLACE BELT

ACCESSORY DRIVE (Continued)

SERPENTINE DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage.	2. Replace belt.
RIB OR BELT WEAR	1. Pulley(s) misaligned.	1. Align pulley(s).
	2. Abrasive environment.	2. Clean pulley(s). Replace belt if necessary.
	3. Rusted pulley(s).	3. Clean rust from pulley(s).
	4. Sharp or jagged pulley groove tips.	4. Replace pulley.
	5. Rubber deteriorated.	5. Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	1. Belt has mistracked from pulley groove.	1. Replace belt.
	2. Pulley groove tip has worn away rubber to tensile member.	2. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Belt or pulley subjected to substance (belt dressing, oil ethylene glycol) that has reduced friction.	4. Replace belt and clean pulleys.
	5. Driven component bearing failure.	5. Replace faulty component bearing.
	6. Belt glazed and hardened from heat and excessive slippage.	6. Replace belt.
“GROOVE JUMPING” (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	1. Belt tension either too high or too low.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly.	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Pulley(s) not within design tolerance.	4. Replace pulley(s).
	5. Foreign object(s) in grooves.	5. Remove foreign objects from grooves.
	6. Pulley misalignment.	6. Check and replace.
	7. Belt cord line is broken.	7. Replace belt.

ACCESSORY DRIVE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension. 2. Incorrect belt. 3. Tensile member damaged during belt installation. 4. Severe misalignment. 5. Bracket, pulley, or bearing failure.	1. Replace belt and automatic belt tensioner. 2. Replace belt. 3. Replace belt. 4. Check and replace. 5. Replace defective component and belt.
NOISE (OBJECTIONABLE SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION)	1. Belt slippage. 2. Bearing noise. 3. Belt misalignment. 4. Belt-to-pulley mismatch.	1. Replace belt or automatic belt tensioner. 2. Locate and repair. 3. Replace belt. 4. Install correct belt.

BELT TENSIONERS

REMOVAL

REMOVAL - 3.7L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove tensioner assembly from engine front cover (Fig. 2).

WARNING: BECAUSE OF HIGH SPRING TENSION, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY (EXCEPT FOR PULLEY ON TENSIONER).

(3) Remove pulley bolt. Remove pulley from tensioner.

REMOVAL - 2.4L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove tensioner assembly from engine accessory drive bracket (Fig. 3).

WARNING: BECAUSE OF HIGH SPRING TENSION, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY (EXCEPT FOR PULLEY ON TENSIONER).

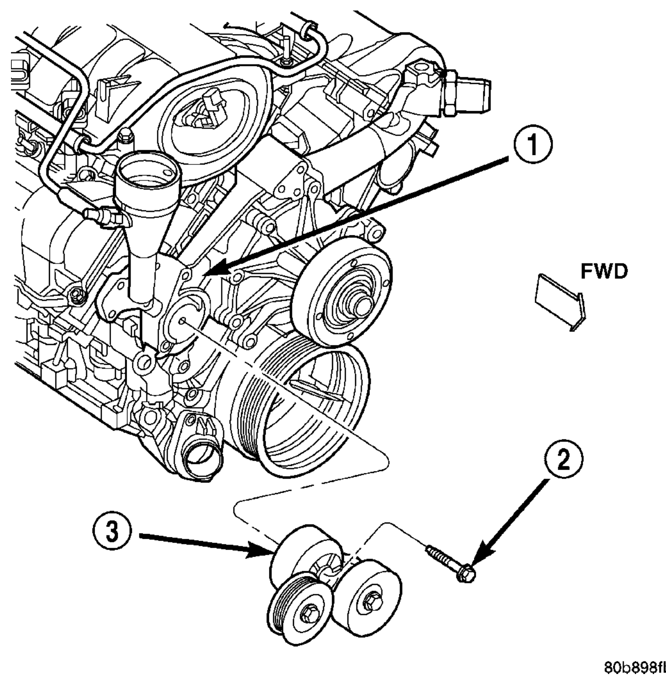

Fig. 2 Automatic Belt Tensioner

1 - TIMING CHAIN COVER
2 - BOLT TORQUE TO 41 N·m (30 FT LBS)
3 - AUTOMATIC BELT TENSIONER

(3) Remove pulley bolt. Remove pulley from tensioner.

BELT TENSIONERS (Continued)

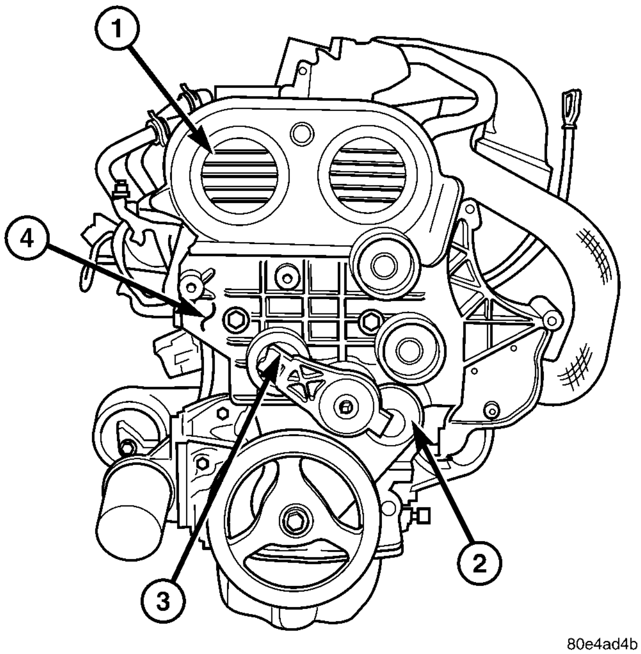

Fig. 3 ACCESSORY DRIVE BRACKET

1- UPPER TIMING BELT COVER
2- LOWER TIMING BELT COVER
3- BELT TENSIONER
4- ACCESSORY DRIVE BRACKET

INSTALLATION

INSTALLATION - 3.7L ENGINE

(1) Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N·m (45 ft. lbs.) torque.

(2) An indexing slot is located on back of tensioner. Align this slot to the head of the bolt on the front cover. Install the mounting bolt. Tighten bolt to 41 N·m (30 ft. lbs.).

(3) Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

INSTALLATION - 2.4L ENGINE

(1) Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N·m (45 ft. lbs.) torque.

(2) An indexing slot is located on back of tensioner. Align this slot to the head of the nut on the front cover. Install the mounting nut on the stud. Tighten stud to 41 N·m (30 ft. lbs.).

(3) Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

DRIVE BELTS -2.4L

REMOVAL - 2.4L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position.

INSTALLATION - 2.4L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

DRIVE BELTS -2.4L (Continued)

(2) Install new belt (Fig. 4) or (Fig. 5). Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

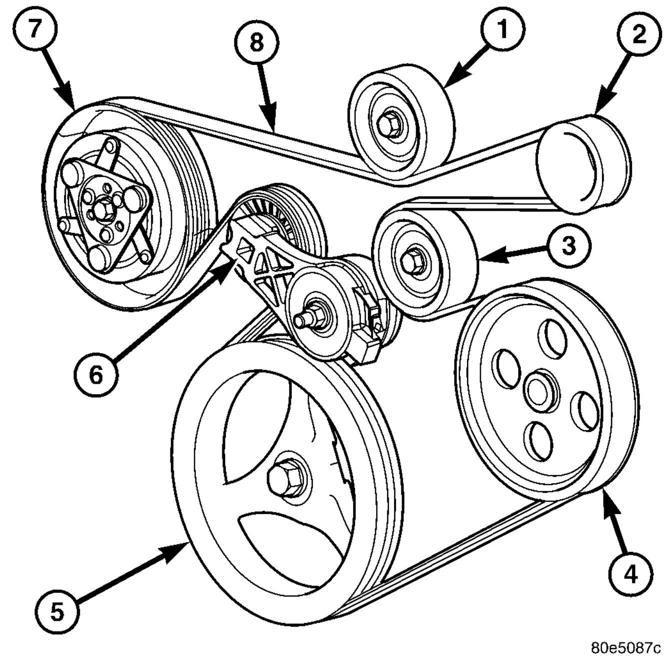

Fig. 4 BELT ROUTING 2.4L WITH A/C

1 - IDLER PULLEY
2 - GENERATOR PULLEY
3 - IDLER PULLEY
4 - POWER STEERING PUMP PULLEY
5 -CRANKSHAFT PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - ACCESSORY DRIVE BELT

(3) With the drive belt installed, inspect the belt wear indicator. On 2.4L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches).

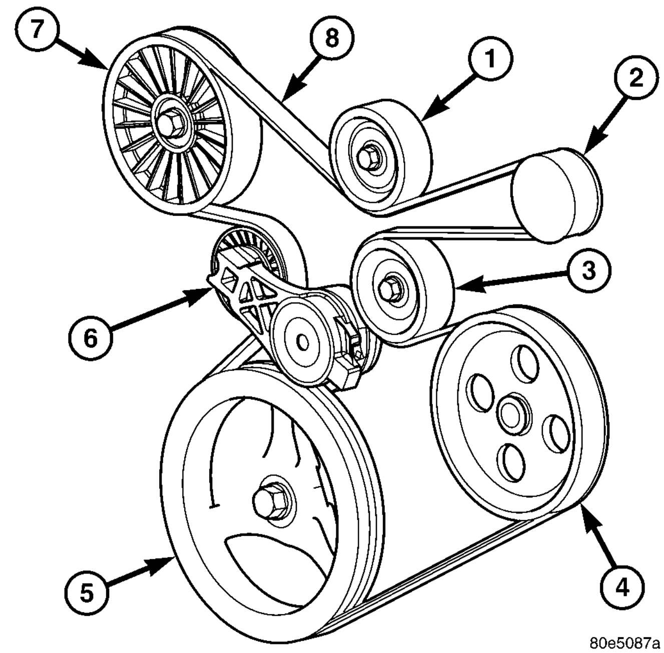

Fig. 5 BELT ROUTING 2.4L WITHOUT A/C

1 - IDLER PULLEY
2 - GENERATOR PULLEY
3 - IDLER PULLEY
4 - POWER STEERING PUMP PULLEY
5 -CRANKSHAFT PULLEY
6 - TENSIONER
7 - NON A/C IDLER PULLEY
8 - ACCESSORY DRIVE BELT

DRIVE BELTS - 3.7L

REMOVAL - 3.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

DRIVE BELTS - 3.7L (Continued)

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position. (Fig. 6).

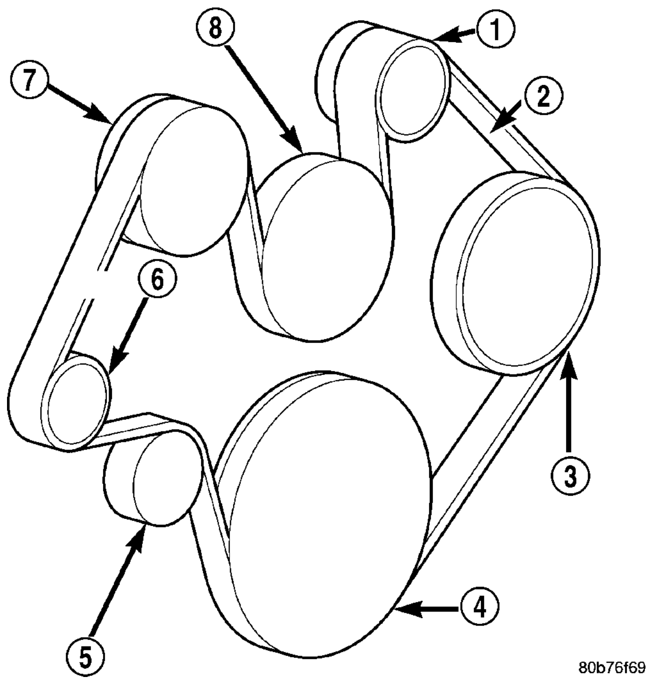

Fig. 6 Belt Routing - 3.7L

1 - GENERATOR PULLEY
2 - ACCESSORY DRIVE BELT
3 - POWER STEERING PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - IDLER PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - WATER PUMP PULLEY

INSTALLATION - 3.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction (Fig. 6).

(2) Install new belt (Fig. 6). Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

(3) With the drive belt installed, inspect the belt wear indicator (Fig. 7). On 3.7L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches).

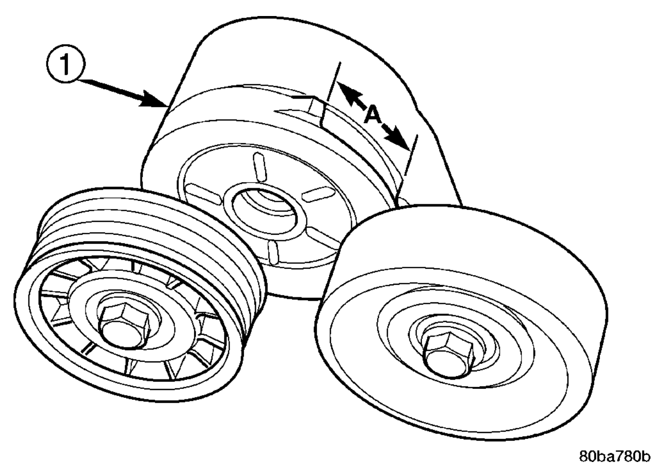

Fig. 7 Accessory Drive Belt Wear Indicator

1 - AUTOMATIC TENSIONER ASSEMBLY

ENGINE

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COOLANT

DESCRIPTION

DESCRIPTION - HOAT COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE-GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE-GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.

CAUTION: Use of Propylene-Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene-glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% ethylene-glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water-Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water-Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

COOLANT (Continued)

DESCRIPTION - ENGINE COOLANT

ETHYLENE-GLYCOL MIXTURES

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37 deg. C (-35 deg. F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7 deg. C (-90 deg. F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149 deg. C (300) deg. F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22 deg. C (-8 deg. F).

PROPYLENE-GLYCOL MIXTURES

It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32 deg. C (-26 deg. F). 5 deg. C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125 deg. C (257 deg. F) at 96.5 kPa (14 psi), compared to 128 deg. C (263 deg. F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

OPERATION

Coolant flows through the engine block absorbing the heat from the engine, then flows to the radiator where the cooling fins in the radiator transfers the heat from the coolant to the atmosphere. During cold weather the ethylene-glycol or propylene-glycol coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.

COOLANT RECOVERY PRESS CONTAINER

DESCRIPTION

This system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.
- A convenient and safe method for checking/adjusting coolant level at atmospheric pressure. This is done without removing the radiator pressure cap.
- Some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

The coolant reservoir/overflow system has a radiator mounted pressurized cap, an overflow tube, and a plastic coolant reservoir/overflow tank, mounted to the right side of the cowl. It is mounted to the cowl with two nuts on top, and a slide bracket on the bottom.

OPERATION

The pressure chamber keeps the coolant free of trapped air, provides a volume for expansion and contraction, and provides a convenient and safe method for checking and adjusting coolant level at atmospheric pressure. It also provides some reserve coolant to cover minor leaks, evaporation or boiling losses. The overflow chamber allows coolant recovery in case of an overheat.

COOLANT RECOVERY PRESS CONTAINER (Continued)

REMOVAL

(1) Disconnect the hose from radiator filler neck.
(2) Remove coolant recovery bottle (Fig. 1).

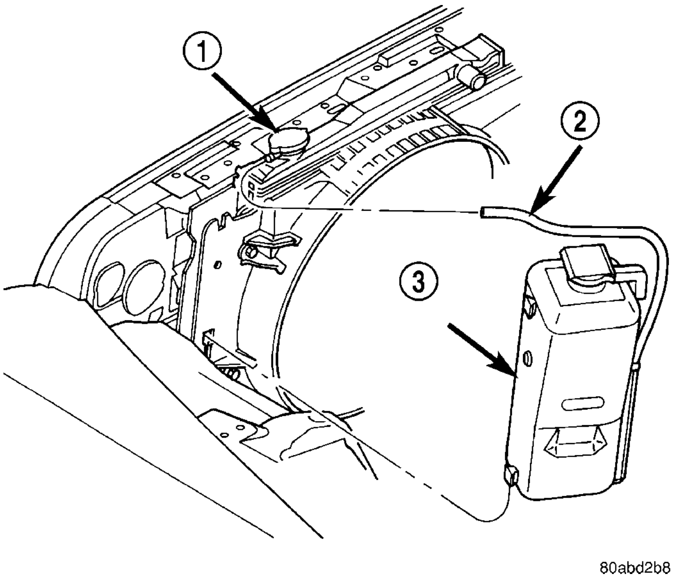

Fig. 1 Coolant Reserve/Overflow Bottle

1 - RADIATOR PRESSURE CAP
2 - HOSE
3 - COOLANT RECOVERY BOTTLE

INSTALLATION

(1) Position the tabs on the overflow bottle into the slots on the fan shroud.
(2) Reconnect the overflow hose onto the radiator filler neck.
(3) Fill resrevoir/overflow bottle.

ENGINE BLOCK HEATER

DESCRIPTION

The block heater is operated by ordinary house current (110 Volt A.C.) through a power cord and connector located in the engine compartment. The heater is mounted in a core hole (in place of a core hole plug) in the engine block, with the heating element immersed in coolant.

CAUTION: The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged.

OPERATION

The block heater element is submerged in the cooling system's coolant. When electrical power (110 volt A.C.) is applied to the element, it creates heat. This heat is transferred to the engine coolant. This provides easier engine starting and faster warm-up when vehicle is operated in areas having extremely low temperatures.

REMOVAL

REMOVAL - 2.4L

(1) Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
(2) Raise vehicle on hoist.
(3) Detach power cord plug from heater.
(4) Loosen screw in center of heater. Remove heater assembly.

REMOVAL - 3.7L

(1) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(2) Raise vehicle on hoist.
(3) Detach power cord plug from heater.
(4) Loosen screw in center of heater. Remove heater assembly.

INSTALLATION

INSTALLATION - 2.4L

(1) Thoroughly clean core hole and heater seat.
(2) Insert heater assembly (Fig. 2) with element loop positioned **upward** .

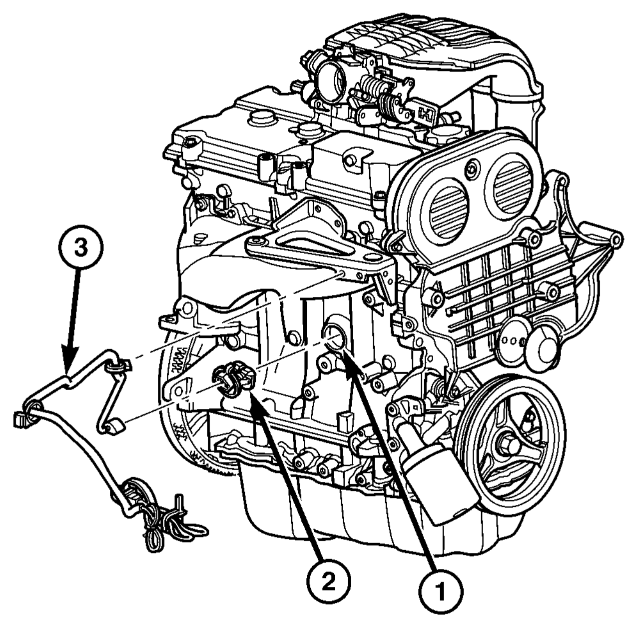

Fig. 2 ENGINE BLOCK HEATER 2.4L

1 - CORE HOLE
2 - BLOCK HEATER
3 - POWER CORD

ENGINE BLOCK HEATER (Continued)

(3) With heater seated, tighten center screw securely to assure a positive seal.

CAUTION: To prevent damage, the power cord must be secured in it's retaining clips, and not positioned so it could contact linkages or exhaust manifold.

(4) Connect power cord to heater.

(5) Lower vehicle.

(6) Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

INSTALLATION - 3.7L

(1) Thoroughly clean core hole and heater seat.

(2) Insert heater assembly (Fig. 3) with element loop positioned **upward** .

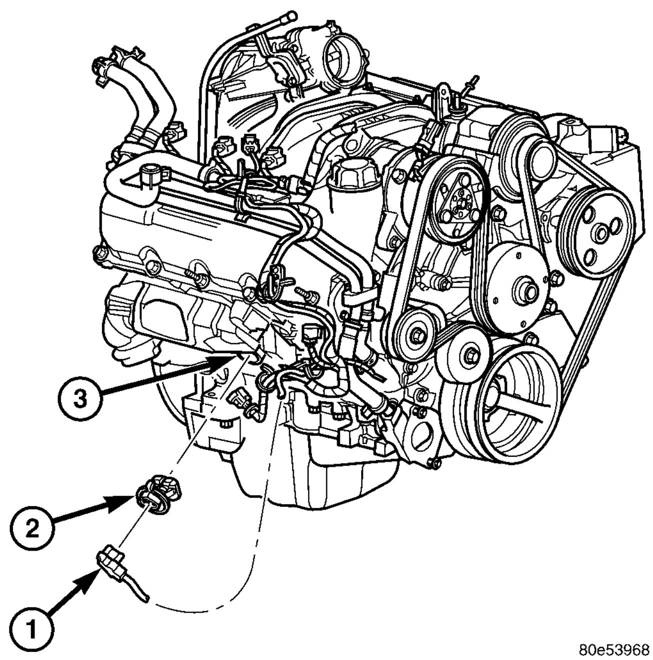

Fig. 3 ENGINE BLOCK HEATER 3.7L

1 - POWER CORD
2 - BLOCK HEATER
3 - CORE HOLE

(3) With heater seated, tighten center screw securely to assure a positive seal.

CAUTION: To prevent damage, the power cord must be secured in it's retaining clips, and not positioned so it could contact linkages or exhaust manifold.

(4) Connect power cord to heater.

(5) Lower vehicle.

(6) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

ENGINE COOLANT TEMPERATURE SENSOR

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to sense engine coolant temperature. The sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

- for engine coolant temperature gauge operation through CCD or PCI (J1850) communications
- Injector pulse-width
- Spark-advance curves
- ASD relay shut-down times
- Idle Air Control (IAC) motor key-on steps
- Pulse-width prime-shot during cranking
- O2 sensor closed loop times
- Purge solenoid on/off times
- EGR solenoid on/off times (if equipped)
- Leak Detection Pump operation (if equipped)
- Radiator fan relay on/off times (if equipped)
- Target idle speed

ENGINE COOLANT TEMPERATURE SENSOR (Continued)

REMOVAL

2.4L

The Engine Coolant Temperature (ECT) sensor is installed into a water jacket at left front of cylinder head (Fig. 4).

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR.

(1) Partially drain cooling system.
(2) Disconnect electrical connector from sensor.
(3) Remove sensor from cylinder head.

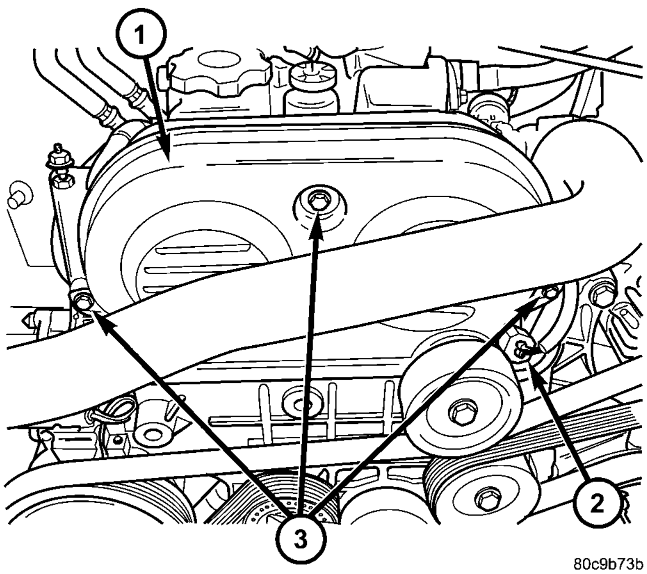

Fig. 4 ECT AND UPPER TIMING BELT COVER/ BOLTS-2.4L

1 - UPPER TIMING BELT COVER
2 - ELECTRICAL CONNECTOR (ECT)
3 - MOUNTING BOLTS (3)

3.7L

The Engine Coolant Temperature (ECT) sensor is installed into a water jacket at front of intake manifold near rear of generator (Fig. 5).

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR.

(1) Partially drain cooling system.
(2) Disconnect electrical connector from sensor.
(3) Remove sensor from intake manifold.

INSTALLATION

(1) Apply thread sealant to sensor threads.
(2) Install sensor to engine.

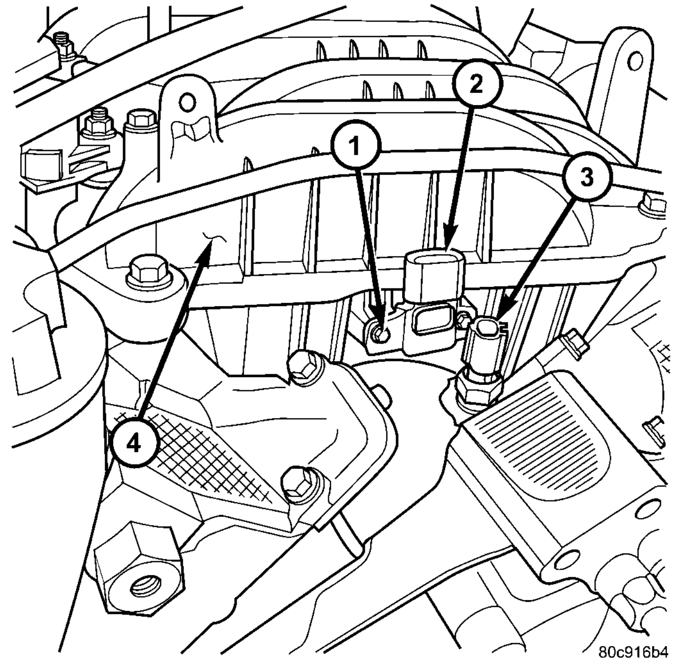

Fig. 5 MAP SENSOR / ECT SENSOR - 3.7L V-6

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

(3) Tighten sensor to 11 N·m (8 ft. lbs.) torque.
(4) Replace any lost engine coolant.

ENGINE COOLANT THERMOSTAT

DESCRIPTION - 3.7L ENGINE

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm up and overall temperature control. On the 3.7L engine the thermostat is designed to block the flow of the coolant bypass journal by 50% instead of completely blocking the flow. This design controls coolant temperature more accurately (Fig. 6).

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warmup time, unreliable warmup performance, increased exhaust

ENGINE COOLANT THERMOSTAT (Continued)

emissions and crankcase condensation. This condensation can result in sludge formation.

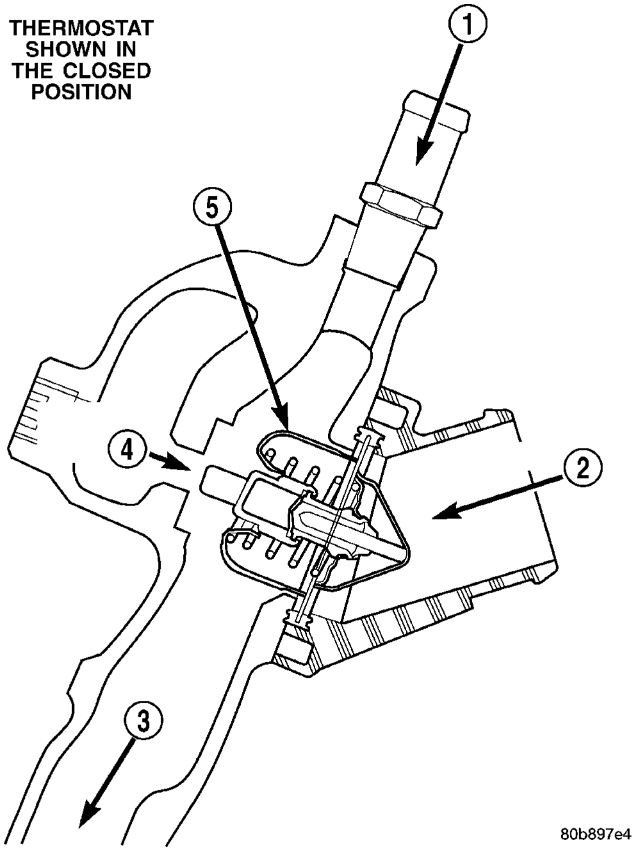

Fig. 6 3.7L Thermostat

1 - FROM HEATER
2 - FROM RADIATOR
3 - TO WATER PUMP
4 - ENGINE BYPASS
5 - THERMOSTAT

OPERATION

The wax pellet is located in a sealed container at the spring end of the thermostat. When heated, the pellet expands, overcoming closing spring tension and water pump pressure to force the valve to open.

DIAGNOSIS AND TESTING - THERMOSTAT

ON-BOARD DIAGNOSTICS

All models are equipped with On-Board Diagnostics for certain cooling system components.If the powertrain control module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC). For other DTC numbers, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

The DTC can also be accessed through the DRB scan tool.

REMOVAL

REMOVAL - 3.7L ENGINE

WARNING: DO NOT LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Do not waste reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

If thermostat is being replaced, be sure that replacement is specified thermostat for vehicle model and engine type.

(1) Disconnect negative battery cable at battery.

(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Raise vehicle on hoist.

(4) Remove splash shield.

(5) Remove lower radiator hose clamp and lower radiator hose at thermostat housing.

(6) Remove thermostat housing mounting bolts, thermostat housing and thermostat (Fig. 7).

REMOVAL

(1) Drain cooling system below thermostat housing level.

(2) Disconnect engine coolant temperature sensor.

(3) Disconnect heater supply hose.

(4) Remove housing attaching bolts (Fig. 8).

(5) Remove housing, gasket and thermostat (Fig. 8).

INSTALLATION

INSTALLATION - 3.7L ENGINE

(1) Clean mating areas of timing chain cover and thermostat housing.

(2) Install thermostat (spring side down) into recessed machined groove on housing assembly. Make sure rubber seal locating tab is positioned in the corresponding notch in the housing.

(3) Position thermostat housing on timing chain cover.

(4) Install two housing-to-timing chain cover bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.

(5) Install lower radiator hose on thermostat housing.

(6) Install splash shield.

(7) Lower vehicle.

(8) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(9) Connect negative battery cable to battery.

(10) Start and warm the engine. Check for leaks.

ENGINE COOLANT THERMOSTAT (Continued)

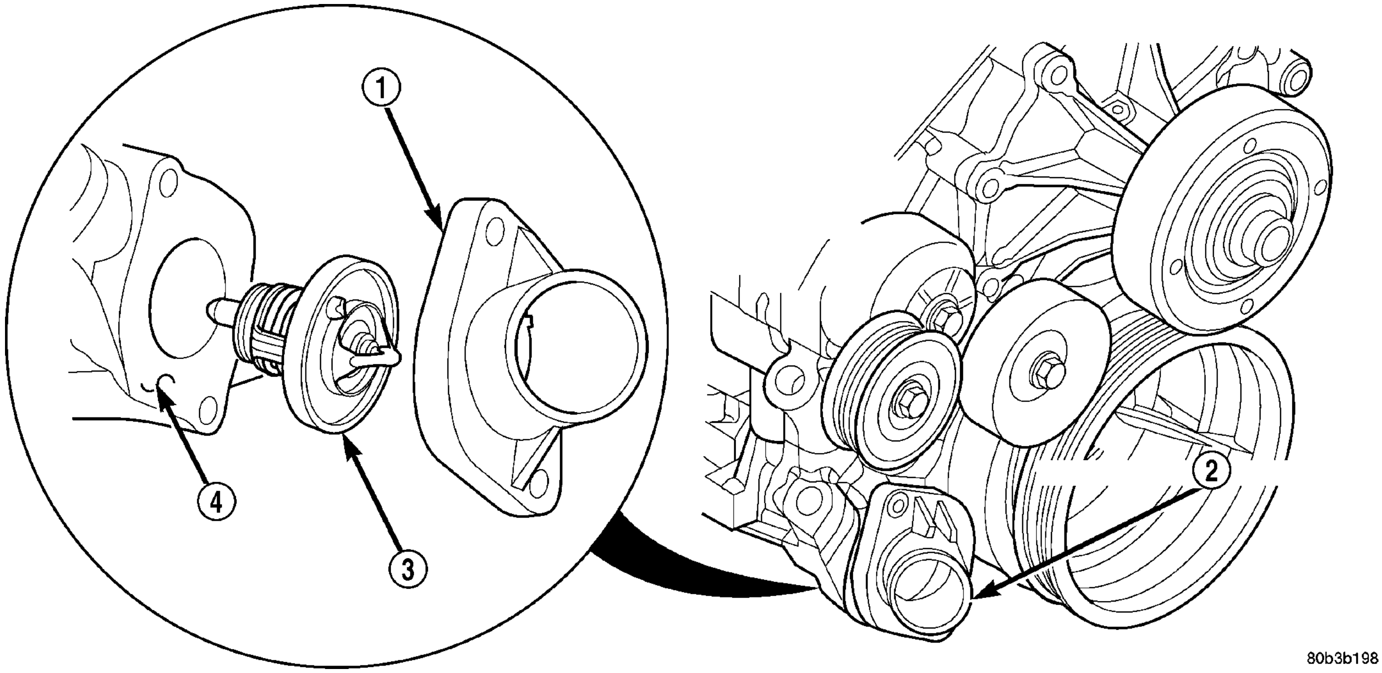

Fig. 7 Thermostat and Thermostat Housing

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

INSTALLATION

(1) Clean all gasket sealing surfaces.

(2) Place a new gasket (dipped in clean water) on the coolant outlet connector surface. Position thermostat with air bleed at 12 o'clock position in thermostat housing.

(3) Position the coolant outlet connector and gasket over the thermostat, making sure thermostat is seated in the thermostat housing (Fig. 9).

(4) Position outlet connector to thermostat housing and install bolts. Tighten bolts to 28 N·m (20 ft. lbs.).

(5) Install radiator hose to coolant outlet housing.

(6) Connect engine coolant temperature sensor.

(7) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

FAN DRIVE VISCOUS CLUTCH

DESCRIPTION

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

The thermal viscous fan drive (Fig. 10) is a silicone-fluid-filled coupling used to connect the fan blades to the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

OPERATION

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit (a typical viscous unit is shown in (Fig. 11). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

FAN DRIVE VISCOUS CLUTCH (Continued)

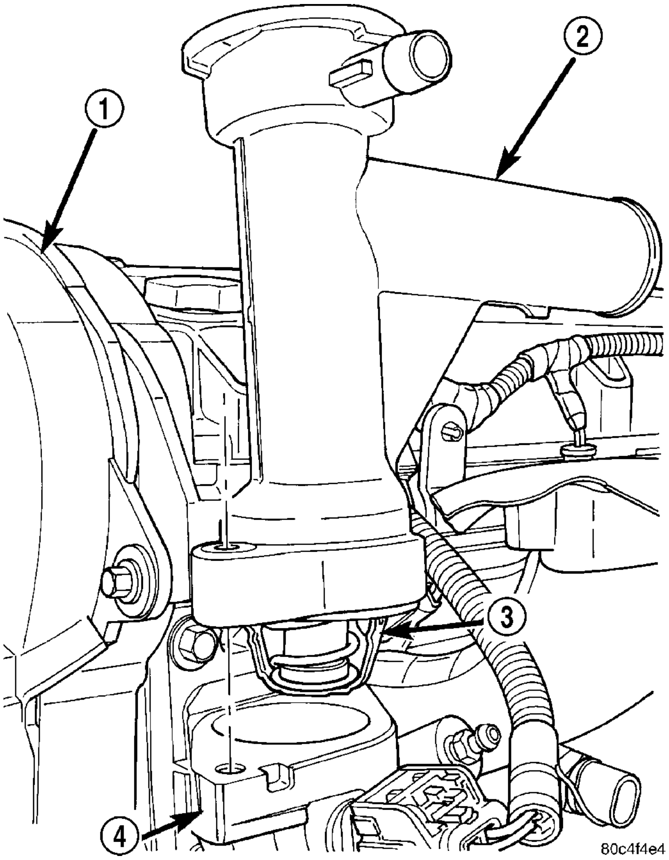

Fig. 8 Thermostat and Coolant Outlet Connector

1 - TIMING BELT COVER
2 - OUTLET CONNECTOR
3 - THERMOSTAT
4 - HOUSING

DIAGNOSIS AND TESTING

VISCOUS FAN DRIVE

NOISE

NOTE: It is normal for fan noise to be louder (roaring) when:

- The underhood temperature is above the engagement point for the viscous drive coupling. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.
- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

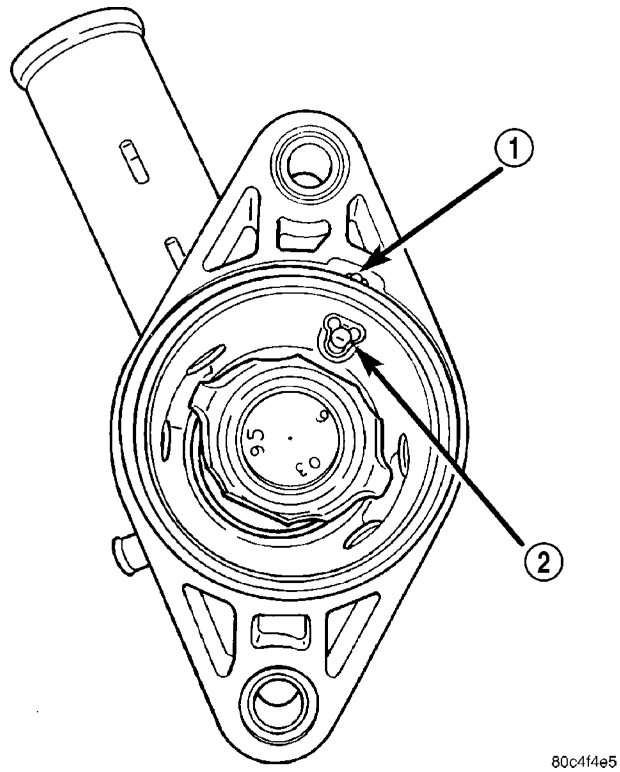

Fig. 9 Thermostat Position

1 - LOCATOR NOTCH
2 - AIR BLEED

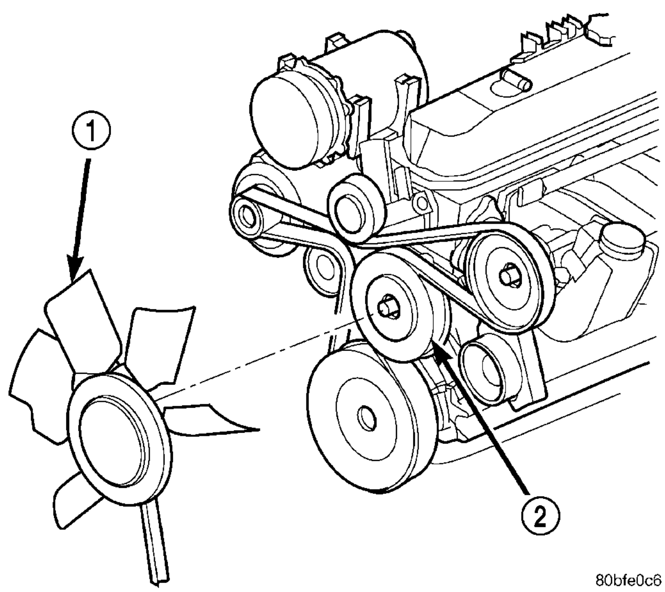

Fig. 10 Water Pump Mounted Fan Drive - 4.0L Engine

1 - FAN AND FAN DRIVE
2 - WATER PUMP PULLEY

FAN DRIVE VISCOUS CLUTCH (Continued)

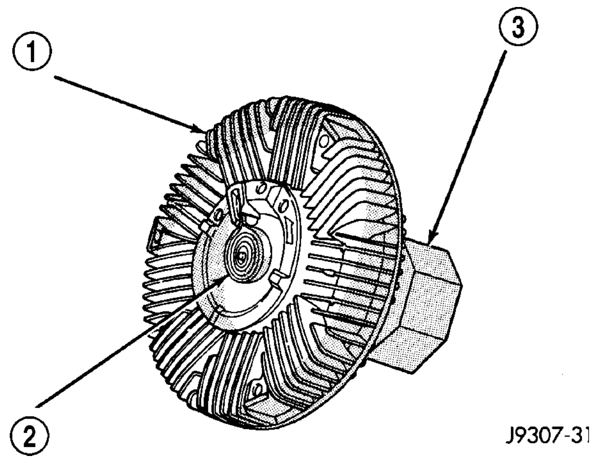

Fig. 11 Viscous Fan Drive - 4.0L Engine

1 - VISCOUS FAN DRIVE
2 - THERMOSTATIC SPRING
3 - MOUNTING NUT TO WATER PUMP HUB

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

TESTING

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18°-to-105°C (0°-to-220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should have started to occur at between 74° to 85° C (165° to 185° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 88° C (190° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 57° to 82° C (135° to 180° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

REMOVAL

(1) **2.5L Engine**Loosen but do not remove at this time, the four fan hub mounting nuts (Fig. 12).

(2) **4.0L Engine**The thermal viscous fan drive/fan blade assembly is attached (threaded) to water pump hub shaft. Remove fan blade/viscous fan drive assembly from water pump by turning mounting nut counterclockwise as viewed from front. Threads on viscous fan drive are **RIGHT HAND.** Using a suitable fan wrench loosen the fan drive (Fig. 13).

(3) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(4) Some models with certain engines may require the removal of the fan shroud to remove the viscous fan drive. The fan shroud and fan blade/viscous fan drive should be removed from the vehicle as one assembly.

(5) **2.5L Engine**Remove four fan hub mounting nuts (Fig. 12) and remove fan/viscous fan drive assembly from vehicle.

FAN DRIVE VISCOUS CLUTCH (Continued)

(6) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

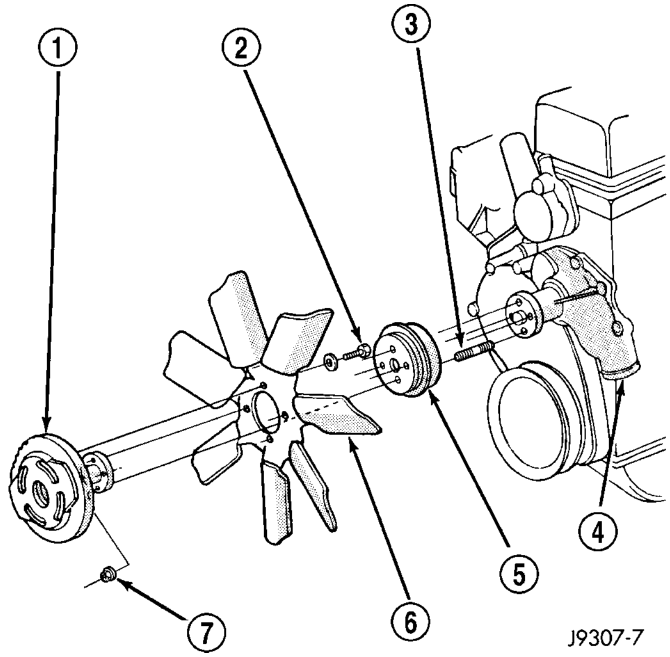

Fig. 12 Fan Mount - 2.5L Engine

1 - THERMAL VISCOUS FAN DRIVE
2 - (4) FAN BLADE-TO-VISCOUS DRIVE BOLTS
3 - (4) FAN HUB-TO-PUMP PULLEY STUDS
4 - WATER PUMP
5 - WATER PUMP PULLEY
6 - FAN BLADE
7 - (4) FAN HUB-TO-PUMP PULLEY NUTS

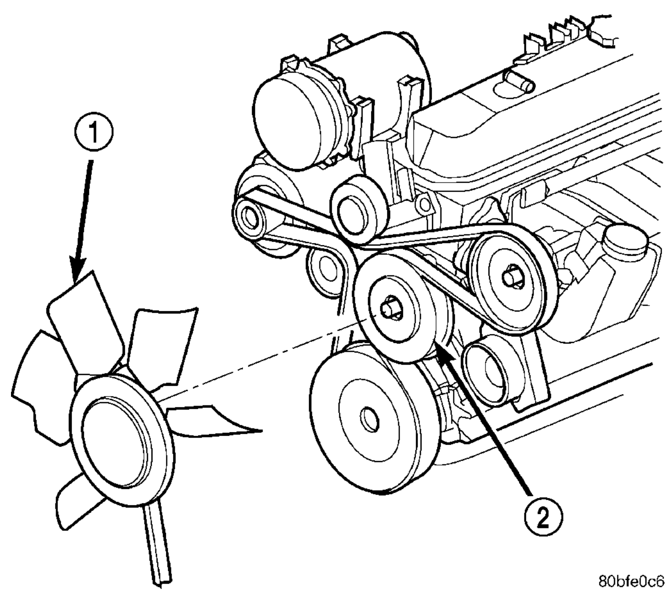

Fig. 13 Fan and Fan Drive - 4.0L Engine

1 - FAN AND FAN DRIVE
2 - WATER PUMP PULLEY

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

(2) **2.5L Engine**Position mounting flange of fan blade/viscous fan drive assembly onto hub. Install four nuts and tighten to 24 N·m (18 ft. lbs.) torque. Tighten the first two nuts 180 degrees apart. Then tighten last two nuts.

(3) **4.0L Engine**Thread the fan and fan drive onto the water pump pulley.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

(4) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

RADIATOR

DESCRIPTION

All vehicles are equipped with a cross flow type radiator with plastic side tanks (Fig. 14).

Plastic tanks, while stronger than brass, are subject to damage by impact, such as from tools or wrenches. Handle radiator with care.

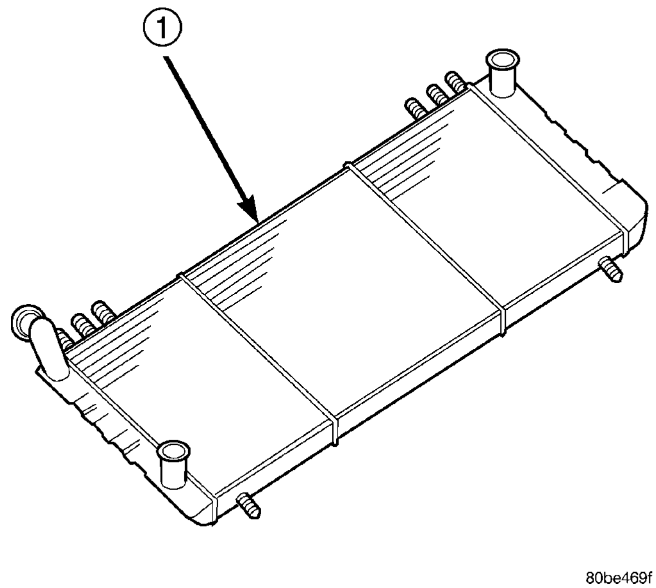

Fig. 14 Cross Flow Radiator - Typical

1 - RADIATOR

REMOVAL

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR. REFER TO COOLING SYSTEM DRAINING.

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 15). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 16). If replacement is necessary, use only an original equipment clamp with matching number or letter.

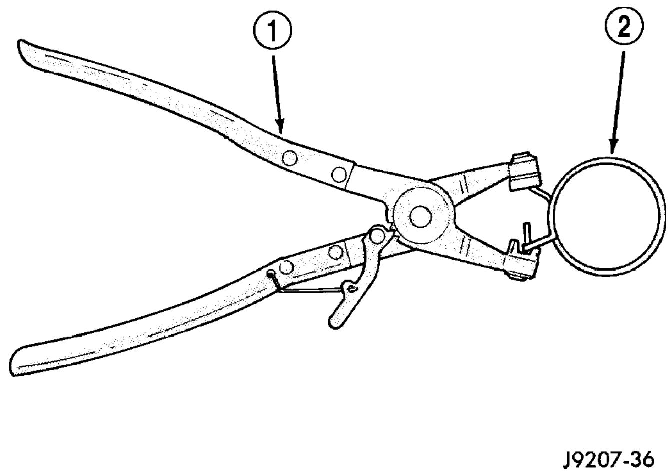

Fig. 15 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

CAUTION: When removing the radiator or A/C condenser for any reason, note the location of all radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 17). These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

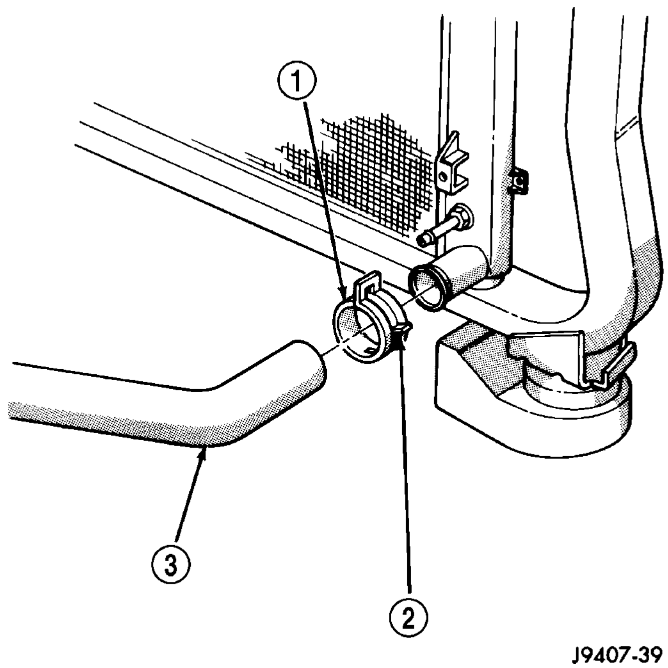

Fig. 16 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

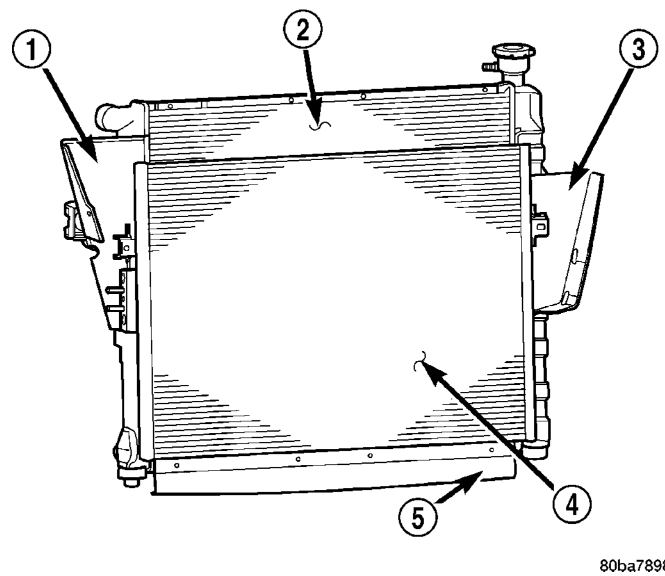

Fig. 17 Air Seals - Typical

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

(1) Disconnect the negative battery cable at battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).

RADIATOR (Continued)

(4) Remove the cooling fan from the engine, if equipped.

(5) Remove the two radiator mounting bolts.

(6) Disconnect both transmission cooler lines from radiator.

(7) Disconnect the connector for the electric fan.

(8) Disconnect the power steering cooler line from cooler.

(9) Disconnect the radiator upper and lower hoses.

(10) Disconnect the overflow hose from radiator.

(11) The lower part of radiator is equipped with two alignment dowel pins (Fig. 18). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

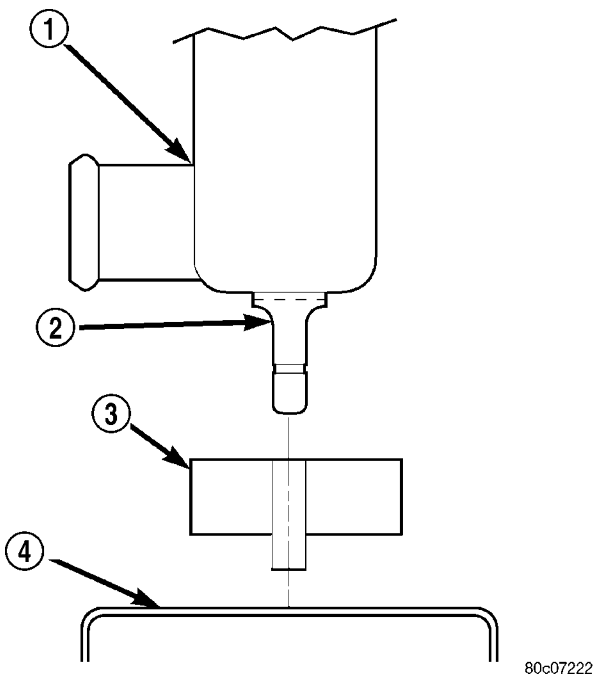

Fig. 18 Radiator Alignment Dowels - Typical

1 - RADIATOR
2 - ALIGNMENT DOWEL
3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

WARNING: THE AIR CONDITIONING SYSTEM (IF EQUIPPED) IS UNDER A CONSTANT PRESSURE EVEN WITH THE ENGINE OFF. REFER TO REFRIGERANT WARNINGS IN, HEATING AND AIR CONDITIONING BEFORE HANDLING ANY AIR CONDITIONING COMPONENT.

NOTE: The radiator and radiator cooling fan can be removed as an assembly. It is not necessary to remove the cooling fan before removing or installing the radiator.

(12) Gently lift up and remove radiator from vehicle. Be careful not to scrape the radiator fins against any other component. Also be careful not to disturb the air conditioning condenser (if equipped).

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR. REFER TO COOLING SYSTEM DRAINING.

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 19). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 20). If replacement is necessary, use only an original equipment clamp with matching number or letter.

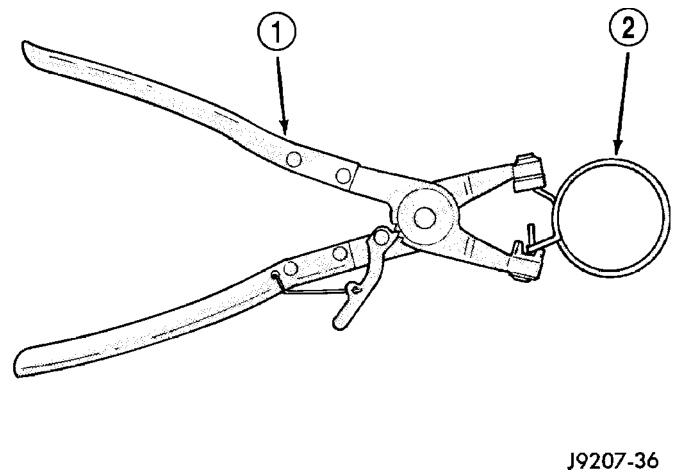

Fig. 19 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

RADIATOR (Continued)

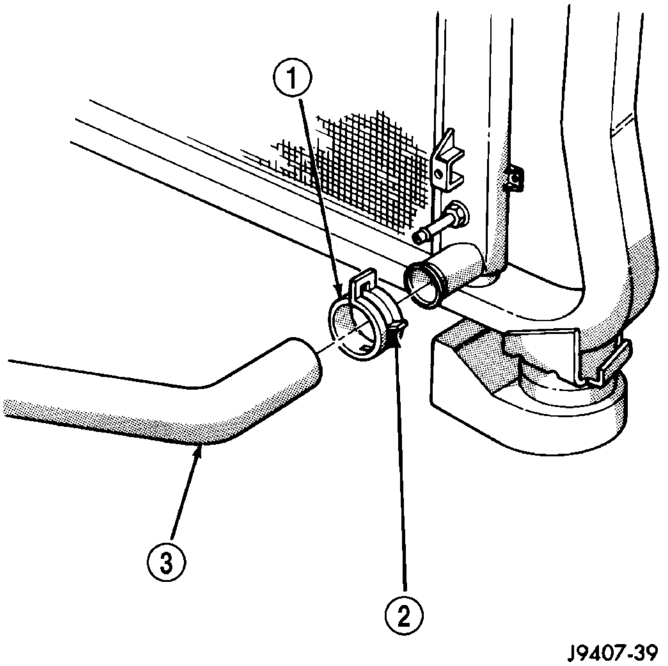

Fig. 20 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

CAUTION: When removing the radiator or A/C condenser for any reason, note the location of all radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 21). These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Disconnect the negative battery cable at battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).

(4) Remove the cooling fan from the engine, if equipped.

(5) Remove the two radiator mounting bolts.

(6) Disconnect both transmission cooler lines from radiator.

(7) Disconnect the connector for the electric fan.

(8) Disconnect the power steering cooler line from cooler.

(9) Disconnect the radiator upper and lower hoses.

(10) Disconnect the overflow hose from radiator.

(11) The lower part of radiator is equipped with two alignment dowel pins (Fig. 22). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

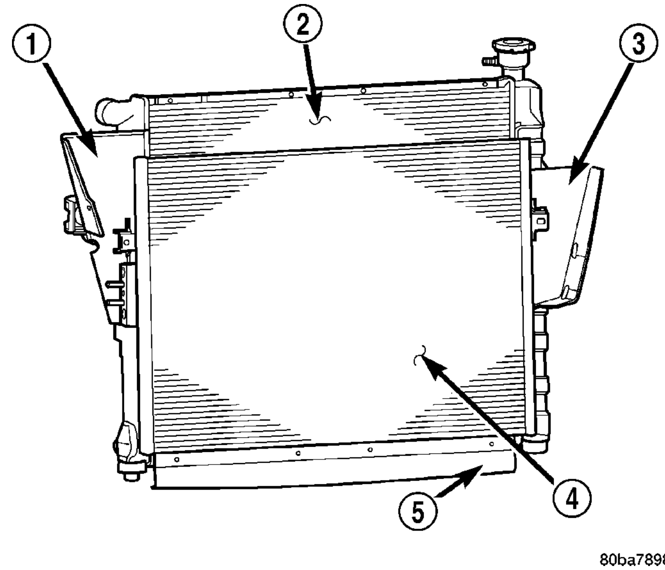

Fig. 21 Air Seals - Typical

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

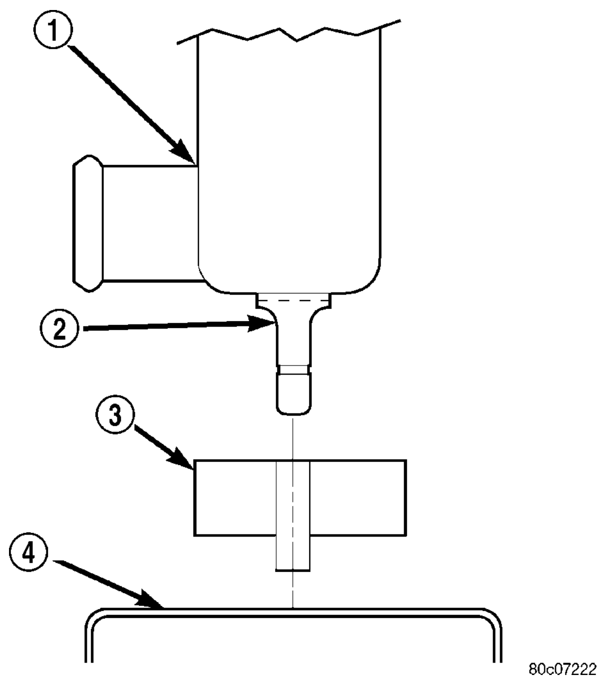

Fig. 22 Radiator Alignment Dowels - Typical

1 - RADIATOR
2 - ALIGNMENT DOWEL
3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

RADIATOR (Continued)

WARNING: THE AIR CONDITIONING SYSTEM (IF EQUIPPED) IS UNDER A CONSTANT PRESSURE EVEN WITH THE ENGINE OFF. REFER TO REFRIGERANT WARNINGS IN, HEATING AND AIR CONDITIONING BEFORE HANDLING ANY AIR CONDITIONING COMPONENT.

NOTE: The radiator and radiator cooling fan can be removed as an assembly. It is not necessary to remove the cooling fan before removing or installing the radiator.

(12) Gently lift up and remove radiator from vehicle. Be careful not to scrape the radiator fins against any other component. Also be careful not to disturb the air conditioning condenser (if equipped).

CLEANING

Clean radiator fins With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

INSTALLATION

INSTALLATION

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Gently lower the radiator and fan shroud into the vehicle. Guide the two radiator alignment dowels into the rubber grommets located in lower radiator crossmember.

(2) Connect the radiator upper and lower hoses and hose clamps to radiator.

CAUTION: The tangs on the hose clamps must be positioned straight down.

(3) Install coolant reserve/overflow tank hose at radiator.

(4) Connect both transmission cooler lines at the radiator.

(5) Install both radiator mounting bolts.

(6) Reconnect the electric cooling fan.

(7) Install the grill (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).

(8) Reinstall the cooling fan to the engine.

(9) Rotate the fan blades (by hand) and check for interference at fan shroud.

(10) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(11) Connect battery cable at battery.

(12) Start and warm engine. Check for leaks.

INSTALLATION

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Gently lower the radiator and fan shroud into the vehicle. Guide the two radiator alignment dowels into the rubber grommets located in lower radiator crossmember.

(2) Connect the radiator upper and lower hoses and hose clamps to radiator.

CAUTION: The tangs on the hose clamps must be positioned straight down.

(3) Install coolant reserve/overflow tank hose at radiator.

(4) Connect both transmission cooler lines at the radiator.

(5) Install both radiator mounting bolts.

(6) Reconnect the electric cooling fan.

(7) Install the grill (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).

(8) Reinstall the cooling fan to the engine.

(9) Rotate the fan blades (by hand) and check for interference at fan shroud.

(10) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(11) Connect battery cable at battery.

(12) Start and warm engine. Check for leaks.

RADIATOR PRESSURE CAP

DESCRIPTION

The cooling system cap is located on the coolant pressure bottle. The cap construction includes; stainless steel swivel top, rubber seals and retainer, main spring, and a spring loaded valve (Fig. 23).

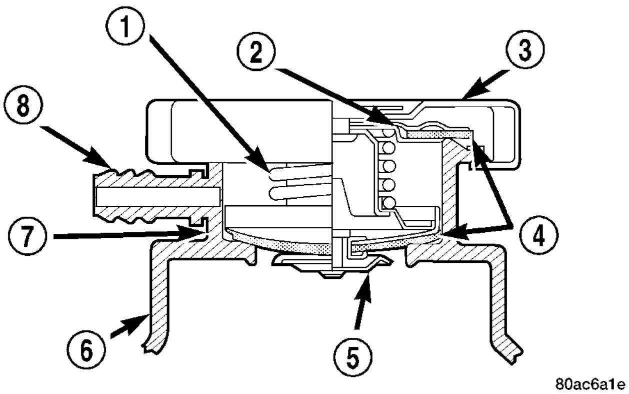

Fig. 23 PRESSURE CAP

1 - MAIN SPRING
2 - GASKET RETAINER
3 - STAINLESS STEEL SWIVEL TOP
4 - RUBBER SEALS
5 - SPRING LOADED VALVE
6 - COOLANT PRESSURE BOTTLE
7 - FILLER NECK
8 - OVERFLOW NIPPLE

OPERATION

The pressure cap allows the cooling system to operate at higher than atmospheric pressure which raises the coolant boiling point, thus allowing increased radiator cooling capacity. The pressure cap releases pressure at some point within a range of 110 kPa ± 14 kPa (16 psi ± 2 psi).

A spring-loaded vent valve in the center of the cap allows the system to pressurize and depressurize without creating a vacuum. If the valve is stuck open, coolant will escape to the overflow hose. There is also a gasket in the cap to seal to the top of the filler neck.

CAUTION: Use only the pressure cap specified for this vehicle. Use of other pressure caps can lead to coolant loss and overheating.

DIAGNOSIS AND TESTING - RADIATOR PRESSURE CAP

Remove cap from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 24).

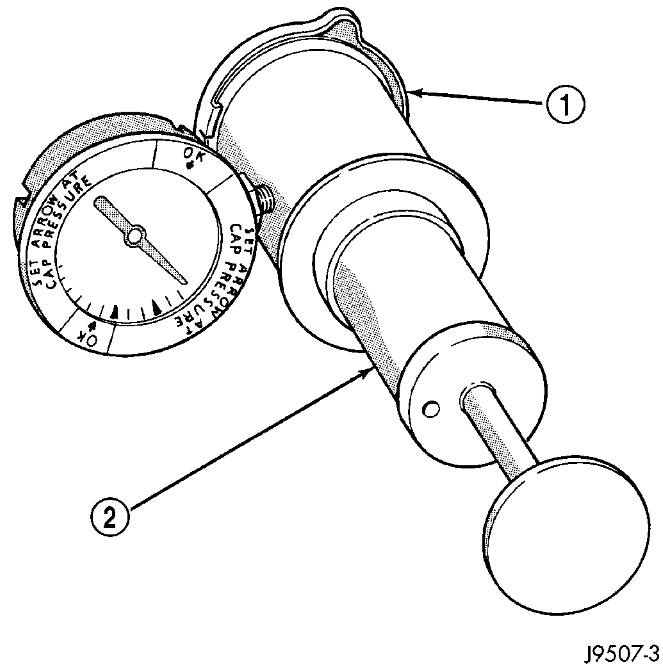

Fig. 24 Pressure Testing Radiator Pressure Cap - Typical

1 - PRESSURE CAP
2 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 124 to 145 kPa (18 to 21 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 124 to 145 kPa (18 to 21 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

CLEANING

Clean the radiator pressure cap using a mild soap and water only.

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

RADIATOR FAN - ELECTRIC

DESCRIPTION

The fan (Fig. 25) is electrically controlled by the powertrain control module (PCM) through the fan control relay. This relay is located on the left wheel house in the engine compartment.

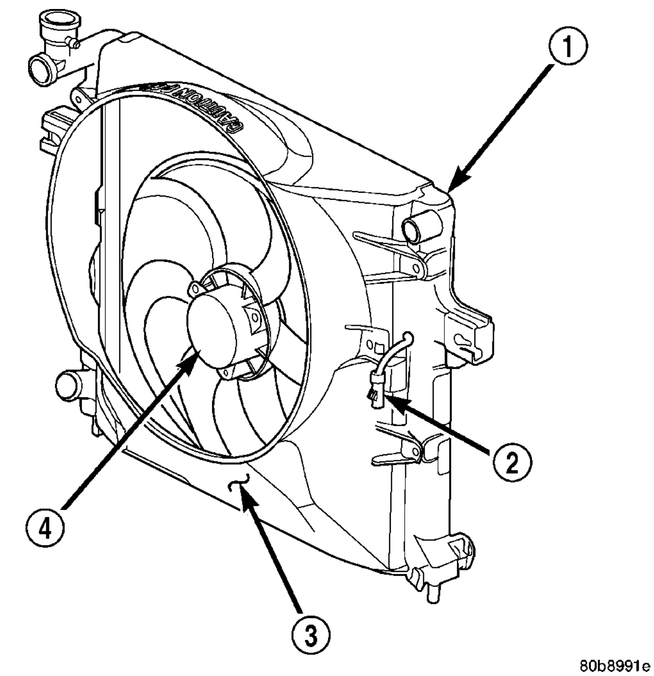

Fig. 25 Radiator Cooling Fan - Typical

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - ELECTRIC COOLING FAN

OPERATION

The electric radiator cooling fan is controlled by the Powertrain Control Module (PCM) through the radiator cooling fan relay. The PCM regulates fan operation based on input from the engine coolant temperature sensor, battery temperature sensor,air conditioning select switch and vehicle speed.

The fan is not energized during engine cranking regardless of the electrical input from the temperature sensors and ,air conditioning switch. However, if engine operation conditions warrant fan engagement, the fan will run once engine starts.

On vehicles NOT equipped with AC: The relay is energized when the coolant temperature is above 80° C (176° F), or battery temperature sensor above – 12° C (10° F). It will then de-energize when coolant temperature drops below 82° C (180° F), or batter temperature sensor below – 9° C (16° F).

Vehicles Equipped with AC: In addition to using coolant temperature and battery temperature sensor to control cooling fan operation, the cooling fan will also be engaged when the ,air conditioning system is activated. The relay is also energized when, air conditioning is selected and coolant temperature is above 95° C (203° F), or , air conditioning is selected and battery temperature sensor is above 41° C (106° F). It will then de-energize when , air conditioning is selected and coolant temperature is below 92° C (198° F), or , air conditioning is selected and battery temperature is below 38° C (100° F).

REMOVAL

REMOVAL

If the fan blade is bent, warped, cracked or damaged in any way, it must be replaced **only** with a replacement fan blade. **Do not attempt to repair a damaged fan blade.**

NOTE: For 3.7L Heavy Duty/Max Cool/Trailer Tow cooling package, the viscous fan cannot be removed seperate from the shroud. Both fan and shroud must be removed together.

(1) Disconnect battery negative cable.

(2) Using special tool 6958 spanner wrench and 8346 adapters, remove the viscous fan from the water pump (Fig. 26).

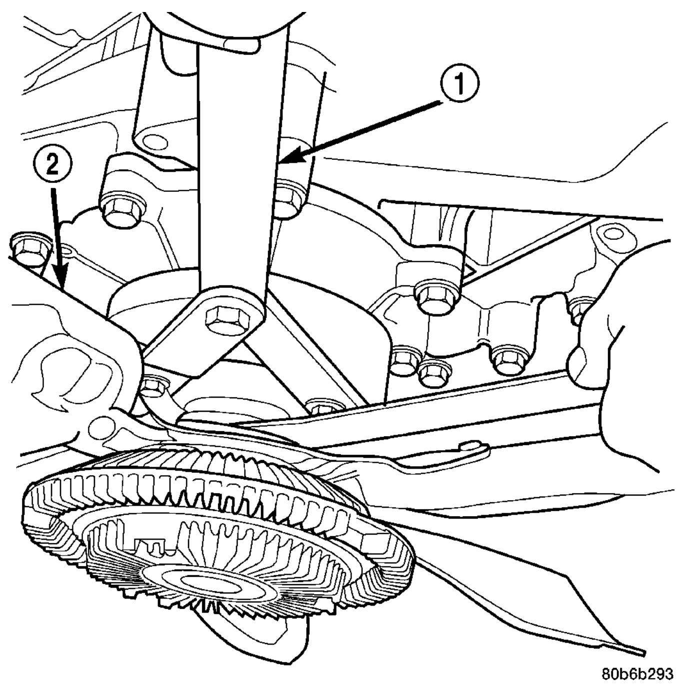

Fig. 26 Viscous Fan and Fan Drive 3.7L

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

(3) Gently lay fan into shroud.

RADIATOR FAN - ELECTRIC (Continued)

(4) Disconnect the electrical connector for the electric fan, then disconnect connector from shroud.

(5) Remove the two fan shroud mounting bolts connecting the fan shroud to the radiator (Fig. 27).

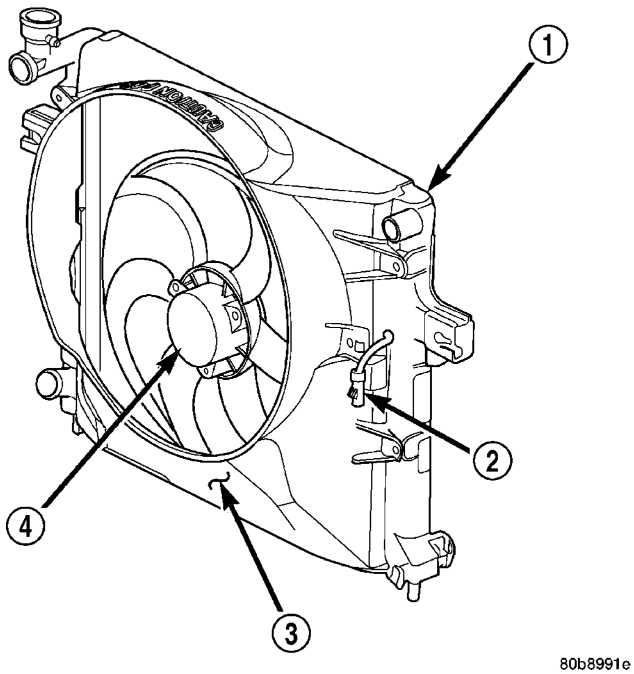

Fig. 27 Radiator Cooling Fan - Typical

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - ELECTRIC COOLING FAN

(6) Remove the shroud and fan from the vehicle.

REMOVAL

(1) Gently lay fan into shroud.

(2) Disconnect the electrical connector for the electric fan, then disconnect connector from shroud.

(3) Remove the two fan shroud mounting bolts connecting the fan shroud to the radiator (Fig. 28).

(4) Remove the shroud and fan from the vehicle.

INSTALLATION

INSTALLATION

NOTE: For 3.7L Heavy Duty/Max Cool/Trailer Tow cooling package, the viscous fan cannot be installed seperate from the shroud. Both fan and shroud must be installed together.

(1) Gently lay viscous fan into shroud.

(2) Install fan shroud assembly into the vehicle. Tighten fan shroud to radiator bolts to (5.5 N·m (50 in. lbs.).

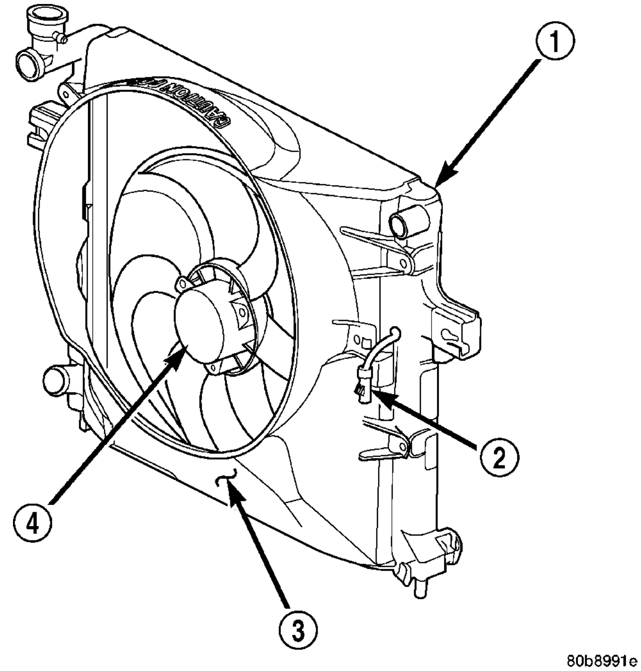

Fig. 28

(3) Using special tool 6958 spanner wrench and 8346 adapters, install the viscous fan on the water pump.

(4) Connect fan motor wire connector to harness connector, and attach connector to shroud.

(5) Connect battery negative cable.

(6) Start engine and check fan operation.

INSTALLATION

(1) Install fan shroud assembly into the vehicle. Tighten fan shroud to radiator bolts to (5.5 N·m (50 in. lbs.).

(2) Connect fan motor wire connector to harness connector, and attach connector to shroud.

(3) Connect battery negative cable.

(4) Start engine and check fan operation.

RADIATOR - FAN - VISCOUS

DESCRIPTION

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

RADIATOR - FAN - VISCOUS (Continued)

The thermal viscous fan drive (Fig. 29) is a silicone-fluid-filled coupling used to connect the fan blades to the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

On the 3.7L engine, an electric fan is standard and the viscous fan is added on for trailer tow packages only.

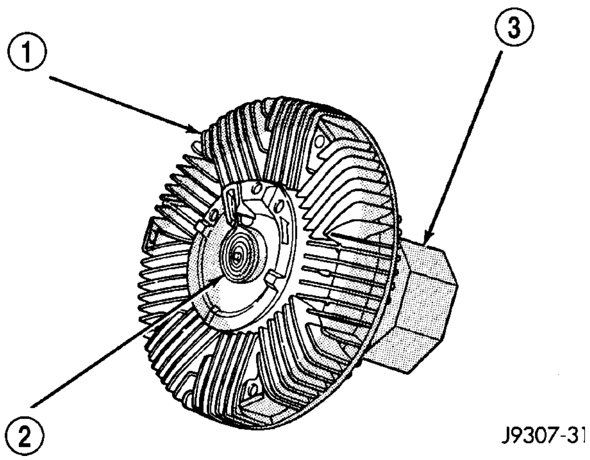

Fig. 29 Viscous Fan Drive - Typical

1 - VISCOUS FAN DRIVE
2 - THERMOSTATIC SPRING
3 - MOUNTING NUT TO WATER PUMP HUB

OPERATION

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit. This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, **the fan will remain at a reduced rpm regardless of engine speed. Normally less than three hundred (300) rpm.**

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

DIAGNOSIS AND TESTING - VISCOUS FAN DRIVE

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18° to 105°C (0° to 220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 93° C (200° F). Fan drive **engagement** should have started to occur at between 91° to 96° C (195° to 205° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 93° C (200° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 62° to 85° C (145° to 185° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

REMOVAL

(1) Disconnect negative battery cable from battery.

NOTE: The thermal viscous fan drive/fan blade assembly is attached (threaded) to water pump hub shaft.

(2) Remove the accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove fan blade/viscous fan drive assembly from water pump using special tool 6958 spanner

wrench and 8346 adapters, by turning mounting nut counterclockwise as viewed from front (Fig. 30). Threads on viscous fan drive are **RIGHT HAND.**

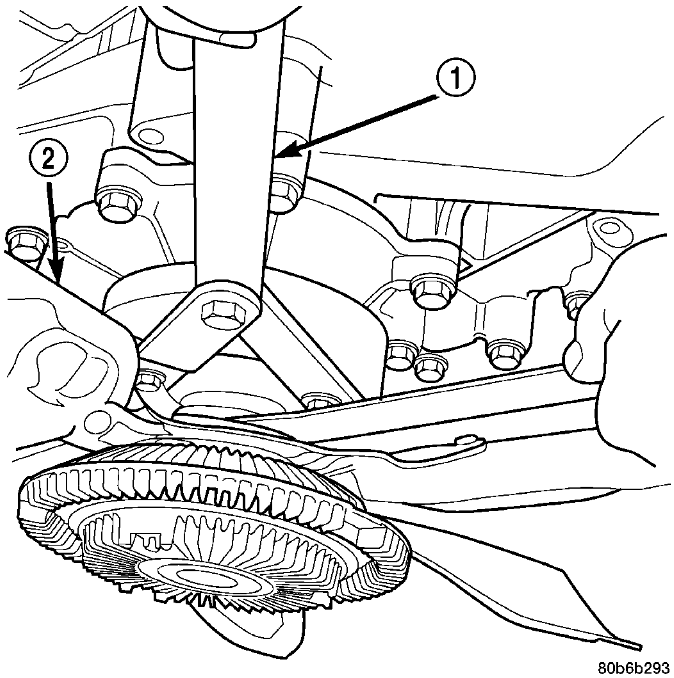

Fig. 30 Viscous Fan and Fan Drive 3.7L

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

(4) Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

(5) Do not unbolt fan blade assembly from viscous fan drive at this time.

(6) Remove fan shroud to radiator bolts.

(7) Remove fan shroud and fan blade/viscous fan drive assembly as a complete unit from vehicle.

(8) After removing fan blade/viscous fan drive assembly, **do not** place viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.

CAUTION: Do not remove water pump pulley-to-water pump bolts. This pulley is under belt tension.

(9) Remove four bolts securing fan blade assembly to viscous fan drive.

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF FAN IS NOT WITHIN SPECIFICATIONS.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

(1) Remove fan blade assembly from viscous fan drive unit (four bolts).

(2) Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.

(3) Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

NOTE: The viscous fan and fan shroud must be installed as an assembly.

(2) Gently lay viscous fan into fan shroud.

(3) Install the fan shroud to radiator mounting bolts, torque bolts to (5.5N·M or 50 in·lbs).

(4) Thread the fan and fan drive onto the water pump pulley, and tighten nut using special tool 6958 spanner wrench and 8346 adapters.

(5) Install accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) for correct belt routing.

THERMOSTAT HOUSING

REMOVAL

(1) Drain cooling system below thermostat housing level (Refer to 7 - COOLING - STANDARD PROCEDURE).

THERMOSTAT HOUSING (Continued)

(2) Remove thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).
(3) Disconnect engine coolant temperature sensor.
(4) Disconnect heater supply hose.
(5) Remove housing attaching bolts (Fig. 31).
(6) Remove housing and gasket (Fig. 31).

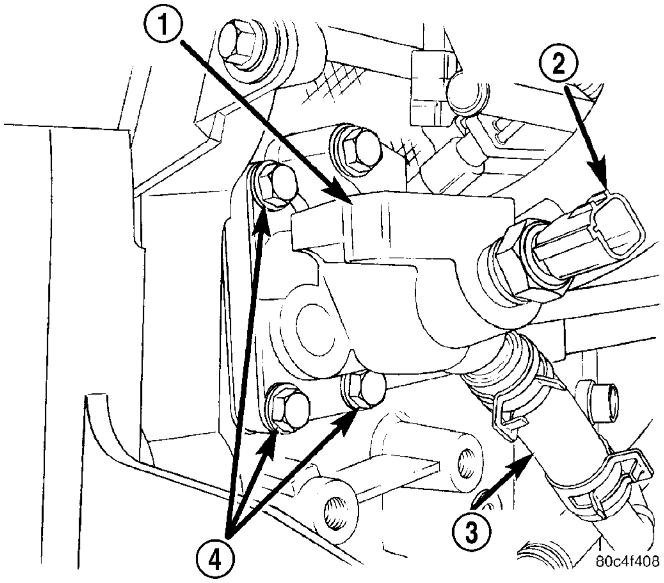

Fig. 31 Thermostat Housing

1 - THERMOSTAT HOUSING
2 - COOLANT TEMPERATURE SENSOR
3 - HOSE-HEATER SUPPLY
4 - BOLTS

INSTALLATION

(1) Clean all gasket sealing surfaces.
(2) Install gasket and housing (Fig. 31). Tighten bolts to 28 N·m (20 ft. lbs.).
(3) Connect engine coolant temperature sensor.
(4) Install thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION).
(5) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

WATER PUMP - 2.4L

DESCRIPTION

The water pump has a cast aluminum body and housing with a stamped steel impeller. The water pump bolts directly to the block (Fig. 32). The cylinder block to water pump seal is provided by a rubber O-ring. The water pump is driven by the engine timing belt.

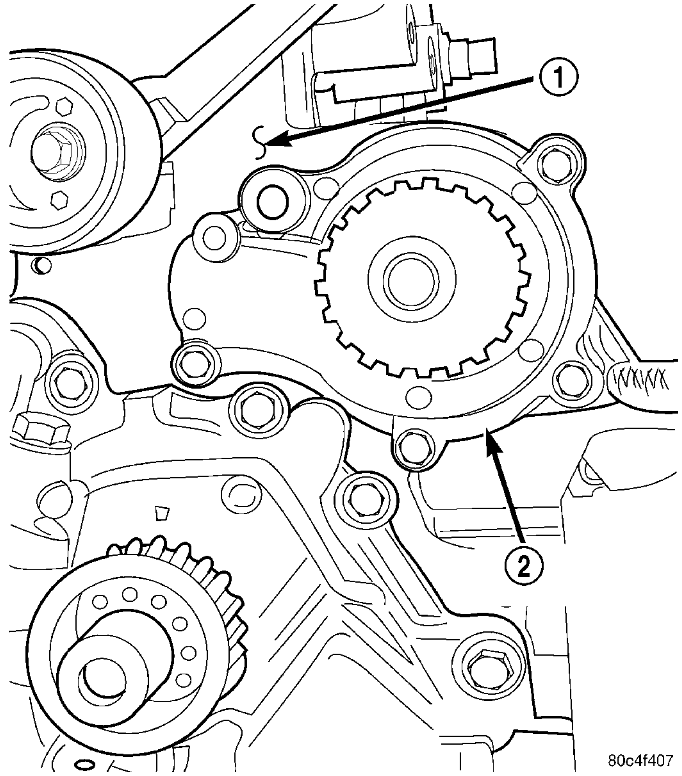

Fig. 32 Water Pump

1 - CYLINDER BLOCK
2 - WATER PUMP

OPERATION

The water pump is the heart of the cooling system. The coolant is pumped through the engine block, cylinder head, heater core, and radiator.

REMOVAL - 2.4L ENGINE

(1) Disconnect negative cable from battery.
(2) Raise vehicle on a hoist.
(3) Remove the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(4) Remove the belt tensioner.
(5) Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(6) Remove the generator.
(7) Remove the power steering pump.
(8) Remove the A/C compressor.
(9) Remove the accessory drive bracket.
(10) Remove the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKET(S) - REMOVAL).
(11) Remove timing belt idler pulley.
(12) Hold camshaft sprocket with Special tool C-4687 and adaptor C-4687-1 while removing bolt. Remove both cam sprockets.

WATER PUMP - 2.4L (Continued)

(13) Remove the timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).

(14) Remove water pump to engine attaching screws (Fig. 33).

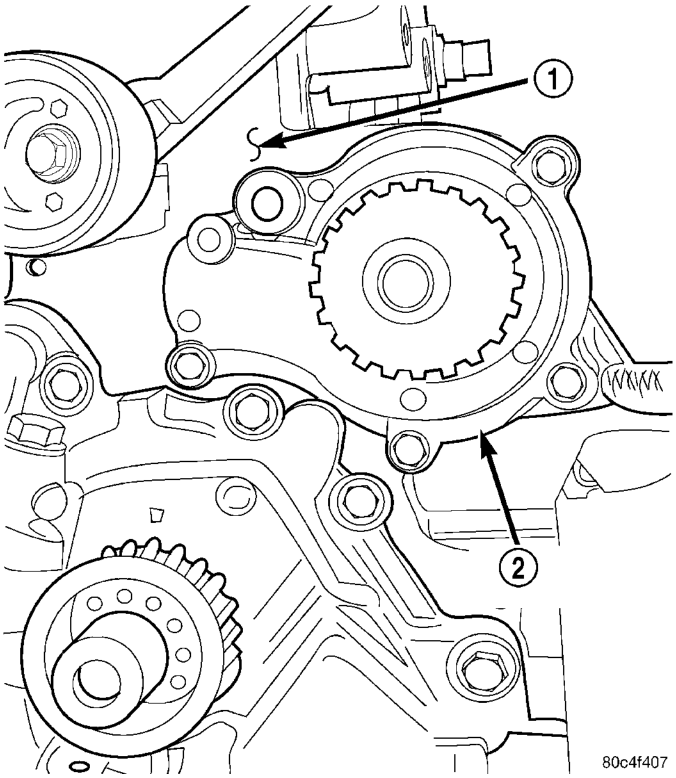

Fig. 33 Water Pump - 2.4L

1 - CYLINDER BLOCK
2 - WATER PUMP

INSPECTION

Replace water pump body assembly if it has any of these defects:

(1) Cracks or damage on the body.

(2) Coolant leaks from the shaft seal, evident by wet coolant traces on the pump body.

(3) Loose or rough turning bearing.

(4) Impeller rubs either the pump body or the engine block.

(5) Impeller loose or damaged.

(6) Sprocket or sprocket flange loose or damaged.

INSTALLATION - 2.4L ENGINE

(1) Install new O-ring gasket in water pump body O-ring locating groove (Fig. 34).

CAUTION: Make sure O-ring is properly seated in water pump groove before tightening screws. An improperly located O-ring may be damaged and cause a coolant leak.

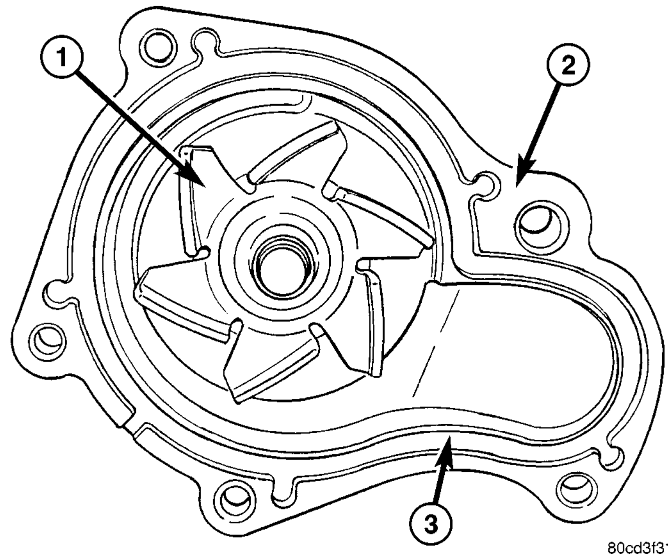

Fig. 34 Water Pump Body

1 - IMPELLER
2 - WATER PUMP BODY
3 - O-RING LOCATING GROOVE

(2) Assemble pump body to block and tighten screws to 12 N·m (105 in. lbs.). Pressurize cooling system to 103.4 Kpa (15 psi) with pressure tester and check water pump shaft seal and O-ring for leaks.

(3) Rotate pump by hand to check for freedom of movement.

(4) Install the timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(5) Install camshaft sprockets and target ring. Torque bolts to 101 N·m (75 ft. lbs.) while holding camshaft sprocket with Special tool C-4687 and adaptor C-4687-1.

(6) Install timing belt idler pulley and torque mounting bolt to 61 N·m (45 ft. lbs.).

(7) Install the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKET(S) - INSTALLATION).

(8) Install the accessory drive mounting bracket (Fig. 35).

(9) Install the power steering pump.

(10) Install the generator.

(11) Install the A/C compressor.

(12) Install the belt tensioner.

(13) Install the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(14) Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(15) Lower vehicle and connect battery cable.

WATER PUMP - 2.4L (Continued)

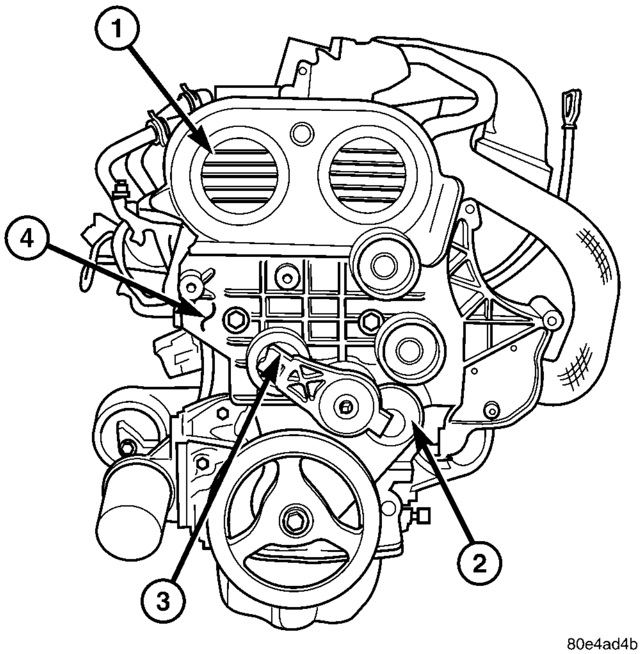

Fig. 35 ACCESSORY DRIVE BRACKET

1- UPPER TIMING BELT COVER
2- LOWER TIMING BELT COVER
3- BELT TENSIONER
4- ACCESSORY DRIVE BRACKET

WATER PUMP - 3.7L

DESCRIPTION

DESCRIPTION - WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a single serpentine drive belt.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

Both heater hoses are connected to fittings on the timing chain front cover. The water pump is also mounted directly to the timing chain cover and is equipped with a non serviceable integral pulley (Fig. 36).

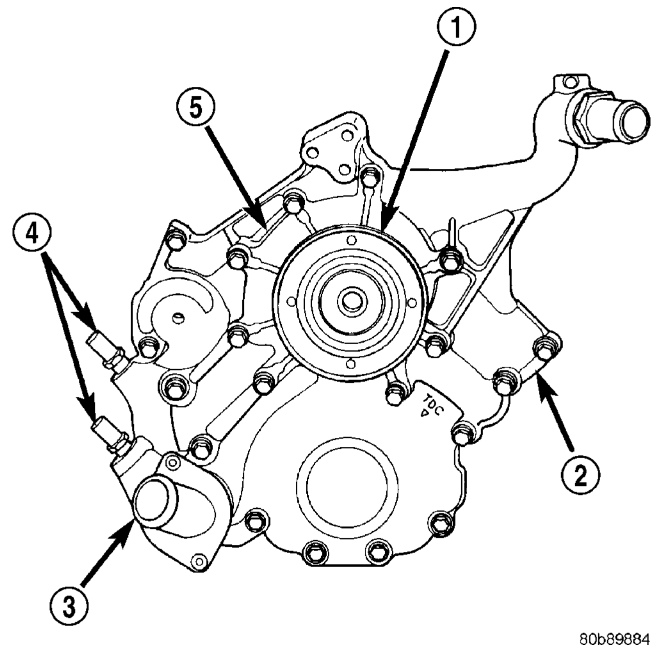

Fig. 36 Water Pump and Timing Chain Cover

1 - INTEGRAL WATER PUMP PULLEY
2 - TIMING CHAIN COVER
3 - THERMOSTAT HOUSING
4 - HEATER HOSE FITTINGS
5 - WATER PUMP

DESCRIPTION - WATER PUMP BYPASS

The 3.7L engine uses an internal water/coolant bypass system. The design uses galleries in the timing chain cover to circulate coolant during engine warm-up preventing the coolant from flowing through the radiator. The thermostat uses a stub shaft located at the rear of the thermostat to control flow through the bypass gallery.

OPERATION - WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core, this coolant absorbs the heat generated when the engine is running. The pump is driven by the engine crankshaft via a drive belt.

REMOVAL

REMOVAL

The water pump on 3.7L engines is bolted directly to the engine timing chain case cover.

(1) Disconnect negative battery cable from battery.

WATER PUMP - 3.7L (Continued)

(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove fan/viscous fan drive assembly from water pump (Fig. 37) (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL). Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

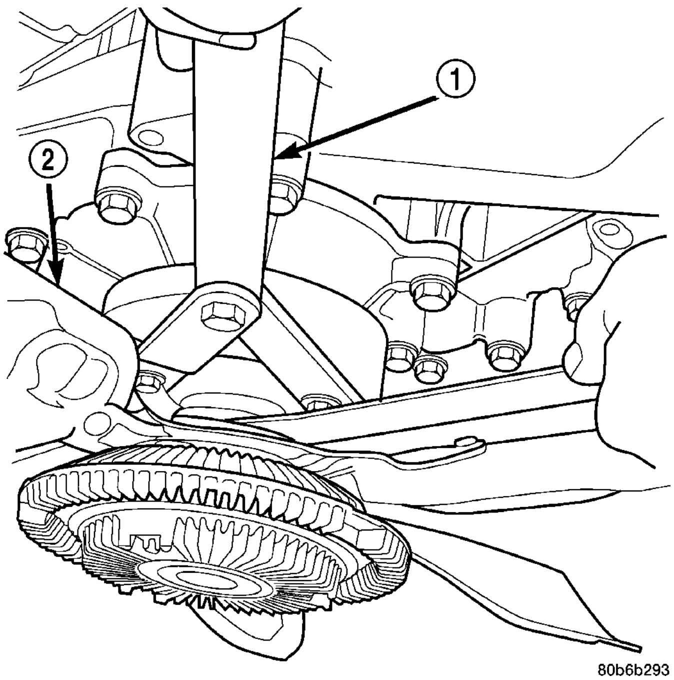

Fig. 37 Viscous Fan and Fan Drive 3.7L

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only an original equipment clamp with matching number or letter.

(4) If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.

(5) Remove two fan shroud-to-radiator screws, Disconnect the coolant overflow hose.

(6) Remove upper fan shroud and fan blade/viscous fan drive assembly from vehicle.

(7) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(8) Remove accessory drive belt (Fig. 38) (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

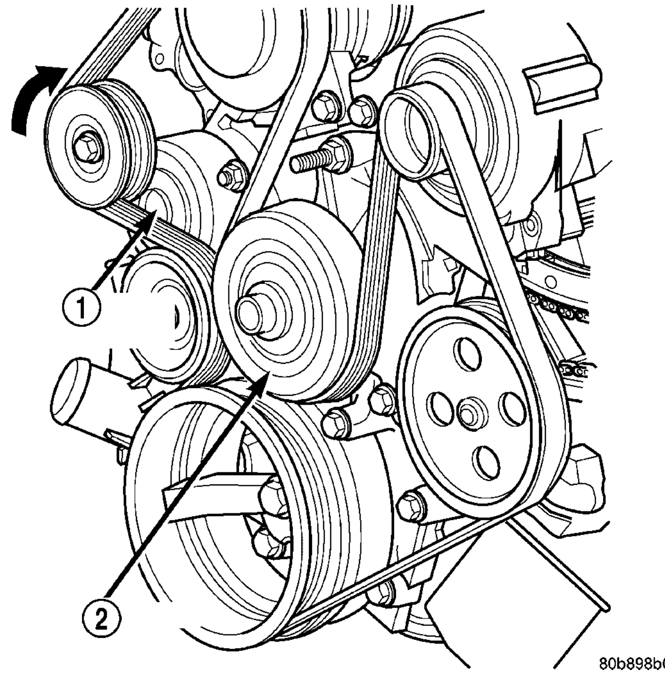

Fig. 38 Automatic Belt Tensioner—3.7L

1 - AUTOMATIC TENSIONER
2 - WATER PUMP PULLEY

(9) Remove lower radiator hose clamp and remove lower hose at water pump.

(10) Remove seven water pump mounting bolts and one stud bolt.

CAUTION: Do not pry water pump at timing chain case/cover. The machined surfaces may be damaged resulting in leaks.

(11) Remove water pump and gasket. Discard gasket.

REMOVAL — 2.4L

(1) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(3) Remove camshaft sprockets and rear timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

WATER PUMP - 3.7L (Continued)

(4) Remove screws attaching water pump to engine. Remove pump (Fig. 39).

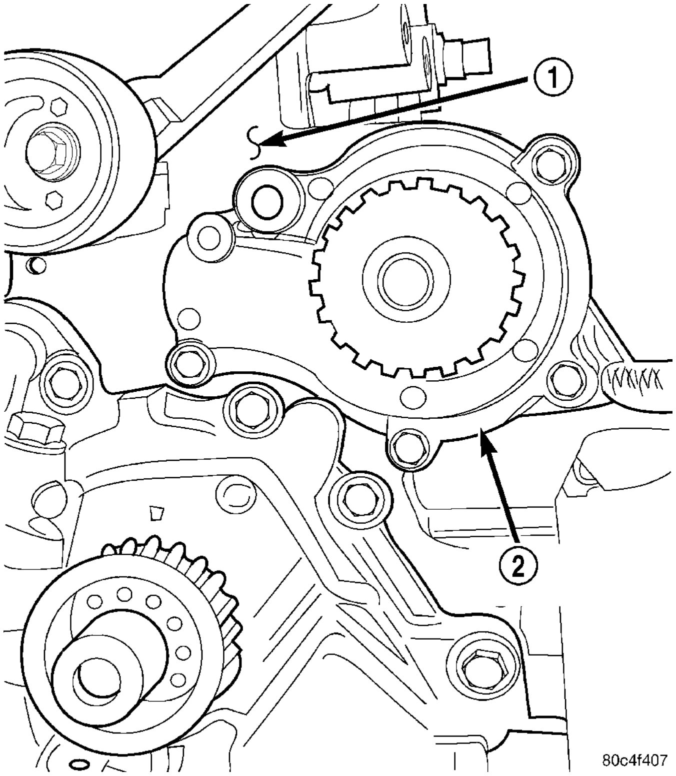

Fig. 39 Water Pump

1 - CYLINDER BLOCK
2 - WATER PUMP

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

INSPECTION

Inspect the water pump assembly for cracks in the housing, Water leaks from shaft seal, Loose or rough turning bearing or Impeller rubbing either the pump body or timing chain case/cover.

INSTALLATION

INSTALLATION

The water pump on 3.7L engines is bolted directly to the engine timing chain case cover.

(1) Clean gasket mating surfaces.

(2) Using a new gasket, position water pump and install mounting bolts as shown. (Fig. 40). Tighten water pump mounting bolts to 54 N·m (40 ft. lbs.) torque.

(3) Spin water pump to be sure that pump impeller does not rub against timing chain case/cover.

(4) Connect radiator lower hose to water pump.

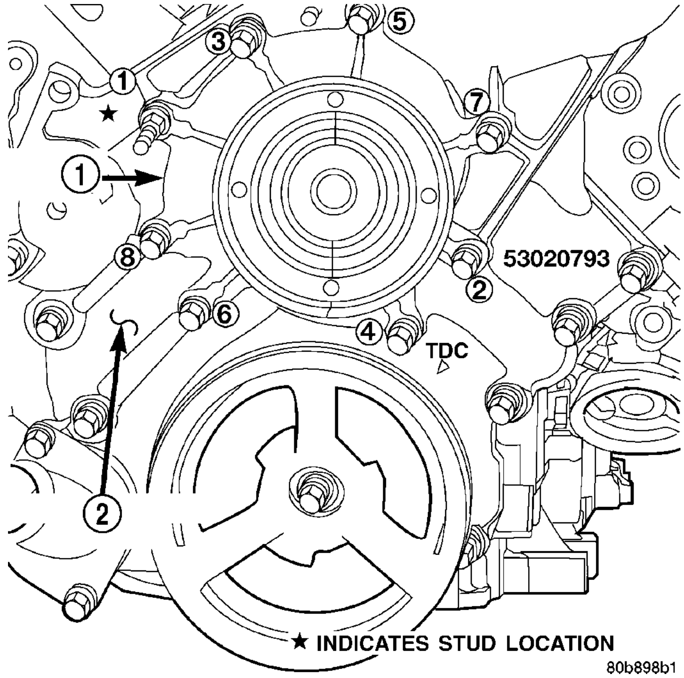

Fig. 40 Water Pump Installation—3.7L

1 - WATER PUMP
2 - TIMING CHAIN COVER

(5) Relax tension from belt tensioner. Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

CAUTION: When installing the serpentine accessory drive belt, belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction. Refer to (Fig. 41) for correct belt routing. Or, refer to the Belt Routing Label located in the engine compartment. The correct belt with correct length must be used.

(6) Position upper fan shroud and fan blade/viscous fan drive assembly.

(7) Be sure the upper and lower portions of the fan shroud are firmly connected. All air must flow through the radiator.

(8) Install two fan shroud-to-radiator screws.

(9) Be sure of at least 25 mm (1.0 inches) between tips of fan blades and fan shroud.

(10) Install fan blade/viscous fan drive assembly to water pump shaft (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).

(11) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(12) Connect negative battery cable.

(13) Start and warm the engine. Check for leaks.

WATER PUMP - 3.7L (Continued)

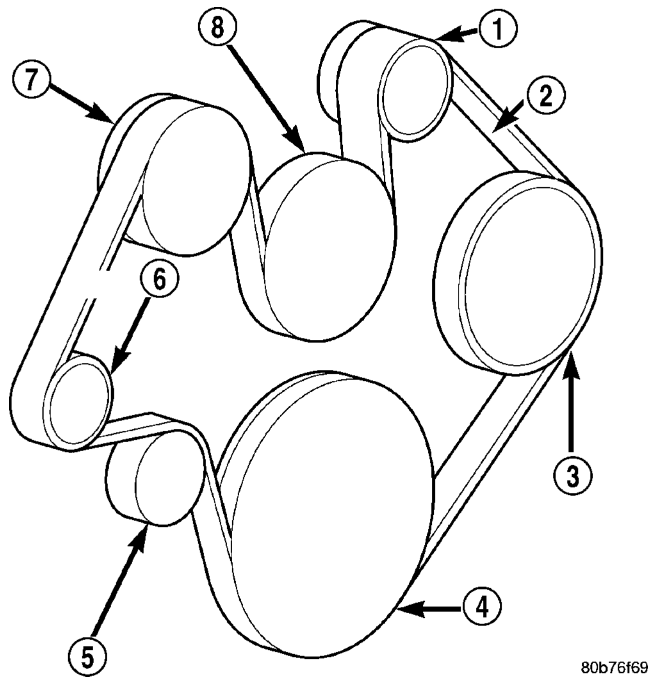

Fig. 41 Belt Routing 3.7L

1 - GENERATOR PULLEY
2 - ACCESSORY DRIVE BELT
3 - POWER STEERING PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - IDLER PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - WATER PUMP PULLEY

INSTALLATION

(1) Apply Mopar® Dielectric Grease to new O-ring before installation (Fig. 42).

(2) Install O-ring gasket in water pump body groove (Fig. 42).

CAUTION: Make sure O-ring gasket is properly seated in water pump groove before tightening screws. An improperly located O-ring may cause damage to the O-ring, resulting in a coolant leak.

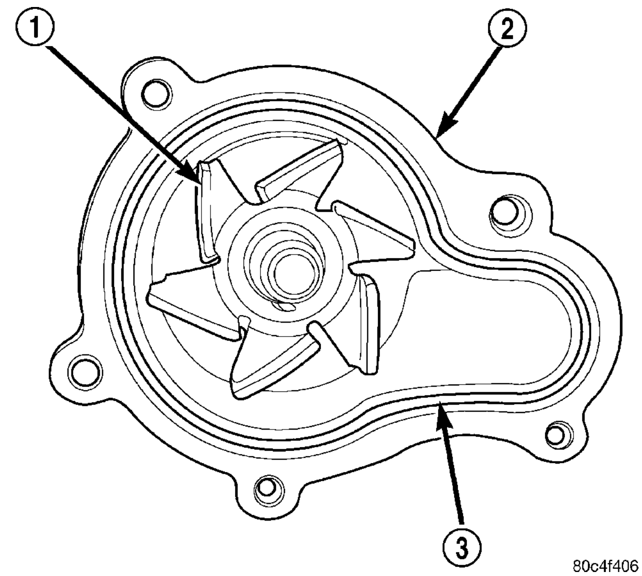

Fig. 42 Water Pump Body

1 - IMPELLER
2 - WATER PUMP BODY
3 - O-RING

(3) Assemble pump body to block (Fig. 39) and tighten screws to 12 N·m (105 in. lbs.).

(4) Rotate pump by hand to check for freedom of movement.

(5) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE). Pressurize cooling system to 103 Kpa (15 psi) with pressure tester and check water pump shaft seal and O-ring for leaks.

(6) Install rear timing belt cover and camshaft sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(7) Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

TRANSMISSION

TABLE OF CONTENTS

TRANS COOLER

DESCRIPTION

An internal high capacity/high efficiency cooler is used on all vehicles, these coolers are an oil-to-coolant type, which consists of plates mounted in the radiator outlet tank.Because the internal oil cooler is so efficient, no auxiliary oil cooler is offered. The cooler is not serviceable separately from the radiator.

AUDIO

TABLE OF CONTENTS

AUDIO

DESCRIPTION

The audio system is standard factory-installed equipment on this model. Several combinations of radio receivers and speaker systems are offered on this model. The audio system uses an ignition switched source of battery current so that the system will only operate when the ignition switch is in the RUN or ACCESSORY positions.

The audio system includes the following components:

- Amplifier choke and relay (with premium speaker system only)
- Antenna
- Compact disc changer (if equipped)
- Power amplifier mounted to each front door speaker (with premium speaker system only)
- Radio noise suppression components
- Radio receiver
- Remote radio switches (if equipped)
- Speakers

Certain functions and features of the audio system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communication Interface (PCI) bus network. The data bus network allows the sharing of sensor information. For diagnosis of these electronic modules or of the data bus network, the use of a DRB III® scan tool and the proper Diagnostic Procedures manual are recommended.

AUDIO (Continued)

Refer to the appropriate wiring information for complete standard and premium audio system circuit diagrams. The wiring information includes proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices, and grounds.

OPERATION

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signals in both the Amplitude Modulating (AM) and Frequency Modulating (FM) commercial frequency ranges.

The audio system components operate on battery current received through a fuse in the Junction Block (JB) on a fused ignition switch output (run-acc) circuit so that the system will only operate when the ignition switch is in the Run or Accessory positions.

On vehicles that are equipped with the optional remote radio switches, the Body Control Module (BCM) receives hard wired resistor multiplexed inputs from the remote radio switches. The programming in the BCM allows it to process those inputs and send the proper messages to the radio receiver over the Programmable Communication Interface (PCI) bus network to control the radio volume up or down, station seek up or down, preset station advance, and mode advance functions.

Refer to the owner's manual for more information on the features, use and operation of each of the available audio systems.

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

AUDIO (Continued)

AUDIO SYSTEM DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO	1. Fuse faulty.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for shorted or open wires. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. Refer to appropriate Diagnostic Service Manual.
	6. Speakers faulty.	6. Replace speaker as necessary.
	7. Choke and relay faulty	7. Replace choke and relay as necessary.
NO RADIO DISPLAY	1. Fuse faulty.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. Refer to appropriate Diagnostic Service Manual.
CLOCK WILL NOT KEEP SET TIME	1. Fuse faulty.	1. Check Ignition-Off Draw (IOD) fuse in the Junction Block (JB). Replace fuse, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. Refer to appropriate Diagnostic Service Manual.
POOR RADIO RECEPTION	1. Antenna faulty.	1. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - DIAGNOSIS AND TESTING).
	2. Radio ground faulty.	2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	3. Radio noise suppression faulty.	3. Repair or replace ground strap as necessary.
	4. Radio faulty.	4. Refer to appropriate Diagnostic Service Manual.

AUDIO (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO/POOR TAPE OPERATION	1. Faulty tape.	1. Insert known good tape and test operation.
	2. Foreign objects behind tape door.	2. Remove foreign objects and test operation.
	3. Dirty cassette tape head.	3. Clean head with Mopar Cassette Head Cleaner.
	4. Faulty tape deck.	4. Exchange or replace radio, if required.
NO COMPACT DISC OPERATION	1. Faulty CD.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. Faulty CD player.	4. Refer to appropriate Diagnostic Service Manual.

AMPLIFIER CHOKE AND RELAY

DESCRIPTION

Models equipped with the premium speaker package have a amplifier choke and relay. The amplifier choke and relay is mounted to the lower instrument panel above the pedals and towards the instrument panel center stack.

The amplifier choke and relay should be checked if there is no sound output from the speakers. The amplifier choke and relay can not be repaired or adjusted and, if faulty or damaged, the unit must be replaced.

OPERATION

The amplifier choke and relay is used to control the supply of fused battery current to the front door speaker-mounted dual amplifiers. The speaker relay is energized by a fused 12 volt output from the radio receiver whenever the radio is turned on. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - AMPLIFIER CHOKE AND RELAY

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

The amplifier choke and relay is used to switch power to the individual speaker amplifiers used with the premium speaker package. The amplifier choke and relay is serviced only as a unit. If all of the speakers are inoperative the amplifier choke and relay should be inspected. Before replacement, make the following inspections of the amplifier choke and relay circuits. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the battery as required.

(3) Disconnect the instrument panel wire harness connector from the amplifier choke and relay. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the amplifier choke and relay. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

(4) Probe the ground circuit cavity of the instrument panel wire harness connector for the amplifier choke and relay. Check for continuity to a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Turn the ignition switch to the RUN position and turn the radio ON. Check for battery voltage at the radio 12-volt output circuit cavity of the instrument panel wire harness connector for the amplifier choke and relay. If OK, go to Step 6. If not OK, repair the open radio 12-volt output circuit to the radio as required.

AMPLIFIER CHOKE AND RELAY (Continued)

(6) Turn the radio and ignition switches to the OFF position. Reconnect the instrument panel wire harness connector to the amplifier choke and relay. Check for battery voltage at the amplified speaker (+) circuit cavity of the instrument panel wire harness connector for the amplifier choke and relay. There should be zero volts. Turn the ignition and radio switches to the ON position. There should now be battery voltage. If OK, repair the open amplified speaker (+) circuits to the speaker-mounted amplifiers as required. If not OK, replace the faulty amplifier choke and relay.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove knee blocker cover and knee blocker.

(3) Disconnect the electrical harness connector from the amplifier choke and relay (Fig. 1).

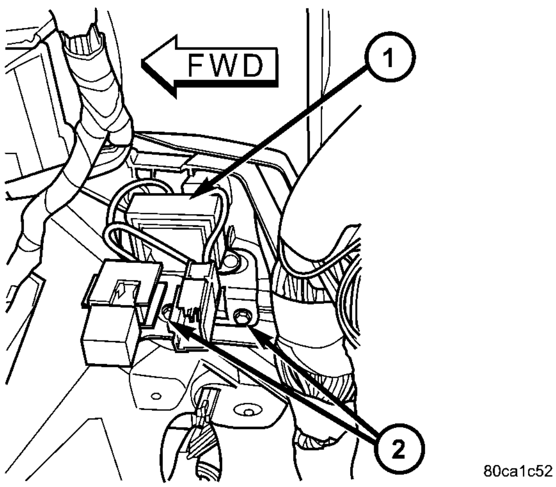

Fig. 1 RADIO CHOKE

1 - RADIO CHOKE
2 - MOUNTING SCREWS

(4) Remove mounting screws and amplifier choke and relay.

INSTALLATION

(1) Install the amplifier choke and relay.

(2) Install the mounting screws.

(3) Connect the electrical harness connector.

(4) Install knee blocker cover and knee blocker.

(5) Connect the battery negative cable.

ANTENNA BODY & CABLE

DESCRIPTION

DOMESTIC

The antenna body and cable is secured below the fender panel by the antenna cap nut through a mounting hole in the side of the right front fender. The primary coaxial antenna cable is then routed beneath the fender sheet metal and through a entry hole in the right cowl side panel into the interior of the vehicle. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right kick panel. The instrument panel antenna cable is then routed behind the instrument panel to the back of the radio.

EXPORT

The primary coaxial antenna cable is routed behind the A-pillar trim, up the right side of the roof panel beneath the headliner. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the A-pillar trim at one end. At the other end, the cable is connected to the antenna module. The instrument panel antenna cable is then routed behind the instrument panel to the back of the radio.

OPERATION

The antenna body and cable connects the antenna mast (domestic) or quarter glass integral antenna (export) to the radio. The radio antenna is an electromagnetic circuit component used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast. The antenna body transfers the weak electromagnetic radio waves induced into the antenna into the center conductor of the flexible primary antenna coaxial cable. The braided outer shield of the antenna coaxial cable is grounded through both the antenna body and the radio chassis, effectively shielding the radio waves as they are conducted to the radio. The radio then tunes and amplifies the weak radio signals into stronger electrical signals in order to operate the audio system speakers.

ANTENNA BODY & CABLE (Continued)

DIAGNOSIS AND TESTING - ANTENNA BODY AND CABLE

The following four tests are used to diagnose the antenna with an ohmmeter:

- **Test 1** - Mast to ground test
- **Test 2** - Tip-of-mast to tip-of-conductor test
- **Test 3** - Body ground to battery ground test
- **Test 4** - Body ground to antenna coaxial cable shield test.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The ohmmeter test lead connections for each test are shown in the illustration (Fig. 2).

NOTE: This model has a two-piece antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate an antenna cable problem. First, test the primary antenna cable (integral to the antenna body and cable) from the coaxial cable connector behind the right side kick panel to the antenna body. Then, test the secondary antenna cable (instrument panel antenna cable) from the coaxial cable connector behind the right side kick panel to the coaxial cable connector at the radio.

TEST 1

Test 1 determines if the antenna mast is insulated from ground. Proceed as follows:

(1) Disconnect and isolate the antenna coaxial cable connector behind the right side kick panel.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to known ground. Check the ohmmeter reading for continuity.

(3) There should be no continuity. If OK, go to Test 2. If not OK, replace the faulty antenna body and cable.

TEST 2

Test 2 checks the antenna conductor components for an open circuit. This test should be performed first on the entire antenna circuit, from the antenna mast to the center conductor of the coaxial cable connector at the radio. If an open circuit is detected, each of the three antenna conductor components (antenna mast, antenna body and cable, instrument panel antenna cable) should be isolated and tested individually to locate the exact component that is the source of the open circuit. To begin this test, proceed as follows:

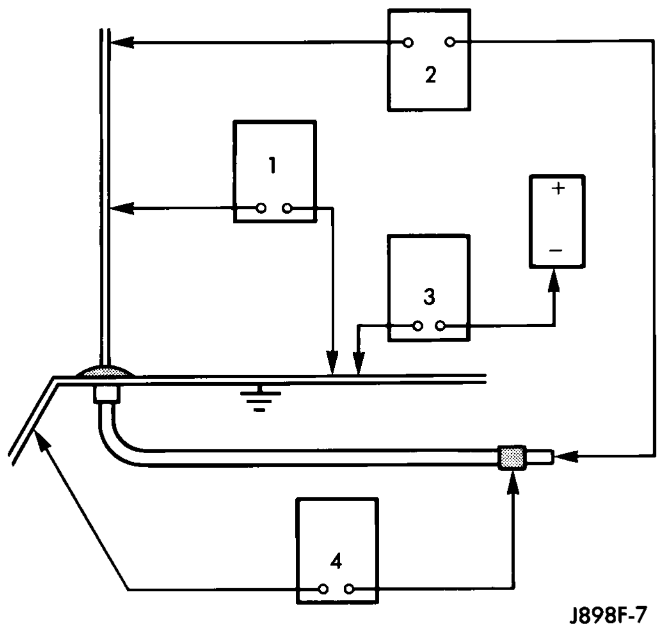

Fig. 2 Antenna Tests - Typical

(1) Disconnect the instrument panel antenna cable coaxial connector from the back of the radio.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the center conductor pin of the instrument panel antenna cable coaxial connector for the radio. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register only a fraction of an ohm resistance. High or infinite resistance indicates a damaged or open antenna conductor. If OK, go to Test 3. If not OK, isolate and test each of the individual antenna conductor components. Replace only the faulty antenna conductor component.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. To begin this test, proceed as follows:

(1) This test must be performed with the battery positive cable disconnected from the battery. Disconnect and isolate both battery cables, negative cable first.

(2) Reconnect the battery negative cable.

(3) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other

ANTENNA BODY & CABLE (Continued)

test lead to the battery negative terminal post. Check the ohmmeter reading for continuity.

(4) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the battery negative terminal and the vehicle body. If OK, go to Test 4. If not OK, check the battery negative cable connection to the vehicle body and the radio noise suppression ground strap connections to the engine and the vehicle body for being loose or corroded. Clean or tighten these connections as required.

TEST 4

Test 4 checks the condition of the connection between the antenna coaxial cable shield and the vehicle body ground as follows:

(1) Disconnect and isolate the antenna coaxial cable connector behind the right side kick panel.

(2) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the outer crimp on the antenna coaxial cable connector. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the antenna body and the vehicle body or between the antenna body and the antenna coaxial cable shield. If not OK, clean the antenna body to fender mating surfaces and tighten the antenna cap nut to specifications.

(4) Check the resistance again with an ohmmeter. If the resistance is still more then one ohm, replace the faulty antenna body and cable.

REMOVAL

DOMESTIC

(1) Disconnect and isolate the battery negative cable.

(2) Remove the antenna mast.

(3) Remove cover (Fig. 3).

(4) Remove mounting nut.

(5) Remove bezel adapter.

(6) Remove right kick panel trim.

(7) Disconnect antenna body and cable from the instrument panel cable. Attach a wire or string (approximately 2 feet in length) to the cable to aid in installation of the new cable.

(8) Remove the upper fender mounting bolts. Loosen the two fender mounting bolts located near the upper door hinge (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - REMOVAL).

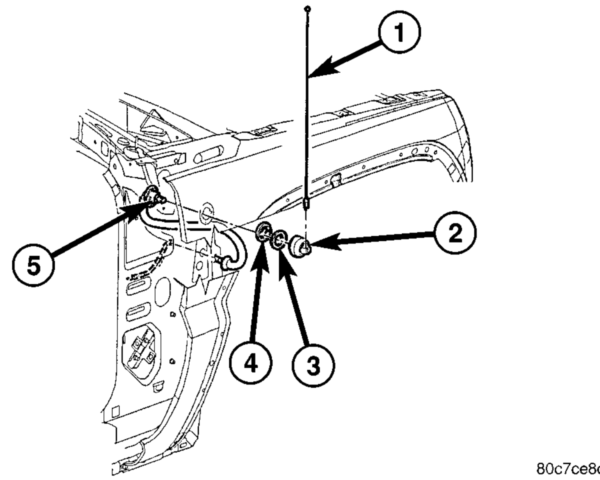

Fig. 3 ANTENNA BODY AND CABLE

1 - ANTENNA MAST
2 - ANTENNA COVER
3 - ANTENNA BASE MOUNTING NUT
4 - ANTENNA BEZEL ADAPTER
5 - ANTENNA BODY AND CABLE

(9) Carefully pull fender out to access the antenna body and cable. Pull cable up through the opening with wire attached.

EXPORT

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the assist handles on the right side of the headliner (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - REMOVAL).

(3) Remove the right side visor (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL).

(4) Remove the A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).

(5) Lower headliner as necessary to access antenna cable (Fig. 4).

(6) Disconnect antenna cable from antenna module.

ANTENNA BODY & CABLE (Continued)

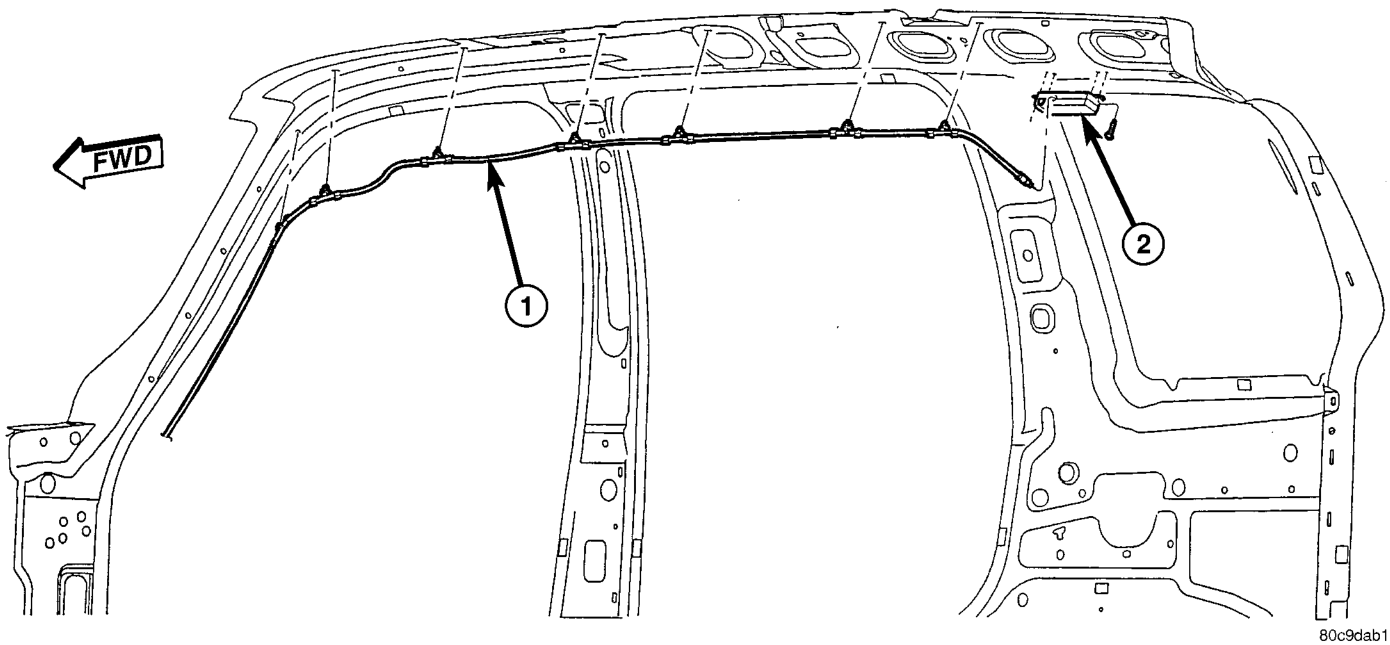

Fig. 4 ANTENNA CABLE

1 -ANTENNA CABLE
2 - ANTENNA MODULE

(7) Remove antenna cable from roof panel by pulling on retaining clips.

(8) Disconnect antenna cable from instrument panel antenna cable by disconnecting the antenna connector.

INSTALLATION

DOMESTIC

(1) Attached wire to new cable. Pull fender out and insert cable into opening.

(2) Pull cable through hole in kick panel area using the attached wire.

(3) Connect antenna body cable to the instrument panel cable.

(4) Install right kick panel trim.

(5) Install bezel adapter.

(6) Install mounting nut. Tighten to 12 N·m (105 in. lbs.).

(7) Install cover.

(8) Install antenna mast. Tighten to 50 N·m (37 ft. lbs.). **Ensure that the antenna mast is fully seated on antenna base and that there is no gap between the mast and base.**

(9) Tighten fender mounting bolts near door hinge area.

(10) Install and tighten the upper fender mounting bolts (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - INSTALLATION).

(11) Connect the battery negative cable.

EXPORT

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Connect antenna cable to the instrument panel antenna cable.

(2) Install antenna cable to the roof panel by pressing retaining clips into position.

(3) Connect antenna cable to the antenna module.

(4) Raise headliner into position.

(5) Install A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(6) Install the right side sunvisor (Refer to 23 - BODY/INTERIOR/SUN VISOR - INSTALLATION).

(7) Install the assist handles (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - INSTALLATION).

(8) Connect the battery negative cable.

ANTENNA MODULE

DESCRIPTION

The antenna module (Fig. 5) is an electromagnetic circuit component designed to capture and enhance radio frequency signals in both the AM and FM broadcast bands. The antenna module is mounted to the right rear roof rail under the headliner. The modules mounting brackets also double as the ground circuit. The module has an electrical connector that connects to the integral radio antenna, located on the right rear quarter glass. There is also an electrical connector for battery voltage and a coax cable connector.

OPERATION

The antenna module receives both AM and FM radio signals supplied by the side window integral radio antenna system and selectively amplifies them. The amplified signal is then sent through the body length coax cable to the radio input.

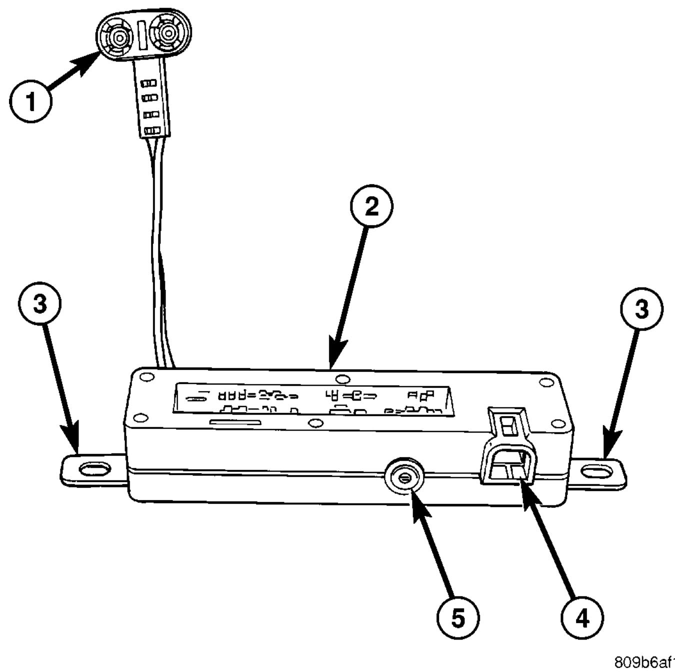

Fig. 5 ANTENNA MODULE - TYPICAL

1 - ANTENNA LEAD CONNECTOR
2 - ANTENNA MODULE
3 - ANTENNA MODULE MOUNT/GROUND BRACKETS
4 - BATTERY SUPPLY CONNECTION POINT
5 - COAX CONNECTION POINT

DIAGNOSIS AND TESTING - ANTENNA MODULE

ANTENNA MODULE DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AM RECEPTION, WEAK FM RECEPTION	1. Antenna module to antenna connector open or disconnected.	1. Repair open, reconnect antenna module connector to glass mounted antenna.
	2. Coax open or disconnected.	2. Repair open, reconnect coax.
	3. No battery power at antenna module.	3. Check fuse. if okay, repair open in battery voltage circuit.
NO AM OR FM RECEPTION	1. Coax disconnected at radio.	1. Reconnect coax.
	2. Coax shorted to ground.	2. Repair or Replace coax
WEAK OR NO AM/FM RECEPTION	1. Antenna Module faulty.	1. Substitute known good module. If reception improves, Antenna Module was faulty.

ANTENNA MODULE (Continued)

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the headliner as necessary to access antenna module.

(3) Disconnect the battery power lead connector from the antenna module.

(4) Disconnect the antenna module connector from the integral antenna (Fig. 6).

(5) Remove the mounting fasteners and the antenna module.

(6) Disconnect the coax lead from the antenna module.

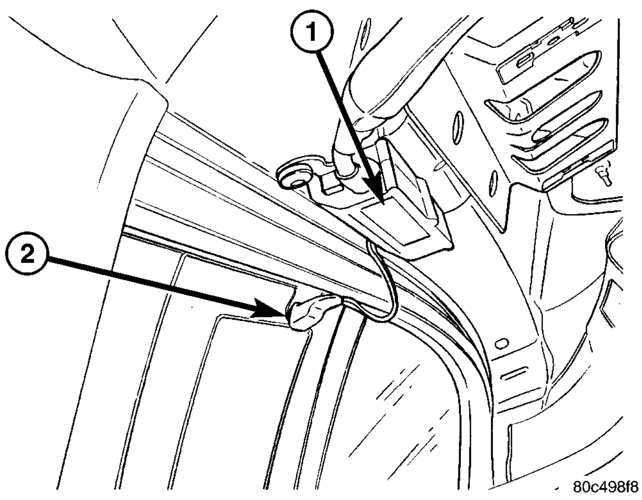

Fig. 6 ANTENNA MODULE

1 - ANTENNA MODULE
2 - ANTENNA MODULE CONNECTOR

INSTALLATION

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Plug coax into antenna module.

(2) Position antenna module onto right side upper roof rail and install screws. Tighten to 2.8 N·m (25 in. lbs.).

(3) Connect antenna module lead to the integral antenna.

(4) Connect battery power supply lead to antenna module.

(5) Install headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

(6) Connect battery negative cable.

CD CHANGER

DESCRIPTION

A factory-installed Compact Disc (CD) changer featuring a six-CD magazine is an available option on this model. The CD changer is mounted in the cargo area of the passenger compartment on the right rear quarter panel.

The controls on the radio receiver operate the CD changer through messages sent over the Programmable Communications Interface (PCI) data bus network. For diagnosis of the messaging functions of the radio receiver and the CD changer, or of the PCI data bus, a DRB scan tool and the proper Diagnostic Procedures manual are required.

The CD changer can only be serviced by an authorized radio repair station. See the latest Warranty Policies and Procedures manual for a current listing of authorized radio repair stations. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

OPERATION

The CD changer will only operate when the ignition switch is in the On or Accessory positions, and the radio is turned on. The six-CD magazine may be ejected with the ignition in the Off position. For more information on the features, loading procedures and radio control functions for the operation of the CD changer, refer to the owner's manual.

CD CHANGER (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the right rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).

(3) Disconnect the electrical wire harness connector (Fig. 7).

(4) Remove the mounting nuts.

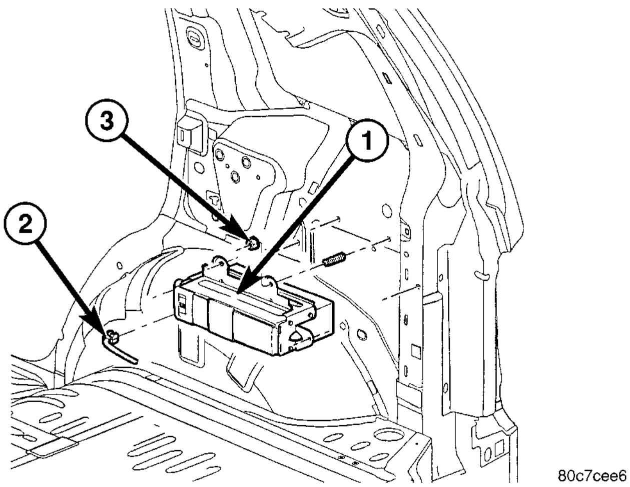

Fig. 7 CD CHANGER

1 - CD CHANGER
2 - WIRE HARNESS CONNECTOR
3 - MOUNTING NUT

(5) Remove the CD Changer from the vehicle.

INSTALLATION

(1) Install the CD Changer to the vehicle.

(2) Install the mounting nuts. Tighten to 11.8 N·m (104 in. lbs.).

(3) Connect the wire harness connector.

(4) Install the right rear quarter trim panel (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).

(5) Connect the battery negative cable.

INSTRUMENT PANEL ANTENNA CABLE

REMOVAL

DOMESTIC

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

(3) Disconnect the antenna cable from radio by pulling the locking antenna connector away from radio (Fig. 8).

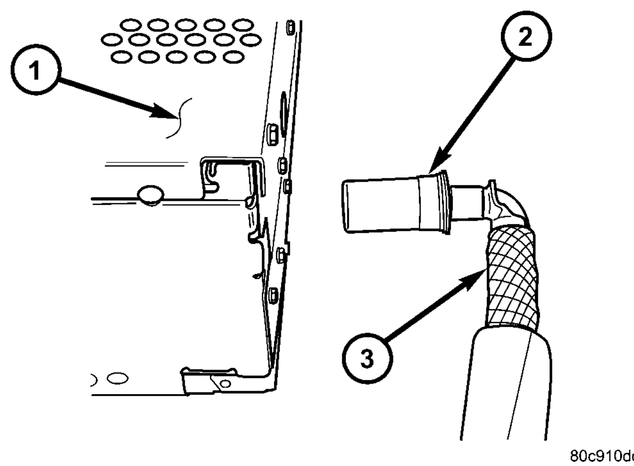

Fig. 8 ANTENNA TO RADIO

1 - RADIO
2 - LOCKING ANTENNA CONNECTOR
3 - INSTRUMENT PANEL ANTENNA CABLE

INSTRUMENT PANEL ANTENNA CABLE (Continued)

(4) Disengage each of the retainers that secure the cable to the instrument panel (Fig. 9).

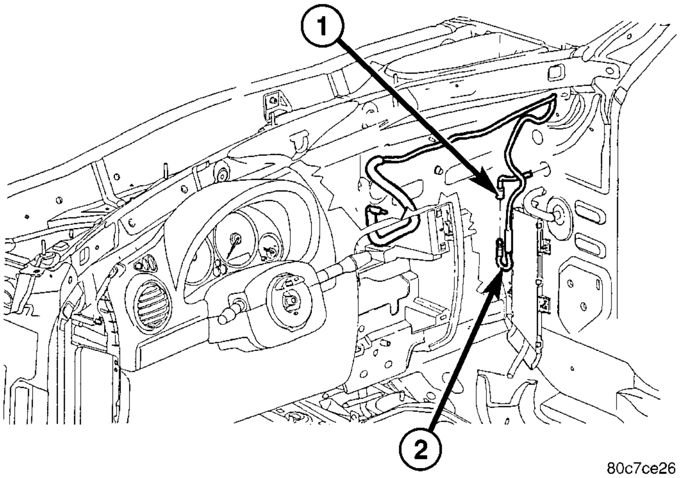

Fig. 9 INSTRUMENT PANEL ANTENNA CABLE - LHD

1 - INSTRUMENT PANEL ANTENNA CABLE
2 - ANTENNA BODY AND CABLE

(5) Remove the cable from the instrument panel.

EXPORT

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

(3) Disconnect antenna cable from radio by pulling on the locking antenna connector (Fig. 8).

(4) Disengage each of the retainers that secure the cable to the instrument panel (Fig. 10).

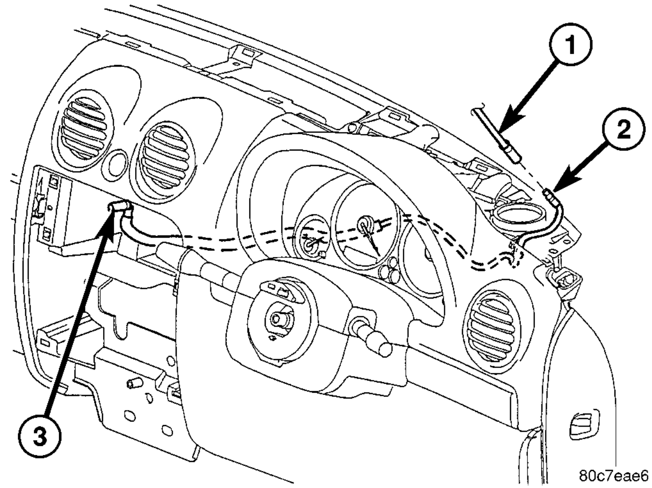

Fig. 10 INSTRUMENT PANEL ANTENNA CABLE - RHD

1 - ANTENNA CABLE TO QUARTER GLASS
2 - INSTRUMENT PANEL ANTENNA CABLE
3 - CONNECTOR TO RADIO

INSTALLATION

DOMESTIC

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the instrument panel antenna cable onto the instrument panel.

(2) Engage each of the retainers that secure the cable to the back side of the instrument panel.

(3) Connect cable to radio.

(4) Install instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(5) Connect the battery negative cable.

INSTRUMENT PANEL ANTENNA CABLE (Continued)

EXPORT

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the instrument panel antenna cable onto the instrument panel.

(2) Engage each of the retainers that secure the cable to the back side of the instrument panel.

(3) Connect cable to radio.

(4) Install instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(5) Connect the battery negative cable.

QUARTER GLASS INTEGRAL ANTENNA

DESCRIPTION

The integral radio antenna element is bonded to the right rear quarter glass and is replaced with the glass assembly only (Fig. 11).

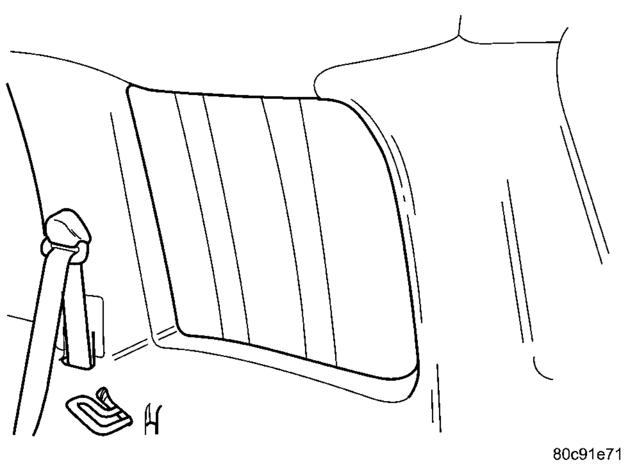

Fig. 11 QUARTER GLASS INTEGRAL ANTENNA

OPERATION

The integral antenna receives radio frequencies and sends them to the antenna module for amplification.

DIAGNOSIS AND TESTING - QUARTER GLASS INTEGRAL ANTENNA

The antenna grid pattern connects to the terminal tab for both AM and FM.

For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. To detect breaks in the integral antenna elements, the following procedure is required:

(1) Disconnect the antenna module connector from the antenna terminals on the glass.

(2) Using an ohmmeter, place a lead on one of the terminals and check each end of the grid pattern connected to this terminal for continuity. If continuity is not present, move one lead through the grid in progression starting at the terminal with the other lead on the terminal until continuity is lost. A break in the antenna grid can be repaired using a Mopar Rear Window Defogger Repair Kit (Part Number 4267922) or equivalent (Refer to 8 - ELECTRICAL/HEATED GLASS - STANDARD PROCEDURE).

RADIO

DESCRIPTION

Available factory-installed radio receivers for this model include:

- AM/FM/cassette with CD changer control feature (RBB sales code)
- AM/FM/cassette/CD/ with CD changer control feature (RBP sales code)
- AM/FM/CD with CD changer control feature (RBK sales code)
- AM/FM/ 6 CD in-dash changer (RBQ sales code)
- AM/FM/cassette/CD with CD changer control feature (RAD, RBT or RBY sales code) - export only

All factory-installed radio receivers can communicate on the Programmable Communications Interface (PCI) data bus network. All factory-installed receivers are stereo Electronically Tuned Radios (ETR) and include an electronic digital clock function.

These radio receivers can only be serviced by an authorized radio repair station. See the latest Warranty Policies and Procedures manual for a current listing of authorized radio repair stations.

RADIO (Continued)

OPERATION

The radio receiver operates on ignition switched battery current that is available only when the ignition switch is in the On or Accessory positions. The electronic digital clock function of the radio operates on fused battery current supplied through the IOD fuse, regardless of the ignition switch position.

For more information on the features, setting procedures, and control functions for each of the available factory-installed radio receivers, refer to the owner's manual. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove the instrument panel center trim panel.
(3) Remove the radio mounting screws (Fig. 12).

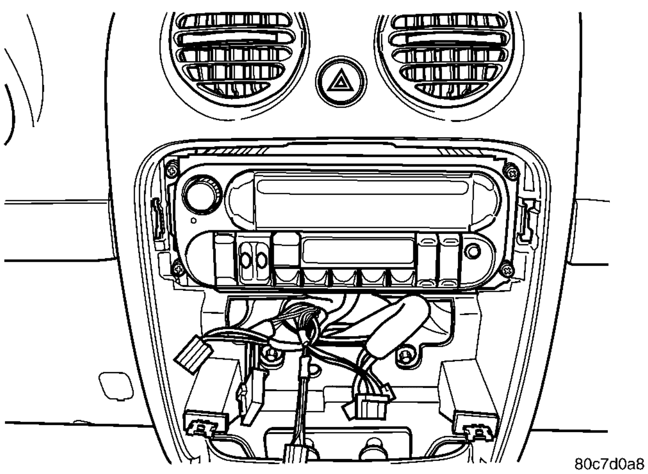

Fig. 12 RADIO

CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

(4) Disconnect the antenna cable by pulling the locking antenna connector away from the radio (Fig. 13).
(5) Disconnect the electrical harness connector(s).
(6) Remove radio from instrument panel.

INSTALLATION

(1) Connect the wire harness connector(s).
(2) Connect the antenna cable.
(3) Install the radio to the instrument panel.

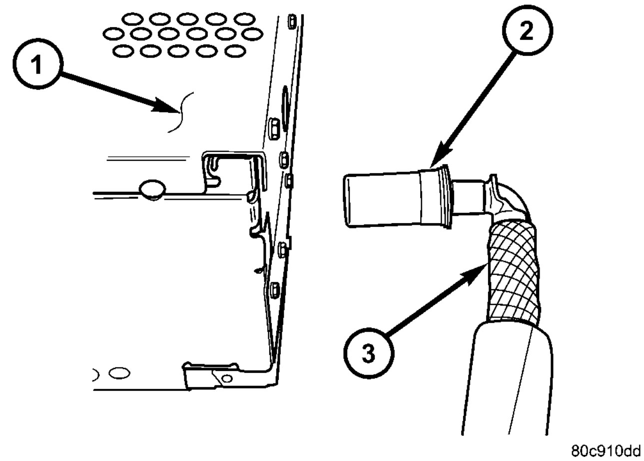

Fig. 13 ANTENNA TO RADIO

1 - RADIO
2 - LOCKING ANTENNA CONNECTOR
3 - INSTRUMENT PANEL ANTENNA CABLE

(4) Install the radio mounting screws.
(5) Install the instrument panel center trim panel.
(6) Connect the battery negative cable.

RADIO NOISE SUPPRESSION GROUND STRAP

DESCRIPTION

Radio noise suppression devices are factory-installed standard equipment on this vehicle. Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) can be produced by any on-board or external source of electromagnetic energy. These electromagnetic energy sources can radiate electromagnetic signals through the air, or conduct them through the vehicle electrical system.

When the audio system converts RFI or EMI to an audible acoustic wave form, it is referred to as radio noise. This undesirable radio noise is generally manifested in the form of “buzzing,” “hissing,” “popping,” “clicking,” “crackling,” and/or “whirring” sounds. In most cases, RFI and EMI radio noise can be suppressed using a combination of vehicle and component grounding, filtering and shielding techniques. This vehicle is equipped with factory-installed radio noise suppression devices that were designed to minimize exposure to typical sources of RFI and EMI; thereby, minimizing radio noise complaints.

Factory-installed radio noise suppression is accomplished primarily through circuitry or devices that are integral to the factory-installed radios, audio power amplifiers and other on-board electrical components such as generators, wiper motors, blower motors, and fuel pumps that have been found to be

RADIO NOISE SUPPRESSION GROUND STRAP (Continued)

potential sources of RFI or EMI. External radio noise suppression devices that are used on this vehicle to control RFI or EMI, and can be serviced, include the following:

- **Engine-to-body ground strap** - This length of braided ground strap has an eyelet terminal connector crimped to each end. One end is secured to the engine cylinder head(s). The other is secured to the plenum.
- **Resistor-type spark plugs** - This type of spark plug has an internal resistor connected in series between the spark plug terminal and the center electrode to help reduce the production of electromagnetic radiation that can result in radio noise.

OPERATION

There are two common strategies that can be used to suppress Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) radio noise. The first suppression strategy involves preventing the production of RFI and EMI electromagnetic signals at their sources. The second suppression strategy involves preventing the reception of RFI and EMI electromagnetic signals by the audio system components.

The use of braided ground straps in key locations is part of the RFI and EMI prevention strategy. These ground straps ensure adequate ground paths, particularly for high current components such as many of those found in the starting, charging, ignition, engine control and transmission control systems. An insufficient ground path for any of these high current components may result in radio noise caused by induced voltages created as the high current seeks alternative ground paths through components or circuits intended for use by, or in close proximity to the audio system components or circuits.

Preventing the reception of RFI and EMI is accomplished by ensuring that the audio system components are correctly installed in the vehicle. Loose, corroded or improperly soldered wire harness connections, improperly routed wiring and inadequate audio system component grounding can all contribute to the reception of RFI and EMI. A properly grounded antenna body and radio chassis, as well as a shielded antenna coaxial cable with clean and tight connections will each help reduce the potential for reception of RFI and EMI.

REMOVAL

2.4L ENGINE

(1) Disconnect and isolate the battery negative cable.

(2) Remove the retaining bolt from the engine cylinder head (Fig. 14).

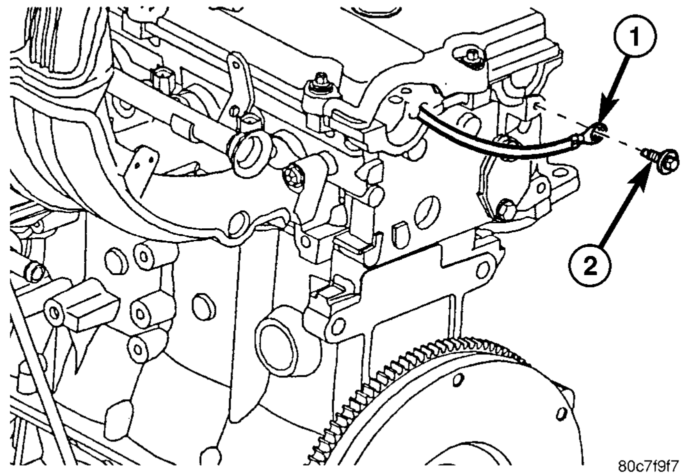

Fig. 14 GROUND STRAP TO ENGINE - 2.4L

1 - GROUND STRAP
2 - BOLT

(3) Remove the retaining nut from the plenum (Fig. 15).

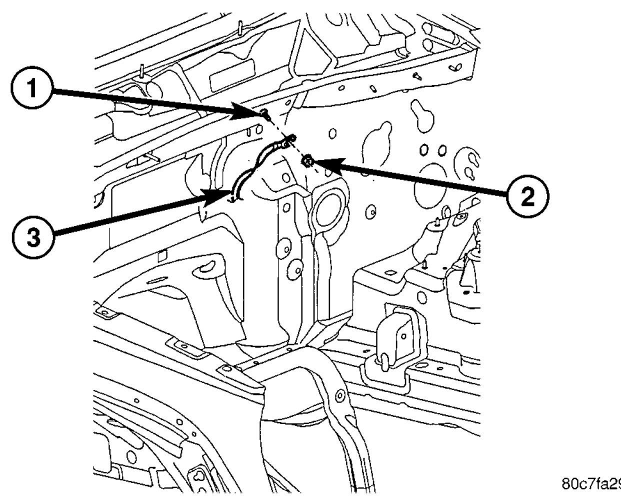

Fig. 15 GROUND STRAP TO PLENUM - 2.4L

1 - PLENUM
2 - RETAINING NUT
3 - GROUND STRAP

RADIO NOISE SUPPRESSION GROUND STRAP (Continued)

2.5L ENGINE

(1) Disconnect and isolate the battery negative cable.

(2) Remove the retaining bolt from the engine cylinder head (Fig. 16).

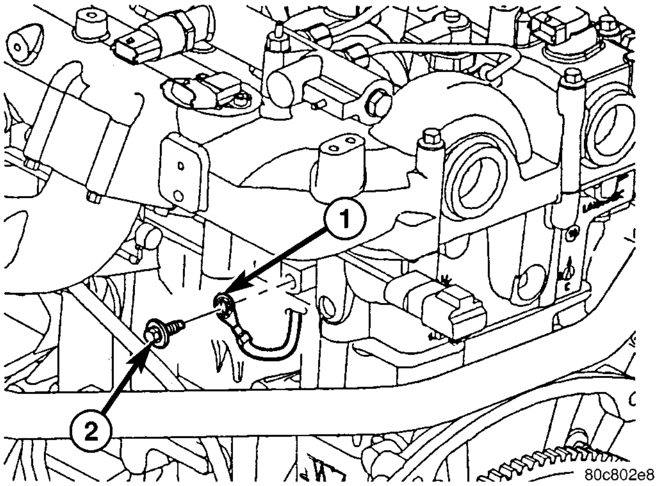

Fig. 16 GROUND STRAP TO ENGINE - 2.5L

1 - GROUND STRAP
2 - BOLT

(3) Remove the retaining nut from the plenum (Fig. 15).

3.7L ENGINE

(1) Disconnect and isolate the battery negative cable.

(2) Remove the retaining bolts from the engine cylinder heads (Fig. 17).

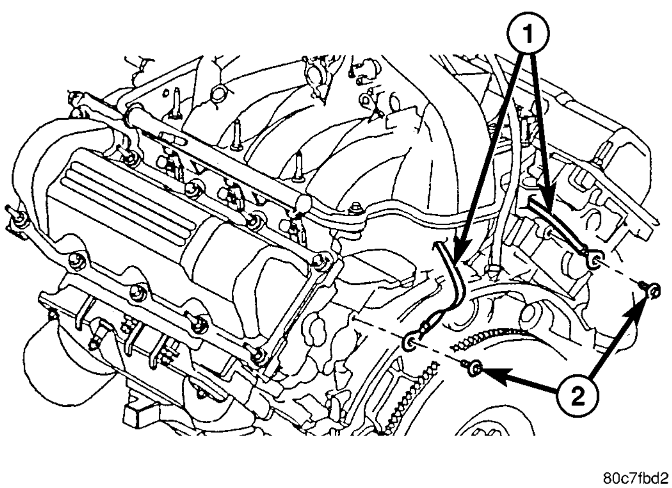

Fig. 17 GROUND STRAP TO ENGINE - 3.7L

1 - GROUND STRAP
2 - RETAINING BOLTS

(3) Remove the retaining nut from the plenum (Fig. 18).

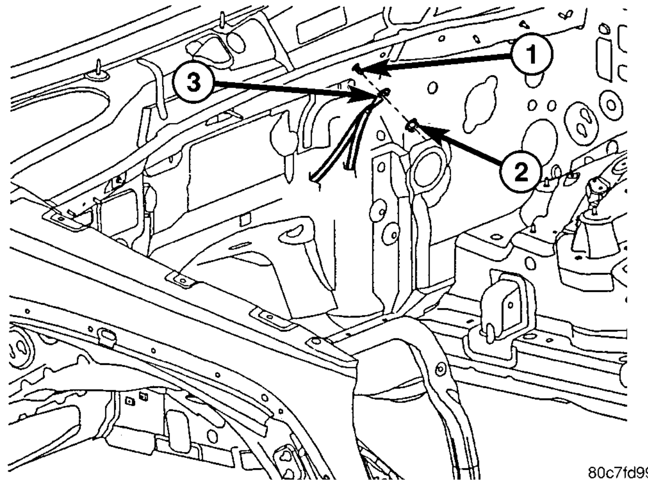

Fig. 18 GROUND STRAP TO PLENUM - 3.7L

1 - PLENUM
2 - RETAINING NUT
3 - GROUND STRAP

INSTALLATION

2.4L ENGINE

(1) Install the retaining nut and ground strap to the plenum. Tighten to 12 N·m (105 in. lbs.).

(2) Install the retaining bolt and ground strap to the engine cylinder head. Tighten to 12 N·m (105 in. lbs.).

(3) Connect the battery negative cable.

2.5L ENGINE

(1) Install the retaining nut and ground strap to the plenum. Tighten to 12 N·m (105 in. lbs.).

(2) Install the retaining bolt and ground strap to the engine cylinder head. Tighten to 12 N·m (105 in. lbs.).

(3) Connect the battery negative cable.

3.7L ENGINE

(1) Install the retaining nut and ground strap to the plenum. Tighten to 12 N·m (105 in. lbs.).

(2) Install the retaining bolts and ground strap to the engine cylinder heads. Tighten to 12 N·m (105 in. lbs.).

(3) Connect the battery negative cable.

REMOTE SWITCHES

DESCRIPTION

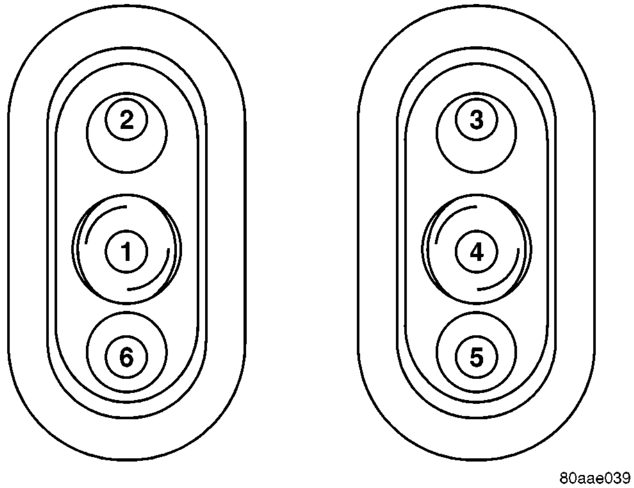

Fig. 19 Remote Radio Switch Operational View

1 - PRESET SEEK
2 - SEEK UP
3 - VOLUME UP
4 - MODE
5 - VOLUME DOWN
6 - SEEK DOWN

A remote radio control switch option is available on some models. Two rocker-type switches are mounted on the back (instrument panel side) of the steering wheel spokes (Fig. 19). The switch on the left spoke is the seek switch and has seek up, seek down, and preset station advance functions. The switch on the right spoke is the volume control switch and has volume up, and volume down functions. The switch on the right spoke also includes a “mode” control that allows the driver to sequentially select AM radio, FM radio, cassette player, CD player or CD changer (if equipped).

OPERATION

The six switches in the two remote radio switch units are normally open, resistor multiplexed momentary switches that are hard wired to the Body Control Module (BCM) through the clockspring. The BCM sends a five volt reference signal to both switch units on one circuit, and senses the status of all of the switches by reading the voltage drop on a second circuit.

When the BCM senses an input (voltage drop) from any one of the remote radio switches, it sends the proper switch status messages on the Programmable Communication Interface (PCI) data bus network to the radio receiver. The electronic circuitry within the radio receiver is programmed to respond to these remote radio switch status messages by adjusting the radio settings as requested. For diagnosis of the BCM or the PCI data bus, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

For more information on the features and control functions for each of the remote radio switches, refer to the owner’s manual.

DIAGNOSIS AND TESTING - REMOTE SWITCHES

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOTE SWITCHES (Continued)

(1) Disconnect and isolate the battery negative cable. Remove the remote radio switch(es) (Fig. 20) from the steering wheel (Refer to 8 - ELECTRICAL/AUDIO/REMOTE SWITCHES - REMOVAL).

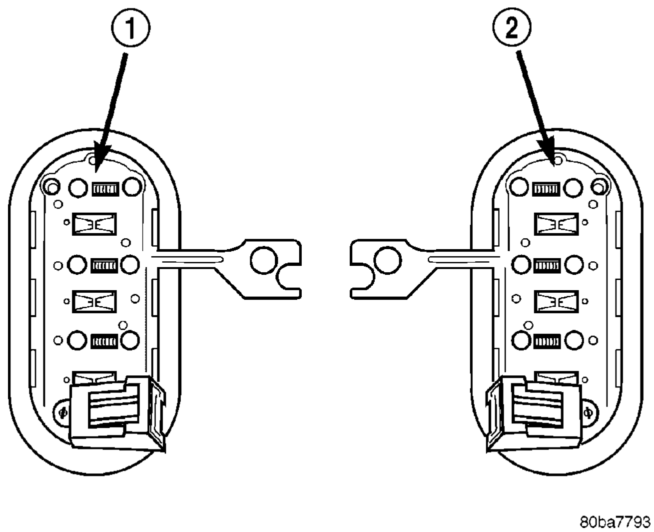

Fig. 20 Remote Radio Switches

1 - BLACK (LEFT) SWITCH
2 - WHITE (RIGHT) SWITCH

(2) Use an ohmmeter to check the switch resistances as shown in the Remote Radio Switch Test chart. If the remote radio switch resistances check OK, go to Step 3. If not OK, replace the faulty switch.

REMOTE RADIO SWITCH TEST TABLE

Switch	Switch Position	Resistance
Right (White)	Volume Up	1.210 Kilohms ± 1%
Right (White)	Volume Down	3.010 Kilohms ± 1%
Right (White)	Mode Advance	0.0511 Kilohms ± 1%
Left (Black)	Seek Up	0.261 Kilohms ± 1%
Left (Black)	Seek Down	0.681 Kilohms ± 1%
Left (Black)	Pre-Set Station Advance	0.162 Kilohms ± 1%

(3) Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for 5 volts at the radio control mux circuit cavities of the steering wheel wire harness connectors for both remote radio switches. If OK, go to Step 4. If not OK, repair the open or shorted radio control mux circuit to the Body Control Module (BCM) as required.

(4) Disconnect and isolate the battery negative cable. Disconnect the 22-way instrument panel wire harness connector from the BCM. Check for continuity between the remote radio switch ground circuit cavities of the steering wheel wire harness connectors for both remote radio switches and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted remote radio switch ground circuit to the BCM as required.

(5) Check for continuity between the remote radio switch ground circuit cavities of the steering wheel wire harness connectors for both remote radio switches and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, refer to the proper Diagnostic Procedures manual to test the BCM and the PCI data bus. If not OK, repair the open remote radio switch ground circuit as required.

REMOVAL

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOTE SWITCHES (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the driver side airbag from the vehicle (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(3) Remove the cruise control switches (Fig. 21).

(4) Unplug the wire harness connector from the remote radio switch(es).

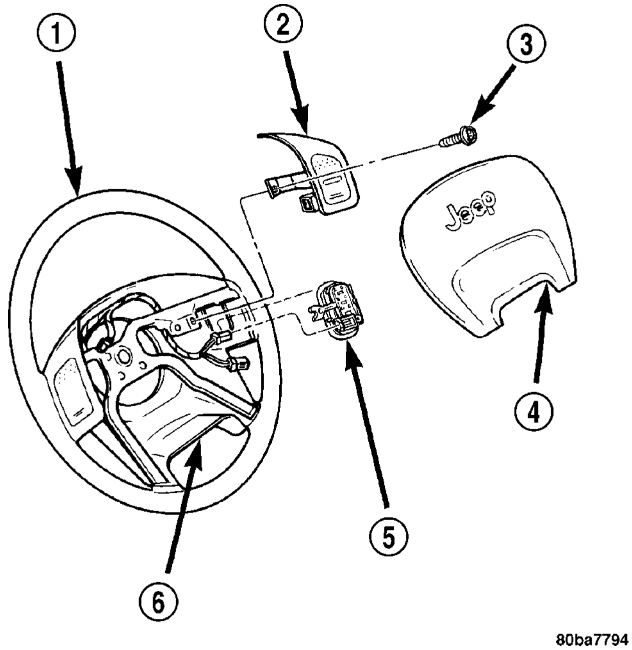

Fig. 21 REMOTE SWITCH

1 - STEERING WHEEL
2 - SPEED CONTROL SWITCH
3 - SCREW
4 - DRIVER SIDE AIRBAG MODULE
5 - REMOTE RADIO SWITCH
6 - REAR TRIM COVER

(5) Depress the tabs on each side of each switch and push the switch through the rear steering wheel cover.

INSTALLATION

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Install remote radio switch to the steering wheel.

(2) Connect the wire harness to the remote radio switch.

(3) Install the cruise control switches.

(4) Install the driver side airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

(5) Connect the battery negative cable.

SPEAKER

DESCRIPTION

STANDARD

The standard equipment speaker system includes speakers in six locations. One 6.4 centimeter (2.50 inch) diameter speaker is installed on each end of the instrument panel top pad. One 16.5 centimeter (6.5 inch) full-range speaker is located in each front door. There is also one full-range 16.5 centimeter (6.5 inch) diameter full-range speaker located in each rear door.

PREMIUM

The optional premium speaker system features six Premium model speakers in six locations. Each of the standard speakers is replaced with Premium model speakers. One 6.4 centimeter (2.50 inch) diameter speaker is installed on each end of the instrument panel top pad. One 16.5 centimeter (6.5 inch) Premium woofer is located in each front door. There is also one full-range 16.5 centimeter (6.5 inch) diameter Premium full-range speaker located in each rear door. The premium speaker system also includes a power amplifier mounted to each front door speaker. The total available power of the premium speaker system is about 160 watts.

OPERATION

Two wires connected to each speaker, one feed circuit (+) and one return circuit (–), allow the audio output signal electrical current to flow through the voice coil. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

SPEAKER (Continued)

DIAGNOSIS AND TESTING - SPEAKER

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: The speaker output of the radio is a “floating ground” system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

NOTE: If poor sound quality is noted in the audio system, check the Cabin Equalization curve programmed in the BCM. Make sure a base speaker system has the Base Cabin Equalization Curve programmed to the vehicle. If the vehicle has a premium speaker system, make sure the Premium Cabin Equalization Curve is programmed to the vehicle

(1) If all speakers are inoperative, check the fuses in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the ON position. Turn the radio receiver ON. Adjust the balance and fader control controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 3.

(3) Turn the radio receiver OFF. Turn the ignition OFF. Disconnect and isolate the battery negative cable. If vehicle is **not** equipped with a amplifier, remove the radio receiver. If vehicle is equipped with an amplifier. disconnect wire harness connector at output side of amplifier. Go to Step 4.

(4) Check both the speaker feed (+) circuit and return (-) circuit cavities for the inoperative speaker at the radio receiver wire harness connector for continuity to ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted speaker feed (+) and/or return (-) circuits(s) to the speaker as required.

(5) Disconnect wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (-) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open speaker feed (+) and/or return (-) circuits(s) as required.

REMOVAL

FRONT DOOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(3) Remove the speaker mounting screws (Fig. 22).

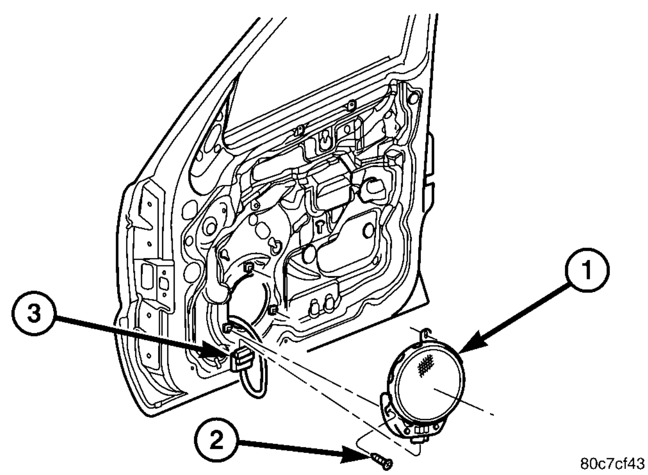

Fig. 22 FRONT DOOR SPEAKER

1 - FRONT DOOR SPEAKER
2 - MOUNTING SCREW
3 - WIRE HARNESS CONNECTOR

(4) Remove the speaker from the door and disconnect the wire harness connector.

SPEAKER (Continued)

INSTRUMENT PANEL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).

(3) Remove instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(4) Remove speaker mounting screws (Fig. 23).

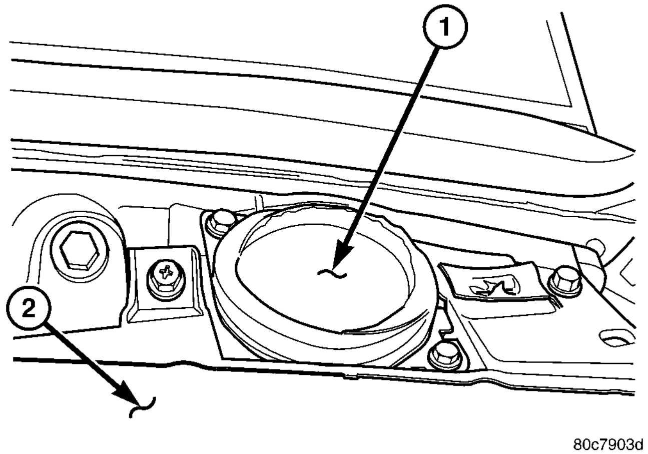

Fig. 23 INSTRUMENT PANEL SPEAKER

1 - INSTRUMENT PANEL SPEAKER
2 - INSTRUMENT PANEL

(5) Remove speaker and disconnect the wire harness connector.

REAR DOOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).

(3) Remove the speaker mounting screws (Fig. 24).

(4) Remove the speaker from the door and disconnect the wire harness connector.

INSTALLATION

FRONT DOOR

(1) Connect the wire harness connector and install the speaker to the door.

(2) Install the speaker mounting screws. Tighten to 2 N·m (20 in. lbs.).

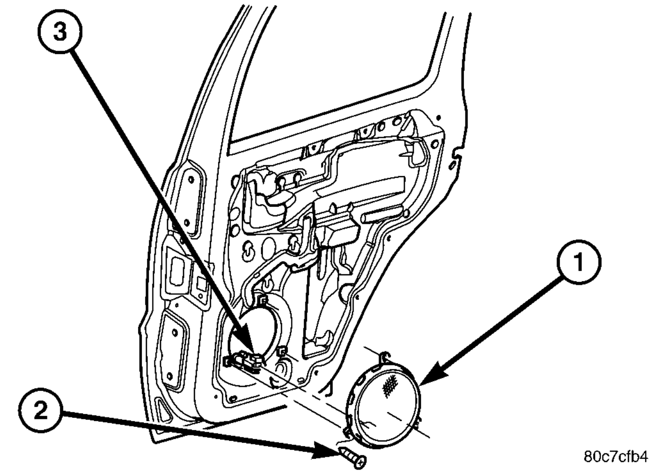

Fig. 24 REAR DOOR SPEAKER

1 - REAR DOOR SPEAKER
2 - MOUNTING SCREW
3 - WIRE HARNESS CONNECTOR

(3) Install the front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

(4) Connect the battery negative cable.

INSTRUMENT PANEL

(1) Connect wire harness connector and install speaker.

(2) Install speaker mounting screws. Tighten to 2 N·m (20 in. lbs.).

(3) Install instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(4) Install the A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(5) Connect the battery negative cable.

REAR DOOR

(1) Connect the wire harness connector and install the speaker to the door.

(2) Install the speaker mounting screws. Tighten to 2 N·m (20 in. lbs.).

(3) Install the rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

(4) Connect the battery negative cable.

CHIME/BUZZER

TABLE OF CONTENTS

CHIME WARNING SYSTEM

DESCRIPTION

A chime warning system is standard factory-installed equipment. The chime warning system uses a single chime tone generator that is soldered onto the electronic circuit board inside to the ElectroMechanical Instrument Cluster (EMIC) to provide audible indications of various vehicle conditions that may require the attention of the vehicle operator or occupants (Fig. 1). The microprocessor-based EMIC utilizes electronic chime request messages received from other modules in the vehicle over the Programmable Communications Interface (PCI) data bus network along with hard wired inputs to the cluster to monitor many sensors and switches throughout the vehicle. In response to those inputs, the circuitry and internal programming of the EMIC allow it to control audible outputs that are produced through its on-board chime tone generator.

The EMIC circuitry and its chime tone generator are capable of producing each of the four following audible outputs:

- **Fixed Duration Beep** - A short, sharp, single tactile "beep-like" tone that is about 150 milliseconds in duration.
- **Single Chime Tone** - A single "bong-like" chime tone.
- **Slow Rate Repetitive Chime** - Repeated chime tones that are issued at a slow rate of about 50 "bong-like" tones per minute.
- **Fast Rate Repetitive Chime** - Repeated chime tones that are issued at a fast rate of about 180 "bong-like" tones per minute.

Hard wired circuitry connects the EMIC and the various chime warning system switch and sensor inputs to their modules and to each other through the electrical system of the vehicle. Refer to the appropriate wiring information.

The EMIC chime warning system and integral chime tone generator cannot be adjusted or repaired. If the EMIC or the chime tone generator are damaged or faulty, the EMIC unit must be replaced.

OPERATION

The chime warning system components operate on battery voltage received through a fuse in the Junction Block (JB) on a non-switched fused B(+) circuit so that the system may operate regardless of the ignition switch position. The chime warning system also monitors the ignition switch position so that some chime features will only occur with ignition switch in the On position, while others occur regardless of the ignition switch position.

The chime warning system provides an audible indication to the vehicle operator or occupants under the following conditions:

- **Airbag Indicator Warning** - The ElectroMechanical Instrument Cluster (EMIC) chime tone generator will generate one, short, chime when the ignition switch is in the On position, and an electronic message is received over the Programmable Communications Interface (PCI) data bus from the Airbag Control Module (ACM) requesting "Airbag" indicator illumination. This warning will only occur following completion of the "Airbag" indicator bulb test, and will only occur once during an ignition cycle. The ACM uses internal programming, hard wired inputs from the front Supplemental Restraint System (SRS) components and, on vehicles so equipped, electronic messages received over the PCI data bus from each Side Impact Airbag Control Module (SIACM) to determine the proper "Airbag" indicator messages to send to the EMIC.
- **Anti-Lock Brake Indicator Warning** - The EMIC chime tone generator will generate one, short, chime when the ignition switch is in the On position, and an electronic message is received over the PCI data bus from the Controller Anti-lock Brake (CAB) requesting "Antilock Brake System (ABS)" indicator illumination. This warning will only occur following completion of the "ABS" indicator bulb test, and will only occur once during an ignition cycle. The CAB uses internal programming, hard wired inputs from the Antilock Brake System (ABS) components, and electronic messages received over the PCI data bus from the Powertrain Control Module (PCM) to deter-

CHIME WARNING SYSTEM (Continued)

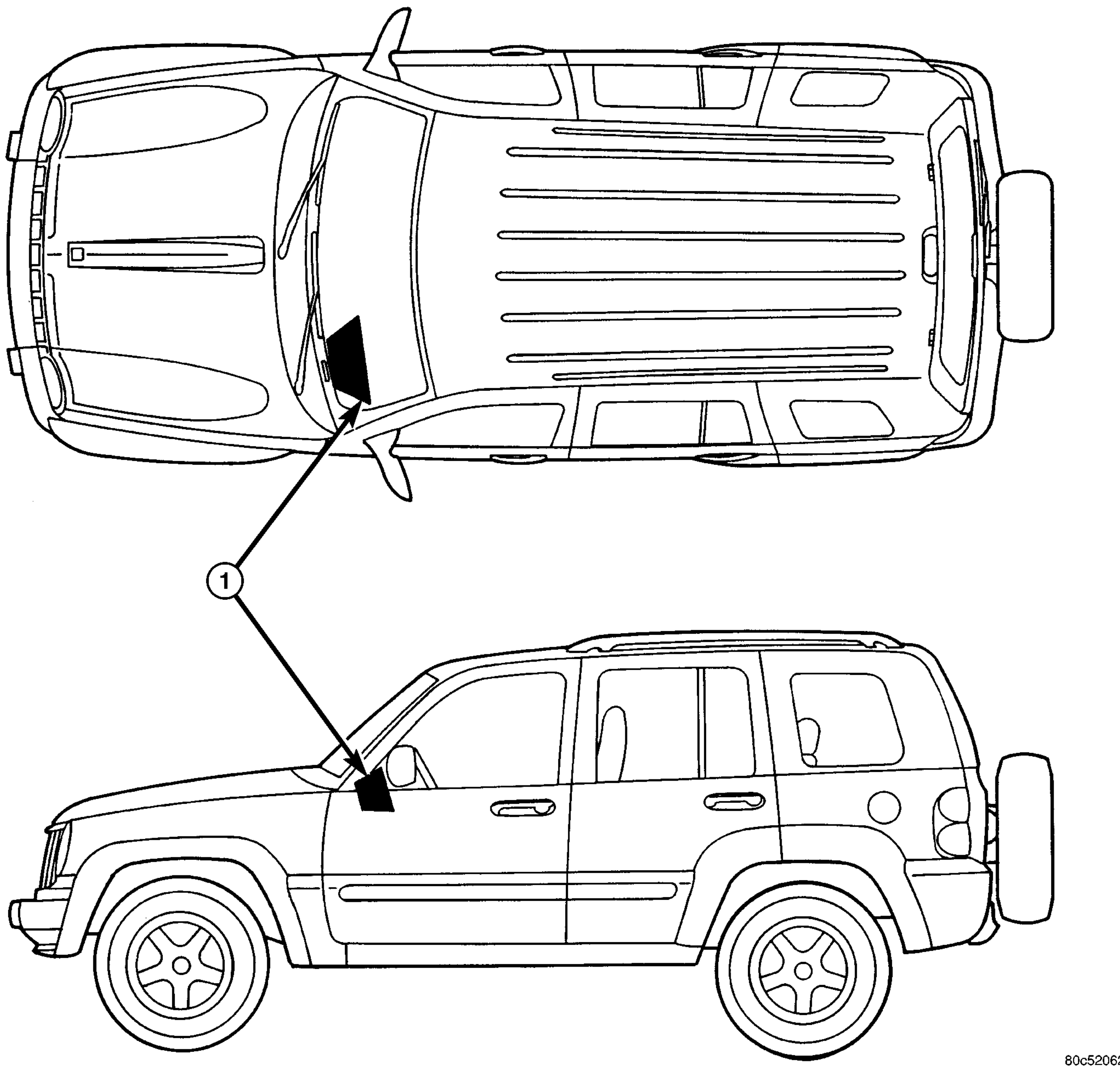

Fig. 1 Chime Warning System

1 - ELECTROMECHANICAL INSTRUMENT CLUSTER

mine the proper "ABS" indicator messages to send to the EMIC.

- **Compass Mini-Trip Computer Reset -** The EMIC chime tone generator will generate one, short, fixed duration chime when the ignition switch is in the On position, and an electronic message is received over the PCI data bus from the optional Compass Mini-Trip Computer (CMTC) requesting that the CMTC elapsed time, average fuel economy, and/or trip odometer data has been reset. The CMTC uses internal programming, hard wired inputs from the U.S./Metric and Reset switches, and electronic messages received from the Body Control Module (BCM) to determine the proper reset messages to send to the EMIC.
- **Door Ajar Warning -** The EMIC chime tone generator will generate a single chime when the ignition switch is in the On position, and electronic messages are received over the PCI data bus from the Body Control Module (BCM) indicating that the status of any door ajar input has changed, and from the PCM indicating that the vehicle is moving. The BCM uses internal programming, and hard wired inputs from the door ajar switches and the ignition switch

CHIME WARNING SYSTEM (Continued)

to determine the proper door ajar switch messages to send to the EMIC. The PCM uses internal programming and a hard wired vehicle speed pulse input received from the BCM to determine the proper vehicle distance messages to send to the EMIC.

• **Electrical System Voltage Low or High Warning** - Each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate a single chime the first time an electronic message is received over the PCI data bus from the PCM requesting “Charging” indicator illumination. This warning would indicate that the monitored electrical system voltage is either too low or too high. This warning will only occur once during an ignition cycle. The PCM uses internal programming and hard wired inputs from the electrical and charging systems to determine the proper “Charging” indicator messages to send to the EMIC.

• **Engine Coolant Temperature High Warning** - Each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate chime the first time an electronic message is received over the PCI data bus from the PCM indicating that the engine coolant temperature is too high. This chime will sound for five consecutive tones, unless an electronic message is received from the PCM indicating that the engine coolant temperature is not too high, or unless the ignition switch is turned to the Off position before the five tones have completed. The PCM uses internal programming and a hard wired input from the engine coolant temperature sensor to determine the proper engine coolant temperature messages to send to the EMIC.

• **Engine Oil Pressure Low Warning** - Each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate a single chime the first time three sequential sets of electronic messages are received over the PCI data bus from the PCM indicating that the engine oil pressure is too low with the engine running. The PCM uses internal programming and hard wired inputs from the oil pressure sensor and the crankshaft position sensor to determine the proper oil pressure and engine speed messages to send to the EMIC.

• **Fasten Seat Belt Warning** - Each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate repetitive chimes at a slow rate the first time an electronic message is received over the PCI data bus from the ACM requesting “Seatbelt” indicator illumination. The ACM uses internal programming and hard wired inputs from the driver side front seat belt switch and the ignition switch to determine that the driver side front seat belt is not fastened with the ignition switch in the On position. These chimes will continue to sound for a duration of about six seconds each time the ignition switch is turned to the On position, or until the driver side front seat belt is fastened, whichever occurs first. This audible warning occurs independent of the visual warning provided by the EMIC “Seatbelt” indicator.

• **Gate Ajar Warning** - The EMIC chime tone generator will generate a single chime when the ignition switch is in the On position, and electronic messages are received over the PCI data bus from the BCM indicating that the status of the tailgate ajar input has changed from closed to not closed, and from the PCM indicating that the vehicle is moving. The BCM uses internal programming, and hard wired inputs from the tailgate ajar switch and the ignition switch to determine the proper tailgate ajar switch messages to send to the EMIC. The PCM uses internal programming and a hard wired vehicle speed pulse input received from the BCM to determine the proper vehicle distance messages to send to the EMIC.

• **Glass Ajar Warning** - The EMIC chime tone generator will generate a single chime when the ignition switch is in the On position, and electronic messages are received over the PCI data bus from the BCM indicating that the status of the rear flip-up glass ajar input has changed from closed to not closed, and from the PCM indicating that the vehicle is moving. The BCM uses internal programming, and hard wired inputs from the flip-up glass ajar switch and the ignition switch to determine the proper flip-up glass ajar switch messages to send to the EMIC. The PCM uses internal programming and a hard wired vehicle speed pulse input received from the BCM to determine the proper vehicle distance messages to send to the EMIC.

• **Head/Park/Fog Lights-On Warning** - The EMIC chime tone generator will generate repetitive chime at a fast rate when the ignition switch is in any position except On, and electronic messages are received over the PCI data bus from the BCM indicating that the exterior lights are On with the ignition switch in any position except On, and the status of the driver side front door is not closed. The BCM uses internal programming and hard wired inputs from the left (lighting) control stalk of the multi-function switch, the ignition switch, and the driver side front door ajar switch to determine the proper messages to send to the EMIC. These chimes will continue to sound until the exterior lighting is turned Off, until the ignition switch is turned to the On position, or until the status of the driver side front door ajar input changes from not closed to closed, whichever occurs first.

• **Key-In-Ignition Warning** - The EMIC chime tone generator will generate repetitive chime at a fast rate when the ignition switch is in any position

CHIME WARNING SYSTEM (Continued)

except On, and electronic messages are received over the PCI data bus from the BCM indicating that the key is in the ignition lock cylinder with the ignition switch in any position except On, and the driver side front door is not closed. The BCM internal programming and hard wired inputs from the key-in ignition circuitry of the ignition switch, the ignition switch, and the driver side front door ajar switch to determine the proper messages to send to the EMIC. These chimes will continue to sound until the key is removed from the ignition lock cylinder, until the ignition switch is turned to the On position, or until the status of the driver side front door ajar input changes from not closed to closed, whichever occurs first.

- **Low Coolant Warning** - On vehicles equipped with a diesel engine, the EMIC chime tone generator will generate a single chime when the ignition switch is first turned to the On position and a hard wired input from the engine coolant level sensor to the EMIC indicates that the coolant level is low for more than about one-quarter second. Any time after the ignition switch is first turned to the On position, the EMIC uses internal programming to check the status of the engine coolant level sensor inputs about once every second, then adjusts an internal counter up or down based upon the status of this input. When the counter accumulates thirty inputs indicating that the coolant level is low, a single chime is sounded. This strategy is intended to reduce the effect that coolant sloshing within the coolant reservoir can have on reliable chime warning operation. This warning will only occur once during an ignition cycle.
- **Low Fuel Warning** - Each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate a single chime the first time an electronic message is received over the PCI data bus from the PCM requesting "Low Fuel" indicator illumination. The chime will only occur a second time during the same ignition cycle if another electronic message has been received from the PCM indicating that there is an increase in the fuel level equal to about 3 liters (0.8 gallon), then a subsequent electronic message from the PCM requests "Low Fuel" indicator illumination. This strategy combined with filtering performed by the internal programming of the PCM on the fuel tank sending unit input is intended to reduce the possibility of fuel sloshing within the fuel tank causing multiple low fuel warning chimes during a given ignition cycle. The EMIC will also respond with the low fuel warning chime when electronic fuel level messages are received from the PCM indicating that the hard wired input to the PCM from the fuel tank sending unit is an open circuit (greater than full), or a short circuit (less than empty).
- **Low Washer Fluid Warning** - The EMIC chime tone generator will generate a single chime when the ignition switch is turned to the On position and a hard wired input from the washer fluid level switch to the EMIC indicates the washer fluid is low for more than about one-quarter second. Any time after the ignition switch is first turned to the On position, the EMIC uses internal programming to check the status of the washer fluid level switch inputs about once every second, then adjusts an internal counter up or down based upon the status of this input. When the counter accumulates thirty inputs indicating that the washer fluid level is low, a single chime is sounded. This strategy is intended to reduce the effect that fluid sloshing within the washer reservoir can have on reliable chime warning operation. This warning will only occur once during an ignition cycle.
- **Overspeed Warning** - The EMIC chime tone generator will generate repetitive chimes at a slow rate when the ignition switch is in the On position, and an electronic message received over the PCI data bus from the PCM indicates that the vehicle speed is over a programmed speed value. The PCM uses internal programming and distance pulse information received over a hard wired vehicle speed pulse input from the BCM to determine the proper vehicle speed messages to send to the EMIC. The BCM uses an internally programmed electronic pinion factor and a hard wired input from the rear wheel speed sensor to calculate the proper distance pulse information to send to the PCM. The electronic pinion factor represents the proper tire size and axle ratio information for the vehicle. These chimes will continue to sound until the vehicle speed messages are below the programmed speed value, or until the ignition switch is turned to the Off position, whichever occurs first. The overspeed warning feature is only enabled on a BCM that has been programmed with a Middle East Gulf Coast Country (GCC) country code.
- **No Airbag Indicator Message Warning** - The EMIC chime tone generator will generate one, short, chime and turn on the "Airbag" indicator when the ignition switch is in the On position, and a PCI data bus "Airbag" indicator on or off message is not received from the ACM for six consecutive seconds.
- **No Antilock Brake Indicator Message Warning** - The EMIC chime tone generator will generate one, short, chime and turn on the "ABS" indicator when the ignition switch is in the On position, and a PCI data bus "ABS" indicator on or off message is not received from the CAB for six consecutive seconds.
- **No Fuel Level Message Warning** - The EMIC chime tone generator will generate one, short, chime and turn on the "Low Fuel" indicator when the igni-

CHIME WARNING SYSTEM (Continued)

tion switch is in the On position, and a PCI data bus fuel level message is not received from the PCM for twelve consecutive seconds.

- **Remote Keyless Entry Transmitter Programming** - On vehicles so equipped, the EMIC chime tone generator will generate a single chime when an electronic message is received over the PCI data bus from the BCM indicating that a Remote Keyless Entry (RKE) transmitter has been successfully programmed by the customer into the RKE module memory.
- **Sentry Key Immobilizer System Transponder Programming** - On vehicles so equipped, the EMIC chime tone generator will generate a single chime when an electronic message is received over PCI data bus message from the Sentry Key Immobilizer Module (SKIM) indicating that the Sentry Key Immobilizer System (SKIS) has been placed in the “Customer Learn” programming mode, and again each time a new SKIS transponder has been successfully programmed by the customer.
- **Turn Signal Cancel Warning** - The EMIC chime tone generator will generate repetitive chimes at a slow rate when the vehicle is driven for a distance of about 3.2 kilometers (about two miles) with a turn signal indicator flashing. The EMIC uses an electronic message received over the PCI data bus from the PCM, and a hard wired input from the turn signal switch circuitry of the multi-function switch to determine when to sound the turn signal cancel warning. The PCM uses internal programming and distance pulse information received over a hard wired vehicle speed pulse input from the BCM to determine the proper vehicle speed messages to send to the EMIC. The BCM uses an internally programmed electronic pinion factor and a hard wired input from the rear wheel speed sensor to calculate the proper distance pulse information to send to the PCM. The electronic pinion factor represents the proper tire size and axle ratio information for the vehicle. These chimes will continue to sound until the turn signal is turned Off, until the hazard warning system is turned On, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Water-In-Fuel Warning** - On vehicles equipped with a diesel engine, each time the ignition switch is turned to the On position, the EMIC chime tone generator will generate a single chime the first time an electronic message is received over the PCI data bus from the PCM requesting “Water-in-Fuel” indicator illumination. The PCM uses internal programming and a hard wired input from the water-in-fuel sensor to determine the proper water-in-fuel messages to send to the EMIC. This warning will only occur once during an ignition cycle.

The EMIC provides chime service for all available features in the chime warning system. The EMIC relies upon its internal programming and hard wired inputs from the turn signal (multi-function) switch, the washer fluid level switch, and the engine coolant level sensor (diesel engine only) to provide chime service for the turn signal cancel warning, the low washer fluid warning, and the low coolant warning respectively. The EMIC relies upon electronic message inputs received from other electronic modules over the PCI data bus network to provide chime service for all of the remaining chime warning system features. Upon receiving the proper inputs, the EMIC activates the chime tone generator to provide the audible chime warning to the vehicle operator. The internal programming of the EMIC determines the priority of each chime request input that is received, as well as the rate and duration of each chime tone that is to be generated. See the owner's manual in the vehicle glove box for more information on the features provided by the chime warning system.

The hard wired chime warning system inputs to the EMIC, as well as other hard wired circuits for this system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the PCI data bus network, or the electronic message inputs used by the EMIC to provide chime warning system service. The most reliable, efficient, and accurate means to diagnose the EMIC, the PCI data bus network, and the electronic message inputs for the chime warning system requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - CHIME WARNING SYSTEM

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CHIME WARNING SYSTEM (Continued)

The hard wired chime warning system inputs to the EMIC, as well as other hard wired circuits for this system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the PCI data bus network, or the electronic message inputs used by the EMIC to provide chime warning system service. The most reliable, efficient, and accurate means to diagnose the EMIC, the PCI data bus network, and the electronic message inputs for the chime warning system requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

ELECTRONIC CONTROL MODULES

TABLE OF CONTENTS

ELECTRONIC CONTROL MODULES

STANDARD PROCEDURE - PCM/SKIM PROGRAMMING

CAUTION: ASSURE THE DRBIII® IS PROGRAMMED WITH THE LATEST VERSION OF CURRENT SOFTWARE.

NOTE: Before replacing the PCM for a failed driver, control circuit, or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal component failures (i.e. relays and solenoids) and shorted circuits (i.e. pull-ups, drivers, and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has been set.

When a PCM (JTEC) and the SKIM are replaced at the same time, perform the following steps in order:

(1) Program the new PCM (JTEC).

(2) Program the new SKIM.

(3) Replace all ignition keys and program them to the new SKIM.

PROGRAMMING THE PCM (JTEC)

The SKIS Secret Key is an ID code that is unique to each SKIM. This code is programmed and stored in the SKIM, the PCM, and the ignition key transponder chip(s). When replacing the PCM, it is necessary to program the secret key into the new PCM using the DRBIII® scan tool. Perform the following steps to program the secret key into the PCM.

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).

ELECTRONIC CONTROL MODULES (Continued)

(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.

(3) Select PCM REPLACED (GAS ENGINE).

(4) Enter secured access mode by entering the vehicle four-digit PIN.

(5) Select ENTER to update PCM VIN.

NOTE: If three attempts are made to enter secured access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit this lockout mode, turn the ignition switch to the ON position for one hour, then enter the correct PIN. (Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary).

(6) Press ENTER to transfer the secret key (the SKIM will send the secret key to the PCM).

(7) Press PAGE BACK to get to the Select System menu and select ENGINE, MISCELLANEOUS, and SRI MEMORY CHECK.

(8) The DRBIII® will ask, “Is odometer reading between XX and XX?” Select the YES or NO button on the DRBIII®. If NO is selected, the DRBIII® will read, “Enter Odometer Reading (From I.P. odometer)”. Enter the odometer reading from the instrument cluster and press ENTER.

PROGRAMMING THE SKIM

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).

(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.

(3) Select PCM REPLACED (GAS ENGINE).

(4) Program the vehicle four-digit PIN into SKIM.

(5) Select COUNTRY CODE and enter the correct country.

NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, it cannot be changed and the SKIM must be replaced.

(6) Select YES to update VIN (the SKIM will learn the VIN from the PCM).

(7) Press ENTER to transfer the secret key (the PCM will send the secret key to the SKIM).

(8) Program ignition keys to the SKIM.

NOTE: If the PCM and the SKIM are replaced at the same time, all vehicle ignition keys will need to be replaced and programmed to the new SKIM.

PROGRAMMING IGNITION KEYS TO THE SKIM

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).

(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.

(3) Select PROGRAM IGNITION KEY'S.

(4) Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM it (the key) cannot be transferred to another vehicle.

(5) Obtain ignition keys to be programmed from the customer (8 keys maximum).

(6) Using the DRBIII®, erase all ignition keys by selecting MISCELLANEOUS, and ERASE ALL CURRENT IGN. KEYS.

(7) Program all of the ignition keys.

If ignition key programming is unsuccessful, the DRBIII® will display one of the following messages:

- **Programming Not Attempted** - The DRBIII® attempts to read the programmed key status and there are no keys programmed into SKIM memory.
- **Programming Key Failed (Possible Used Key From Wrong Vehicle)** - SKIM is unable to program an ignition key transponder due to one of the following:
  - The ignition key transponder is faulty.
  - The ignition key transponder is or has been already programmed to another vehicle.
- **8 Keys Already Learned, Programming Not Done** - The SKIM transponder ID memory is full.
- **Learned Key In Ignition** - The ID for the ignition key transponder currently in the ignition lock cylinder is already programmed in SKIM memory.

BODY CONTROL MODULE

DESCRIPTION

A Body Control Module (BCM) is concealed behind the driver side end of the instrument panel in the passenger compartment, where it is secured to the fuse panel side of the Junction Block (JB) (Fig. 1). The JB is the interface between the body, the instrument panel, and the headlamp and dash wire harnesses. The JB also contains the fuses and relays used for the interior electrical system of the vehicle. The BCM is enclosed in a molded plastic housing with two integral external connectors that connect it to the vehicle electrical system (Fig. 2). The BCM also has an integral interface connector that joins it through a connector to the circuitry within the JB. This connector is referred to as the JB-BCM connector. The combined BCM and JB are sometimes referred to as the Junction Block Module (JBM).

There are two different versions of the BCM: base and premium. The base BCM is a subset of the components in the premium version.The base version

BODY CONTROL MODULE (Continued)

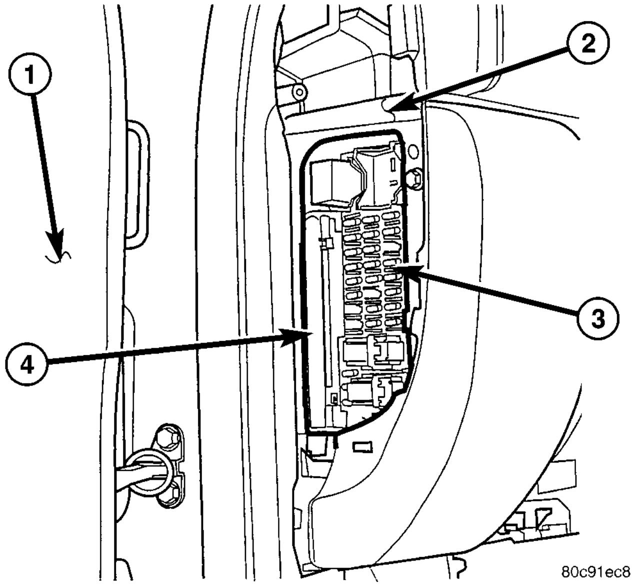

Fig. 1 Body Control Module Location

1 - DRIVER DOOR
2 - INSTRUMENT PANEL END BRACKET
3 - JUNCTION BLOCK
4 - BODY CONTROL MODULE

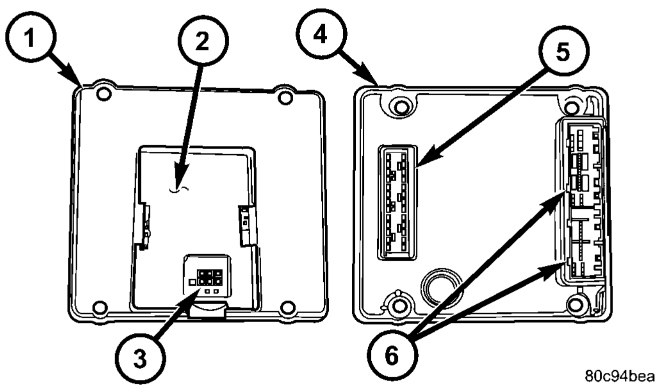

Fig. 2 Body Control Module

1 - BODY CONTROL MODULE (FRONT VIEW)
2 - REMOTE KEYLESS ENTRY MODULE RECEPTACLE
3 - BCM-RKE CONNECTOR
4 - BODY CONTROL MODULE (BACK VIEW)
5 - JB-BCM CONNECTOR
6 - CONNECTOR RECEPTACLE (2)

BCM does not support the following features: Compass Mini-Trip Computer (CMTC), fog lamps (front and/or rear), Remote Keyless Entry (RKE), remote radio switches, or Vehicle Theft Security System (VTSS). Both versions of the BCM utilize integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus network along with many hard wired inputs to monitor many sensor and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the BCM allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the PCI data bus. Any time the BCM is replaced or reflashed for any reason, there may be subsystems that may need to be reprogrammed as well, such as Cabin Equalization. Follow the DRBIII® menu screen for details. The electronic functions and features that the BCM supports or controls include the following:

- **A/C Select Switch Status -** The BCM monitors an input from, and transmits the status of the A/C switch on the heater-A/C control.
- **Ambient Temperature Data -** The premium BCM monitors and transmits the ambient temperature sensor input data.
- **Audio System Cabin Equalization -** Each time the BCM receives an electronic cabin equalization request message from the radio over the PCI data buss, it provides an electronic response to the radio containing the appropriate equalization curve information. Because there are numerous optional radios which are common to many platforms and available with various speaker architectures, each radio contains a Digital Signal Processing (DPS) microprocessor chip. This DPS chip uses the equalization curve information to optimize the radio's sound output for the unique cabin and speaker architecture found within the particular vehicle to which the radio has been installed.
- **Cargo Lamp Disable -** The BCM monitors an input from the cargo lamp switch to provide an interior lighting disable feature.
- **Chimes -** The chime tone generator is located on the ElectroMechanical Instrument Cluster (EMIC) circuit board, but the EMIC goes to sleep with the ignition switch in the Off position. The BCM provides a wake-up output to the EMIC based upon inputs from the key-in ignition switch or the exterior lighting switch, then sends electronic chime request messages to the EMIC for the headlamps-on warning and key-in ignition warning.
- **Door Lock Inhibit -** The BCM monitors the key-in ignition switch and the driver side front door ajar switch to provide a door lock inhibit feature.
- **Exterior Lamp Load Shedding -** The BCM provides a battery saver feature which will automatically turn off exterior lamps that remain on after a timed interval.
- **Exterior Lamp Status -** The BCM monitors the status of the park lamp, low beam, high beam or Daytime Running Lamp (DRL - Canada only), front fog lamp (optional), and rear fog lamp (in required markets only) relays.
- **Exterior Lighting Control -** The BCM provides exterior lamp control for standard head and park lamps, as well as Daytime Running Lamps

BODY CONTROL MODULE (Continued)

(DRL - Canada only), front fog lamps (optional), and rear fog lamps (in required markets only). This includes support for features including optical horn (also known as flash-to-pass) and headlamp time delay.

- **Flip-Up Glass Control** - The BCM monitors the tailgate cylinder lock switch, the tailgate handle switch, the Remote Keyless Entry (RKE) module inputs and the rear wiper switch to provide control for the rear flip-up glass actuator.
- **Fog Lamp Control** - The premium BCM provides fog lamp control for front fog lamps (optional), and rear fog lamps (in required markets only).
- **Front Wiper System Status** - The BCM monitors the status of the front wiper motor park switch.
- **Fuel Economy and Distance to Empty Calculations** - The BCM calculates and transmits the fuel economy and Distance To Empty (DTE) data.
- **Headlamp Time Delay** - The BCM provides a headlamp time delay feature with the ignition switch in the Off position.
- **Heated Rear Glass Control** - The BCM provides control and timer functions for the heated rear glass feature and transmits the system status.
- **Ignition On/Off Timer** - The BCM monitors and transmits the elapsed ignition On timer data and monitors the ignition Off time.
- **Ignition Switch Position Status** - The BCM monitors and transmits the status of the ignition switch.
- **Instrument Panel Dimming** - The BCM monitors and transmits the selected illumination intensity level of the panel lamps dimmer switch.
- **Interior Lamp Load Shedding** - The BCM provides a battery saver feature which will automatically turn off all interior lamps that remain on after a timed interval.
- **Interior Lighting Control** - The BCM monitors inputs from the interior lighting switch, the door ajar switches, the flip-up glass ajar switch, the tailgate ajar switch, the cargo lamp switch, the reading lamp switches, and the Remote Keyless Entry (RKE) module to provide courtesy lamp control. This includes support for timed illuminated entry with theater-style fade-to-off and courtesy illumination defeat features.
- **Intermittent Wipe and Front Wiper System Control** - The BCM monitors inputs from the front wiper and washer switch and the front wiper motor park switch to provide front wiper system control through the wiper on/off and high/low relays. This includes support for adjustable intermittent wipe, mist wipe (also known as pulse wipe), and wipe-after-wash features.
- **Key-In-Ignition Switch Status** - The BCM monitors and transmits the status of the key-in-ignition switch.
- **Panic Mode** - The BCM provides support for the Remote Keyless Entry (RKE) system panic mode feature.
- **Parade Mode** - The BCM provides a parade mode (also known as funeral mode) that allows the interior Vacuum Fluorescent Displays (VFD) to be illuminated at full intensity while driving in daylight with the exterior lamps On.
- **Power Locks** - The BCM monitors inputs from the power lock switches and the Remote Keyless Entry (RKE) module (optional) to provide control of the power lock motors through outputs to the lock, unlock, and driver unlock (RKE only) relays. This includes support for rolling door locks (also known as automatic door locks) and a door lock inhibit mode.
- **Programmable Features** - The BCM provides support for several standard and optional programmable features, including: rolling door locks, headlamp time delay interval, Remote Keyless Entry (RKE) driver-door-only or unlock-all-doors, RKE optical chirp, and RKE audible chirp.
- **Remote Keyless Entry** - The premium BCM provides the optional Remote Keyless Entry (RKE) system features, including support for the RKE Lock, Unlock (with optional driver-door-only unlock, and unlock-all-doors), rear flip-up glass control, Panic, audible chirp, optical chirp, and illuminated entry modes, as well as the ability to be programmed to recognize up to four RKE transmitters.
- **Rolling Door Locks** - The BCM provides support for the power lock system rolling door locks feature (also known as automatic door locks).
- **Tailgate and Flip-Up Glass Ajar Status** - The BCM monitors and transmits the status of the tailgate and rear flip-up glass ajar switches.
- **Remote Radio Switch Interface** - The premium BCM monitors and transmits the status of the optional remote radio switches.
- **Self-Diagnostics** - The BCM provides support for diagnostics through communication with the DRBIII® scan tool over the PCI data bus network. Each analog and digital input can be verified, and each output can be actuated through the use of this diagnostic protocol. The BCM also stores Diagnostic Trouble Codes (DTCs) to assist in troubleshooting this unit.
- **Tire Size** - The BCM calculates vehicle speed based upon a programmed Tire Revolutions per mile (TIRE REV/MILE) value. The correct tire size must be programmed to the BCM using the DRBIII®. Using the DRBIII®, select Body Computer, then Program Tire Size. The BCM must be programmed with

BODY CONTROL MODULE (Continued)

one of the available tire sizes in the DRBIII® menu or by programming the correct REV/MILE value.

- **Vacuum Fluorescent Display Synchronization -** The BCM transmits panel lamp intensity data which allows modules with Vacuum Fluorescent Displays (VFD) to coordinate their illumination intensity.
- **Vehicle Speed System - ABS Equipped -** The CAB provides 12VDC hard wire speed sensor supply to the Left and Right Wheel speed sensors and the Rear Wheel Speed Sensor the speed sensor output hard wire square wave signals back to the CAB. the CAB outputs a hard wire square wave back to the BCM. The BCM calculates vehicle speed based upon a programmed Tire revolutions per mile (TIRE REV/MILE) value. This calculation is based upon tire circumference revolutions per mile. This calculation **must** be programmed into the BCM. New service BCM's are shipped in default mode that prevents speedometer indication until a valid tire size is programmed. The BCM outputs a hard wired square wave Vehicle Speed Output signal to the PCM. The PCM transmits vehicle speed to the instrument cluster via the PCI bus.
- **Vehicle Speed System - NON-ABS Equipped -** The BCM provides a 12VDC hard wire speed sensor supply to the Rear Wheel speed sensor. The speed sensor outputs a hard wire square wave signal back to the BCM. The BCM calculates vehicle speed based upon a programmed Tire Revolutions per mile (TIRE REV/MILE) value. This calculation is based tire circumference revolutions per mile. This calculation **must** be programmed into the BCM. New service BCM's are shipped in default mode that prevents speedometer indication until a valid tire size is programmed. The BCM outputs a hard wired square wave Vehicle Speed Output signal to the PCM. The PCM transmits vehicle speed to the instrument cluster via the PCI bus.
- **Vehicle Theft Security System -** The premium BCM monitors inputs from the door cylinder lock switches, the tailgate cylinder lock switch, the door ajar switches, the tailgate ajar switch, the flip-up glass ajar switch, the hood ajar switch (in required markets only), and the Remote Keyless Entry (RKE) module to control the features of the optional Vehicle Theft Security System (VTSS).

Hard wired circuitry connects the BCM to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the BCM through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

Many of the electronic features in the vehicle controlled or supported by the BCM are programmable using a customer programming procedure or the DRBIII® scan tool. In addition, the BCM software is Flash compatible, which means it can be reprogrammed using Flash reprogramming procedures. However, if any of the BCM hardware components is damaged or faulty, the entire BCM unit must be replaced.

OPERATION

The Body Control Module (BCM) monitors many hard wired switch and sensor inputs as well as those resources it shares with other electronic modules in the vehicle through its communication over the Programmable Communications Interface (PCI) data bus network. The internal programming and all of these inputs allow the BCM microprocessor to determine the tasks it needs to perform and their priorities, as well as both the standard and optional features that it should provide. The BCM programming then performs those tasks and provides those features through both PCI data bus communication with other electronic modules and through hard wired outputs through a number of driver circuits, relays, and actuators. These outputs allow the BCM the ability to control numerous accessory systems in the vehicle.

The BCM operates on battery and ignition voltage inputs received through several fuses in the Junction Block (JB). This arrangement allows the BCM to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On, Start, and/or Accessory positions. All of the battery voltage circuits are connected to the BCM through the JB/BCM connector. The BCM receives ground through five separate circuits. Three of these circuits are connected to the BCM through a connector of the instrument panel wire harness on three separate ground circuits, while the other two circuits are connected to the BCM through the JB/BCM connector. All of these circuits are grounded through a splice block located in the instrument panel wire harness, on the driver side instrument panel end bracket, near the JB.

The BCM monitors its own internal circuitry as well as many of its input and output circuits, and will store a Diagnostic Trouble Code (DTC) in electronic memory for any failure it detects. These DTCs can be retrieved and diagnosed using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

BODY CONTROL MODULE (Continued)

HARD WIRED INPUTS The hard wired inputs to the BCM include the following:

- **A/C on/off control**
- **Ambient temperature sensor signal**
- **Body control module flash enable**
- **Door lock switch**
- **Driver door ajar switch sense**
- **Flip-up glass ajar switch sense**
- **Flip-up glass release switch sense**
- **Fog lamp switch sense**
- **Front wiper park switch sense**
- **Front wiper switch**
- **Front washer pump driver**
- **Fused B(+)**
- **Fused ignition switch output (run-acc)**
- **Fused ignition switch output (run-start)**
- **Headlamp switch**
- **High beam switch sense**
- **Hood ajar switch sense - premium with VTSS - in markets where required only**
- **Key-in ignition switch sense**
- **Left cylinder lock switch sense - premium with VTSS only - omitted in some markets as required**
- **Panel lamps dimmer switch**
- **Passenger doors ajar switch sense (input from three ajar switches connected in parallel)**
- **Radio control - premium with remote radio switches only**
- **Rear courtesy lamp control**
- **Rear window defogger control**
- **Rear wiper intermittent driver**
- **Rear wiper on driver**
- **Right cylinder lock switch sense - premium with VTSS only - omitted in some markets as required**
- **RKE antenna (two circuits) - premium with RKE only**
- **Tailgate ajar switch sense**
- **Tailgate cylinder lock switch sense**
- **Vehicle speed sensor signal**

Refer to the appropriate wiring information for additional details.

HARD WIRED OUTPUTS The hard wired outputs of the BCM include the following:

- **Courtesy lamp driver**
- **Courtesy lamp load shed**
- **Door lock relay control**
- **Driver door unlock relay control - premium with RKE only**
- **Flip-up glass release motor driver**
- **Front fog lamp relay control - premium with front fog lamps only**
- **Front wiper high/low relay control**
- **Front wiper on/off relay control**
- **Hazard lamp control**
- **High beam relay control**
- **Horn relay control - premium with RKE only**
- **Instrument cluster wake up signal**
- **Low beam relay control**
- **Park lamp relay control**
- **Passenger door unlock relay control**
- **Rear fog lamp relay control - premium with rear fog lamps in markets where required only**
- **Rear window defogger relay control**
- **RKE supply - premium with RKE only**
- **Tailgate lock driver**
- **Tailgate unlock driver**
- **Vehicle speed output**
- **Vehicle speed sensor supply (Non-ABS)**
- **VTSS indicator driver - premium with VTSS only**

Refer to the appropriate wiring information for additional details.

GROUNDS The BCM receives ground through five separate circuits, and also supplies a ground path to several switches through the following hard wired circuits:

- **Ambient temperature sensor return**
- **Door lock switch ground**
- **Headlamp switch return**
- **Radio control return**
- **RKE ground - premium with RKE only**
- **Tailgate switch ground**

Refer to the appropriate wiring information for additional details.

COMMUNICATION Not including the two RKE antenna circuits (RKE antenna + and –), which merely pass through the premium BCM from the RKE module to the external RKE antenna in the instrument panel wire harness, the BCM has the following communication circuits:

- **PCI bus**
- **RKE program serial data - premium with RKE only**
- **RKE transmit serial data - premium with RKE only**

Refer to the appropriate wiring information for additional details.

MESSAGING The BCM uses the following messages received from other electronic modules over the PCI data bus:

- **Battery Temperature (PCM)**
- **Compass Mini-Trip Computer Button Status (CMTC) - premium only**
- **Coolant Temperature (PCM)**
- **Distance Pulses (PCM)**
- **Engine Speed (PCM)**
- **Fuel Tank Level (PCM)**
- **Fuel Used (PCM)**

BODY CONTROL MODULE (Continued)

- **Intrusion Transceiver Module Commands (ITM) - premium in markets where required only**
- **Manifold Absolute Pressure (PCM)**
- **OK to Lock - Rolling Locks (PCM)**
- **SKIS Status (SKIM)**
- **Vehicle Identification Number (PCM)**
- **Vehicle Speed from CAB with ABS**

The BCM provides the following messages to other electronic modules over the PCI data bus:

- **A/C Select Switch Status (PCM)**
- **Country Code (EMIC, PCM, CMTC)**
- **Distance to Empty (CMTC) - premium only**
- **Door Ajar Status (EMIC)**
- **Exterior Lighting Status (EMIC)**
- **Flip-up Glass Ajar Status (EMIC)**
- **Fuel Economy (Average and Instantaneous) (CMTC) - premium only**
- **Hood Ajar Status (ITM) - premium in markets where required only**
- **Ignition On Timer (CMTC) - premium only**
- **Intrusion Transceiver Module Commands (ITM) - premium in markets where required only**
- **Key-In Ignition Switch Status (EMIC)**
- **Outside Temperature (CMTC) - premium only**
- **Panel Lamp Intensity (CMTC, Radio)**
- **Tailgate Ajar Status (EMIC)**
- **Radio EQ Curve (Radio) - premium only**
- **Radio Mode (Radio) - premium only**
- **Radio Preset Scan (Radio) - premium only**
- **Radio Seek Down (Radio) - premium only**
- **Radio Seek Up (Radio) - premium only**
- **Radio Volume Down (Radio) - premium only**
- **Radio Volume Up (Radio) - premium only**
- **Vacuum Fluorescent Display Synchronization (CMTC, EMIC, Radio)**
- **Vehicle Theft Security System Status (PCM, ITM) - premium only**

Refer to the appropriate diagnostic information for additional details.

DIAGNOSIS AND TESTING - BODY CONTROL MODULE

The hard wired inputs to and outputs from the Body Control Module (BCM), as well as other hard wired circuits for this module may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the BCM, the Programmable Communications Interface (PCI) data bus network, or the electronic messages received and transmitted by the BCM over the PCI data bus. The most reliable, efficient, and accurate means to diagnose the BCM and the PCI data bus network inputs to and outputs from this module requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before replacing a Body Control Module (BCM), use the DRBIII® scan tool to retrieve the current settings for the BCM Programmable Features and the current REV/MILE (Tire Size). These settings must be programmed to the replacement BCM using the DRBIII® before returning the vehicle to service. New BCM's are shipped in default mode that prevents speedometer indication until a valid tire size is programmed. Refer to the appropriate diagnostic information.

BODY CONTROL MODULE (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the Junction Block Module (JBM) from the instrument panel end bracket on the driver side of the vehicle. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - REMOVAL).

(3) Remove the screws that secure the BCM to the Junction Block (JB) (Fig. 3).

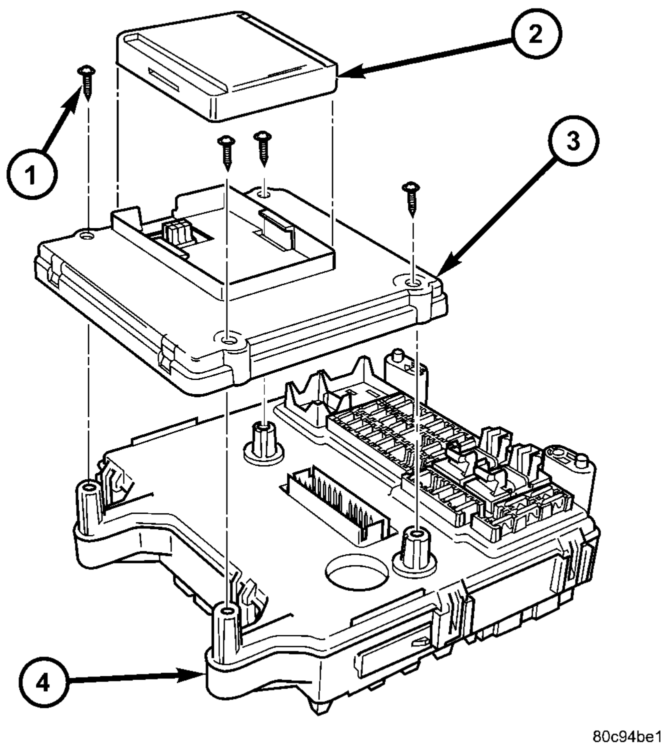

Fig. 3 Body Control Module Remove/Install

1 - SCREW (4)
2 - RKE MODULE
3 - BODY CONTROL MODULE
4 - JUNCTION BLOCK

(4) Remove the BCM from the JB.

(5) If the vehicle is equipped with the optional Remote Keyless Entry (RKE) system, remove the RKE module from the BCM. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY MODULE - REMOVAL).

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before replacing a Body Control Module (BCM), use a DRBIII® scan tool to retrieve the current settings for the BCM programmable features and the axle ratio/tire size (electronic pinion factor). Refer to the appropriate diagnostic information. These settings should be duplicated in the replacement BCM using the DRBIII® scan tool before returning the vehicle to service.

(1) If the vehicle is equipped with the optional Remote Keyless Entry (RKE) system, reinstall the RKE module into the BCM. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY MODULE - INSTALLATION).

(2) Position the BCM onto the Junction Block (JB) (Fig. 3).

(3) Install and tighten the screws that secure the BCM to the JB. Tighten the screws to 2 N·m (18 in. lbs.).

(4) Reinstall the Junction Block Module (JBM) onto the instrument panel end bracket on the driver side of the vehicle. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - INSTALLATION).

(5) Reconnect the battery negative cable.

COMMUNICATION

DESCRIPTION

The DaimlerChrysler Programmable Communication Interface (PCI) data bus system is a single wire multiplex system used for vehicle communications on many DaimlerChrysler Corporation vehicles. Multiplexing is a system that enables the transmission of several messages over a single channel or circuit. All DaimlerChrysler vehicles use this principle for communication between various microprocessor-based electronic control modules. The PCI data bus exceeds the Society of Automotive Engineers (SAE) J1850 Standard for Class B Multiplexing.

Many of the electronic control modules in a vehicle require information from the same sensing device. In the past, if information from one sensing device was required by several controllers, a wire from each controller needed to be connected in parallel to that sensor. In addition, each controller utilizing analog sensors required an Analog/Digital (A/D) converter in

COMMUNICATION (Continued)

order to "read" these sensor inputs. Multiplexing reduces wire harness complexity, sensor current loads and controller hardware because each sensing device is connected to only one controller, which reads and distributes the sensor information to the other controllers over the data bus. Also, because each controller on the data bus can access the controller sensor inputs to every other controller on the data bus, more function and feature capabilities are possible.

In addition to reducing wire harness complexity, component sensor current loads and controller hardware, multiplexing offers a diagnostic advantage. A multiplex system allows the information flowing between controllers to be monitored using a diagnostic scan tool. The DaimlerChrysler system allows an electronic control module to broadcast message data out onto the bus where all other electronic control modules can "hear" the messages that are being sent. When a module hears a message on the data bus that it requires, it relays that message to its microprocessor. Each module ignores the messages on the data bus that are being sent to other electronic control modules.

OPERATION

Data exchange between modules is achieved by serial transmission of encoded data over a single wire broadcast network. The wire colors used for the PCI data bus circuits are yellow with a violet tracer, or violet with a yellow tracer, depending upon the application. The PCI data bus messages are carried over the bus in the form of Variable Pulse Width Modulated (VPWM) signals. The PCI data bus speed is an average 10.4 Kilo-bits per second (Kbps). By comparison, the prior two-wire Chrysler Collision Detection (CCD) data bus system is designed to run at 7.8125 Kbps.

The voltage network used to transmit messages requires biasing and termination. Each module on the PCI data bus system provides its own biasing and termination. Each module (also referred to as a node) terminates the bus through a terminating resistor and a terminating capacitor. There are two types of nodes on the bus. The dominant node terminates the bus through a 1 KW resistor and a 3300 pF capacitor. The Powertrain Control Module (PCM) is the only dominant node for the PCI data bus system. A standard node terminates the bus through an 11 KW resistor and a 330 pF capacitor.

The modules bias the bus when transmitting a message. The PCI bus uses low and high voltage levels to generate signals. Low voltage is around zero volts and the high voltage is about seven and one-half volts. The low and high voltage levels are generated by means of variable-pulse width modulation to form signals of varying length. The Variable Pulse Width Modulation (VPWM) used in PCI bus messaging is a method in which both the state of the bus and the width of the pulse are used to encode bit information. A "zero" bit is defined as a short low pulse or a long high pulse. A "one" bit is defined as a long low pulse or a short high pulse. A low (passive) state on the bus does not necessarily mean a zero bit. It also depends upon pulse width. If the width is short, it stands for a zero bit. If the width is long, it stands for a one bit. Similarly, a high (active) state does not necessarily mean a one bit. This too depends upon pulse width. If the width is short, it stands for a one bit. If the width is long, it stands for a zero bit.

In the case where there are successive zero or one data bits, both the state of the bus and the width of the pulse are changed alternately. This encoding scheme is used for two reasons. First, this ensures that only one symbol per transition and one transition per symbol exists. On each transition, every transmitting module must decode the symbol on the bus and begin timing of the next symbol. Since timing of the next symbol begins with the last transition detected on the bus, all of the modules are re-synchronized with each symbol. This ensures that there are no accumulated timing errors during PCI data bus communication.

The second reason for this encoding scheme is to guarantee that the zero bit is the dominant bit on the bus. When two modules are transmitting simultaneously on the bus, there must be some form of arbitration to determine which module will gain control. A data collision occurs when two modules are transmitting different messages at the same time. When a module is transmitting on the bus, it is reading the bus at the same time to ensure message integrity. When a collision is detected, the module that transmitted the one bit stops sending messages over the bus until the bus becomes idle.

Each module is capable of transmitting and receiving data simultaneously. The typical PCI bus message has the following four components:

- **Message Header** - One to three bytes in length. The header contains information identifying the message type and length, message priority, target module(s) and sending module.
- **Data Byte(s)** - This is the actual message that is being sent.
- **Cyclic Redundancy Check (CRC) Byte** - This byte is used to detect errors during a message transmission.
- **In-Frame Response (IFR) byte(s)** - If a response is required from the target module(s), it can be sent during this frame. This function is described in greater detail in the following paragraph.

COMMUNICATION (Continued)

The IFR consists of one or more bytes, which are transmitted during a message. If the sending module requires information to be received immediately, the target module(s) can send data over the bus during the original message. This allows the sending module to receive time-critical information without having to wait for the target module to access the bus. After the IFR is received, the sending module broadcasts an End of Frame (EOF) message and releases control of the bus.

The PCI data bus can be monitored using the DRBIII® scan tool. It is possible, however, for the bus to pass all DRBIII® tests and still be faulty if the voltage parameters are all within the specified range and false messages are being sent.

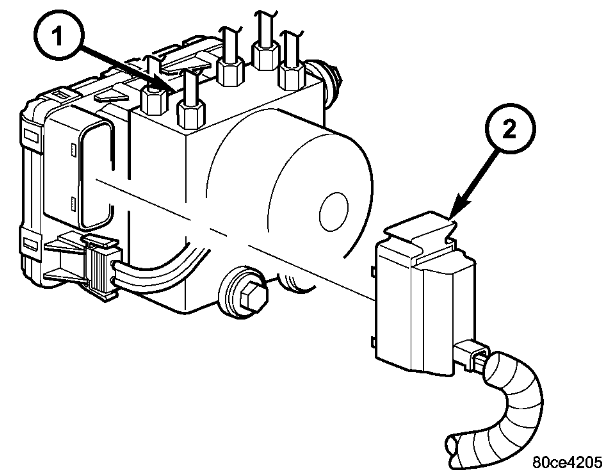

Fig. 4 CAB HARNESS CONNECTOR RELEASE

1 - ABS MODULE
2 - ELECTRICAL CONNECTOR

CONTROLLER ANTILOCK BRAKE

DESCRIPTION

The Controler Antilock Brake (CAB) is mounted to the Hydraulic Control Unit (HCU) and operates the ABS system.

OPERATION

The CAB voltage source is through the ignition switch in the RUN position. The CAB contains dual microprocessors. A logic block in each microprocessor receives identical sensor signals. These signals are processed and compared simultaneously. The CAB contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in a diagnostic program memory and are accessible with the DRB scan tool. ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are **not** erased if the battery is disconnected.

REMOVAL

(1) Remove the negative battery cable from the battery.

(2) Pull up on the CAB harness connector release (Fig. 4)and remove connector.

(3) Remove the pump connector from the CAB.

(4) Remove the CAB mounting bolts (Fig. 5).

(5) Remove the CAB from the HCU (Fig. 6).

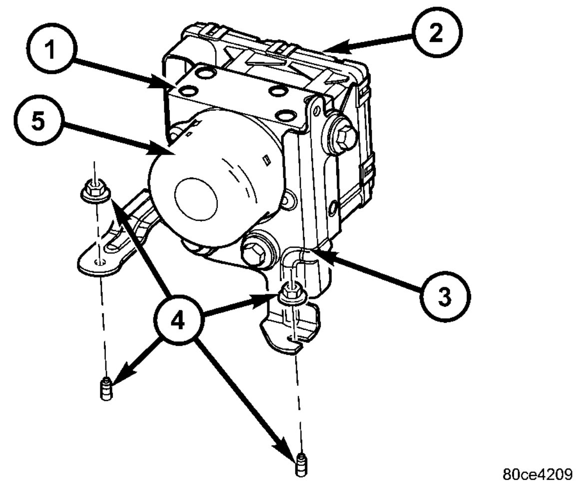

Fig. 5 HCU/CAB MOUNTING

1 - HCU
2 - CAB
3 - HCU/CAB BRACKET
4 - MOUNTING NUTS AND STUDS
5 - MOTOR

INSTALLATION

NOTE: If the CAB is being replaced with a new CAB is must be reprogrammed with the use of a DRB III.

(1) Install CAB to the HCU (Fig. 6).

(2) Install mounting bolts. Tighten to 2 N·m (16 in. lbs.).

(3) Install the pump electircal connector to the CAB (Fig. 6).

(4) Install the wiring harness connector to the CAB and push down on the release to secure the connector.

(5) Install negative battery cable to the battery.

CONTROLLER ANTILOCK BRAKE (Continued)

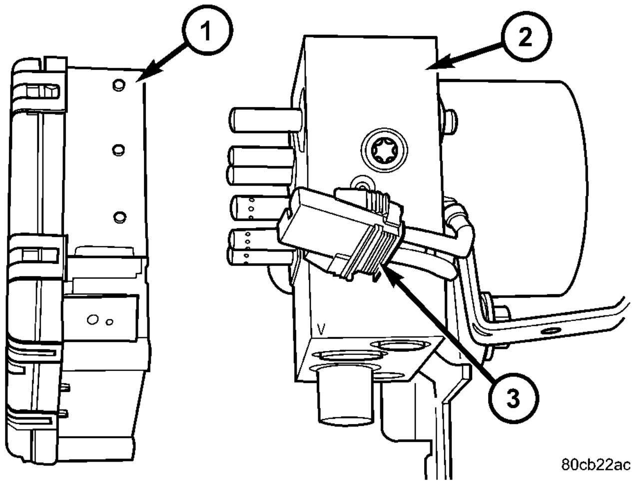

Fig. 6 CONTROLLER AND HCU

1 - CONTROLLER ANTILOCK BRAKE MODULE
2 - HYDRAULIC CONTROL UNIT (H.C.U)
3 - ELECTRICAL CONNECTOR

DATA LINK CONNECTOR

DESCRIPTION - DATA LINK CONNECTOR

The data link connector is located at the lower edge of the instrument panel near the steering column (Fig. 7).

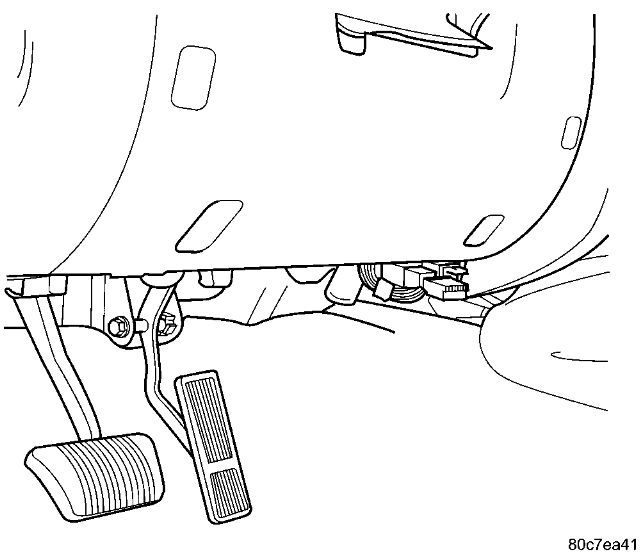

Fig. 7 DATA LINK CONNECTOR LOCATION

OPERATION - DATA LINK CONNECTOR

The 16–way data link connector (diagnostic scan tool connector) links the Diagnostic Readout Box (DRB) scan tool or the Mopar Diagnostic System (MDS) with the Powertrain Control Module (PCM).

POWERTRAIN CONTROL MODULE

DESCRIPTION

DESCRIPTION - PCM

The Powertrain Control Module (PCM) is located in the engine compartment (Fig. 8). The PCM is referred to as JTEC.

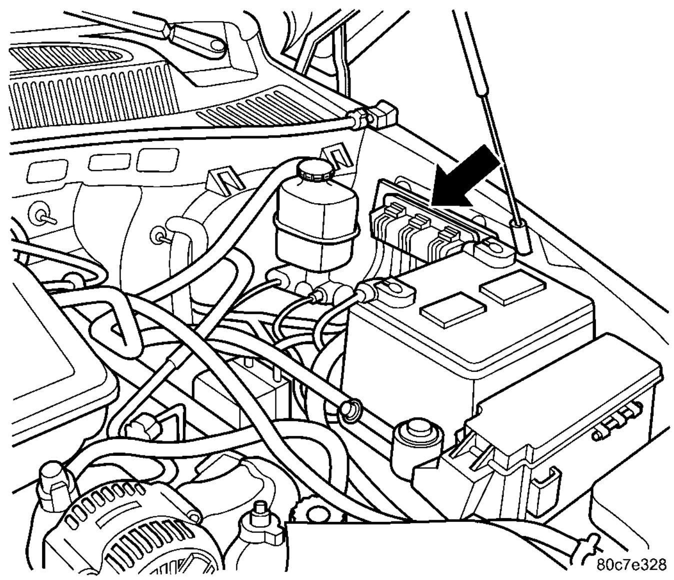

Fig. 8 PCM LOCATION

DESCRIPTION - MODES OF OPERATION

As input signals to the Powertrain Control Module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

The PCM will operate in two different modes: **Open Loop and Closed Loop**.

During Open Loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen (O2S) sensors is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O2S) sensors input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

POWERTRAIN CONTROL MODULE (Continued)

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

- The PCM pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.
- Intake manifold air temperature sensor input is monitored.
- Throttle position sensor (TPS) is monitored.
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged.
- The O2S sensor heater element is energized via the ASD or O2S heater relay. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.

ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The PCM receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the PCM receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the A/C compressor clutch relay. This is done if A/C has been selected by the vehicle operator and specified pressures are met at the high and low–pressure A/C switches. Refer to Heating and Air Conditioning for additional information.
- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor

POWERTRAIN CONTROL MODULE (Continued)

- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.
- The PCM operates the A/C compressor clutch through the A/C compressor clutch relay. This is done if A/C has been selected by the vehicle operator and specified pressures are met at the high and low–pressure A/C switches. Refer to Heating and Air Conditioning for additional information.

CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O2S) sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by turning the ground path to the coil(s) on and off.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

ACCELERATION MODE

This is an Open Loop mode. The PCM recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the PCM receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Vehicle speed

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply a ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the PCM receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

During wide open throttle conditions, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.

- The PCM adjusts ignition timing by turning the ground path to the coil(s) on and off.

IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

DESCRIPTION - 5 VOLT SUPPLIES

Two different Powertrain Control Module (PCM) five volt supply circuits are used; primary and secondary.

DESCRIPTION - IGNITION CIRCUIT SENSE

This circuit ties the ignition switch to the Powertrain Control Module (PCM).

DESCRIPTION - POWER GROUNDS

The Powertrain Control Module (PCM) has 2 main grounds. Both of these grounds are referred to as power grounds. All of the high-current, noisy, electrical devices are connected to these grounds as well as all of the sensor returns. The sensor return comes into the sensor return circuit, passes through noise suppression, and is then connected to the power ground.

The power ground is used to control ground circuits for the following PCM loads:

- Generator field winding
- Fuel injectors
- Ignition coil(s)
- Certain relays/solenoids
- Certain sensors

DESCRIPTION - SENSOR RETURN

The Sensor Return circuits are internal to the Powertrain Control Module (PCM).

Sensor Return provides a low–noise ground reference for all engine control system sensors. Refer to Power Grounds for more information.

OPERATION

OPERATION - PCM

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed, power steering pump pressure, and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

NOTE: PCM Inputs:

- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- A/C pressure transducer
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage
- Brake switch
- J1850 bus (+) circuits
- J1850 bus (-) circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connection for DRB scan tool
- Engine coolant temperature sensor
- Fuel level (through J1850 circuitry)
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Knock sensors (2 on 3.7L engine)
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Power steering pressure switch
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Transfer case switch (4WD range position)

POWERTRAIN CONTROL MODULE (Continued)

• Vehicle speed sensor

NOTE: PCM Outputs:

• A/C clutch relay
• Auto shutdown (ASD) relay
• J1850 bus (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
• Clutch pedal position switch override relay
• Data link connection for DRB scan tool
• EGR valve control solenoid (if equipped)
• EVAP canister purge solenoid
• Five volt sensor supply (primary)
• Five volt sensor supply (secondary)
• Fuel injectors
• Fuel pump relay
• Generator field driver (-)
• Generator field driver (+)
• Idle air control (IAC) motor
• Ignition coil(s)
• Leak detection pump (if equipped)
• Malfunction indicator lamp (Check engine lamp). Driven through J1850 circuits.
• Oxygen sensor heater relays
• Oxygen sensors (pulse width modulated)
• Radiator cooling fan relay (pulse width modulated)
• Speed control vacuum solenoid
• Speed control vent solenoid
• Tachometer (if equipped). Driven through J1850 circuits.
• Transmission convertor clutch circuit. Driven through J1850 circuits.

OPERATION - 5 VOLT SUPPLIES

Primary 5–volt supply:

• supplies the required 5 volt power source to the Crankshaft Position (CKP) sensor.
• supplies the required 5 volt power source to the Camshaft Position (CMP) sensor.
• supplies a reference voltage for the Manifold Absolute Pressure (MAP) sensor.
• supplies a reference voltage for the Throttle Position Sensor (TPS) sensor.

Secondary 5–volt supply:

• supplies the required 5 volt power source to the oil pressure sensor.
• supplies the required 5 volt power source for the Vehicle Speed Sensor (VSS) (if equipped).
• supplies the 5 volt power source to the transmission pressure sensor (certain automatic transmissions).

OPERATION - IGNITION CIRCUIT SENSE

The ignition circuit sense input tells the PCM the ignition switch has energized the ignition circuit.

Battery voltage is also supplied to the PCM through the ignition switch when the ignition is in the RUN or START position. This is referred to as the ″ignition sense″ circuit and is used to ″wake up″ the PCM. Voltage on the ignition input can be as low as 6 volts and the PCM will still function. Voltage is supplied to this circuit to power the PCM's 8-volt regulator and to allow the PCM to perform fuel, ignition and emissions control functions.

REMOVAL

USE THE DRB SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

The PCM is located in the engine compartment near the battery (Fig. 9).

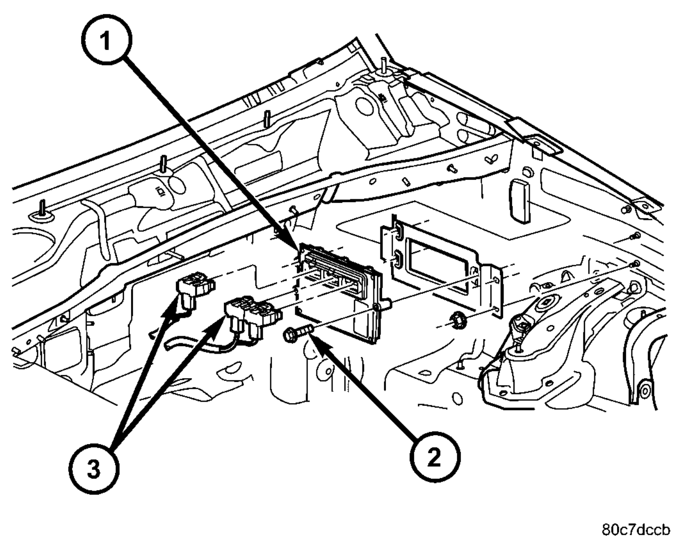

Fig. 9 PCM REMOVE/INSTALL

1 - PCM
2 - MOUNTING BOLTS (3)
3 - 32-WAY CONNECTORS

To avoid possible voltage spike damage to the PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

(1) Disconnect negative battery cable at battery.

(2) Remove cover over electrical connectors. Cover snaps onto PCM.

(3) Carefully unplug the three 32–way connectors from PCM.

(4) Remove three PCM mounting bolts and remove PCM from vehicle.

POWERTRAIN CONTROL MODULE (Continued)

INSTALLATION

USE THE DRB SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

(1) Install PCM and 3 mounting bolts to vehicle.

(2) Tighten bolts. Refer to torque specifications.

(3) Check pin connectors in the PCM and the three 32–way connectors for corrosion or damage. Also, the pin heights in connectors should all be same. Repair as necessary before installing connectors.

(4) Install three 32–way connectors.

(5) Install cover over electrical connectors. Cover snaps onto PCM.

(6) Install battery cable.

(7) Use the DRB scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.

SENTRY KEY IMMOBILIZER MODULE

DESCRIPTION

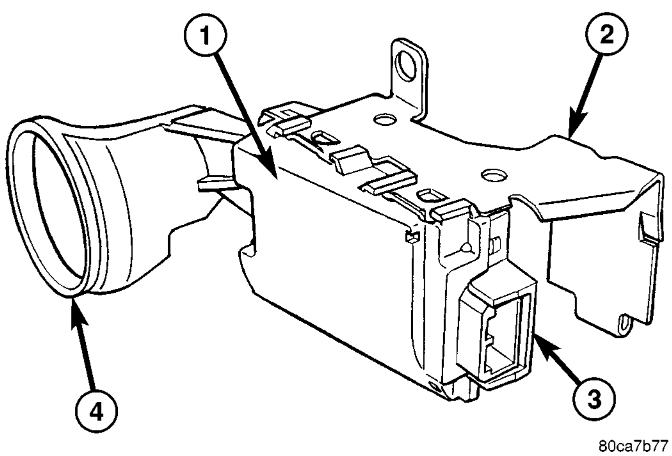

Fig. 10 Sentry Key Immobilizer Module

1 - SKIM
2 - BRACKET
3 - CONNECTOR RECEPTACLE
4 - ANTENNA RING

The Sentry Key Immobilizer Module (SKIM) is the primary component of the Sentry Key Immobilizer System (SKIS) (Fig. 10). The SKIM is located on the right side of the steering column, below the ignition lock cylinder housing and is concealed beneath the steering column shrouds. The housing for the SKIM has an molded plastic halo-like antenna ring. When the SKIM is properly installed on the steering column, the antenna ring is oriented around the circumference of the ignition lock cylinder housing. A single connector containing six terminal pins is located on the opposite end of the SKIM from the antenna ring. A stamped metal mounting bracket secured to the SKIM housing is used to secure the component to the right lower flange of the steering column jacket.

The SKIM cannot be adjusted or repaired. If faulty or damaged, the entire SKIM unit must be replaced.

OPERATION

The Sentry Key Immobilizer Module (SKIM) contains a Radio Frequency (RF) transceiver and a microprocessor. The SKIM transmits RF signals to, and receives RF signals from the Sentry Key transponder through a tuned antenna enclosed within the molded plastic antenna ring. If this antenna ring is not mounted properly around the ignition lock cylinder housing, communication problems between the SKIM and the transponder may arise. These communication problems will result in Sentry Key transponder-related faults. The SKIM also communicates over the Programmable Communications Interface (PCI) data bus with the Powertrain Control Module (PCM), the ElectroMechanical Instrument Cluster (EMIC) and/or the DRBIII® scan tool.

The SKIM retains in memory the ID numbers of any Sentry Key transponder that is programmed into it. A maximum of eight Sentry Key transponders can be programmed into the SKIM. For added system security, each SKIM is programmed with a unique Secret Key code. This code is stored in memory, sent over the PCI data bus to the PCM, and is encoded to the transponder of every Sentry Key that is programmed into the SKIM. Therefore, the Secret Key code is a common element that is found in every component of the Sentry Key Immobilizer System (SKIS). Another security code, called a PIN, is used to gain access to the SKIM Secured Access Mode. The Secured Access Mode is required during service to perform the SKIS initialization and Sentry Key transponder programming procedures. The SKIM also stores the Vehicle Identification Number (VIN) in its memory, which it learns through a PCI data bus message from the PCM during SKIS initialization.

In the event that a SKIM replacement is required, the Secret Key code can be transferred to the new SKIM from the PCM using the DRBIII® scan tool and the SKIS initialization procedure. Proper completion of the SKIS initialization will allow the existing Sentry Keys to be programmed into the new SKIM so that new keys will not be required. In the event that the original Secret Key code cannot be recovered, SKIM replacement will also require new Sentry Keys. The DRBIII® scan tool will alert the

SENTRY KEY IMMOBILIZER MODULE (Continued)

technician during the SKIS initialization procedure if new Sentry Keys are required.

When the ignition switch is turned to the On position, the SKIM transmits an RF signal to the transponder in the ignition key. The SKIM then waits for an RF signal response from the transponder. If the response received identifies the key as valid, the SKIM sends a valid key message to the PCM over the PCI data bus. If the response received identifies the key as invalid, or if no response is received from the key transponder, the SKIM sends an invalid key message to the PCM. The PCM will enable or disable engine operation based upon the status of the SKIM messages. It is important to note that the default condition in the PCM is an invalid key. If no message is received from the SKIM by the PCM, the engine will be disabled and the vehicle immobilized after two seconds of running.

The SKIM also sends SKIS indicator status messages to the EMIC over the PCI data bus to tell the EMIC how to operate the SKIS indicator. This indicator status message tells the EMIC to turn the indicator on for about three seconds each time the ignition switch is turned to the On position as a bulb test. After completion of the bulb test, the SKIM sends indicator status messages to the EMIC to turn the indicator off, turn the indicator on, or to flash the indicator on and off. If the SKIS indicator flashes upon ignition On or stays on solid after the bulb test, it signifies a SKIS fault. If the SKIM detects a system malfunction and/or the SKIS has become inoperative, the SKIS indicator will stay on solid. If the SKIM detects an invalid key or if a key transponder-related fault exists, the SKIS indicator will flash. If the vehicle is equipped with the Customer Learn transponder programming feature, the SKIM will also send messages to the EMIC to flash the SKIS indicator and to generate a single audible chime whenever the Customer Learn programming mode is being utilized. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SENTRY KEY TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of Diagnostic Trouble Codes (DTC's) in SKIM memory if a system malfunction is detected. The SKIM can be diagnosed, and any stored DTC's can be retrieved using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column to the fully lowered position and leave the tilt release lever in the released (down) position.

(3) From below the steering column, remove the screws that secure the lower shroud to the upper shroud (Fig. 11).

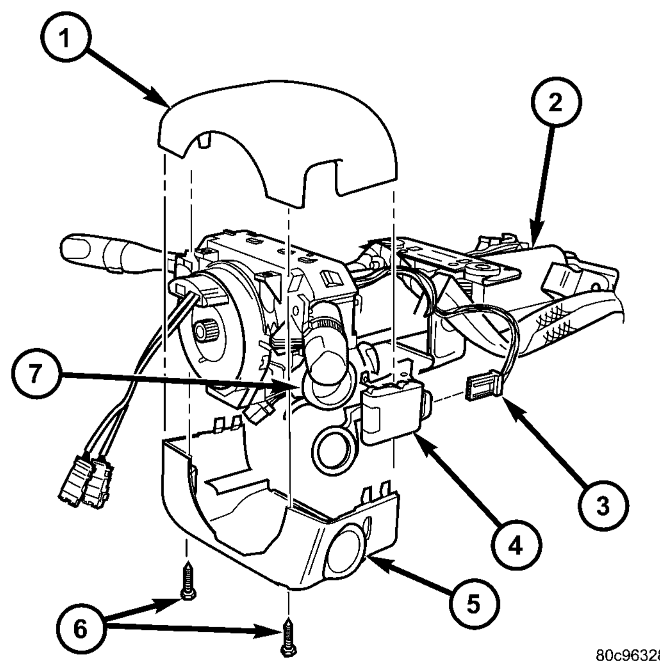

Fig. 11 Sentry Key Immobilizer Module Remove/Install

1 - UPPER SHROUD
2 - STEERING COLUMN
3 - WIRE HARNESS CONNECTOR
4 - SENTRY KEY IMMOBILIZER MODULE
5 - LOWER SHROUD
6 - SCREW (2)
7 - IGNITION LOCK CYLINDER HOUSING

SENTRY KEY IMMOBILIZER MODULE (Continued)

(4) Push gently inward on both sides of the upper shroud near the parting line between the upper and lower shrouds to release the snap features that secure the two halves to each other.

(5) Remove both the upper and lower shrouds from the steering column.

(6) Disconnect the instrument panel wire harness connector for the SKIM from the module connector.

(7) The SKIM mounting bracket features a clip that secures the SKIM to the right lower flange of the steering column jacket. Pull downward on the connector end of the SKIM mounting bracket to release this clip from the steering column jacket.

(8) Rotate the SKIM and its mounting bracket downwards and then to the side away from the steering column to slide the SKIM antenna ring from around the ignition switch lock cylinder housing. Lift the multi-function switch upward off of the upper steering column housing far enough to remove the SKIM antenna ring formation from between the ignition key release button and the multi-function switch housing.

(9) Remove the SKIM from the steering column.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the Sentry Key Immobilizer Module (SKIM) to the right side of the steering column (Fig. 11). Lift the multi-function switch upward off of the upper steering column housing far enough to insert the SKIM antenna ring formation between the ignition key release button and the multi-function switch housing.

(2) Slide the SKIM antenna ring around the ignition switch lock cylinder housing, then rotate the SKIM and its mounting bracket upwards and toward the steering column.

(3) Align the SKIM mounting bracket clip with the right lower flange of the steering column jacket and, push upward firmly and evenly on the connector end of the SKIM mounting bracket to engage this clip with the steering column jacket.

(4) Reconnect the instrument panel wire harness connector for the SKIM to the module connector.

(5) Position both the upper and lower shrouds onto the steering column.

(6) Align the snap features on the lower shroud the upper shroud and apply pressure to snap them together.

(7) From below the steering column, install and tighten the screws that secure the lower shroud to the upper shroud. Tighten the screws to 2 N·m (18 in. lbs.).

(8) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column to the fully raised position and secure it in place by moving the tilt release lever back to the locked (up) position.

(9) Reconnect the battery negative cable.

NOTE: If the SKIM has been replaced with a new unit, the Sentry Key Immobilizer System (SKIS) MUST be initialized before the vehicle can be operated. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SKIS INITIALIZATION).

TRANSMISSION CONTROL MODULE

DESCRIPTION

The Transmission Control Module (TCM) is located in the engine compartment on the right (passenger) side and is mounted to the inner fender (Fig. 12).

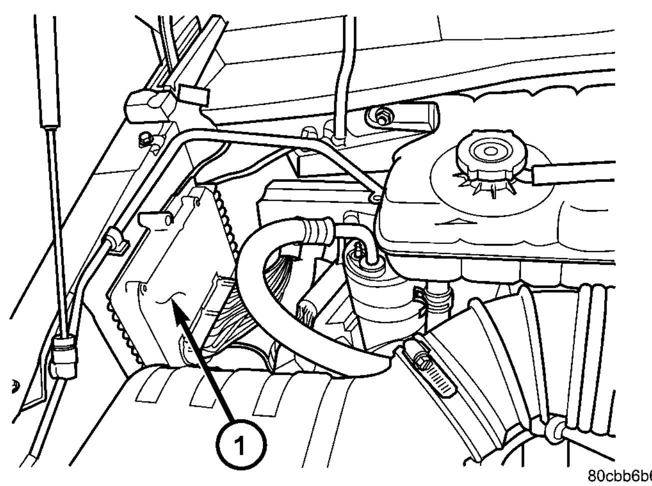

Fig. 12 Transmission Control Module Location

TRANSMISSION CONTROL MODULE (Continued)

OPERATION

The Transmission Control Module (TCM) is the controlling unit for all electronic operations of the transmission. The TCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hardwired to, and used specifically by the TCM. Indirect inputs originate from other components/modules, and are shared with the TCM via the vehicle communication bus.

Some examples of **direct inputs** to the TCM are:
- Battery (B+) voltage
- Ignition "ON" voltage
- Transmission Control Relay (Switched B+)
- Throttle Position Sensor
- Crankshaft Position Sensor
- Transmission Range Sensor
- Pressure Switches
- Transmission Temperature Sensor
- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Line Pressure Sensor

Some examples of **indirect inputs** to the TCM are:
- Engine/Body Identification
- Manifold Pressure
- Target Idle
- Torque Reduction Confirmation
- Engine Coolant Temperature
- Ambient/Battery Temperature
- DRB® III Scan Tool Communication

Based on the information received from these various inputs, the TCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of TCM **direct outputs** are:
- Transmission Control Relay
- Solenoids
- Torque Reduction Request

Some examples of TCM **indirect outputs** are:
- Transmission Temperature (to PCM)
- PRNDL Position (to BCM)

In addition to monitoring inputs and controlling outputs, the TCM has other important responsibilities and functions:
- Storing and maintaining Clutch Volume Indexes (CVI)
- Storing and selecting appropriate Shift Schedules
- System self-diagnostics
- Diagnostic capabilities (with DRB® scan tool)

NOTE: If the TCM has been replaced, the "Quick Learn Procedure" must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

BATTERY FEED

A fused, direct battery feed to the TCM is used for continuous power. This battery voltage is necessary to retain adaptive learn values in the TCM's RAM (Random Access Memory). When the battery (B+) is disconnected, this memory is lost. When the battery (B+) is restored, this memory loss is detected by the TCM and a Diagnostic Trouble Code (DTC) is set.

CLUTCH VOLUME INDEXES (CVI)

An important function of the TCM is to monitor Clutch Volume Indexes (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The TCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input, or Turbine Speed Sensor sends an electrical signal to the TCM that represents input shaft rpm. The Output Speed Sensor provides the TCM with output shaft speed information.

By comparing the two inputs, the TCM can determine transmission gear position. This is important to the CVI calculation because the TCM determines CVIs by monitoring how long it takes for a gear change to occur (Fig. 13).

Gear ratios can be determined by using the DRB® Scan Tool and reading the Input/Output Speed Sensor values in the "Monitors" display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

For example, if the input shaft is rotating at 1000 rpm and the output shaft is rotating at 500 rpm, then the TCM can determine that the gear ratio is 2:1. In direct drive (3rd gear), the gear ratio changes to 1:1. The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the TCM can determine the volume of fluid used to apply or release a friction element.

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

TRANSMISSION CONTROL MODULE (Continued)

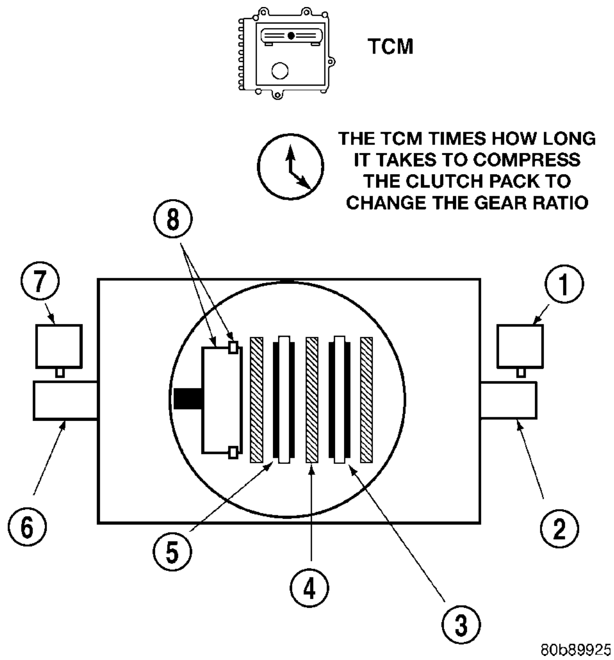

Fig. 13 Example of CVI Calculation

1 - OUTPUT SPEED SENSOR
2 - OUTPUT SHAFT
3 - CLUTCH PACK
4 - SEPARATOR PLATE
5 - FRICTION DISCS
6 - INPUT SHAFT
7 - INPUT SPEED SENSOR
8 - PISTON AND SEAL

Certain mechanical problems within the input clutch assembly (broken return springs, out of position snap rings, excessive clutch pack clearance, improper assembly, etc.) can cause inadequate or out-of-range element volumes. Also, defective Input/Output Speed Sensors and wiring can cause these conditions. The following tables 45RFE CVI Values and 42RLE CVI Values identifies the appropriate clutch volumes and when they are monitored/updated:

45RFE CVI VALUES

CLUTCH VOLUMES		
Clutch	**When Updated**	**Proper Clutch Volume**
L/R	2-1 or 3-1 downshift	45 to 134
2C	3-2 kickdown shift	25 to 85
OD	2-3 upshift	30 to 100
4C	3-4 upshift	30 to 85
UD	4-3 kickdown shift	30 to 100

42RLE CVI VALUES

CLUTCH VOLUMES				
Clutch	**When Updated**			**Proper Clutch Volume**
	Shift Sequence	**Oil Temper-ature**	**Throttle Angle**	
L/R	2-1 or 3-1 coast downshift	> 70°	< 5°	35 to 83
2/4	1-2 shift	> 110°	5 - 54°	20 to 77
OD	2-3 shift			48 to 150
UD	4-3 or 4-2 shift		> 5°	24 to 70

SHIFT SCHEDULES

As mentioned earlier, the TCM has programming that allows it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software level

As driving conditions change, the TCM appropriately adjusts the shift schedule. Refer to the following tables 45RFE Shift Schedule and 42RLE Shift Schedule to determine the appropriate operation expected, depending on driving conditions.

TRANSMISSION CONTROL MODULE (Continued)

45RFE SHIFT SCHEDULE

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature below -16° F	-Park, Reverse, Neutral and 1st and 3rd gear only in D position, 2nd gear only in Manual 2 or L -No EMCC
Super Cold	Oil temperature between -12° F and 10° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - Early 4-3 coastdown shift - High speed 4-2, 3-2, 2-1 kickdown shifts are prevented -Shifts at high throttle openings willl be early. - No EMCC
Cold	Oil temperature between 10° F and 36° F	-Shift schedule is the same as Super Cold except that the 2-3 upshifts are not delayed.
Warm	Oil temperature between 40° F and 80° F	- Normal operation (upshift, kickdowns, and coastdowns) - No EMCC
Hot	Oil temperature between 80° F and 240° F	- Normal operation (upshift, kickdowns, and coastdowns) - Normal EMCC operation
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - 3rd gear FEMCC from 30-48 mph - 3rd gear PEMCC above 35 mph - Above 25 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

TRANSMISSION CONTROL MODULE (Continued)

42RLE SHIFT SCHEDULE

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature at start-up below -16° F	Park, Reverse, Neutral and 2nd gear only (prevents shifting which may fail a clutch with frequent shifts)
Cold	Oil temperature at start-up above -12° F and below 36° F	– Delayed 2-3 upshift (approximately 22-31 mph) – Delayed 3-4 upshift (45-53 mph) – Early 4-3 costdown shift (approximately 30 mph) – Early 3-2 coastdown shift (approximately 17 mph) – High speed 4-2, 3-2, 2-1 kickdown shifts are prevented – No EMCC
Warm	Oil temperature at start-up above 36° F and below 80 degree F	– Normal operation (upshift, kickdowns, and coastdowns) – No EMCC
Hot	Oil temperature at start-up above 80° F	– Normal operation (upshift, kickdowns, and coastdowns) – Full EMCC, no PEMCC except to engage FEMCC (except at closed throttle at speeds above 70-83 mph)
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	– Delayed 2-3 upshift (25-32 mph) – Delayed 3-4 upshift (41-48 mph) – 3rd gear FEMCC from 30-48 mph – 3rd gear PEMCC from 27-31 mph
Super Overheat	Oil temperature above 260° F	– All ″Overheat″ shift schedule features apply – 2nd gear PEMCC above 22 mph – Above 22 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

STANDARD PROCEDURE

STANDARD PROCEDURE - TCM QUICK LEARN

The quick learn procedure requires the use of the DRB® scan tool.

This program allows the electronic transmission system to recalibrate itself. This will provide the proper transmission operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay in PARK until prompted to shift to overdrive

TRANSMISSION CONTROL MODULE (Continued)

- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the DRB® indicates the procedure is complete
- The calculated oil temperature must be above 60° and below 200°

STANDARD PROCEDURE - DRIVE LEARN - RFE TRANSMISSIONS ONLY

When a transmission is repaired and a Quick Learn procedure has been performed on the Transmission Control Module (TCM), the following Drive Learn procedure can be performed to fine tune any shifts which are particularly objectionable.

NOTE: It is not necessary to perform the complete Drive Learn procedure every time the TCM is Quick Learned. Perform only the portions which target the objectionable shift.

LEARN A SMOOTH 1ST NEUTRAL TO DRIVE SHIFT

Perform this procedure only if the complaint is for a delayed or harsh shift the first time the transmission is put into gear after the vehicle is allowed to set with the engine not running for at least 10 minutes. Use the following steps to have the TCM learn the 1st N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C).

(1) Start the engine only when the engine and ignition have been off for at least ten (10) minutes.

(2) With the vehicle at a stop and the service brake applied, record the 1st N-D UD CVI while performing a Neutral to Drive shift. The 1st N-D UD CVI accounts for air entrapment in the UD clutch that may occur after the engine has been off for a period of time.

(3) Repeat Step 1 and Step 2 until the recorded 1st N-D UD CVI value stabilizes.

NOTE: It is important that this procedure be performed when the transmission temperature is between 80 - 110°F (27 - 43°C). If this procedure takes too long to complete fully for the allowed transmission oil temperature, the vehicle may be returned to the customer with an explanation that the shift will improve daily during normal vehicle usage. The TCM also learns at higher oil temperatures, but these values (line pressure correction values) are not available for viewing on the DRB® III.

LEARN A SMOOTH NEUTRAL TO DRIVE GARAGE SHIFT

Perform this procedure if the complaint is for a delayed or harsh shift when the transmission is put into gear after the vehicle has had its first shift. Use the following steps to have the TCM learn the Norm N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C) to learn the UD CVI. Additional learning occurs at temperatures as low as 0°F and as high as 200°F. This procedure may be performed at any temperature that experiences poor shift quality. Although the UD CVI may not change, shift quality should improve.

(1) Start the vehicle engine and shift to drive.

(2) Move the vehicle forward to a speed of at least 16 km/h (10 MPH) and come to a stop. This ensures no air is present in the UD hydraulic circuit.

(3) Perform repeated N-D shifts at a stop while pausing in Neutral for at least 2-3 seconds and monitor Norm N-D UD CVI volume until the value stabilizes. The value will change during the N-D shift. This is normal since the UD value is different for the N-D shift then the normal value shown which is used for 4-3 coastdown and kickdowns. Perform repeated shifts in this temperature range until the Norm N-D UD CVI value stabilizes and the N-D shifts become smooth.

LEARN THE 1ST 2-3 SHIFT AFTER A RESTART OR SHIFT TO REVERSE

Use the following steps to have the TCM learn the 1st 2-3 shift OD CVI.

NOTE: The transmission oil temperature must be above 80°F (27°C).

(1) With the vehicle engine running, select reverse gear for over 2 seconds.

(2) Shift the transmission to Drive and accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform a 2-3 shift while noting the 1st 2-3 OD CVI.

(3) Repeat Step 1 and Step 2 until the 1st 2-3 upshift becomes smooth and the 1st 2-3 OD CVI stabilizes.

LEARN A SMOOTH 2-3 AND 3-4 UPSHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the OD and 4C CVI's.

TRANSMISSION CONTROL MODULE (Continued)

(1) Accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform multiple 1-2, 2-3, and 3-4 upshifts. The 2nd 2-3 shift following a restart or shift to reverse will be shown during the shift as a value between the 1st 2-3 OD CVI and the normal OD CVI. Updates to the normal OD CVI will occur after the 2nd shift into 3rd gear, following a restart or shift to reverse.

(2) Repeat Step 1 until the 2-3 and 3-4 shifts become smooth and the OD and 4C CVI become stable.

LEARN A SMOOTH 4-3 COASTDOWN AND PART THROTTLE 4-3 KICKDOWN

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the UD shift volume.

(1) At a vehicle speed between 64-97 km/h (40-60 MPH), perform repeated 4-3 kickdown shifts.

(2) Repeat Step 1 until the UD volume becomes somewhat stable and the shift becomes smooth.

LEARN A SMOOTH 1-2 UPSHIFT AND 3-2 KICKDOWN

Use the following steps to have the TCM learn the 2C shift volume.

NOTE: The transmission oil temperature must be above 110°F (43°C).

(1) With a vehicle speed below 48 km/h (30 MPH) and the transmission in 3rd gear, perform multiple 3-2 kickdowns.

(2) Repeat Step 1 until the 3-2 kickdowns become smooth and the 2C CVI becomes stable.

LEARN A SMOOTH MANUAL 2-1 PULLDOWN SHIFT AS WELL AS A NEUTRAL TO REVERSE SHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the LR volume.

(1) With the vehicle speed around 40-48 km/h (25-30 MPH) in Manual 2nd, perform manual pulldowns to Low or 1st gear at closed throttle.

(2) Repeat Step 1 until the LR CVI becomes stable and the manual 2-1 becomes smooth.

LEARN A SMOOTH NEUTRAL TO REVERSE SHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

(1) With the vehicle at a stop, perform Neutral to Reverse shifts until the shift is smooth. An unlearned Neutral to Reverse shift may be harsh or exhibit a double bump.

(2) If any of the shifts are still not smooth after the clutch volume stabilizes, an internal transmission problem may be present.

HEATED SEAT MODULE

DESCRIPTION

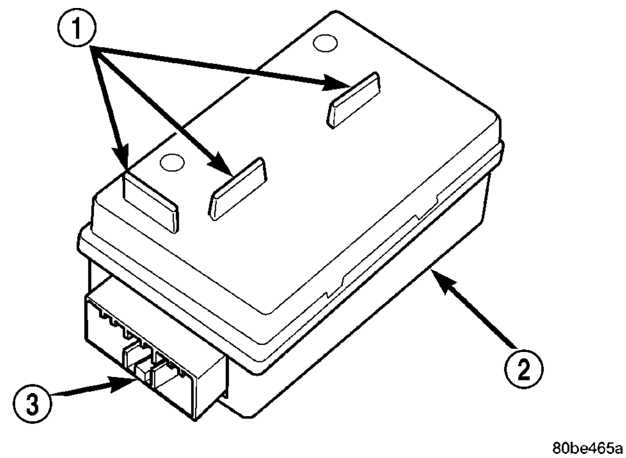

Fig. 14 Heated Seat Module

1 - Mounting Tabs (Not Used On KJ)
2 - Heated Seat Module
3 - Connector Receptacle

The heated seat module is also known as the Seat Heat Interface Module. The heated seat module (Fig. 14) is located under the left front seat cushion, where it is secured to a mounting bracket via two push-pin retainers. The heated seat module has a single connector receptacle that allows the module to be connected to all of the required inputs and outputs through the seat wire harness.

The heated seat module is an electronic microprocessor controlled device designed and programmed to use inputs from the heated seat relay, the two heated seat switches and the two heated seat sensors to operate and control the heated seat elements in both front seats and the two heated seat indicator lamp Light-Emitting Diodes (LEDs) in each heated seat switch. The heated seat module is also programmed to perform self-diagnosis of certain heated seat system functions and provide feedback of that diagnosis through the heated seat switch indicator lamps.

HEATED SEAT MODULE (Continued)

The heated seat module cannot be repaired. If the heated seat module is damaged or faulty, the entire module must be replaced.

OPERATION

The heated seat module operates on fused battery current received from a fuse in the junction block. The module is grounded at all times. Inputs to the module include a resistor multiplexed heated seat switch request circuit for each of the two heated seat switches and the heated seat sensor inputs from the seat cushions of each front seat. In response to those inputs, the heated seat module controls battery current to the heated seat elements and sensors, and controls the ground for the heated seat switch indicator lamps (LED's).

When a heated seat switch (Driver or Passenger) is depressed a signal is received by the heated seat module, the module energizes the proper indicator LED (Low or High) in the switch by grounding the indicator lamp circuit to indicate that the heated seat system is operating. At the same time, the heated seat module energizes the selected heated seat sensor circuit and the sensor provides the module with an input indicating the surface temperature of the selected seat cushion.

The Low heat set point is about 36° C (96.8° F), and the High heat set point is about 42° C (107.6° F). If the seat cushion surface temperature input is below the temperature set point for the selected temperature setting, the heated seat module energizes an N-channel Field Effect Transistor (N-FET) within the module which energizes the heated seat elements in the selected seat cushion and back. When the sensor input to the module indicates the correct temperature set point has been achieved, the module de-energizes the N-FET which de-energizes the heated seat elements. The heated seat module will continue to cycle the N-FET as needed to maintain the selected temperature set point.

If the heated seat module detects a heated seat sensor value input that is out of range or a shorted or open heated seat element circuit, it will notify the vehicle operator or the repair technician of this condition by flashing the High and/or Low indicator lamps in the affected heated seat switch. Refer to **Diagnosis and Testing Heated Seat System** in Heated Systems for flashing LED diagnosis and testing procedures. Refer to **Diagnosis and Testing Heated Seat Module** in this section for heated seat module diagnosis and testing procedures. Also refer to the Body Diagnostic Manual for additional diagnosis and testing procedures.

DIAGNOSIS AND TESTING - HEATED SEAT MODULE

If a heated seat fails to heat and one or both of the indicator lamps on a heated seat switch flash, refer to **Heated Seat System Diagnosis and Testing** in Heated Systems for flashing LED failure identification. Refer to **Wiring Diagrams** in for complete heated seat system wiring diagrams.

(1) Remove the heated seat module from its mounting location (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - REMOVAL).

NOTE: ANY RESISTANCE VALUES (Ohms Ω) GIVEN IN THE FOLLOWING TEXT ARE SUPPLIED USING THE AUTOMATIC RANGE GENERATED BY A FLUKE® AUTOMOTIVE METER. IF ANOTHER TYPE OF MEASURING DEVICE IS USED THE VALUES GENERATED MAY NOT BE THE SAME AS THE RESULTS SHOWN HERE, OR MAY HAVE TO BE CONVERTED TO THE RANGE USED HERE.

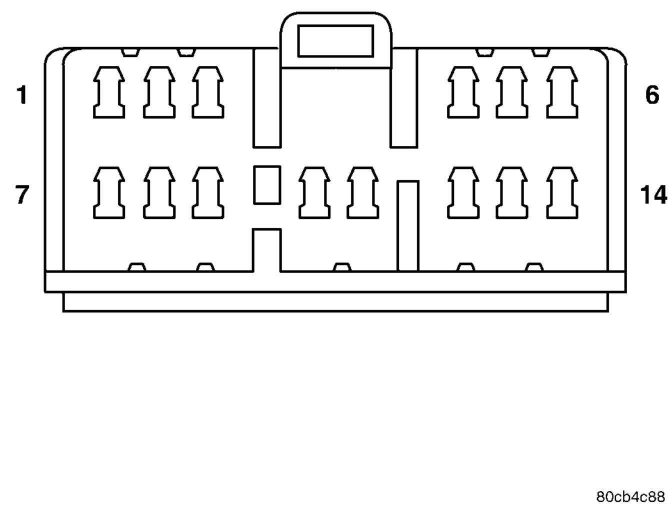

Fig. 15 Heated Seat Module Electrical Connector

RIGHT SEAT HEATER INOPERATIVE

(1) If a heated seat heats but one or both indicator lamps (LED's) on the heated seat switch fail to illuminate, check the driver circuit with the inoperative LED for a short to ground. If OK, replace the heated seat switch. If NOT OK repair the short to ground as required and than replace the heated seat switch.

NOTE: IF THE RIGHT SEAT CUSHION IS ALREADY WARM THE FOLLOWING STEP WILL NOT PROVE CONCLUSIVE.

HEATED SEAT MODULE (Continued)

(2) Back-probe the heated seat module wire harness connector (Fig. 15), do not disconnect. Check cavity #3 for battery voltage when the right heated seat switch is turned “ON”, voltage should be present, If OK go to Step 3 If NOT OK, test the right heated seat switch (Refer to 8 - ELECTRICAL/ HEATED SEATS/PASSENGER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING). If the switch tests OK, check for continuity between the switch and control module on the MUX circuit, If OK replace the heated seat control module. If NOT OK, repair the open or shorted MUX circuit as required.

NOTE: BE CERTAIN THE BATTERY IS FULLY CHARGED BEFORE TESTIMG. FAILURE TO DO SO CAN RESULT IN INCORRECT READINGS.

(3) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #10 for battery voltage, while observing the voltmeter depress the right heated seat switch **low** setting twice, voltage should toggle between approx.12v and 8v, If OK go to Step 4. If NOT OK check for continuity between the switch and control module on the low heat driver circuit, If OK replace the heated seat control module.

(4) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #11 for battery voltage, while observing the voltmeter depress the right heated seat switch **high** setting twice, voltage should toggle between approx.12v and 8v, If OK go to Step 5. If NOT OK check for continuity between the switch and control module on the high heat driver circuit, If OK replace the heated seat control module.

(5) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #2 for approx. 5v, voltage should be present, If OK go to Step 6. If NOT OK replace the heated seat control module.

(6) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #7 for a range in voltage from 1.72v (warm seat) – 3.0v (cold seat). It should be within this range, If OK replace the heated seat module. If NOT OK test the Heated Seat Sensor. If NOT OK, replace the right heated seat element and sensor assembly. If the heated seat sensor tests OK, check for continuity between the right heated seat cushion connector and control module connector on the 5v supply circuit, If NOT OK, repair the open or shorted 5v supply circuit as required. If OK check for continuity between the right heated seat cushion connector and control module connector on the temperature sensor input circuit. If NOT OK, repair the open or shorted temperature sensor input circuit as required. If OK replace the heated seat control module.

LEFT SEAT HEATER INOPERATIVE

(1) If a heated seat heats but one or both indicator lamps (LED's) on the heated seat switch fail to illuminate, check the driver circuit with the inoperative LED for a short to ground. If OK, replace the heated seat switch. If NOT OK repair the short to ground as required and than replace the heated seat switch.

NOTE: IF THE LEFT SEAT CUSHION IS ALREADY WARM THE FOLLOWING STEP WILL NOT PROVE CONCLUSIVE.

(2) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #5 for battery voltage when the left heated seat switch is turned “ON”, voltage should be present, If OK go to Step 3 If NOT OK, test the left heated seat switch (Refer to 8 - ELECTRICAL/HEATED SEATS/ DRIVER HEATED SEAT SWITCH - DIAGNOSIS AND TESTING). If the switch tests OK, check for continuity between the switch and control module on the MUX circuit, If OK replace the heated seat control module. If NOT OK, repair the open or shorted MUX circuit as required.

(3) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #12 for battery voltage, while observing the voltmeter depress the left heated seat switch **low** setting twice, voltage should toggle between approx.12v and 8v, If OK go to Step 4. If NOT OK check for continuity between the switch and control module on the low heat driver circuit, If OK replace the heated seat control module.

(4) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #14 for battery voltage, while observing the voltmeter depress the left heated seat switch **high** setting twice, voltage should toggle between approx.12v and 8v, If OK go to Step 5. If NOT OK check for continuity between the switch and control module on the high heat driver circuit, If OK replace the heated seat control module.

(5) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #2 for approx. 5v, 5 voltage should be present, If OK go to Step 6. If NOT OK replace the heated seat control module.

(6) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #8 for a range in voltage from 1.72v (warm seat) – 3.0v (cold seat). It should be within this range, If OK replace the heated seat control module. If NOT OK, test the Heated Seat Sensor. If NOT OK, replace the left heated seat element and sensor assembly. If the heated seat sensor tests OK, check for continuity between the left heated seat cushion connector and control module connector on the 5v supply circuit, If

HEATED SEAT MODULE (Continued)

NOT OK, repair the open or shorted 5v supply circuit as required. If OK check for continuity between the left heated seat cushion connector and control module connector on the temperature sensor input circuit. If NOT OK, repair the open or shorted temperature sensor input circuit as required. If OK replace the heated seat control module.

BOTH SEATS INOPERATIVE

If both seats (driver and passenger) fail to heat and the indicator lamps on the heated seat switches for both seats fail to operate, test the heated seat fuses in the junction block. If the heated seat fuses check OK, go to Step 1.

(1) Back-probe the heated seat module wire harness connector, do not disconnect. Check for continuity between the ground circuit cavity #13 of the heated seat module connector and a good ground. If OK go to Step 2. If NOT OK, repair the open or shorted ground circuit as required.

(2) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #4 and #6 for battery voltage, voltage should be present, If OK go to Step 3. If NOT OK repair the open or shorted fused B(+) circuit as required.

(3) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity #2 for approx. 5v, voltage should be present, replace the heated seat control module with a known good module and verify system operation.

REMOVAL

(1) Working under the front seat cushion (Fig. 16), remove the heated seat module from its mounting bracket by gently prying the module off of the two mounting pushpins.

(2) Disconnect the seat wire harness connector from the connector receptacle on the side of the heated seat module.

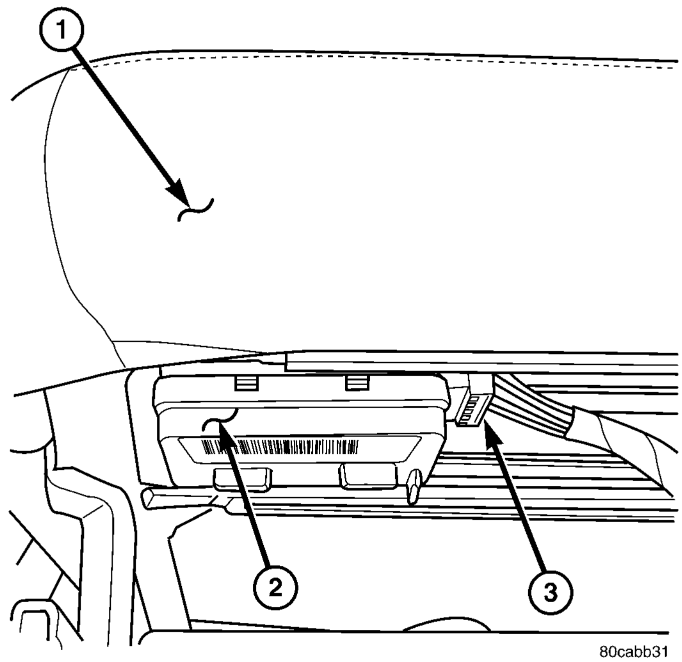

Fig. 16 Heated Seat Module Location

1 - Front Seat Cushion
2 - Heated Seat Module
3 - Electrical Connector

(3) Remove the heated seat module from the vehicle.

INSTALLATION

(1) Connect the seat wire harness connector to the connector receptacle on the side of the heated seat module.

(2) Install the heated seat module on its mounting bracket under the front seat.

(3) Verify heated seat system operation.

ENGINE SYSTEMS

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BATTERY SYSTEM

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BATTERY SYSTEM

DESCRIPTION

A single 12-volt battery is standard factory-installed equipment on this model. All of the components of the battery system are located within the engine compartment of the vehicle. The battery system for this vehicle covers the following related components, which are covered in further detail later in this section of the service manual:

- **Battery** - The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables** - The battery cables connect the battery terminal posts to the vehicle electrical system.

BATTERY SYSTEM (Continued)

- **Battery Holddown** - The battery holddown hardware secures the battery in the battery tray in the engine compartment.
- **Battery Thermal Guard** - The battery thermal guard insulates the battery to protect it from engine compartment temperature extremes.
- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery holddown hardware.

For battery system maintenance schedules and jump starting procedure, see the owner's manual in the vehicle glove box. Optionally, refer to the Lubrication and Maintenance section of this manual for the recommended battery maintenance schedules and for the proper battery jump starting procedure. While battery charging can be considered a maintenance procedure, the battery charging procedure and related information are located later in this section of the service manual. This was done because the battery must be fully-charged before any battery system diagnosis or testing procedures can be performed.

OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

DIAGNOSIS AND TESTING - BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting, and charging systems include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. Refer to Charging System for the proper charging system on-board diagnostic test procedures.

MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to help the dealership technicians diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro 420 battery tester.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is faulty.	2. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Charge the faulty battery, as required.
	4. The battery terminal connections are loose or corroded.	4. Refer to Battery Cables for the proper battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. Refer to Battery System Specifications for the proper size and rating. Replace an incorrect battery, as required.
	6. The battery is faulty.	6. Determine the battery cranking capacity using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Replace the faulty battery, as required.
	7. The starting system is faulty.	7. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	1. The battery has an incorrect size or rating for this vehicle.	1. Refer to Battery System Specifications for the proper specifications. Replace an incorrect battery, as required.
	2. The battery terminal connections are loose or corroded.	2. Refer to Battery Cable for the proper cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	3. The electrical system ignition-off draw is excessive.	3. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the faulty electrical system, as required.
	4. The battery is faulty.	4. Test the battery using the Micro 420 battery tester. Refer to Standard Procedures for additional test procedures. Replace the faulty battery, as required.
	5. The starting system is faulty.	5. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	6. The charging system is faulty.	6. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	7. Electrical loads exceed the output of the charging system.	7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.
	8. Slow driving or prolonged idling with high-amperage draw systems in use.	8. Advise the vehicle operator, as required.
THE BATTERY WILL NOT ACCEPT A CHARGE.	1. The battery is faulty.	1. Test the battery using the Micro 420 battery tester. Charge or replace the faulty battery, as required.

ABNORMAL BATTERY DISCHARGING

Any of the following conditions can result in abnormal battery discharging:

1. A faulty or incorrect charging system component. Refer to Charging System for additional charging system diagnosis and testing procedures.
2. A faulty or incorrect battery. Use Micro 420 battery tester and refer to Battery System for additional battery diagnosis and testing procedures.
3. A faulty circuit or component causing excessive ignition-off draw.
4. Electrical loads that exceed the output of the charging system. This can be due to equipment installed after manufacture, or repeated short trip use.
5. A faulty or incorrect starting system component. Refer to Starting System for the proper starting system diagnosis and testing procedures.
6. Corroded or loose battery posts and/or terminal clamps.
7. Slow driving speeds (heavy traffic conditions) or prolonged idling, with high-amperage draw systems in use.

BATTERY SYSTEM (Continued)

CLEANING

The following information details the recommended cleaning procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Clean the battery cable terminal clamps of all corrosion. Remove any corrosion using a wire brush or a post and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 1).

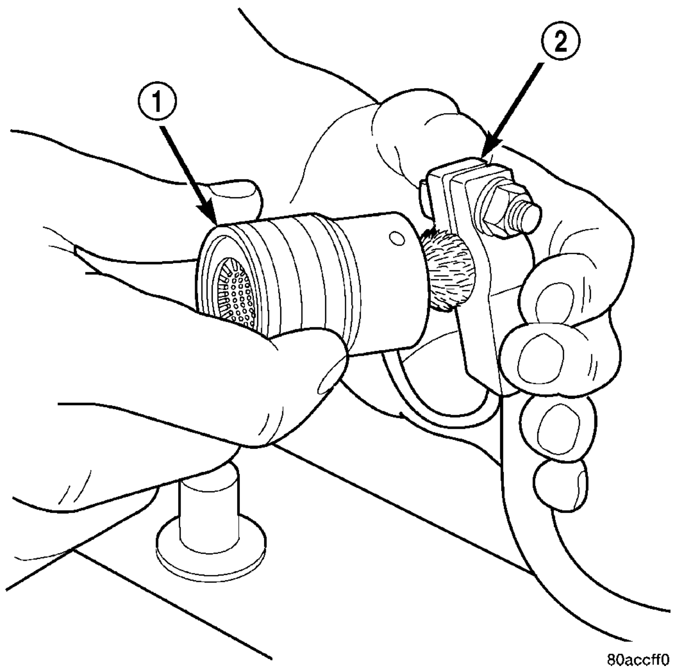


Fig. 1 Clean Battery Cable Terminal Clamp - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE

(2) Clean the battery tray and battery hold down hardware of all corrosion. Remove any corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal.

(3) If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film (Fig. 2). Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, refer to Battery System Specifications for the factory-installed battery specifications. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.

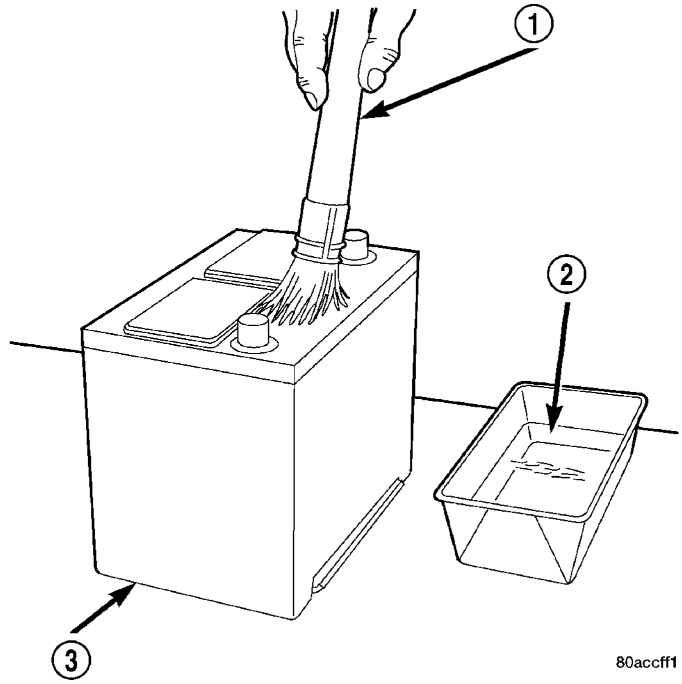


Fig. 2 Battery Cleaning - Typical

1 - CLEANING BRUSH
2 - WARM WATER AND BAKING SODA SOLUTION
3 - BATTERY

(4) If the vehicle is so equipped, clean the battery thermal guard with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film.

(5) Clean any corrosion from the battery terminal posts with a wire brush or a post and terminal cleaner, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 3).

INSPECTION

The following information details the recommended inspection procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Inspect the battery cable terminal clamps for damage. Replace any battery cable that has a damaged or deformed terminal clamp.

(2) Inspect the battery tray and battery holddown hardware for damage. Replace any damaged parts.

(3) Slide the thermal guard off of the battery case. Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose terminal posts must be replaced.

BATTERY SYSTEM (Continued)

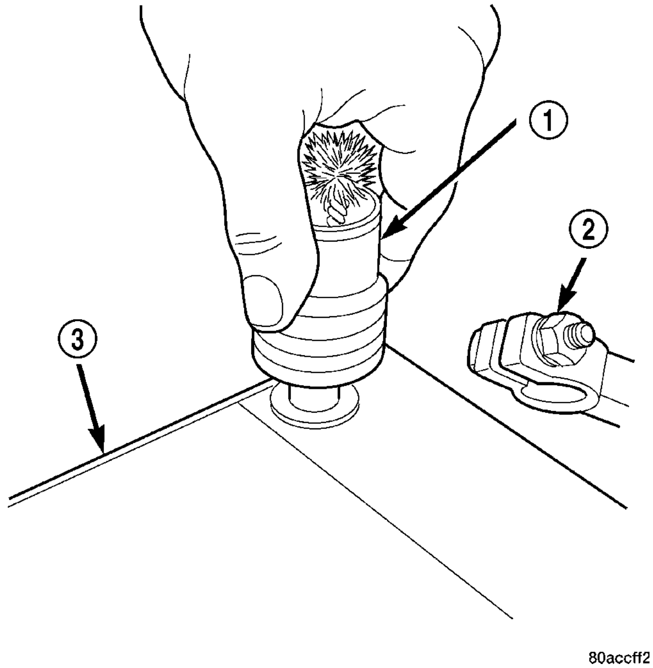


Fig. 3 Clean Battery Terminal Post - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE
3 - BATTERY

(4) Inspect the battery thermal guard for tears, cracks, deformation or other damage. Replace any battery thermal guard that has been damaged.

(5) Inspect the battery built-in test indicator sight glass for an indication of the battery condition. If the battery is discharged, charge as required. Refer to Standard Procedures for the proper battery built-in indicator test procedures. Also refer to Standard Procedures for the proper battery charging procedures.

SPECIFICATIONS

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

- **Group Size -** The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.
- **Cold Cranking Amperage -** The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18° C (0° F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.
- **Reserve Capacity -** The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7° C (80° F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.
- **Ampere-Hours -** The Ampere-Hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for twenty hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the twenty-hour discharge rating.

BATTERY CLASSIFICATIONS & RATINGS					
Part Number	BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Ampere - Hours	Load Test Amperage
56041380AA	86	525	100 Minutes	60	250

BATTERY

DESCRIPTION

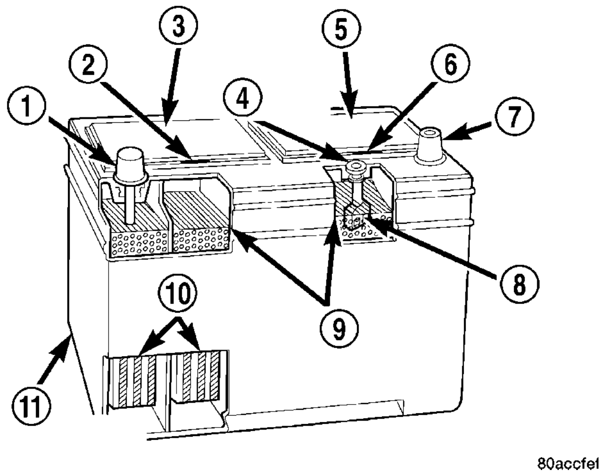


Fig. 4 Low-Maintenance Battery - Typical

1 - POSITIVE POST
2 - VENT
3 - CELL CAP
4 - VENT
5 - CELL CAP
6 - VENT
7 - NEGATIVE POST
8 - GREEN BALL
9 - ELECTROLYTE LEVEL
10 - PLATE GROUPS
11 - LOW-MAINTENANCE BATTERY

A large capacity, low-maintenance storage battery (Fig. 4) is standard factory-installed equipment on this model. Refer to Battery Specifications for the proper specifications of the factory-installed batteries available on this model. Male post type terminals made of a soft lead material protrude from the top of the molded plastic battery case to provide the means for connecting the battery to the vehicle electrical system. The battery positive terminal post is physically larger in diameter than the negative terminal post to ensure proper battery connection. The letters **POS** and **NEG** are also molded into the top of the battery case adjacent to their respective positive and negative terminal posts for identification confirmation. Refer to Battery Cables for more information on the battery cables that connect the battery to the vehicle electrical system.

The battery is made up of six individual cells that are connected in series. Each cell contains positively charged plate groups that are connected with lead straps to the positive terminal post, and negatively charged plate groups that are connected with lead straps to the negative terminal post. Each plate consists of a stiff mesh framework or grid coated with lead dioxide (positive plate) or sponge lead (negative plate). Insulators or plate separators made of a nonconductive material are inserted between the positive and negative plates to prevent them from contacting or shorting against one another. These dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte.

The factory-installed battery has a built-in test indicator (hydrometer). The color visible in the sight glass of the indicator will reveal the battery condition. Refer to Standard Procedures for the proper built-in indicator test procedures. **The factory-installed low-maintenance battery has removable battery cell caps.** Distilled water can be added to this battery. The battery is not sealed and has vent holes in the cell caps. The chemical composition of the metal coated plates within the low-maintenance battery reduces battery gassing and water loss, at normal charge and discharge rates. Therefore, the battery should not require additional water in normal service. If the electrolyte level in this battery does become low, water must be added. However, rapid loss of electrolyte can be caused by an overcharging condition. Be certain to diagnose the charging system after replenishing the water in the battery for a low electrolyte condition and before returning the vehicle to service. Refer to Charging System for the proper charging system diagnosis and testing procedures.

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron

BATTERY (Continued)

charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING - BATTERY

The battery must be completely charged and the top, posts and terminal clamps should be properly cleaned and inspected before diagnostic procedures are performed. Refer to Battery System Cleaning for the proper cleaning procedures, and Battery System Inspection for the proper battery inspection procedures. Refer to Standard Procedures for the proper battery charging procedures.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS ARE IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

The condition of a battery is determined by two criteria:

1. **State-Of-Charge** - This can be determined by checking the specific gravity of the battery electrolyte (built-in indicator test or hydrometer test), or by checking the battery voltage (open-circuit voltage test).
2. **Cranking Capacity** - This can be determined by performing a battery load test, which measures the ability of the battery to supply high-amperage current.

First, determine the battery state-of-charge. This can be done numerous ways. The Micro 420 battery tester is recommended. If the battery has a built-in test indicator, perform the built-in indicator test to determine the state-of-charge. If the battery has no built-in test indicator but does have removable cell caps, perform the hydrometer test to determine the state-of-charge. If the battery cell caps are not removable, or a hydrometer is not available, perform the open-circuit voltage test to determine the state-of-charge. Refer to open-circuit voltage test in the Standard Procedures section of this group.

Second, determine the battery cranking capacity by performing a load test. The battery must be charged before proceeding with a load test if:

- Micro 420 tester indicates battery charging is required.
- The battery built-in test indicator has a black or dark color visible.
- The temperature corrected specific gravity of the battery electrolyte is less than 1.235.
- The battery open-circuit voltage is less than 12.4 volts.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

A battery is fully-charged when:

- Micro 420 tester indicates battery is OK.
- A green color is visible in the sight glass of the battery built-in test indicator.
- Three corrected specific gravity tests, taken at one-hour intervals, indicate no increase in the specific gravity of the battery electrolyte.
- Open-circuit voltage of the battery is 12.4 volts or greater.

BATTERY (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - BATTERY CHARGING

Battery charging can be performed fast or slow, it terms of time. **Slow** battery charging is the best means of restoring a battery to full potential. Fast battery charging should only be performed when absolutely necessary due to time restraints. A battery is fully-charged when:

- Micro 420 tester indicates the battery is OK.
- A green color is visible in the sight glass of the battery built-in test indicator.
- Open-circuit voltage of the battery is 12.65 volts or above.

WARNING: NEVER EXCEED TWENTY AMPERES WHEN CHARGING A COLD (-1° C [30° F] OR LOWER) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.

CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

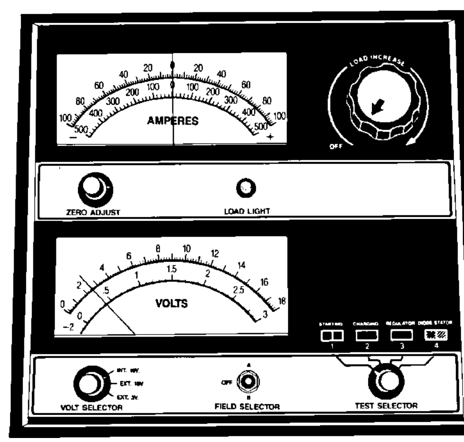
After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity. Refer to Standard Procedures for the proper battery load test procedures. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. Refer to Battery System Cleaning for the proper battery system cleaning procedures, and Battery System Inspection for the proper battery system inspection procedures.

CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

(1) Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt (Fig. 5). If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.



898A-12

Fig. 5 Voltmeter - Typical

(2) Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

BATTERY (Continued)

(3) Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

STANDARD PROCEDURE - BUILT-IN INDICATOR TEST

An indicator (hydrometer) built into the top of the battery case provides visual information for battery testing (Fig. 6). Like a hydrometer, the built-in indicator measures the specific gravity of the battery electrolyte. The specific gravity of the electrolyte reveals the battery state-of-charge; however, it will not reveal the cranking capacity of the battery. A load test must be performed to determine the battery cranking capacity. Refer to Standard Procedures for the proper battery load test procedures.

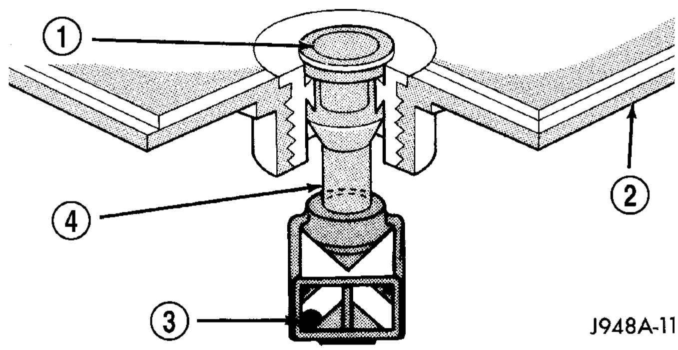


Fig. 6 Built-In Indicator

1 - SIGHT GLASS
2 - BATTERY TOP
3 - GREEN BALL
4 - PLASTIC ROD

BATTERY (Continued)

Before testing, visually inspect the battery for any damage (a cracked case or cover, loose posts, etc.) that would cause the battery to be faulty. In order to obtain correct indications from the built-in indicator, it is important that the battery be level and have a clean sight glass. Additional light may be required to view the indicator. **Do not use open flame as a source of additional light.**

To read the built-in indicator, look into the sight glass and note the color of the indication (Fig. 7). The battery condition that each color indicates is described in the following list:

- **Green -** Indicates 75% to 100% battery state-of-charge. The battery is adequately charged for further testing or return to service. If the starter will not crank for a minimum of fifteen seconds with a fully-charged battery, the battery must be load tested. Refer to Standard Procedures for the proper battery load test procedures.
- **Black or Dark -** Indicates 0% to 75% battery state-of-charge. The battery is inadequately charged and must be charged until a green indication is visible in the sight glass (12.4 volts or more), before the battery is tested further or returned to service. Refer to Standard Procedures for the proper battery charging procedures. Also refer to Diagnosis and Testing for more information on the possible causes of the discharged battery condition.
- **Clear or Bright -** Indicates a low battery electrolyte level. The electrolyte level in the battery is below the built-in indicator. A maintenance-free battery with non-removable cell caps must be replaced if the electrolyte level is low. Water must be added to a low-maintenance battery with removable cell caps before it is charged. Refer to Standard Procedures for the proper battery filling procedures. A low electrolyte level may be caused by an overcharging condition. Refer to Charging System for the proper charging system diagnosis and testing procedures.

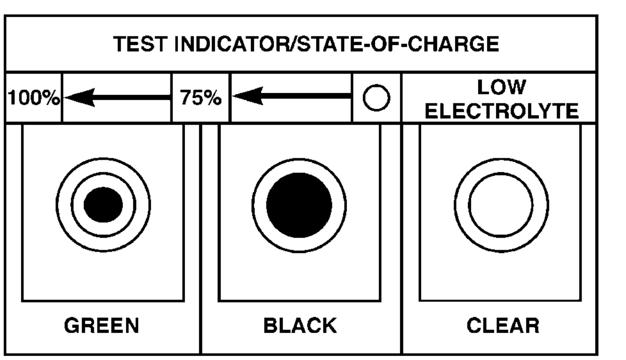


Fig. 7 Built-In Indicator Sight Glass Chart

STANDARD PROCEDURE - HYDROMETER TEST

The hydrometer test reveals the battery state-of-charge by measuring the specific gravity of the electrolyte. **This test cannot be performed on maintenance-free batteries with non-removable cell caps.** If the battery has non-removable cell caps, refer to Diagnosis and Testing for alternate methods of determining the battery state-of-charge.

Specific gravity is a comparison of the density of the battery electrolyte to the density of pure water. Pure water has a specific gravity of 1.000, and sulfuric acid has a specific gravity of 1.835. Sulfuric acid makes up approximately 35% of the battery electrolyte by weight, or 24% by volume. In a fully-charged battery the electrolyte will have a temperature-corrected specific gravity of 1.260 to 1.290. However, a specific gravity of 1.235 or above is satisfactory for the battery to be load tested and/or returned to service.

Before testing, visually inspect the battery for any damage (a cracked case or cover, loose posts, etc.) that would cause the battery to be faulty. Then remove the battery cell caps and check the electrolyte level. Add distilled water if the electrolyte level is below the top of the battery plates. Refer to Battery System Cleaning for the proper battery inspection procedures.

See the instructions provided by the manufacturer of the hydrometer for recommendations on the correct use of the hydrometer that you are using. Remove only enough electrolyte from the battery cell so that the float is off the bottom of the hydrometer barrel with pressure on the bulb released. To read the hydrometer correctly, hold it with the top surface of the electrolyte at eye level (Fig. 8).

CAUTION: Exercise care when inserting the tip of the hydrometer into a battery cell to avoid damaging the plate separators. Damaged plate separators can cause early battery failure.

Hydrometer floats are generally calibrated to indicate the specific gravity correctly only at 26.7° C. When testing the specific gravity at any other temperature, a correction factor is required. The correction factor is approximately a specific gravity value of 0.004, which may also be identified as four points of specific gravity. For each 5.5° C above 26.7° C, add four points. For each 5.5° C below 26.7° C, subtract four points. Always correct the specific gravity for temperature variation.

BATTERY (Continued)

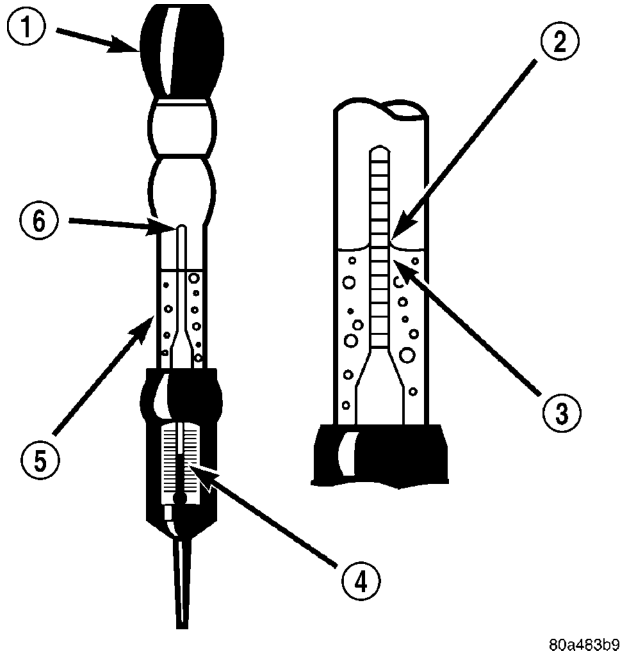


Fig. 8 Hydrometer - Typical

1 - BULB
2 - SURFACE COHESION
3 - SPECIFIC GRAVITY READING
4 - TEMPERATURE READING
5 - HYDROMETER BARREL
6 - FLOAT

EXAMPLE: A battery is tested at -12.2° C and has a specific gravity of 1.240. Determine the actual specific gravity as follows:

(1) Determine the number of degrees above or below 26.7° C: **26.7° C + -12.2° C = 14.5° C below the 26.7° C specification**

(2) Divide the result from Step 1 by 5.5° C: **14.5° C ÷ 5.5° C = 2.64**

(3) Multiply the result from Step 2 by the temperature correction factor (0.004): **2.64 X 0.004 = 0.01**

(4) The temperature at testing was below 26.7° C; therefore, the temperature correction factor is subtracted: **1.240 - 0.01 = 1.23**

(5) The corrected specific gravity of the battery cell in this example is 1.23.

Test the specific gravity of the electrolyte in each battery cell. If the specific gravity of all cells is above 1.235, but the variation between cells is more than fifty points (0.050), the battery should be replaced. If the specific gravity of one or more cells is less than 1.235, charge the battery at a rate of approximately five amperes. Continue charging the battery until three consecutive specific gravity tests, taken at one-hour intervals, are constant. If the cell specific gravity variation is more than fifty points (0.050) at the end of the charge period, replace the battery.

When the specific gravity of all cells is above 1.235, and the cell variation is less than fifty points (0.050), the battery may be load tested to determine its cranking capacity. Refer to Standard Procedures for the proper battery load test procedures.

STANDARD PROCEDURE - OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery. This test can be used in place of the hydrometer test when a hydrometer is not available, or for maintenance-free batteries with non-removable cell caps.

Before proceeding with this test, completely charge the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

(1) Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.

(2) Disconnect and isolate both battery cables, negative cable first.

(3) Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage (Fig. 9).

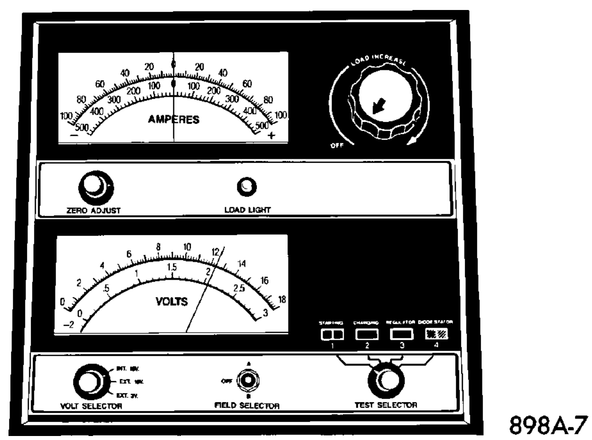


Fig. 9 Testing Open-Circuit Voltage - Typical

BATTERY (Continued)

See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

STANDARD PROCEDURE - IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Power Distribution Center (PDC). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Faulty or improperly adjusted switches.
- Faulty or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

(1) Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes. See the Electronic Module Ignition-Off Draw Table for more information.

ELECTRONIC MODULE IGNITION-OFF DRAW (IOD) TABLE			
Module	Time Out? (If Yes, Interval And Wake-Up Input)	IOD	IOD After Time Out
Radio	No	1 to 3 milliamperes	N/A
Audio Power Amplifier	No	up to 1 milliampere	N/A
Body Control Module (BCM)	No	4.75 milliamperes (max.)	N/A
Powertrain Control Module (PCM)	No	0.95 milliampere	N/A
ElectroMechanical Instrument Cluster (EMIC)	No	0.44 milliampere	N/A
Combination Flasher	No	0.08 milliampere	N/A
Automatic Transmission Controller (EATX)	Yes, 20 minutes	120 milliampere	0.70 ma

BATTERY (Continued)

(2) Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.

(3) Disconnect the battery negative cable.

(4) Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to three minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.

(5) After about three minutes, the high-amperage IOD reading on the multi-meter should become very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Power Distribution Center (PDC) and then in the Junction Block (JB), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information in this service manual for complete PDC and JB fuse, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, refer to Charging System for the proper charging system diagnosis and testing procedures. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multi-meter to check the low-amperage IOD.

CAUTION: Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multi-meter may be damaged.

(6) Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or a component failure is at fault.

STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER

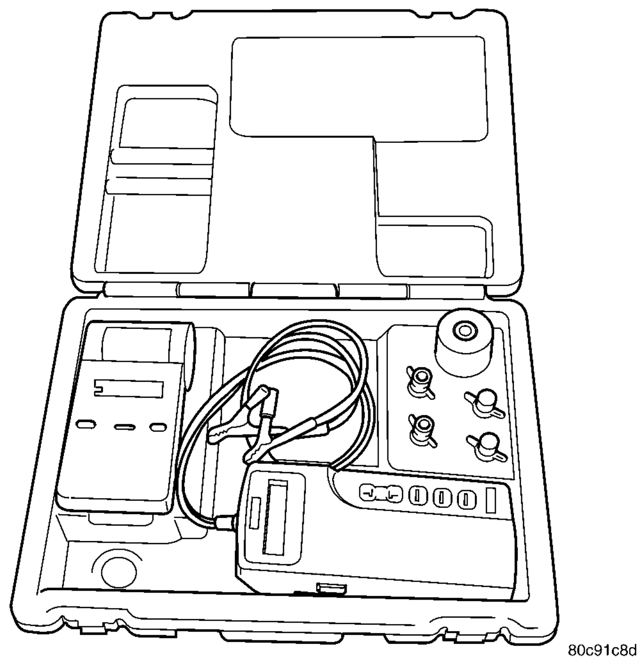


Fig. 10 Micro 420 Battery Tester

Always use the Micro 420 instruction manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:

WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION AND USE EXTREME CAUTION WHEN WORKING WITH BATTERIES.

BATTERY TESTING

(1) If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing. If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.

BATTERY (Continued)

(2) If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. **The preferred test position is at the battery terminal**. If the battery is not accessible, you may test using both the positive and negative jumper posts. Select TESTING AT JUMPER POST when connecting to that location.

(3) Connect the tester (Fig. 10) to the battery or jumper posts, the red clamp to positive (+) and the black clamp to negative (–).

(4) Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.

(5) If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the test result table noted below.

CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.

(6) While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

NOTE: The SERVICE CODE is required on every warranty claim submitted for battery replacement.

REMOVAL

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Loosen the battery negative cable terminal clamp pinch-bolt hex nut.

(3) Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post (Fig. 11).

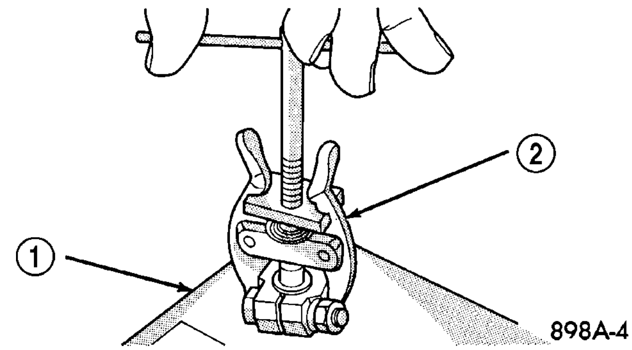


Fig. 11 Remove Battery Cable Terminal Clamp - Typical

1 - BATTERY
2 - BATTERY TERMINAL PULLER

(4) Loosen the battery positive cable terminal clamp pinch-bolt hex nut.

(5) Disconnect the battery positive cable terminal clamp from the battery positive terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

(6) Remove the battery holddowns from the battery. Refer to Battery Holddown for the proper battery holddown removal procedures.

WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES SHOULD ALSO BE WORN. IF THE BATTERY IS CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.

(7) Remove the battery and the battery thermal guard from the battery tray as a unit.

(8) Remove the battery thermal guard from the battery case. Refer to Thermal Guard for the proper battery thermal guard removal procedures.

INSTALLATION

(1) Clean and inspect all of the battery system components. Refer to Battery System Cleaning for the proper cleaning procedures, and refer to Battery System Inspection for the proper inspection procedures.

(2) Reinstall the battery thermal guard onto the battery case. Refer to Thermal Guard for the proper battery thermal guard installation procedures.

BATTERY (Continued)

(3) Position the battery and the battery thermal guard onto the battery tray as a unit. Ensure that the battery positive and negative terminal posts are correctly positioned. The battery cable terminal clamps must reach the correct battery terminal post without stretching the cables (Fig. 12).

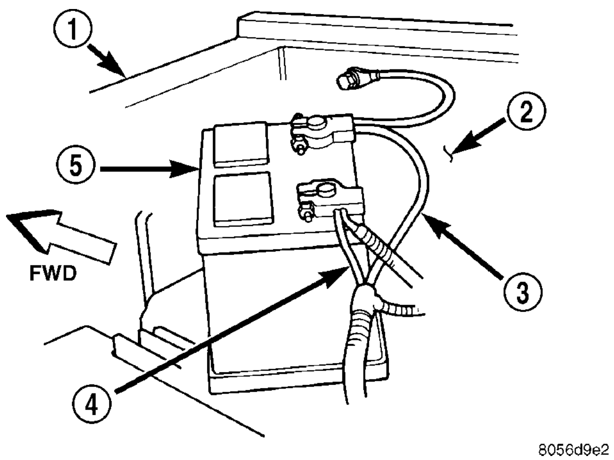


Fig. 12 Battery Cables - Typical

1 - RADIATOR CROSSMEMBER
2 - WHEELHOUSE INNER PANEL
3 - NEGATIVE CABLE
4 - POSITIVE CABLE
5 - BATTERY

(4) Reinstall the battery holddowns onto the battery. Refer to Battery Holddown for the proper installation procedure.

CAUTION: Be certain that the battery cable terminal clamps are connected to the correct battery terminal posts. Reversed battery polarity may damage electrical components of the vehicle.

(5) Clean the battery cable terminal clamps and the battery terminal posts. Refer to Battery System Cleaning for cleaning procedure.

(6) Reconnect the battery positive cable terminal clamp to the battery positive terminal post. Tighten the terminal clamp pinch-bolt hex nut to 75 in. lbs.

(7) Reconnect the battery negative cable terminal clamp to the battery negative terminal post. Tighten the terminal clamp pinch-bolt hex nut to 75 in. lbs.

(8) Apply a thin coating of petroleum jelly or chassis grease to the exposed surfaces of the battery cable terminal clamps and the battery terminal posts.

BATTERY HOLDDOWN

DESCRIPTION

The battery holddown hardware includes a plastic holddown bracket and retaining bolt. The battery holddown bracket meshes with the battery tray to secure the battery to the battery tray.

When installing a battery into the battery tray, it is important that the holddown hardware is properly installed and that the fastener is tightened to the proper specifications. Improper holddown fastener tightness, whether too loose or too tight, can result in damage to the battery, the vehicle, or both. Refer to Battery Holddown for the proper installation procedure, including the proper holddown fastener torque specifications.

OPERATION

The battery holddown secures the battery in the battery tray. This holddown is designed to prevent battery movement during the most extreme vehicle operation conditions. Periodic removal and lubrication of the battery holddown hardware is recommended to prevent hardware seizure at a later date.

CAUTION: Never operate a vehicle without a battery holddown device properly installed. Damage to the vehicle, components and battery could result.

REMOVAL

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Loosen the battery negative cable terminal clamp pinch-bolt hex nut.

(3) Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

(4) Remove the battery hold down bracket retaining bolt from the threaded insert in the battery tray assembly.

INSTALLATION

(1) Clean and inspect the battery hold down hardware. Refer to Battery Cleaning for the proper battery system component cleaning procedures, and Battery Inspection for the proper battery system component inspection procedures.

(2) Position the battery hold down bracket onto the battery tray.

BATTERY HOLDDOWN (Continued)

(3) Install and tighten the battery hold down bracket retaining bolt. Tighten the bolt to 4 N·m (35 in. lbs.).

(4) Reconnect the battery negative cable terminal clamp to the battery negative terminal post. Tighten the terminal clamp pinch-bolt hex nut to 8.4 N·m (75 in. lbs.).

BATTERY CABLES

DESCRIPTION

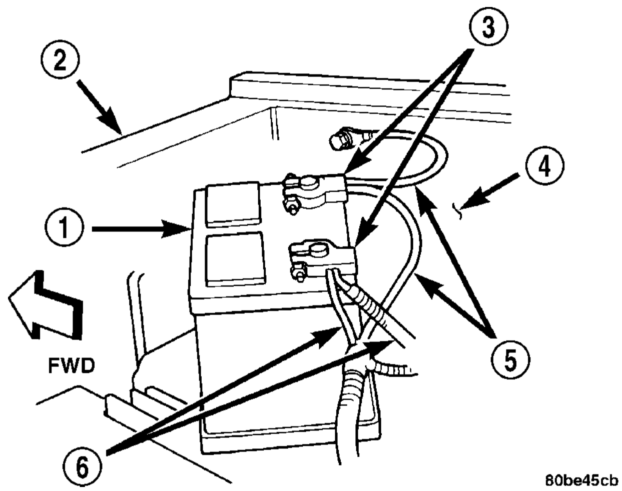


Fig. 13 Battery Cables - Typical

1 - BATTERY
2 - RADIATOR CROSSMEMBER
3 - TERMINAL CLAMPS
4 - FENDER INNER SHIELD
5 - NEGATIVE CABLE
6 - POSITIVE CABLE

The battery cables (Fig. 13) are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. The battery cables feature a clamping type female battery terminal made of soft lead that is die cast onto one end of the battery cable wire. A square headed pinch-bolt and hex nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then solder-dipped. The battery positive cable wires have a red insulating jacket to provide visual identification and feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a black insulating jacket and a smaller female battery terminal clamp.

The battery cables cannot be repaired and, if damaged or faulty they must be replaced. Both the battery positive and negative cables are available for service replacement only as a unit with the battery wire harness, which may include portions of the wiring circuits for the generator and other components on some models. Refer to the appropriate wiring information in this service manual for the location of the proper battery cable wire harness diagrams. The wiring information also includes proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

The battery positive cable terminal clamp is die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal studs of the Power Distribution Center (PDC), and the other wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the engine starter motor solenoid. The battery negative cable terminal clamp is also die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery negative cable to the vehicle powertrain through a stud on the left side of the engine cylinder block. The other wire has an eyelet terminal that connects the battery negative cable to the vehicle body through a ground stud on the left wheel house, near the battery.

DIAGNOSIS AND TESTING - BATTERY CABLES

A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cable. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

BATTERY CABLES (Continued)

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

VOLTAGE DROP TEST

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

- The battery is fully-charged and load tested. Refer to Standard Procedures for the proper battery charging and load test procedures.
- Fully engage the parking brake.
- If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
- Verify that all lamps and accessories are turned off.
- To prevent the engine from starting, remove the Automatic Shut Down (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. See the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.

(1) Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable terminal clamp (Fig. 14). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.

(2) Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable terminal clamp (Fig. 15). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.

(3) Connect the voltmeter to measure between the battery positive cable terminal clamp and the starter solenoid B(+) terminal stud (Fig. 16). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

(4) Connect the voltmeter to measure between the battery negative cable terminal clamp and a good clean ground on the engine block (Fig. 17). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection to the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.

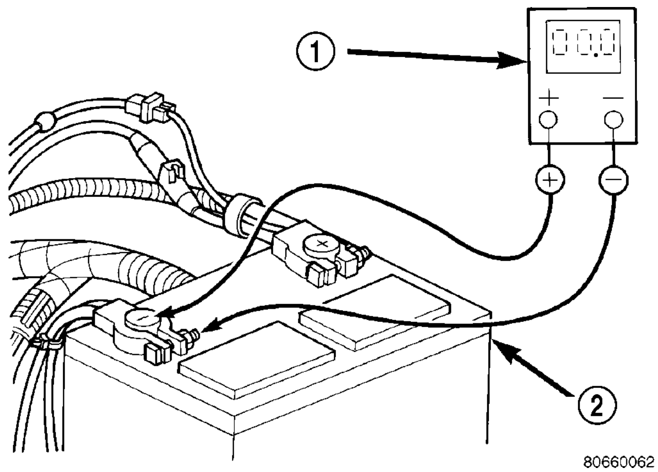


Fig. 14 TEST BATTERY NEGATIVE CONNECTION RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY

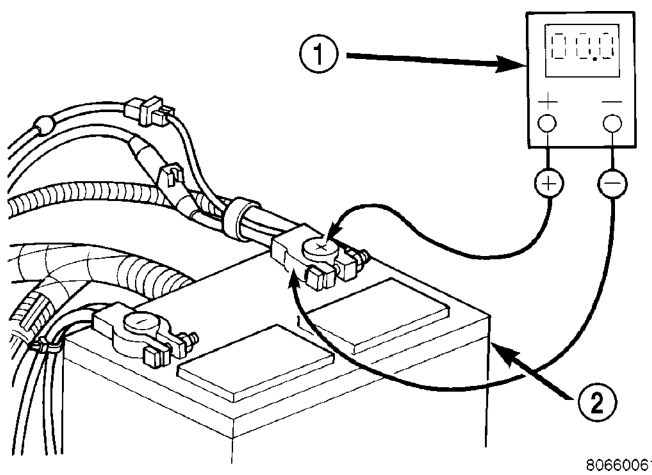


Fig. 15 TEST BATTERY POSITIVE CONNECTION RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY

BATTERY CABLES (Continued)

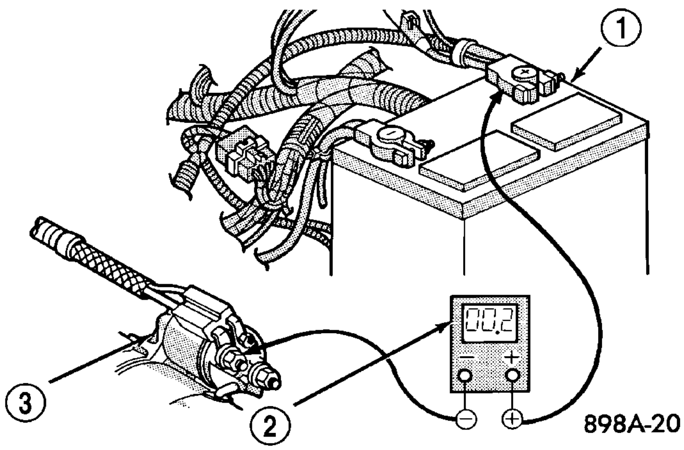


Fig. 16 TEST BATTERY POSITIVE CABLE RESISTANCE - TYPICAL

1 - BATTERY
2 - VOLTMETER
3 - STARTER MOTOR

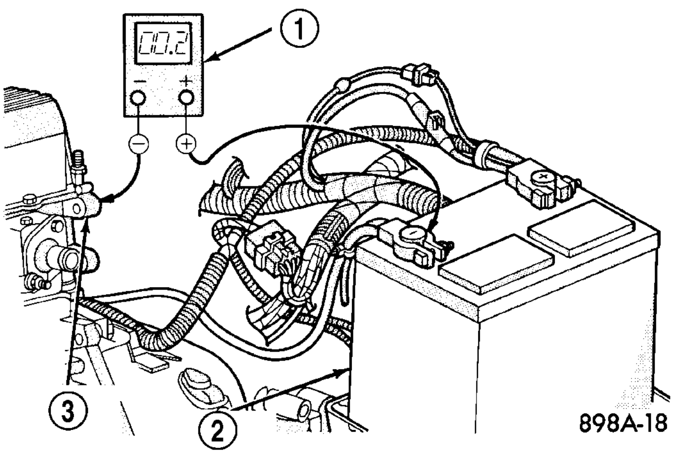


Fig. 17 TEST GROUND CIRCUIT RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY
3 - ENGINE GROUND

THERMAL GUARD

DESCRIPTION

A flexible plastic bubble-wrap style thermal guard (Fig. 18) slides over the battery case to enclose the sides of the battery. The thermal guard consists of a heavy black plastic outer skin and two lighter plies of plastic that have been formed into a sheet with hundreds of small air pockets entrapped between them. The resulting material is very similar to the bubble-wrap used to protect items in many parcel packaging and shipping applications.

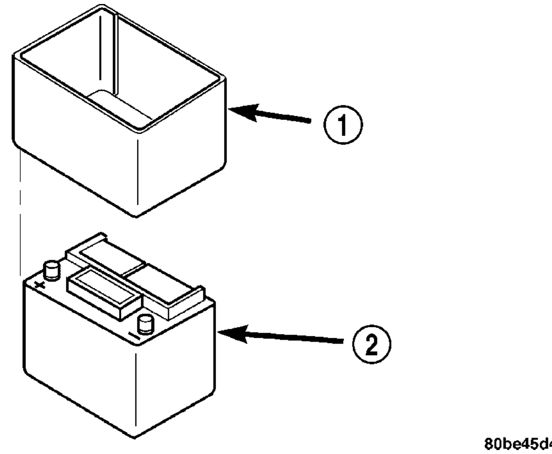


Fig. 18 Battery Thermal guard

1 - THERMAL GUARD
2 - BATTERY

OPERATION

The thermal guard protects the battery from engine compartment temperature extremes. The temperature of the battery can affect battery performance. The air trapped between the plastic plies of the thermal guard create a dead air space, which helps to insulate the sides of the battery case from the air temperature found in the surrounding engine compartment.

REMOVAL

(1) Remove the battery and the battery thermal guard from the battery tray as a unit. Refer to Battery Removal for the proper battery removal procedures.

(2) Carefully and evenly slide the battery thermal guard up off of the battery case (Fig. 19).

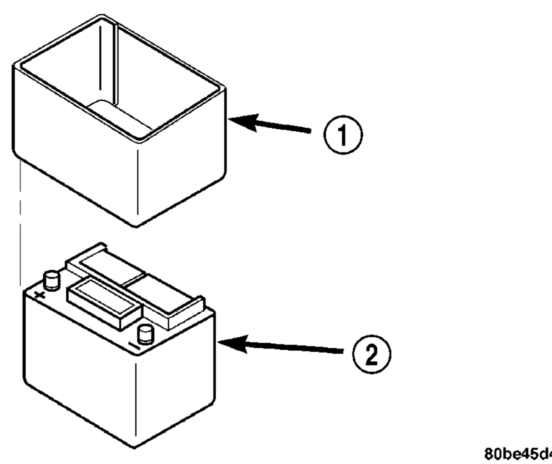


Fig. 19 Battery thermal guard

1 - THERMAL GUARD
2 - BATTERY

THERMAL GUARD (Continued)

INSTALLATION

(1) Clean and inspect the battery thermal guard. Refer to Battery System Cleaning for the proper cleaning procedures, and refer to Battery System Inspection for the proper inspection procedures.

(2) Carefully and evenly slide the battery thermal guard down over the battery case.

(3) Install the battery and the battery thermal guard into the battery tray as a unit. Refer to Battery Installation for the proper battery installation procedures.

BATTERY TRAY

DESCRIPTION

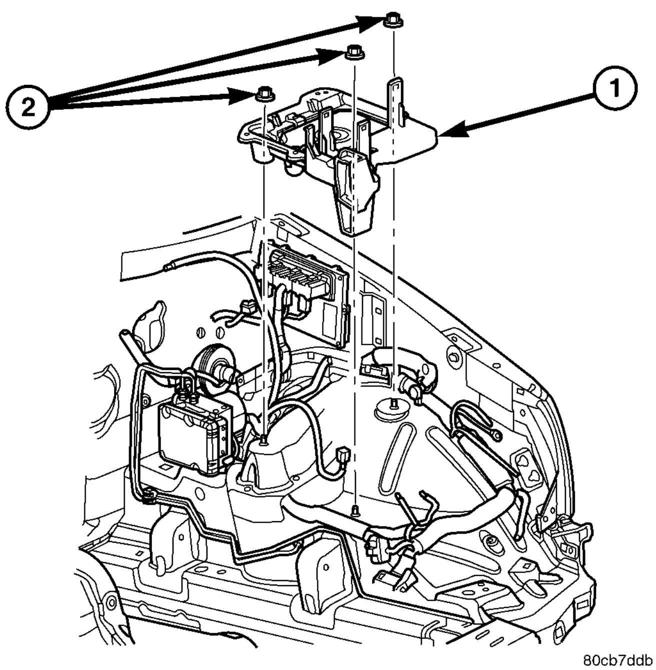


Fig. 20 Battery Tray Location

1 - BATTERY TRAY
2 - BATTERY TRAY RETAINING NUTS

The battery is placed in a molded plastic tray located in the left front corner of the engine compartment (Fig. 20). The battery hold down hardware is contained within the battery tray. A hole in the bottom of the battery tray is fitted with a battery temperature sensor. Refer to Charging System for more information on the battery temperature sensor. Refer to Battery Hold down for more information on hold down hardware.

OPERATION

The battery tray provides a secure mounting location and supports the battery. On some vehicles, the battery tray also provides the anchor point/s for the battery holddown hardware. The battery tray and the battery holddown hardware combine to secure and stabilize the battery in the engine compartment, which prevents battery movement during vehicle operation. Unrestrained battery movement during vehicle operation could result in damage to the vehicle, the battery, or both.

REMOVAL

(1) Remove the battery from the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).

(2) Unlatch and remove the PDC from the battery tray.

(3) Remove the battery temperature sensor from the battery tray (Refer to 8 - ELECTRICAL/CHARGING/BATTERY TEMPERATURE SENSOR - REMOVAL).

(4) Remove the three nuts that secure the battery tray to the weld studs on the front extension of the left front wheelhouse inner panel (Fig. 20).

(5) Remove the battery tray from the vehicle.

INSTALLATION

(1) Clean and inspect the battery tray. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING).

(2) Position the battery tray onto the weld studs on the front extension of the left front wheelhouse inner panel.

(3) Install the battery temperature sensor onto the battery tray. (Refer to 8 - ELECTRICAL/CHARGING/BATTERY TEMPERATURE SENSOR - INSTALLATION).

(4) Install and tighten the three nuts that secure the battery tray to the weld studs on the front extension of the left front wheelhouse inner panel. Tighten the nuts to 7 N·m (65 in. lbs.).

(5) Install the PDC on the battery tray.

(6) Install the battery onto the battery tray. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

CHARGING SYSTEM

TABLE OF CONTENTS

CHARGING SYSTEM

DESCRIPTION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch
- Battery (refer to 8, Battery for information)
- Battery temperature sensor
- Generator Lamp (if equipped)
- Check Gauges Lamp (if equipped)
- Wiring harness and connections (refer to 8, Wiring for information)

OPERATION

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. When the ASD relay is on, voltage is supplied to the ASD relay sense circuit at the PCM. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

A battery temperature sensor, located in the battery tray housing, is used to sense battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects. Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The signal to activate the lamp is sent via the CCD bus circuits. The lamp is located on the instrument panel. Refer to 8, Instrument Cluster for additional information.

CHARGING SYSTEM (Continued)

DIAGNOSIS AND TESTING - CHARGING SYSTEM

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp (if equipped) is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to Ignition-Off Draw Test in 8, Battery for more information.

INSPECTION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the DRB® scan tool. Perform the following inspections before attaching the scan tool.

(1) Inspect the battery condition. Refer to 8, Battery for procedures.

(2) Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.

(3) Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.

(4) Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in 7, Cooling System.

(6) Inspect automatic belt tensioner (if equipped). Refer to 7, Cooling System for information.

(7) Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

SPECIFICATIONS

TORQUE - EXCEPT DIESEL

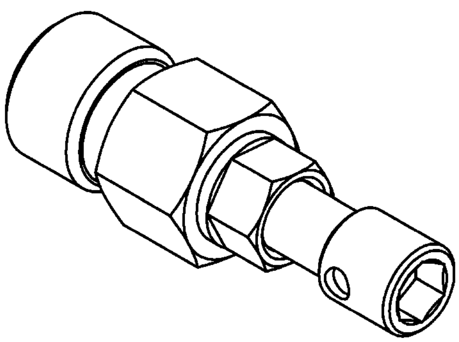
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Generator Horizontal Mounting Bolts - 3.7L	57	42	-
Generator Vertical Mounting Bolt - 3.7L	40	29	-
Generator Mounting Bolts - 2.4L	57	42	-
B+ Terminal Nut at Top of Generator	13	-	115
Generator Decoupler	110	81	-

CHARGING SYSTEM (Continued)

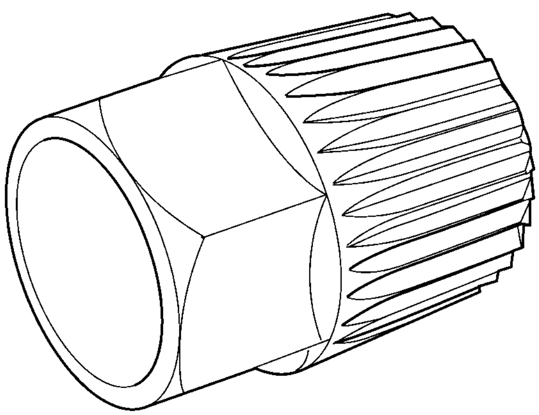
GENERATOR RATINGS - GAS ENGINES

TYPE	PART NUMBER	RATED SAE AMPS	ENGINES	MINIMUM TEST AMPS
DENSO	56044530AB	124	2.4L	88
DENSO	56044532AB	136	2.4L	96
DENSO	56041693AA	136	3.7L	96
DENSO	56029914AA	160	3.7L	112

SPECIAL TOOLS



GENERATOR DECOUPLER TOOL #8433



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GENERATOR DECOUPLER TOOL #8823

BATTERY TEMPERATURE SENSOR

DESCRIPTION

The Battery Temperature Sensor (BTS) is attached to the battery tray located under the battery.

OPERATION

The BTS is used to determine the battery temperature and control battery charging rate. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

The PCM sends 5 volts to the sensor and is grounded through the sensor return line. As temperature increases, resistance in the sensor decreases and the detection voltage at the PCM increases.

The BTS is also used for OBD II diagnostics. Certain faults and OBD II monitors are either enabled or disabled, depending upon BTS input (for example, disable purge and enable Leak Detection Pump (LDP) and O2 sensor heater tests). Most OBD II monitors are disabled below 20 degrees F.

REMOVAL

The battery temperature sensor is located under the vehicle battery (Fig. 1) and is attached to a mounting hole on battery tray.

(1) Remove battery. Refer to 8, Battery for procedures.

(2) Disconnect sensor pigtail harness from engine wire harness electrical connector.

(3) Pry sensor straight up from battery tray mounting hole.

INSTALLATION

The battery temperature sensor is located under vehicle battery and is attached to a mounting hole on battery tray.

(1) Feed pigtail harness through hole in top of battery tray and press sensor into top of battery tray.

(2) Connect pigtail harness.

BATTERY TEMPERATURE SENSOR (Continued)

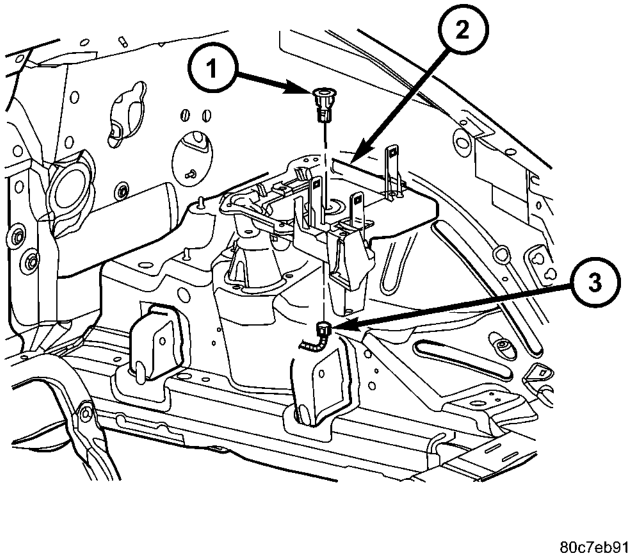

Fig. 1 BATTERY TEMPERATURE SENSOR

1 - BATTERY TEMPERATURE SENSOR
2 - BATTERY TRAY
3 - ELECTRICAL CONNECTOR

(3) Install battery. Refer to 8, Battery for procedures.

GENERATOR

DESCRIPTION

The generator is belt-driven by the engine using a serpentine type drive belt. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicle electrical system through the generator battery terminal.

Although the generators appear the same externally, different generators with different output ratings are used on this vehicle. Be certain that the replacement generator has the same output rating and part number as the original unit. Refer to Specifications and see Generator Ratings for amperage ratings and part numbers.

Noise emitting from the generator may be caused by: worn, loose or defective bearings; a loose or defective drive pulley; incorrect, worn, damaged or misadjusted fan drive belt; loose mounting bolts; a misaligned drive pulley or a defective stator or diode.

REMOVAL

Gasoline Powered Engines

CAUTION: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY.

(1) Disconnect and isolate negative battery cable at battery.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in Cooling System.

(2) Remove generator drive belt. Refer to 7, Cooling System for procedures.
(3) Unsnap plastic protective cover (Fig. 2) from B+ mounting stud.
(4) Remove B+ terminal mounting nut (Fig. 2) at top of generator.
(5) Disconnect field wire electrical connector at rear of generator (Fig. 2) by pushing on connector tab.
(6) 2.4L Engine: Remove 2 generator mounting bolts (Fig. 3).
(7) 3.7L Engine: Remove 1 vertical generator mounting bolt and 2 horizontal mounting bolts (Fig. 4).
(8) Remove generator from vehicle.

INSTALLATION

Gasoline Powered Engines

(1) 2.4L Engine: Position generator to engine and install 2 mounting bolts. Refer to torque specifications.
(2) 3.7L Engine: Position generator to engine and install 3 mounting bolts. Tighten 2 horizontal mounting bolts to specified torque. Tighten 1 verticle mounting bolt to specified torque. Refer to torque specifications.

GENERATOR (Continued)

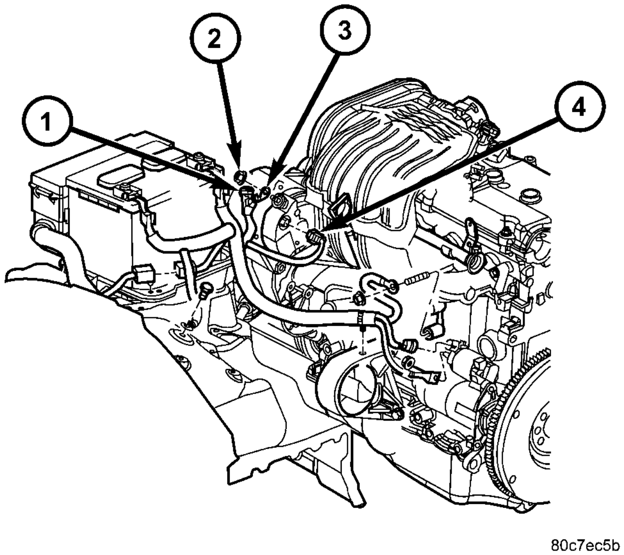

Fig. 2 GENERATOR ELECTRICAL CONNECTORS - TYPICAL

1 - PROTECTIVE CAP
2 - B+ NUT
3 - B+ TERMINAL
4 - FIELD ELECTRICAL CONNECTOR

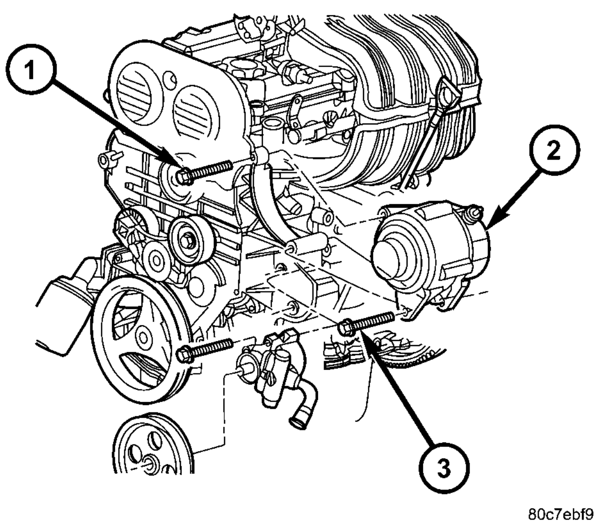

Fig. 3 GENERATOR - 2.4L

1 - UPPER MOUNTING BOLT
2 - GENERTOR
3 - LOWER MOUNTING BOLT

(3) Snap field wire connector into rear of generator.

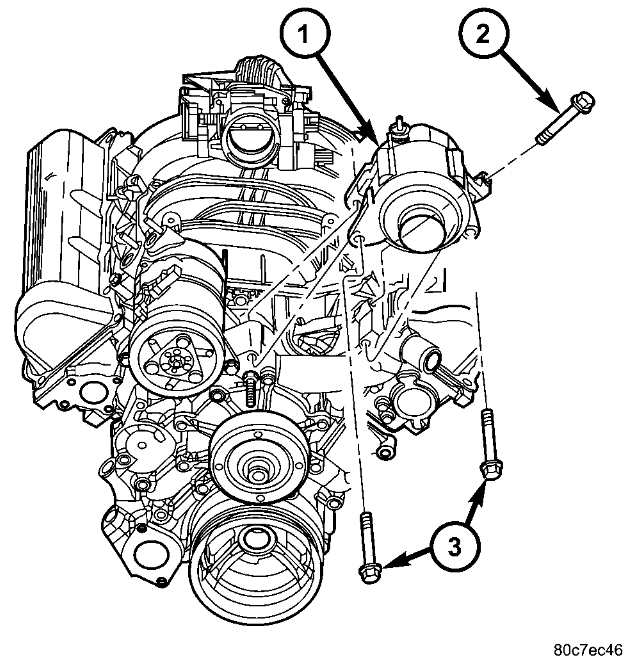

Fig. 4 GENERATOR - 3.7L

1 - GENERATOR
2 - VERTICAL MOUNTING BOLT
3 - HORIZONTAL MOUNTING BOLTS

(4) Install B+ terminal and nut to generator mounting stud. Refer to torque specifications.

(5) Snap plastic protective cover to B+ terminal.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in 7, Cooling System.

(6) Install drive belt Refer to 7, Cooling System for belt routing, belt adjustment and bolt tightening procedures.

(7) Install negative battery cable to battery.

GENERATOR DECOUPLER PULLEY

DESCRIPTION

The generator decoupler is used only with certain engines. The decoupler is used in place of the standard generator drive pulley (Fig. 5).

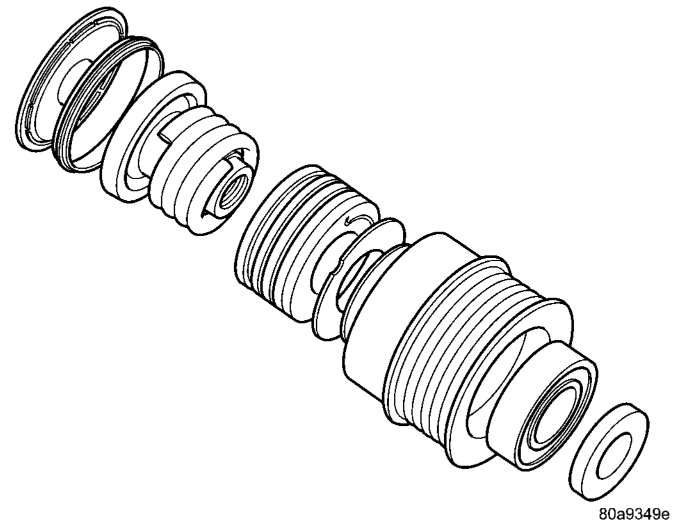

Fig. 5 GENERATOR DECOUPLER PULLEY (TYPICAL)

OPERATION

The generator decoupler is used only with certain engines. The decoupler (Fig. 5). is a one-way clutch designed to help reduce belt tension fluctuation, vibration, reduce fatigue loads, improve belt life, reduce hubloads on components, and reduce noise. Dry operation is used (no grease or lubricants). The decoupler is not temperature sensitive and also has a low sensitivity to electrical load. The decoupler is a non-serviceable item and is to be replaced as an assembly.

DIAGNOSIS AND TESTING - GENERATOR DECOUPLER

CONDITION	POSSIBLE CAUSES	CORRECTION
Does not drive generator (generator not charging)	Internal failure	Replace decoupler
Noise coming from decoupler	Internal failure	Replace decoupler

REMOVAL

The generator decoupler is used only with certain engines.

Two different type generator decoupler pulleys are used. One can be identified by the use of machined splines (Fig. 6). The other can be identified by a hex opening (Fig. 7) and will not use splines.

Different special tools are required to service each different decoupler. Refer to following procedure.

INA Decoupler

(1) Disconnect negative battery cable.

(2) Remove generator and accessory drive belt. Refer to Generator Removal.

(3) Position Special Tool #8823 (VM.1048) into decoupler (Fig. 8).

(4) Determine if end of generator shaft is hex shaped (Fig. 9) or is splined (Fig. 10). If hex is used, insert a 10MM deep socket into tool #8823 (VM.1048) (Fig. 11). If splined, insert a 5/16” 6-point hex driver, or a 10MM 12-point triple square driver into tool #8823 (VM.1048) (Fig. 12).

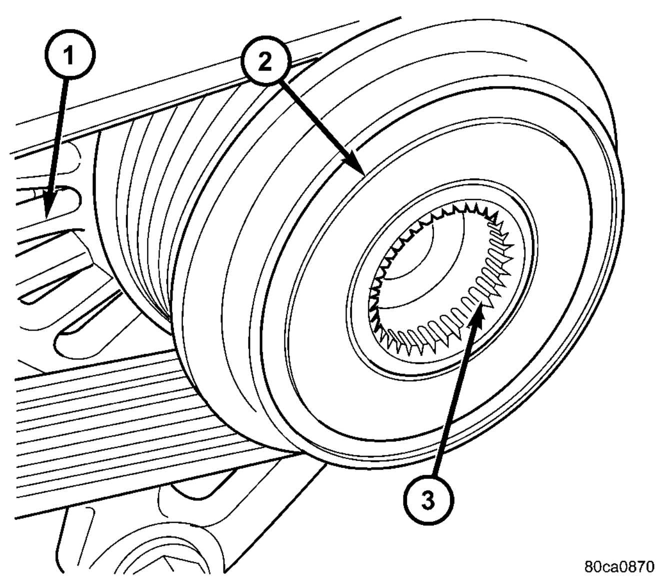

Fig. 6 GENERATOR DECOUPLER PULLEY (INA)

1 - GENERATOR
2 - DECOUPLER (INA)
3 - MACHINED SPLINES

GENERATOR DECOUPLER PULLEY (Continued)

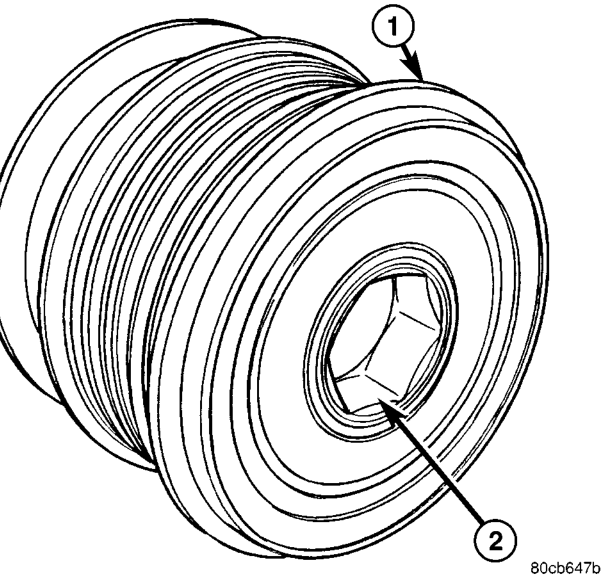

Fig. 7 GENERATOR DECOUPLER PULLEY (LITENS)

1 - DECOUPLER (LITENS)
2 - HEX OPENING

(5) The generator shaft uses conventional right-hand threads to attach decoupler. To break decoupler loose from generator threads, rotate end of tool clockwise (Fig. 11) or, (Fig. 12).

(6) After breaking loose with tool, unthread decoupler by hand from generator.

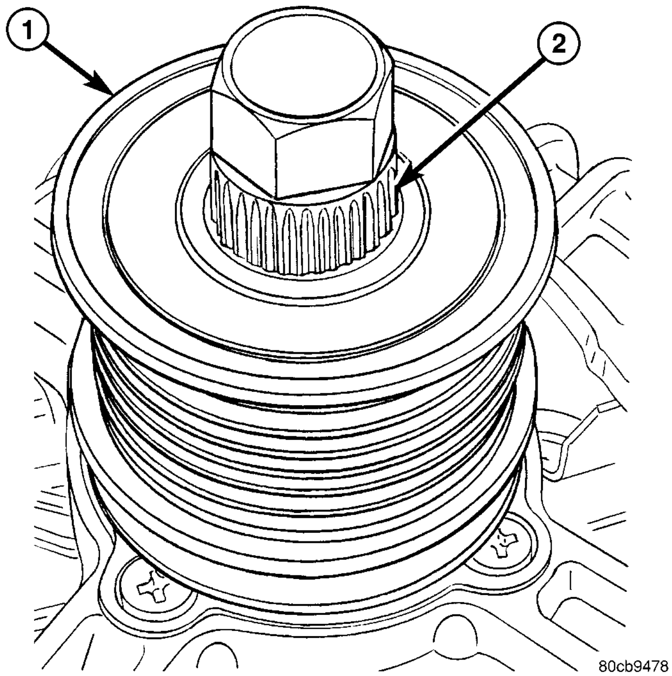

Fig. 8 #8823 (VM.1048) TOOL AND INA DECOUPLER

1 - INA DECOUPLER
2 - TOOL #8823 (VM.1048)

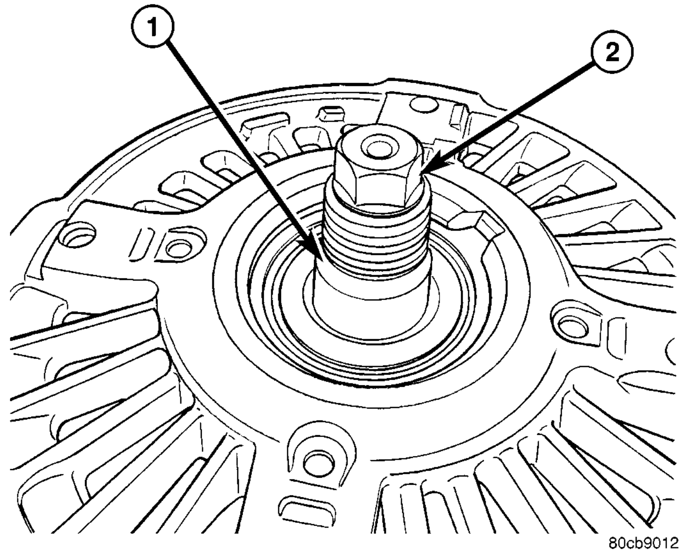

Fig. 9 END OF GENERATOR SHAFT (HEX)

1 - GENERATOR SHAFT
2 - HEX

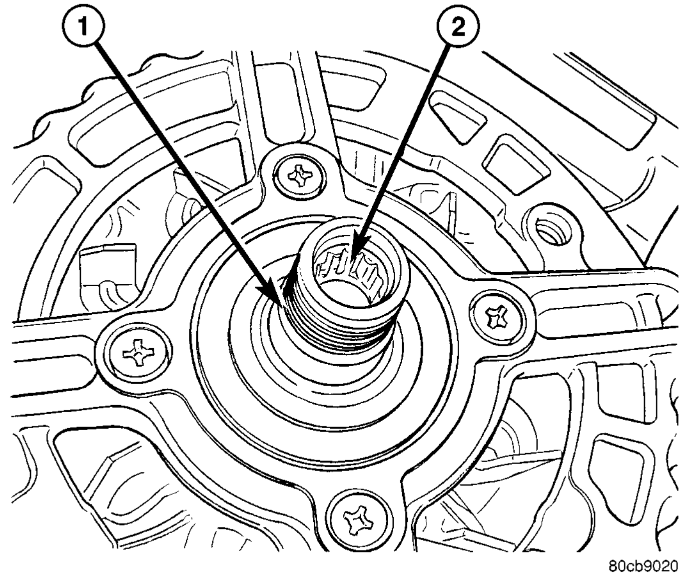

Fig. 10 END OF GENERATOR SHAFT (SPLINED)

1 - GENERATOR SHAFT
2 - SPLINES

Litens Decoupler

(1) Disconnect negative battery cable.

(2) Remove generator and accessory drive belt. Refer to Generator Removal.

(3) Position Special Tool #8433 (Fig. 13) into decoupler. Align to hex end of generator shaft.

(4) The generator shaft uses conventional right-hand threads to attach decoupler. To break decoupler loose from generator threads, rotate end of tool clockwise (Fig. 14).

GENERATOR DECOUPLER PULLEY (Continued)

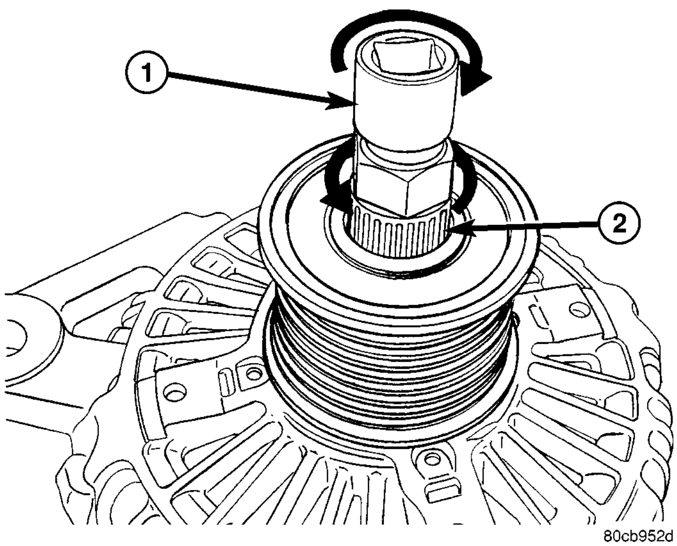

Fig. 11 DECOUPLER REMOVAL (INA-HEX)

1 - DEEP 10 MM SOCKET
2 - TOOL #8823 (VM.1048)

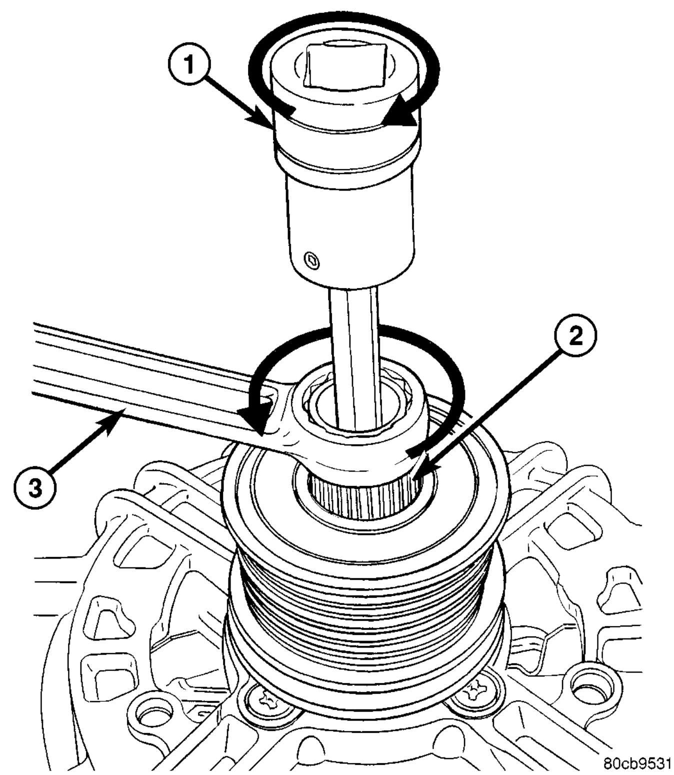

Fig. 12 DECOUPLER REMOVAL (INA-SPLINED)

1 - DRIVER
2 - TOOL #8823 (VM.1048)
3 - 17 MM WRENCH

(5) After breaking loose with tool, unthread decoupler by hand from generator.

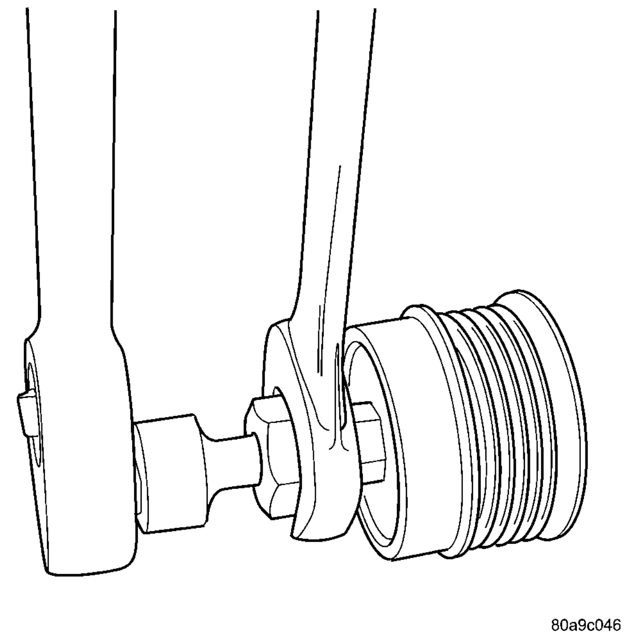

Fig. 13 # 8433 TOOL AND LITENS DECOUPLER

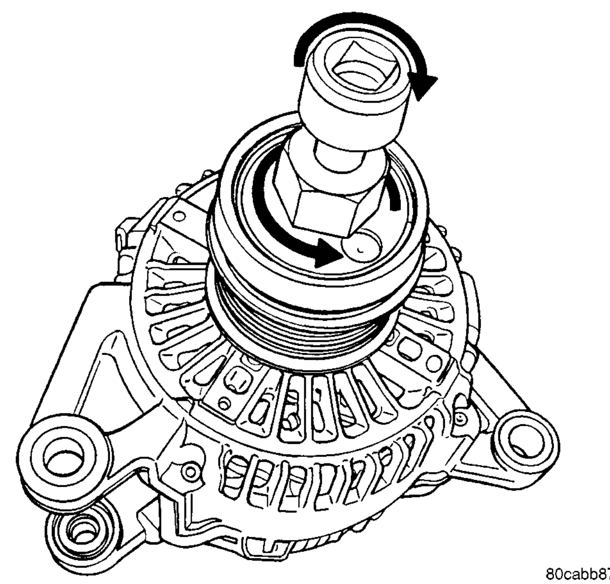

Fig. 14 DECOUPLER REMOVAL (LITENS)

INSTALLATION

INA Decoupler

(1) Thread decoupler pulley onto generator shaft by hand (right-hand threads).

(2) Position Special Tool #8823 (VM.1048) into decoupler (Fig. 8).

GENERATOR DECOUPLER PULLEY (Continued)

(3) Determine if end of generator shaft is hex shaped (Fig. 9) or is splined (Fig. 10). If hex is used, insert a 10MM deep socket into tool #8823 (VM.1048) (Fig. 15). If splined, insert a 5/16” 6-point hex driver, or a 10MM 12-point triple square driver into tool #8823 (VM.1048) (Fig. 16).

(4) **Do not use an adjustable, ratcheting “click type” torque wrench. Most “click type” wrenches will only allow torque to be applied in a clockwise rotation. Use a dial-type or beam-type wrench.** Tighten in counter-clockwise rotation (Fig. 15) or, (Fig. 16). Refer to torque specifications.

(5) Install accessory drive belt, and generator. Refer to Generator Installation.

(6) Connect negative battery cable.

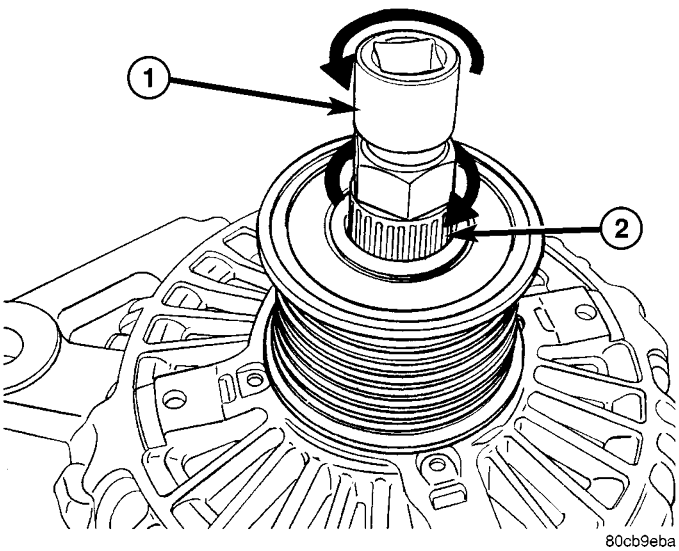

Fig. 15 DECOUPLER INSTALLATION (INA-HEX)

1 - 10MM DEEP SOCKET
2 - TOOL # 8823 (VM.1048)

Litens Decoupler

(1) Thread decoupler pulley onto generator shaft by hand (right-hand threads).

(2) Position Special Tool 8433 (Fig. 13) into decoupler. Align tool to hex end of generator shaft.

(3) **Do not use an adjustable, ratcheting “click type” torque wrench. Most “click type” wrenches will only allow torque to be applied in a clockwise rotation. Use a dial-type or beam-type wrench.** Tighten in counter-clockwise rotation (Fig. 17). Refer to torque specifications.

(4) Install accessory drive belt, and generator. Refer to Generator Installation.

(5) Connect negative battery cable.

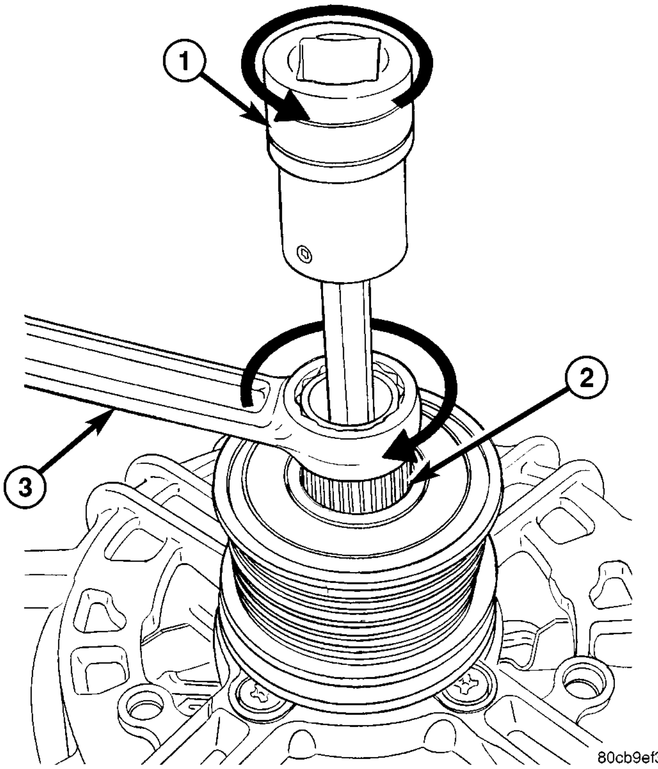

Fig. 16 DECOUPLER INSTALLATION (INA SPLINED)

1 - DRIVER
2 - TOOL # 8823 (VM.1048)

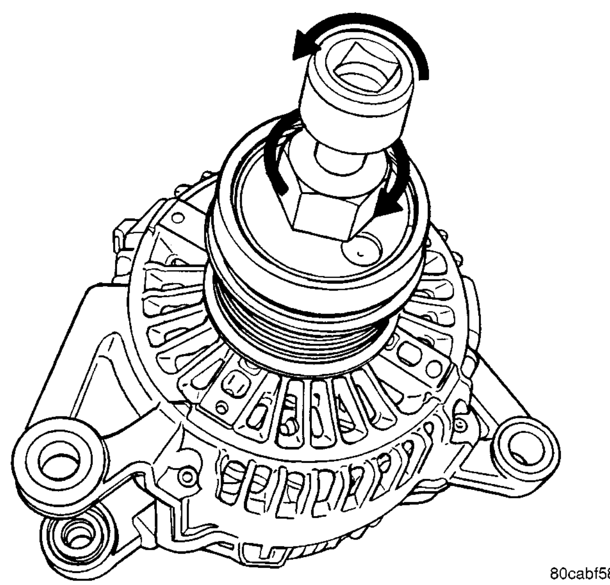

Fig. 17 DECOUPLER INSTALLATION (Litens)

VOLTAGE REGULATOR

DESCRIPTION

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

OPERATION

The amount of DC current produced by the generator is controlled by EVR circuitry contained within the Powertrain Control Module (PCM). This circuitry is connected in series with the generators second rotor field terminal and its ground.

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage (B+) and battery temperature (refer to Battery Temperature Sensor for more information). It then determines a target charging voltage. If sensed battery voltage is 0.5 volts or lower than the target voltage, the PCM grounds the field winding until sensed battery voltage is 0.5 volts above target voltage. A circuit in the PCM cycles the ground side of the generator field up to 100 times per second (100Hz), but has the capability to ground the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 25% is used by the PCM in order to have some generator output. Also refer to Charging Operation for additional information.

STARTING SYSTEM

TABLE OF CONTENTS

STARTING SYSTEM

DESCRIPTION

The starting system consists of:

- Starter relay
- Starter motor (including an integral starter solenoid)

Other components to be considered as part of starting system are:

- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Clutch pedal position switch (manual transmission)
- Park/neutral position switch (automatic transmission)
- Wire harnesses and connections.

The Battery, Starting, and Charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in each of these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

Certain starting system components are monitored by the PCM and may produce a Diagnostic Trouble Code (DTC).

OPERATION

The starting system components form two separate circuits. A high-amperage feed circuit that feeds the starter motor between 150 and 350 amperes (700 amperes - diesel engine), and a low-amperage control circuit that operates on less than 20 amperes. The high-amperage feed circuit components include the battery, the battery cables, the contact disc portion of the starter solenoid, and the starter motor. The low-amperage control circuit components include the ignition switch, the clutch pedal position switch (manual transmission), the park/neutral position switch (automatic transmission), the starter relay, the electromagnetic windings of the starter solenoid, and the connecting wire harness components.

If the vehicle is equipped with a manual transmission, it has a clutch pedal position switch installed in series between the ignition switch and the coil battery terminal of the starter relay. This normally open switch prevents the starter relay from being energized when the ignition switch is turned to the momentary Start position, unless the clutch pedal is depressed. This feature prevents starter motor operation while the clutch disc and the flywheel are engaged. The starter relay coil ground terminal is always grounded on vehicles with a manual transmission.

STARTING SYSTEM (Continued)

If the vehicle is equipped with an automatic transmission, battery voltage is supplied through the low-amperage control circuit to the coil battery terminal of the starter relay when the ignition switch is turned to the momentary Start position. The park/neutral position switch is installed in series between the starter relay coil ground terminal and ground. This normally open switch prevents the starter relay from being energized and the starter motor from operating unless the automatic transmission gear selector is in the Neutral or Park positions.

When the starter relay coil is energized, the normally open relay contacts close. The relay contacts connect the relay common feed terminal to the relay normally open terminal. The closed relay contacts energize the starter solenoid coil windings.

The energized solenoid pull-in coil pulls in the solenoid plunger. The solenoid plunger pulls the shift lever in the starter motor. This engages the starter overrunning clutch and pinion gear with the starter ring gear on the manual transmission flywheel or on the automatic transmission torque converter or torque converter drive plate.

As the solenoid plunger reaches the end of its travel, the solenoid contact disc completes the high-amperage starter feed circuit and energizes the solenoid plunger hold-in coil. Current now flows between the solenoid battery terminal and the starter motor, energizing the starter.

Once the engine starts, the overrunning clutch protects the starter motor from damage by allowing the starter pinion gear to spin faster than the pinion shaft. When the driver releases the ignition switch to the On position, the starter relay coil is de-energized. This causes the relay contacts to open. When the relay contacts open, the starter solenoid plunger hold-in coil is de-energized.

When the solenoid plunger hold-in coil is de-energized, the solenoid plunger return spring returns the plunger to its relaxed position. This causes the contact disc to open the starter feed circuit, and the shift lever to disengage the overrunning clutch and pinion gear from the starter ring gear.

DIAGNOSIS AND TESTING - STARTING SYSTEM

The battery, starting, and charging systems operate in conjunction with one another, and must be tested as a complete system. For correct starting/charging system operation, all of the components involved in these 3 systems must perform within specifications.

Starting System Diagnosis

CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO OPERATE.	1. Battery discharged or faulty.	1. Refer to Battery. Charge or replace battery, if required.
	2. Starting circuit wiring faulty.	2. Refer to 8, Wiring Diagrams. Test and repair starter feed and/or control circuits, if required.
	3. Starter relay faulty.	3. Refer to Starter Relay in Diagnosis and Testing. Replace starter relay if required.
	4. Ignition switch faulty.	4. Refer to Ignition Switch and Key Lock Cylinder. Replace ignition switch if required.
	5. Clutch pedal position switch faulty.	5. Refer to Clutch Pedal Position Switch.
	6. Park/Neutral position switch faulty or misadjusted.	6. Refer to Park/Neutral Position Switch. Replace park/neutral position switch if required.
	7. Starter solenoid faulty.	7. Refer to Starter Motor. Replace starter motor assembly if required.
	8. Starter motor faulty.	8. If all other starting system components and circuits test OK, replace starter motor.

STARTING SYSTEM (Continued)

Starting System Diagnosis		
CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. Battery discharged or faulty.	1. Refer to Battery. Charge or replace battery if required.
	2. Starting circuit wiring faulty.	2. Refer to 8, Wiring Diagrams. Test and repair starter feed and/or control circuits if required.
	3. Starter motor faulty.	3. If all other starting system components and circuits test OK, replace starter motor assembly.
	4. Engine seized.	4. Refer to Engine Diagnosis in the Diagnosis and Testing section of 9, Engine.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. Starter ring gear faulty.	1. Refer to Starter Motor Removal and Installation. Remove starter motor to inspect starter ring gear. Replace starter ring gear if required.
	2. Starter motor faulty.	2. If all other starting system components and circuits test OK, replace starter motor assembly.
STARTER DOES NOT DISENGAGE.	1. Starter motor improperly installed.	1. Refer to Starter Motor Removal and Installation. Tighten starter mounting hardware to correct torque specifications.
	2. Starter relay faulty.	2. Refer to Starter Relay Diagnosis and Testing. Replace starter relay if required.
	3. Ignition switch faulty.	3. Refer to Ignition Switch and Key Lock Cylinder. Replace ignition switch if required.
	4. Starter motor faulty.	4. If all other starting system components and circuits test OK, replace starter motor.

INSPECTION

For complete starter wiring circuit diagrams, refer to 8, Wiring Diagrams. Before removing any unit from starting system for repair or diagnosis, perform the following inspections:

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO 8, PASSIVE RESTRAINT SYSTEMS, BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

- **Battery -** Visually inspect battery for indications of physical damage and loose or corroded cable connections. Determine state-of-charge and cranking capacity of battery. Charge or replace battery if required. Refer to **Battery** in 8, Battery. **Note: If equipped with diesel engine, a dual battery system may be used, and both batteries must be inspected.**
- **Ignition Switch -** Visually inspect ignition switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Ignition Switch and Key Lock Cylinder.**
- **Clutch Pedal Position Switch -** If equipped with manual transmission, visually inspect clutch pedal position switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Clutch Pedal Position Switch** in 6, Clutch.
- **Park/Neutral Position Switch -** If equipped with automatic transmission, visually inspect park/neutral position switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Park/Neutral Position Switch** in 21, Transmission.
- **Starter Relay -** Visually inspect starter relay for indications of physical damage and loose or corroded wire harness connections.
- **Starter Motor -** Visually inspect starter motor for indications of physical damage and loose or corroded wire harness connections.
- **Starter Solenoid -** Visually inspect starter solenoid for indications of physical damage and loose or corroded wire harness connections.
- **Wiring -** Visually inspect wire harnesses for damage. Repair or replace any faulty wiring, as required. Refer to 8, Wiring Diagrams.

STARTING SYSTEM (Continued)

TESTING

COLD CRANKING TEST

For complete starter wiring circuit diagrams, refer to 8, Wiring Diagrams. The battery must be fully-charged and load-tested before proceeding. Refer to **Battery** in 8, Battery.

(1) Connect volt-ampere tester to battery terminals (Fig. 1). See instructions provided by manufacturer of volt-ampere tester being used. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, tester should be connected to battery on left side of vehicle only. Also, tester current reading must be taken from positive battery cable lead that connects to starter motor.**

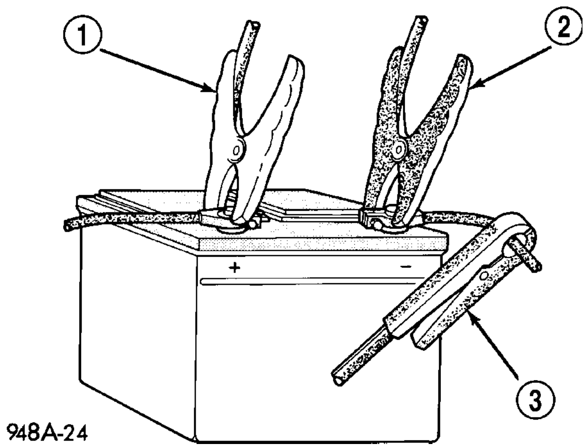

Fig. 1 Volts-Amps Tester Connections - Typical

1 - POSITIVE CLAMP
2 - NEGATIVE CLAMP
3 - INDUCTION AMMETER CLAMP

(2) Fully engage parking brake.

(3) If equipped with manual transmission, place gearshift selector lever in Neutral position and block clutch pedal in fully depressed position. If equipped with automatic transmission, place gearshift selector lever in Park position.

(4) Verify that all lamps and accessories are turned off.

(5) To prevent a gasoline engine from starting, remove Automatic ShutDown (ASD) relay. To prevent a diesel engine from starting, remove Fuel Pump Relay. These relays are located in Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

WARNING: IF EQUIPPED WITH DIESEL ENGINE, ATTEMPT TO START ENGINE A FEW TIMES BEFORE PROCEEDING WITH FOLLOWING STEP.

(6) Rotate and hold ignition switch in Start position. Note cranking voltage and current (amperage) draw readings shown on volt-ampere tester.

(a) If voltage reads below 9.6 volts, refer to **Starter Motor** in Diagnosis and Testing. If starter motor is OK, refer to **Engine Diagnosis** in 9, Engine for further testing of engine. If starter motor is not OK, replace faulty starter motor.

(b) If voltage reads above 9.6 volts and current (amperage) draw reads below specifications, refer to **Feed Circuit Test** in this section.

(c) If voltage reads 12.5 volts or greater and starter motor does not turn, refer to **Control Circuit Testing** in this section.

(d) If voltage reads 12.5 volts or greater and starter motor turns very slowly, refer to **Feed Circuit Test** in this section.

NOTE: A cold engine will increase starter current (amperage) draw reading, and reduce battery voltage reading.

FEED CIRCUIT TEST

The starter feed circuit test (voltage drop method) will determine if there is excessive resistance in high-amperage feed circuit. For complete starter wiring circuit diagrams, refer 8, Wiring Diagrams.

When performing these tests, it is important to remember that voltage drop is giving an indication of resistance between two points at which voltmeter probes are attached.

Example: When testing resistance of positive battery cable, touch voltmeter leads to positive battery cable clamp and cable connector at starter solenoid. If you probe positive battery terminal post and cable connector at starter solenoid, you are reading combined voltage drop in positive battery cable clamp-to-terminal post connection and positive battery cable.

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing tests, be certain that following procedures are accomplished:

- Battery is fully-charged and load-tested. Refer to **Battery** in 8, Battery.
- Fully engage parking brake.

STARTING SYSTEM (Continued)

• If equipped with manual transmission, place gearshift selector lever in Neutral position and block clutch pedal in fully depressed position. If equipped with automatic transmission, place gearshift selector lever in Park position.

• Verify that all lamps and accessories are turned off.

• To prevent a gasoline engine from starting, remove Automatic ShutDown (ASD) relay. To prevent a diesel engine from starting, remove Fuel Pump Relay. These relays are located in Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

(1) Connect positive lead of voltmeter to negative battery cable terminal post. Connect negative lead of voltmeter to negative battery cable clamp (Fig. 2). Rotate and hold ignition switch in Start position. Observe voltmeter. If voltage is detected, correct poor contact between cable clamp and terminal post. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, procedure must be performed twice, once for each battery.**

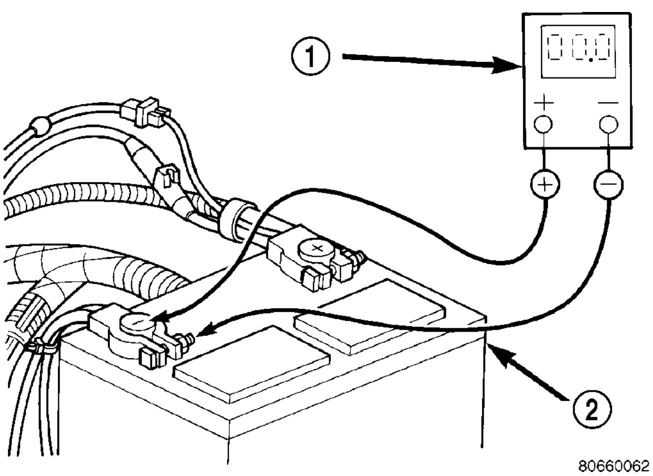

Fig. 2 Test Negative Battery Cable Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(2) Connect positive lead of voltmeter to positive battery terminal post. Connect negative lead of voltmeter to battery positive cable clamp (Fig. 3). Rotate and hold ignition switch in Start position. Observe voltmeter. If voltage is detected, correct poor contact between cable clamp and terminal post. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed twice, once for each battery.**

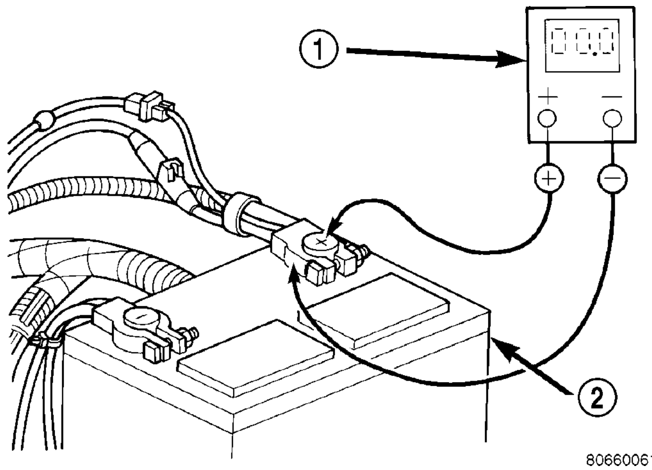

Fig. 3 Test Positive Battery Cable Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(3) Connect voltmeter to measure between battery positive terminal post and starter solenoid battery terminal stud (Fig. 4). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cable connection at solenoid. Repeat test. If reading is still above 0.2 volt, replace faulty positive battery cable. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed on driver side battery only.**

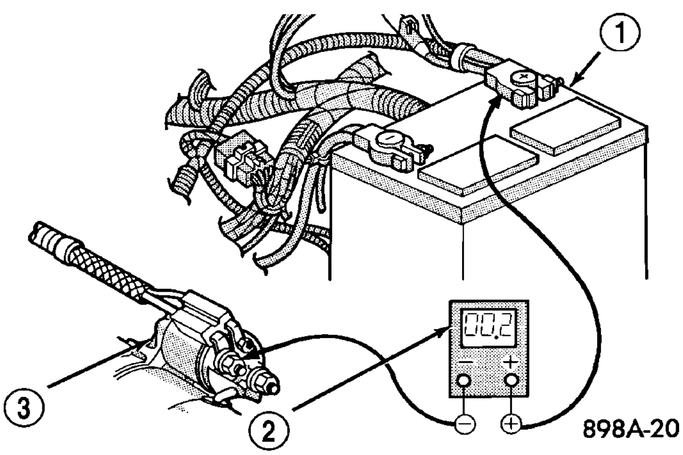

Fig. 4 Test Positive Battery Cable

1 - BATTERY
2 - VOLTMETER
3 - STARTER MOTOR

STARTING SYSTEM (Continued)

(4) Connect voltmeter to measure between negative battery terminal post and a good clean ground on engine block (Fig. 5). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten negative battery cable attachment on engine block. Repeat test. If reading is still above 0.2 volt, replace faulty negative battery cable. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed twice, once for each battery.**

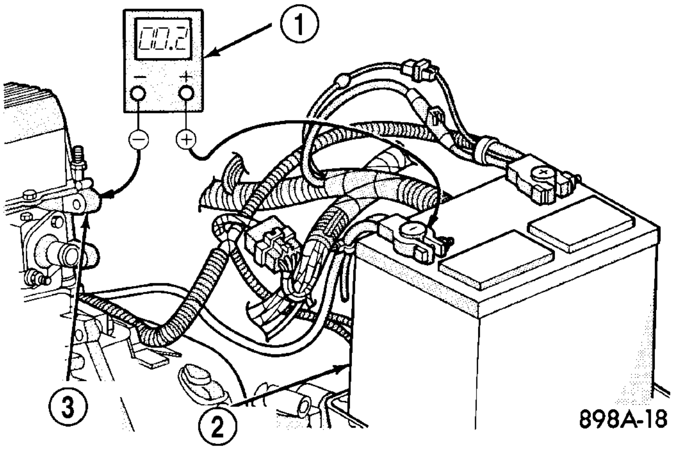

Fig. 5 Test Ground Circuit Resistance - Typical

1 - VOLTMETER
2 - BATTERY
3 - ENGINE GROUND

(5) Connect positive lead of voltmeter to starter housing. Connect negative lead of voltmeter to negative battery terminal post (Fig. 6). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, correct poor starter to engine block ground contact. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed on driver side battery only.**

(6) If equipped with dual battery system (certain diesel equipped models), connect positive lead of voltmeter to positive battery cable clamp on battery located on left side of vehicle. Connect negative lead of voltmeter to positive battery terminal post on battery located on right side of vehicle. Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cables at both batteries. Repeat test. If reading is still above 0.2 volt, replace faulty positive battery cable.

If resistance tests detect no feed circuit problems, refer to **Starter Motor** in the Diagnosis and Testing.

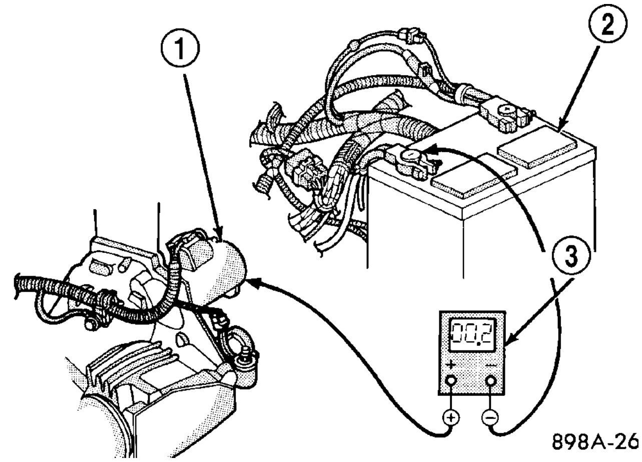

Fig. 6 Test Starter Ground - Typical

1 - STARTER MOTOR
2 - BATTERY
3 - VOLTMETER

CONTROL CIRCUIT TESTING

The starter control circuit components should be tested in the order in which they are listed, as follows:

- **Starter Relay** - Refer to **Starter Relay** Diagnosis and Testing.
- **Starter Solenoid** - Refer to **Starter Motor** Diagnosis and Testing.
- **Ignition Switch** - Refer to **Ignition Switch and Key Lock Cylinder**
- **Clutch Pedal Position Switch** - If equipped with manual transmission, refer to **Clutch Pedal Position Switch** in 6, Clutch.
- **Park/Neutral Position Switch** - If equipped with automatic transmission, refer to **Park/Neutral Position Switch** in 21, Transmission.
- **Wire harnesses and connections** - Refer to 8, Wiring Diagrams.

INSPECTION - STARTING SYSTEM

The following starting system components should be carefully inspected whenever any starting system problem is encountered.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE AIRBAG SYSTEM. FAILURE TO TAKE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

STARTING SYSTEM (Continued)

Battery

• Visually inspect battery for indications of physical damage and loose or corroded cable connections. Determine state-of-charge and cranking capacity of battery. Charge or replace battery, if required. Refer to **Battery** for battery cleaning and inspection procedures.

Ignition Switch

• Visually inspect ignition switch for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. Refer to **Wiring Diagrams**. Refer to **Ignition Switch and Key Lock Cylinder** for ignition switch service procedures.

Clutch Pedal Position Switch

• If vehicle is equipped with a manual transmission, visually inspect clutch pedal position switch for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. Refer to **Clutch Hydraulic Linkage** for clutch pedal position switch service procedures.

Park/Neutral Position Switch

• If vehicle is equipped with an automatic transmission, visually inspect park/neutral position switch for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. Refer to **Park/Neutral Position Switch** for park/neutral position switch service procedures.

Starter Relay

• Visually inspect starter relay for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. Refer to **Starter Relay** for starter relay service procedures.

Starter Motor

• Visually inspect starter motor for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. If problem being diagnosed involves improper starter engagement, disengagement or noise complaints, starter motor should be removed. With starter motor removed, inspect starter pinion and ring gears for damaged or missing teeth. Replace faulty components as required. Refer to **Starter Motor** for removal/installation procedures.

Starter Solenoid

• Visually inspect starter solenoid for indications of physical damage and loose or corroded wire harness connections. Clean corroded connections as required. Refer to **Starter Motor** for starter solenoid service procedures.

Wiring

• Visually inspect starting system wire harnesses for indications of physical damage. Repair or replace any faulty wiring, as required. Refer to **Wiring Diagrams** for repair or connector and terminal service procedures.

SPECIFICATIONS

TORQUE - GAS POWERED

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Starter Solenoid Battery Cable Nut	11	-	100
Starter Mounting Bolts - 2.4L	54	40	-
Starter Mounting Bolts -3.7L	54	40	-
Starter Heat Shield Mounting Bolts	6	-	55

STARTING SYSTEM (Continued)

STARTER MOTOR - GAS POWERED

Starter Motor and Solenoid	
Manufacturer	Mitsubishi
Engine Application	2.4L / 3.7L
Power Rating	1.4 Kilowatt (1.9 Horsepower)
Voltage	12 Volts
** Number of Permanent Magnets	6
Number of Brushes	4
Drive Type	Planetary Gear Reduction
Free Running Test Voltage	11.2 Volts
Free Running Test Maximum Amperage Draw	90 Amperes
Free Running Test Minimum Speed	2400 rpm
Solenoid Closing Maximum Voltage Required	7.8 Volts
* Cranking Amperage Draw Test	160 Amperes
*Test at operating temperature. Cold engine, tight (new) engine, or heavy oil will increase starter amperage draw.	
**The starter is equipped with permanent magnets. Never strike the starter case to attempt to loosen a sticking/ stuck armature as permanent magnets may crack or break.	

STARTER MOTOR

DIAGNOSIS AND TESTING - STARTER MOTOR

Correct starter motor operation can be confirmed by performing the following free running bench test. This test can only be performed with starter motor removed from vehicle. Refer to Specifications for starter motor specifications.

(1) Remove starter motor from vehicle. Refer to Starter Motor Removal and Installation.

(2) Mount starter motor securely in a soft-jawed bench vise. The vise jaws should be clamped on the mounting flange of starter motor. Never clamp on starter motor by field frame.

(3) Connect a suitable volt-ampere tester and a 12-volt battery to starter motor in series, and set ammeter to 100 ampere scale. See instructions provided by manufacturer of volt-ampere tester being used.

(4) Install jumper wire from solenoid terminal to solenoid battery terminal. The starter motor should operate. If starter motor fails to operate, replace faulty starter motor assembly.

(5) Adjust carbon pile load of tester to obtain free running test voltage. Refer to Specifications for starter motor free running test voltage specifications.

(6) Note reading on ammeter and compare reading to free running test maximum amperage draw. Refer to Specifications for starter motor free running test maximum amperage draw specifications.

(7) If ammeter reading exceeds maximum amperage draw specification, replace faulty starter motor assembly.

STARTER SOLENOID

This test can only be performed with starter motor removed from vehicle.

(1) Remove starter motor from vehicle. Refer to Starter Motor Removal and Installation.

(2) Disconnect wire from solenoid field coil terminal.

(3) Check for continuity between solenoid terminal and solenoid field coil terminal with a continuity tester (Fig. 7). There should be continuity. If OK, go to Step 4. If not OK, replace faulty starter motor assembly.

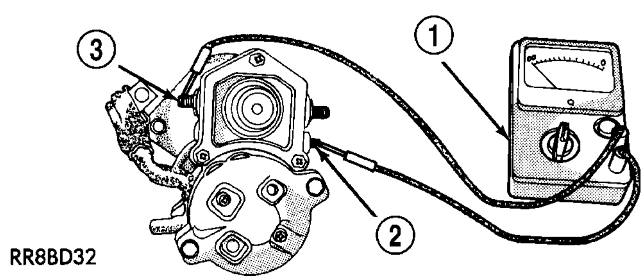

Fig. 7 CONTINUITY BETWEEN SOLENOID AND FIELD COIL TERMINALS - TYPICAL

1 - OHMMETER
2 - SOLENOID TERMINAL
3 - FIELD COIL TERMINAL

STARTER MOTOR (Continued)

(4) Check for continuity between solenoid terminal and solenoid case (Fig. 8). There should be continuity. If not OK, replace faulty starter motor assembly.

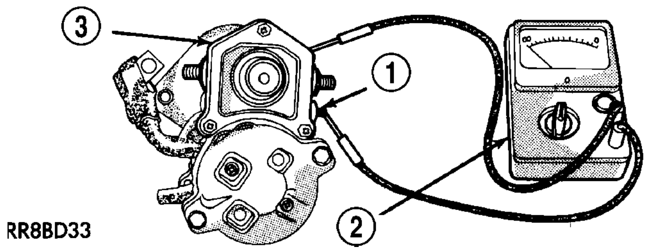

Fig. 8 CONTINUITY BETWEEN SOLENOID TERMINAL AND CASE - TYPICAL

1 - SOLENOID TERMINAL
2 - OHMMETER
3 - SOLENOID

REMOVAL

2.4L 4–Cylinder

(1) Disconnect and isolate negative battery cable.

(2) Raise and support vehicle.

(3) Remove solenoid wire from solenoid terminal (Fig. 11).

(4) Remove battery cable from stud on starter solenoid (Fig. 11).

(5) Remove 2 starter mounting bolts (Fig. 9) and remove starter from vehicle.

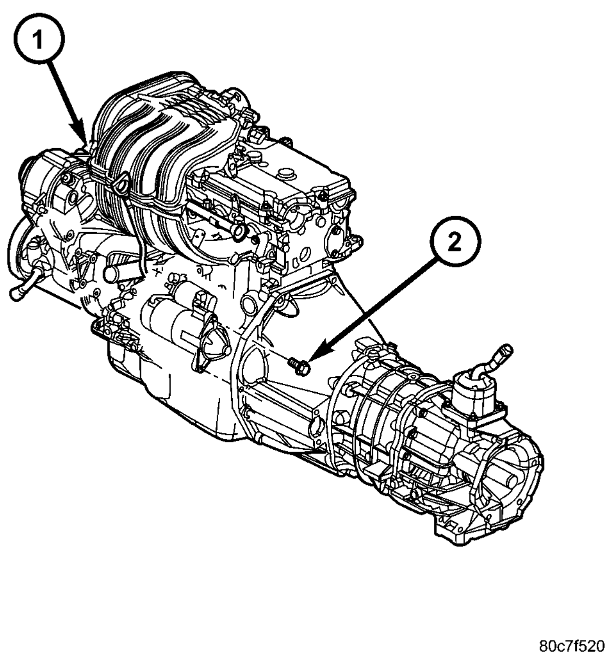

Fig. 9 STARTER - 2.4L

1 - STARTER
2 - MOUNTING BOLTS (2)

3.7L V-6

(1) Disconnect and isolate negative battery cable.

(2) Raise and support vehicle.

(3) Remove 2 flange bolts securing left exhaust downpipe to crossover pipe. Lower pipe slightly to allow front propeller shaft removal.

(4) Remove front propeller shaft.

(5) Remove 2 starter heat shield bolts at side of starter (Fig. 10).

(6) Remove starter heat shield nut at front of starter (Fig. 10).

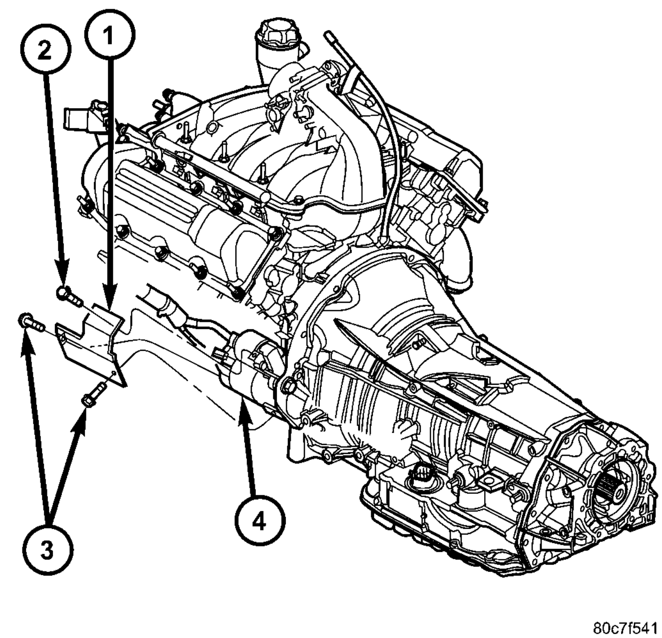

Fig. 10 STARTER HEAT SHIELD - 3.7L

1 - STARTER HEAT SHIELD
2 - HEAT SHIELD BOLTS
3 - HEAT SHIELD BOLTS
4 - STARTER

(7) Remove starter heat shield.

(8) Remove solenoid wire from solenoid terminal (Fig. 11).

(9) Remove battery cable from stud on starter solenoid (Fig. 11).

(10) Remove 2 starter mounting bolts (Fig. 12).

(11) Position front of starter to face rear of vehicle. Rotate starter until solenoid position is located below starter.

(12) Remove starter from vehicle by passing it between exhaust pipe and transmission bellhousing.

STARTER MOTOR (Continued)

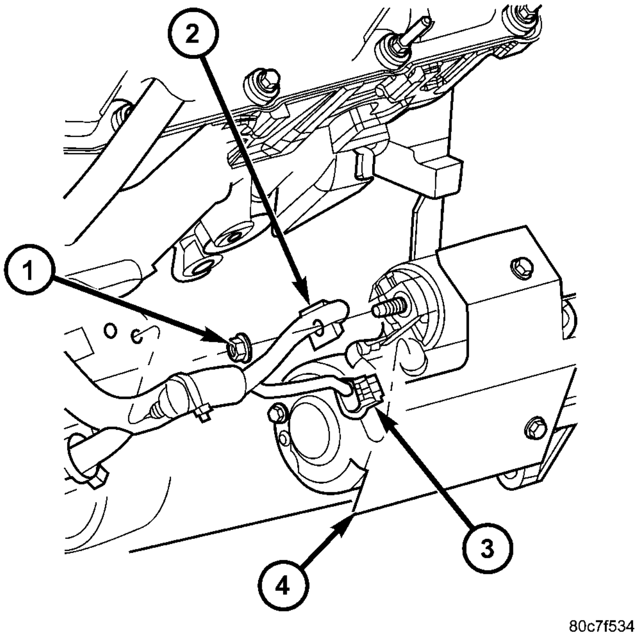

Fig. 11 STARTER ELECTRICAL CONNECTORS - 2.4L/3.7L

1 - BATERY CABLE NUT
2 - BATTERY CABLE
3 - SOLENOID CONNECTOR
4 - HEAT SHIELD

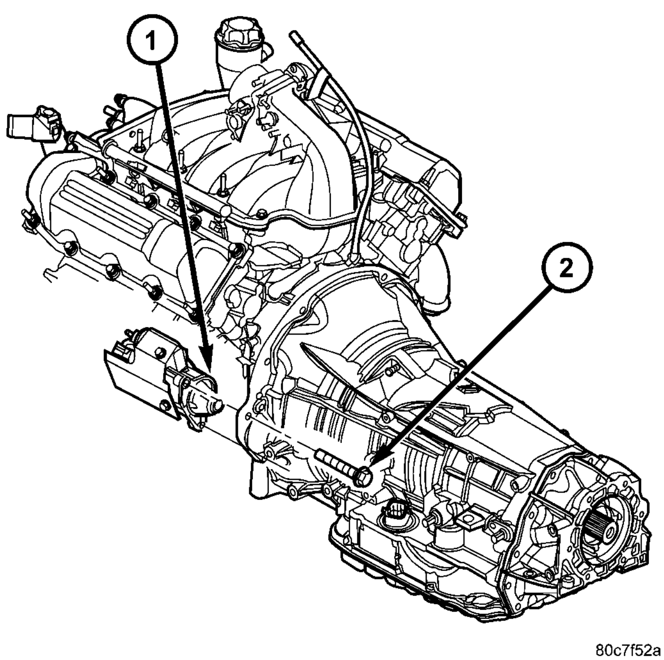

Fig. 12 STARTER - 3.7L

1 - STARTER
2 - MOUNTING BOLTS (2)

INSTALLATION

2.4L 4–Cylinder

(1) Position starter into bellhousing and install 2 bolts. Refer to torque specifications.

(2) Install battery cable and nut to stud on starter solenoid. Refer to torque specifications.

(3) Install solenoid wire connector to solenoid terminal.

(4) Lower vehicle.

(5) Connect negative battery cable.

3.7L V-6

(1) Position front of starter towards rear of vehicle with solenoid position rotated until it is located below starter. Install starter by passing it between exhaust pipe and transmission bellhousing.

(2) Position starter into bellhousing and install 2 bolts. Refer to torque specifications.

(3) Install battery cable and nut to stud on starter solenoid. Refer to torque specifications.

(4) Install solenoid wire connector to solenoid terminal.

(5) Position starter heat shield and install nut at front of starter.

(6) Install 2 starter heat shield bolts at side of starter.

(7) Install front propeller shaft.

(8) Install 2 flange bolts securing left exhaust downpipe to crossover pipe.

(9) Lower vehicle.

(10) Connect negative battery cable.

STARTER MOTOR RELAY

DESCRIPTION

The starter relay is an electromechanical device that switches battery current to the pull-in coil of the starter solenoid when ignition switch is turned to Start position. The starter relay is located in the Power Distribution Center (PDC) in the engine compartment. See PDC cover for relay identification and location.

The starter relay is a International Standards Organization (ISO) relay. Relays conforming to ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

The starter relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

STARTER MOTOR RELAY (Continued)

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When electromagnetic coil is energized, it draws the movable contact away from normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When electromagnetic coil is de-energized, spring pressure returns movable contact to normally closed position. The resistor or diode is connected in parallel with electromagnetic coil within relay, and helps to dissipate voltage spikes produced when coil is de-energized.

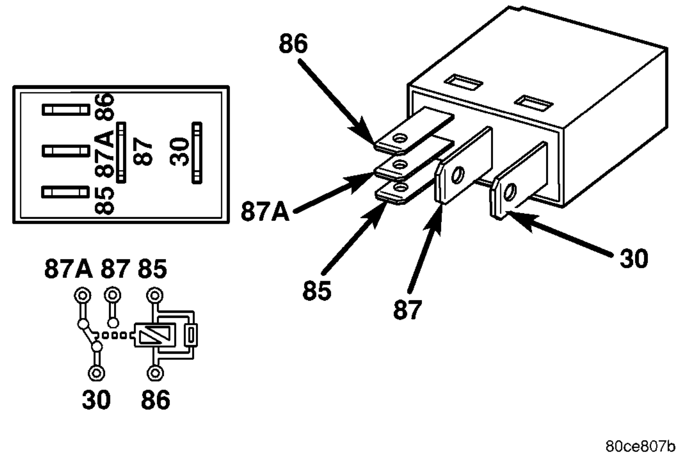

Fig. 13 STARTER RELAY (ISO MICRO RELAY)

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

DIAGNOSIS AND TESTING - STARTER RELAY

The starter relay is located in the Power Distribution Center (PDC) in engine compartment. Refer to label on PDC cover for relay location.

RELAY TEST

(1) Remove starter relay (Fig. 13) from PDC.

(2) A relay in de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform following Relay Circuit Test. If not OK, replace faulty relay.

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair open circuit to fused B(+) fuse in PDC as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to common feed terminal (30) in energized position. This terminal supplies battery voltage to starter solenoid field coil. There should be continuity between cavity for relay terminal 87 and starter solenoid terminal at all times. If OK, go to Step 4. If not OK, repair open engine starter motor relay output circuit to starter solenoid as required.

(4) The coil battery terminal (86) is connected to electromagnet in relay. It is energized when ignition switch is held in Start position. On vehicles with a manual transmission, the clutch pedal must be blocked in fully depressed position for this test. Check for battery voltage at cavity for relay terminal 86 with ignition switch in Start position, and no voltage when ignition switch is released to On position. If OK, go to Step 5. If not OK with a manual transmission, disconnect clutch pedal position switch wire harness connector and install a jumper wire between two cavities in body half of connector and check for battery voltage again at cavity for relay terminal 86. If now OK, replace faulty clutch pedal position switch. If still not OK with a manual transmission or if not OK with an automatic transmission, check for open or shorted fused ignition switch output (start) circuit to ignition switch and repair as required. If fused ignition switch output (start) circuit is OK, refer to **Ignition Switch and Key Lock Cylinder.**

(5) The coil ground terminal (85) is connected to electromagnet in relay. On vehicles with manual transmission, it is grounded at all times. On vehicles with automatic transmission, it is grounded through park/neutral position switch only when gearshift selector lever is in Park or Neutral positions. Check for continuity to ground at cavity for relay terminal 85. If not OK with a manual transmission, repair open park/neutral position switch sense circuit to ground as required. If not OK with an automatic transmission, check for open or shorted park/neutral position switch sense circuit to park/neutral position switch and repair, as required. If park/neutral position switch sense circuit checks OK, refer to **Park/ Neutral Position Switch.**

STARTER MOTOR RELAY (Continued)

REMOVAL

The starter relay is located in the Power Distribution Center (PDC) (Fig. 14). Refer to label on PDC cover for relay location.

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

(1) Refer to Power Distribution Center (PDC) cover for starter relay location.

(2) Install relay to PDC.

(3) Install cover to PDC.

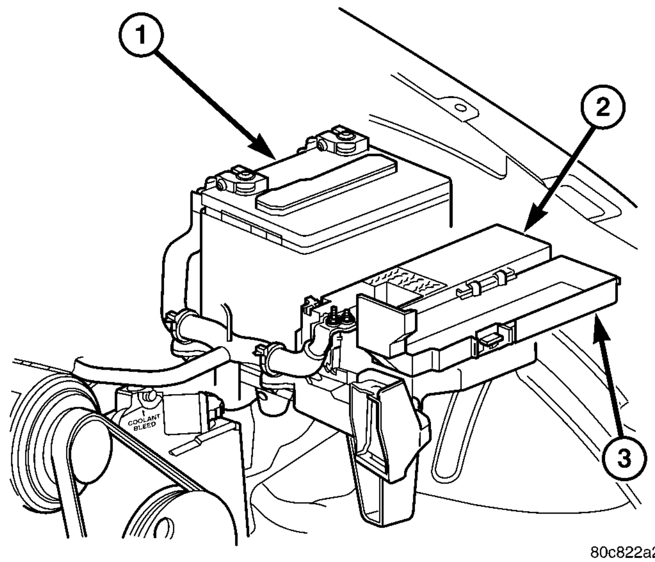

Fig. 14 POWER DISTRIBUTION CENTER (PDC)

1 - BATTERY
2 - PDC
3 - PDC COVER

HEATED SYSTEMS

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HEATED MIRRORS

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HEATED MIRRORS

DESCRIPTION

Vehicles equipped with the optional heated mirror package have an electric heating grid located behind the mirror glass of each outside rear view mirror. The heated mirrors are controlled by the rear window defogger switch. Electrical current is directed to the heating grid inside the mirror only when the rear window defogger switch is in the On position.

If the outside mirror heating grids and the rear window heating grid are all inoperative, (Refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING). If the outside mirror heating grids are inoperative, but the rear window heating grid is operating as designed, (Refer to 8 - ELECTRICAL/ HEATED MIRRORS - DIAGNOSIS AND TESTING).

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the entire power mirror unit must be replaced(Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - REMOVAL) and (Refer to 8 - ELECTRICAL/ POWER MIRRORS/SIDEVIEW MIRROR - INSTALLATION).

OPERATION

The heated mirror is controlled by the rear window defogger switch. The only time that the heated mirror is on is when the rear window defogger is on. The mirror should become warm to the touch.

DIAGNOSIS AND TESTING - HEATED MIRRORS

For circuit descriptions and diagrams (Refer to Appropriate Wiring Information).

(1) Check the fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fuse in the junction block. If OK, go to Step 3. If not OK, repair the open circuit to the ignition switch as required.

(3) Disconnect and isolate the battery negative cable. Remove the front door trim panel on the side of the vehicle with the inoperative mirror heating grid. Unplug the wire harness connector at the mirror. Check for continuity between the ground circuit cavity in the body half of the power mirror wire harness connector and a good ground. If OK, go to Step 4. If not OK, repair the open circuit to ground as required.

(4) Connect the battery negative cable. Turn the ignition switch to the On position. Turn on the rear window defogger system. Check for battery voltage at the rear window defogger relay output circuit cavity in the body half of the power mirror wire harness connector. If OK, go to Step 5. If not OK, repair the open circuit to the rear window defogger relay as required.

HEATED MIRRORS (Continued)

(5) Check for continuity between the ground circuit and the rear window defogger relay output circuit cavities in the mirror half of the power mirror wire harness connector. There should be continuity. If not OK, replace the faulty power mirror(Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - REMOVAL) and (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - INSTALLATION). If OK, check the resistance through the electric heating grid circuit. Correct resistance through the electric heating grid should be from 10 to 16 ohms when measured at an ambient temperature of 21° C (70° F). If not OK, replace the faulty power mirror(Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - REMOVAL) and (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - INSTALLATION).

WINDOW DEFOGGER

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WINDOW DEFOGGER

DESCRIPTION - REAR WINDOW DEFOGGER

The rear window defogger system will only operate when the ignition switch is in the run position. When the defogger switch is in the run position, an electric heater grid on the rear window glass is energized. Vehicles with the heated mirror options also have heater grids located behind the outside rear view mirror glass. Each of these grids produce heat to help clear the rear window glass and outside rear view mirrors of ice, snow, or fog.

OPERATION - REAR WINDOW DEFOGGER

The rear window defogger system is controlled by a switch installed with the HVAC control assembly. An amber indicator lamp in the switch button will light to indicate when the rear window defogger system is turned on. The HVAC control head circuitry, which contains the defogger system timer logic, monitors the state of the defogger switch through a hard-wired input. The instrument cluster circuitry controls the rear window defogger system through a hard-wired control output to the rear window defogger relay. The rear window defogger timer and logic circuitry cannot be adjusted or repaired and, if faulty or damaged, the HVAC control head assembly must be replaced.

The rear window defogger system will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the rear window defogger switch is turned on again during the same ignition cycle, the defogger system will automatically turn off after about five minutes.

The rear window defogger system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the instrument panel switch. Following are general descriptions of the major components in the rear window defogger system. Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the defogger system.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information). The operation of the electrically heated rear window defogger system can be confirmed in one of the following manners:

1. Turn the ignition switch to the run position.
2. Set the defogger switch in the run position. The rear window defogger operation can be checked by feeling the rear window or outside rear view mirror glass. A distinct difference in temperature between the grid lines and the adjacent clear glass or the mirror glass can be detected within three to four minutes of operation.

WINDOW DEFOGGER (Continued)

3. Using a 12-volt DC voltmeter, contact the rear glass heating grid terminal B (right side) with the negative lead, and terminal A (left side) with the positive lead (Fig. 1). The voltmeter should read battery voltage.

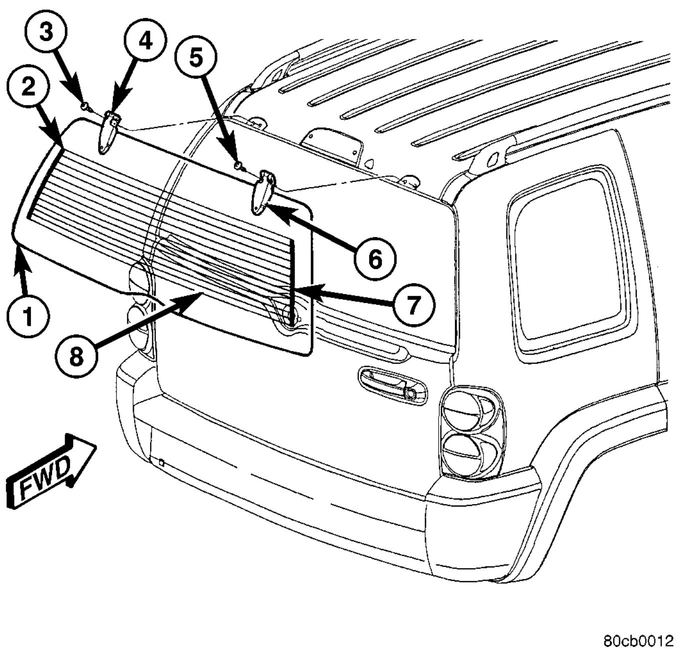

Fig. 1 REAR WINDOW DEFOGGER

1 - DEFOGGER BACKGLASS
2 - HEATED GLASS CONNECTOR ″A″
3 - HINDGE MOUNTING SCREWS (2)
4 - HINDGE (LEFT SIDE)
5 - HINDGE MOUNTING SCREWS (2)
6 - HINDGE (RIGHT SIDE)
7 - HEATED GLASS CONNECTOR ″B″
8 - BACKGLASS DEFOGGER GRID

The above checks will confirm system operation. Illumination of the defogger switch indicator lamp means that there is electrical current available at the output of the defogger relay, but does not confirm that the electrical current is reaching the rear glass heating grid lines.

If the defogger system does not operate, the problem should be isolated in the following manner:

(1) Confirm that the ignition switch is in the run position.

(2) Ensure that the rear glass heating grid feed and ground wires are connected to the glass. Confirm that the ground wire has continuity to ground.

(3) Check the fuses in the Power Distribution Center (PDC) and in the junction block. The fuses must be tight in their receptacles and all electrical connections must be secure.

When the above steps have been completed and the rear glass or outside rear view mirror heating grid is still inoperative, one or more of the following is faulty:

- Defogger switch
- Defogger relay
- HVAC control head circuitry
- Rear window grid lines (all grid lines would have to be broken or one of the feed wires disconnected for the entire system to be inoperative)
- Outside rear view mirror heating grid.

If setting the defogger switch to the On position produces a severe voltmeter deflection, check for a short circuit between the defogger relay output and the rear glass or outside rear view mirror heating grids.

STANDARD PROCEDURE - REAR GLASS HEATING GRID REPAIR

Repair of the rear glass heating grid lines, bus bars, terminals or pigtail wires can be accomplished using a Mopar Rear Window Defogger Repair Kit (Part Number 4267922) or equivalent.

WARNING: MATERIALS CONTAINED IN THE REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION. THE KIT CONTAINS EPOXY RESIN AND AMINE TYPE HARDENER, WHICH ARE HARMFUL IF SWALLOWED. AVOID CONTACT WITH THE SKIN AND EYES. FOR SKIN CONTACT, WASH THE AFFECTED AREAS WITH SOAP AND WATER. FOR CONTACT WITH THE EYES, FLUSH WITH PLENTY OF WATER. DO NOT TAKE INTERNALLY. IF TAKEN INTERNALLY, INDUCE VOMITING AND CALL A PHYSICIAN IMMEDIATELY. USE WITH ADEQUATE VENTILATION. DO NOT USE NEAR FIRE OR FLAME. CONTAINS FLAMMABLE SOLVENTS. KEEP OUT OF THE REACH OF CHILDREN.

(1) Mask the repair area so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line or the bus bar on each side of the break (Fig. 2).

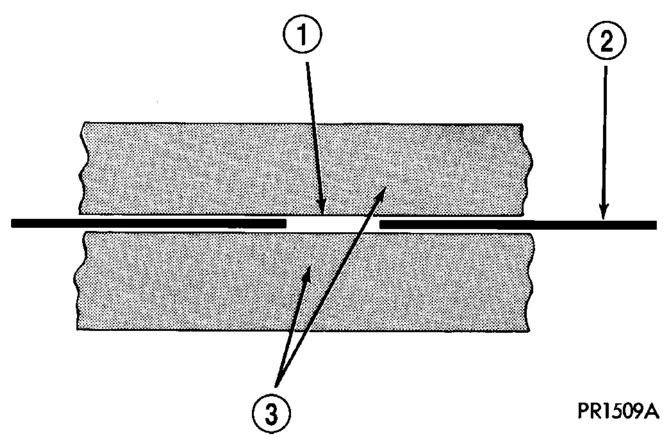

Fig. 2 GRID LINE REPAIR

1 - BREAK
2 - GRID LINE
3 - MASKING TAPE

WINDOW DEFOGGER (Continued)

(2) Follow the instructions in the repair kit for preparing the damaged area.

(3) Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.

(4) For grid line repairs, mask the area to be repaired with masking tape or a template.

(5) Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).

(6) For a terminal or pigtail wire replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar. Apply a thin layer of epoxy to the area where the terminal or pigtail wire was fastened and onto the adjacent grid line.

(7) Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place it in the proper location on the bus bar. To prevent the terminal or pigtail wire from moving while the epoxy is curing, it must be wedged or clamped.

(8) Carefully remove the masking tape or template.

CAUTION: Do not allow the glass surface to exceed 204° C (400° F) or the glass may fracture.

(9) Allow the epoxy to cure 24 hours at room temperature, or use a heat gun that will not over heat the glass. Hold the heat gun approximately 25.4 centimeters (10 inches) from the repair.

(10) After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire. Do not attach the wire harness connectors until the curing process is complete.

(11) Check the operation of the rear window defogger glass heating grid.

REAR WINDOW DEFOGGER GRID

DESCRIPTION

The heated rear window glass has two electrically conductive vertical bus bars and a series of 11 horizontal grid lines made of a silver-ceramic material, which is baked on and bonded to the inside surface of the glass. The grid lines and bus bars comprise a parallel electrical circuit.

OPERATION

When the rear window defogger switch is placed in the On position, electrical current is directed to the rear window grid lines through the bus bars. The grid lines heat the rear window to clear the surface of fog or snow. Protection for the heated grid circuit is provided by a fuse in the Power Distribution Center (PDC).

The grid lines and bus bars are highly resistant to abrasion. However, it is possible for an open circuit to occur in an individual grid line, resulting in no current flow through the line.

The grid lines can be damaged or scraped off with sharp instruments. Care should be taken when cleaning the glass or removing foreign materials, decals, or stickers from the glass. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

A repair kit is available to repair the grid lines and bus bars, or to reinstall the heated glass pigtail wires.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER GRID

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information). To detect breaks in the grid lines, the following procedure is required:

(1) Turn the ignition switch to the run position. Set the defogger switch in the On position. The indicator lamp should light. If OK, go to Step 2. If not OK, (Refer to 8 - ELECTRICAL/HEATED GLASS/ REAR WINDOW DEFOGGER RELAY - DIAGNOSIS AND TESTING)

(2) Using a 12-volt DC voltmeter, contact the vertical bus bar on the right side of the vehicle with the negative lead. With the positive lead, contact the vertical bus bar on the left side of the vehicle. The voltmeter should read battery voltage. If OK, go to Step 3. If not OK, repair the open circuit to the defogger relay as required.

(3) With the negative lead of the voltmeter, contact a good body ground point. The voltage reading should not change. If OK, go to Step 4. If not OK, repair the circuit to ground as required.

REAR WINDOW DEFOGGER GRID (Continued)

(4) Connect the negative lead of the voltmeter to the right side bus bar and touch each grid line at its midpoint with the positive lead (Fig. 3). A reading of approximately six volts indicates a line is good. A reading of zero volts indicates a break in the grid line between the midpoint of the grid line and the left side bus bar. A reading of ten to fourteen volts indicates a break between the midpoint of the grid line and the right side bus bar. Move the positive lead on the grid line towards the break and the voltage reading will change as soon as the break is crossed.

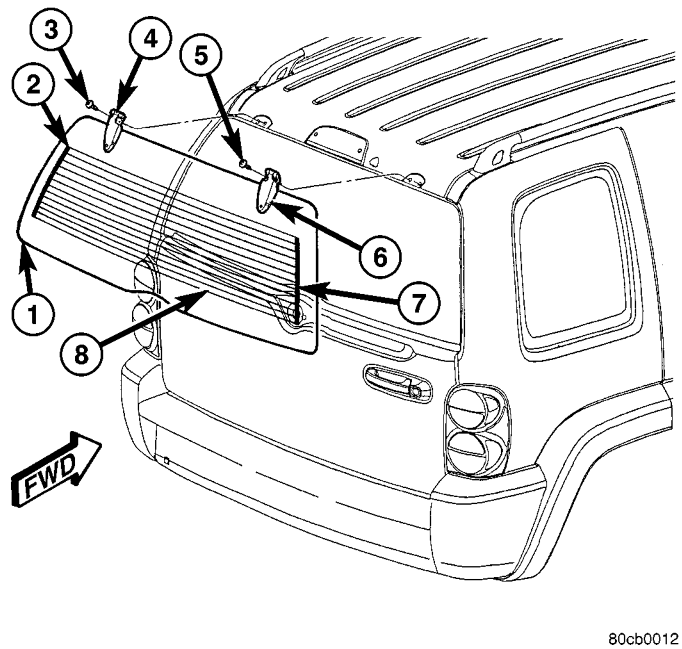

Fig. 3 REAR WINDOW DEFOGGER

1 - DEFOGGER BACKGLASS
2 - HEATED GLASS CONNECTOR ″A″
3 - HINDGE MOUNTING SCREWS (2)
4 - HINDGE (LEFT SIDE)
5 - HINDGE MOUNTING SCREWS (2)
6 - HINDGE (RIGHT SIDE)
7 - HEATED GLASS CONNECTOR ″B″
8 - BACKGLASS DEFOGGER GRID

REAR WINDOW DEFOGGER RELAY

DESCRIPTION

The rear window defogger relay is a International Standards Organization (ISO)-type relay. The rear window defogger relay is a electromechanical device that switches fused battery current to the rear glass and outside mirror heating grids, and the indicator lamp of the defogger switch, when the HVAC control head rear window defogger timer and logic circuitry grounds the relay coil. (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER RELAY - DIAGNOSIS AND TESTING)

The rear window defogger relay is located in the junction block, on the left side of the instrument panel inboard to the center of the vehicle (just to the left and above the brake pedal or behind the knee blocker). The rear window defogger relay cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER RELAY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

RELAY TEST

The defogger relay (Fig. 4) is located in the junction block, on the left side of the instrument panel inboard to the center of the vehicle (just to the right and above the brake pedal or behind the knee blocker). Remove the defogger relay from the junction block to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and

REAR WINDOW DEFOGGER RELAY (Continued)

no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 60.7 to 80.3 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test in this group. If not OK, replace the faulty relay.

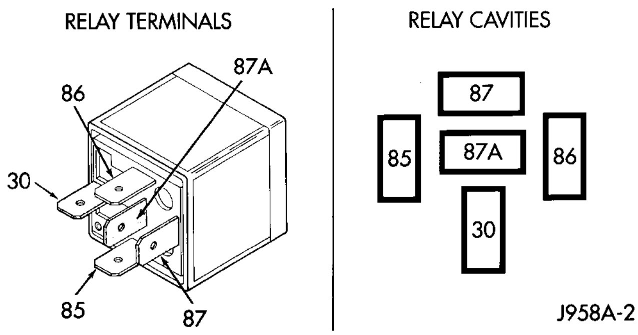

Fig. 4 DEFOGGER RELAY- TERMINAL LEGEND

30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the PDC fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the rear glass and outside rear view mirror heating grids and the defogger switch indicator lamp. There should be continuity between the cavity for relay terminal 87 and the rear window defogger relay output circuit cavities of the rear glass heating grid connector, both outside rear view mirror heating grid connectors, and the defogger switch connector at all times. If OK, go to Step 4. If not OK, repair the open circuit(s) as required.

(4) The coil ground terminal (85) is connected to the electromagnet in the relay. This terminal is provided with ground by the instrument cluster rear window defogger timer and logic circuitry to energize the defogger relay. There should be continuity to ground at the cavity for relay terminal 85 when the defogger switch is turned On. However, with the defogger relay removed, the defogger switch indicator lamp will not light to show that the defogger system is turned On. Be certain that you depress the defogger switch at least twice to confirm that the system is turned on during this test. If OK, go to Step 5. If not OK, repair the open circuit to the HVAC control head as required.

(5) The coil battery terminal (86) is connected to the electromagnet in the relay. It is connected to fused ignition switch output voltage and should be hot when the ignition switch is in the run position. Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the run position. If OK, see the diagnosis for Instrument Cluster in this group. If not OK, repair the open circuit to the fuse in the junction block as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the rear window defogger relay from the junction block.

INSTALLATION

(1) Install the rear window defogger relay by aligning the relay terminals with the cavities in the junction block and pushing the relay firmly into place.

(2) Connect the battery negative cable.

(3) Test the relay operation.

REAR WINDOW DEFOGGER SWITCH

DESCRIPTION

The rear window defogger switch is installed in the instrument panel HVAC contol head assembly. The momentary-type switch provides a hard-wired ground signal to the HVAC control head each time it is depressed. The instrument cluster rear window defogger timer and logic circuitry responds by energizing or de-energizing the rear window defogger relay.

OPERATION

Energizing the rear window defogger relay provides electrical current to the rear window defogger grid and, if the vehicle is so equipped, the outside rear view mirror heating grids. An amber indicator lamp in the defogger switch, which lights to indicate when the defogger system is turned On, is also powered by the defogger relay output.

The defogger switch illumination lamp and indicator lamp bulbs are serviceable. The defogger switch cannot be repaired and, if faulty or damaged the entire HVAC control head assembly must be replaced.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SWITCH

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the HVAC control head assembly from the instrument panel and unplug the defogger switch wire harness connector-B.

(2) Check for continuity between the ground circuit cavity of the defogger switch wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit as required.

(3) Check for continuity between the ground circuit terminal and the rear window defogger switch sense circuit terminal on the back of the defogger switch housing (Fig. 5). There should be momentary continuity as the defogger switch button is depressed, and then no continuity. If OK, (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER SWITCH - DIAGNOSIS AND TESTING - INSTRUMENT CLUSTER REAR WINDOW DEFOGGER FUNCTION) If not OK, replace the faulty switch (Fig. 5).

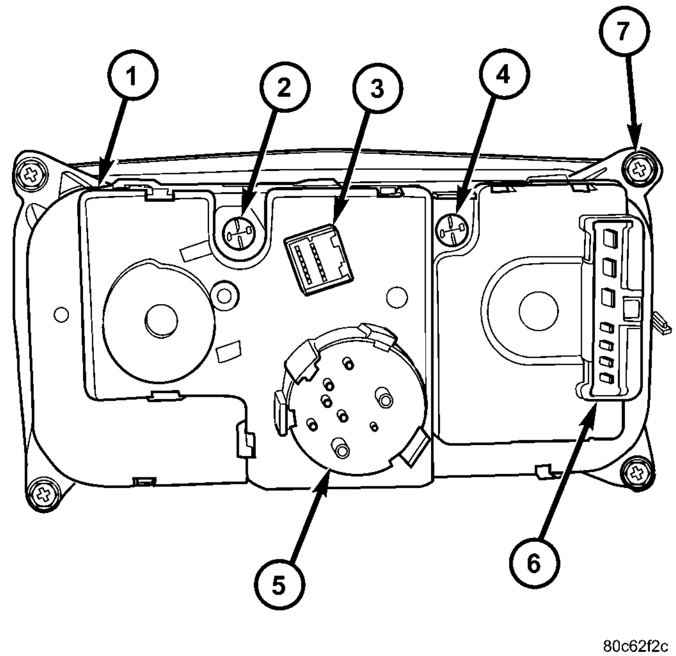

Fig. 5 A/C HEATER CONTROL HEAD (Rear View)

1 - A/C HEATER CONTROL HEAD
2 - A/C HEATER CONTROL HEAD LIGHT
3 - REAR WINDOW DEFOGGER SWITCH AND TEMPERATURE BLEND DOOR- CONNECTOR B (12 PIN)
4 - A/C HEATER CONTROL HEAD LIGHT
5 - MODE SELECT CONTROL
6 - BLOWER SPEED CONTROL- CONNECTOR A (7 PIN)
7 - MOUNTING SCREWS (4)

(4) Check switch position continuity between:

	CONTACT PINS
1 - OFF LAMPS	A-1 - A-7
2 - ON MOMENTARY	B-6 - B-8
3 - ILLUMINATION LAMP	A-7 - A-1
4 - INDICATOR LAMP	B-12 - B-7

REAR WINDOW DEFOGGER SWITCH (Continued)

DIAGNOSIS AND TESTING - REAR HVAC CONTROL ASSEMBLY WINDOW DEFOGGER FUNCTION

Before performing this test, complete the Defogger Switch and Defogger Relay tests as described in this group. For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the defogger relay from the junction block and unplug the defogger switch wire harness connector.

(2) Remove the HVAC control head from the instrument panel. This is accomplished by removing the ashtray and the screw behind the ashtray and uncliping the center bezel.

(3) Check for continuity between the rear window defogger switch sense circuit cavity of the cluster wire harness connector (connector B) and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the rear window defogger switch sense circuit cavity of the right instrument cluster wire harness connector (connector B) and the defogger switch wire harness connector. There should be continuity. If OK, go to Step 5. If not OK, repair the open circuit as required.

(5) Check for continuity between the rear window defogger relay control circuit cavity of the right instrument cluster wire harness connector (connector B) and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the short circuit as required.

(6) Check for continuity between the rear window defogger relay control circuit cavities of the right instrument cluster wire harness connector (connector B) and the defogger relay receptacle (the cavity for ISO relay terminal 85) in the junction block. There should be continuity. If OK, replace the faulty HVAC control head. If not OK, repair the open circuit as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) The Rear Window Defogger switch is part of the HVAC assembly and if damaged or inoperative the entire HVAC control assembly must be replaced(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL).

INSTALLATION

(1) The Rear Window Defogger switch is part of the HVAC control assembly and if damaged or inoperative you must replace the entire HVEAC control head assembly(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - INSTALLATION).

(2) Connect the battery negative cable.

HEATED SEAT SYSTEM

TABLE OF CONTENTS

HEATED SEAT SYSTEM

DESCRIPTION

Individually controlled electrically heated front seats are available on models that are also equipped with the optional leather trim package. Vehicles with this option can be visually identified by the two separate heated seat switches mounted on the outboard seat cushion side shields. The heated seat system allows the front seat driver and passenger to select from two different levels of supplemental electrical seat heating, or no seat heating to suit their individual comfort requirements. The heated seat system for this vehicle includes the following major components:

- **Heated Seat Switches** - Two heated seat switches are used per vehicle, including two Light-Emitting Diode (LED) indicator lamps and an incandescent back lighting bulb for each switch. One switch for the driver and one for the passenger front seats. The switches are mounted on the outboard seat cushion side shields.
- **Heated Seat Module** - also referred to as the Seat Heat Interface Module (SHIM), this module contains the solid state electronic control and diagnostic logic circuitry for the heated seat system. One heated seat module is used per vehicle and is mounted under the left front seat cushion. Refer to the Electronic Control Modules section of the service manual for heated seat module information.
- **Heated Seat Elements** - Four heated seat elements are used per vehicle, one for each front seat back and one for each front seat cushion. The elements are integral to the individual front seat and seat back cushions and cannot be removed from the cushions, once installed at the factory.
- **Heated Seat Sensors** - Two heated seat sensors are used per vehicle, one for each front seat. The sensors are integral to the individual front seat heating elements.

Following are general descriptions of the major components in the heated seat system. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the heated seat system. Refer to **Wiring Diagrams** for the location of complete heated seat system wiring diagrams.

OPERATION

The heated seat module receives fused battery current through fuse #29 in the Junction Block (JB) when the ignition switch is in the “ON” position. The heated seat switches receive battery current through fuse #25 in the Junction Block also, when the ignition switch is in the “ON” position. The heated seat module shares a common ground circuit with each of the heated seat elements. The heated seat elements will only operate when the surface temperature of the seat cushion is below the designed temperature set points of the system.

The heated seat system will also be turned off automatically whenever the ignition switch is turned to any position except On. If the ignition switch is turned to the Off position while a heated seat is turned ON, the heated seat will remain Off after the

HEATED SEAT SYSTEM (Continued)

ignition switch is turned back "ON" until a heated seat switch is depressed again.

The heated seat module monitors inputs from the heated seat sensors and the heated seat switches. In response to these inputs the heated seat module uses its internal programming to control outputs to the heated seat elements in both front seats and to control the heated seat LED indicator lamps located in both of the heated seat switches. The heated seat module is also programmed to provide self-diagnostic capability. When the module detects certain failures within the heated seat system, it will provide a visual indication of the failure by flashing the indicator lamps in the affected heated seat switch. The heated seat module will automatically turn off the heated seat elements if it detects a short or open in the heated seat element circuit or a heated seat sensor value that is out of range.

DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM

HEATED SEAT SYSTEM SELF-DIAGNOSIS

The heated seat system is capable of performing some self-diagnostics. The following table depicts the various monitored failures which will be reported to the vehicle operator or technician by flashing the individual heated seat switch Light Emitting Diode (LED) indicator lamps. Refer to the Heated Seat System Self-Diagnosis table for failure identification. The driver side heated seat switch indicator lamps will flash if a failure occurs in the driver side heated seat, and the passenger side heated seat switch indicator lamps will flash for a passenger side heated seat failure. If a monitored heated seat system failure occurs, the switch indicator lamps will flash at a pulse rate of about one-half second on, followed by about one-half second off for a duration of about one minute after the switch for the faulty heated seat is depressed in either the Low or High direction. This process will repeat every time the faulty heated seat switch is actuated until the problem has been corrected.

Heated Seat System Self-Diagnosis		
Monitored Failure	Switch High Indicator Lamp	Switch Low Indicator Lamp
Heated Seat Element Shorted	Flashing	Flashing
Heated Seat Element Open	Flashing	Off
Heated Seat Sensor Value Out of Range	Off	Flashing

If the heated seat system failure is identified by flashing heated seat switch indicator lamps, go to the appropriate diagnosis and testing procedure in this section and confirm the condition, using the step by step procedure. If the monitored failure is confirmed, replace the component. If the monitored failure is not confirmed, replace the heated seat module with a known good unit and retest the system.

HEATED SEAT SYSTEM TESTING

Refer to **Wiring Diagrams** for the location of complete heated seat system wiring diagrams. Before testing the individual components in the heated seat system, perform the following preliminary checks:

- If a single indicator lamp for one heated seat switch does not operate and the heated seat elements do heat, refer to **Diagnosis and Testing the Heated Seat Switch** in this section for the location of heated seat switch diagnosis and testing procedures.
- If both indicator lamps for a heated seat switch operate, but the heated seat elements do not heat, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules for the location of heated seat module diagnosis and testing procedures.
- If an indicator lamp on either heated seat switch remains illuminated after the heated seat has been turned Off, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules for the location of heated seat module diagnosis and testing procedures. Also refer to the Body Diagnostic Manual for additional diagnosis and testing procedures.

DRIVER HEATED SEAT SWITCH

DESCRIPTION

The heated seat switches are located on the outboard cushion side shield of the driver and passenger front seats. The two, three-position rocker type switches provide a resistor multiplexed signal to the Heated Seat Module through separate hard wired circuits. Each switch has an Off, Low and High setting. Each switch contains two light emitting diodes (LED), one for each High and Low setting to let the occupant know that the seat heater system is on.

The heated seat switches and their LED's cannot be repaired. If either switch is faulty or damaged the entire switch must be replaced.

OPERATION

There are three positions that can be selected with each of the heated seat switches: Off, Low, and High. When the front of the switch rocker is fully depressed, the High position is selected and the high position LED indicator illuminates. When the rear of the switch rocker is fully depressed, the Low position is selected and the low position LED indicator illuminates. When the switch rocker is depressed a second time in either direction, Off is selected and both LED indicators are extinguished.

Both switches provide separate resistor multiplexed hard wire inputs to the Heated Seat Module to indicate the selected switch position. The heated seat module monitors the switch inputs and responds to the heated seat switch status messages by controlling the output to the seat heater elements of the selected seat. The Low heat position set point is about 36° C (97° F), and the High heat position set point is about 41° C (105° F).

DIAGNOSIS AND TESTING - DRIVER HEATED SEAT SWITCH

If a heated seat fails to heat and one or both of the indicator lamps on a heated seat switch flash, refer to **Heated Seat System Diagnosis and Testing** in this section for flashing LED failure identification. Refer to **Wiring Diagrams** for complete heated seat system wiring diagrams.

(1) If the problem being diagnosed involves a heated seat switch indicator lamp that remains illuminated after the heated seat has been turned Off, refer to **Diagnosis and Testing the Heated Seat Module** in the Electronic Control Modules section for heated seat module diagnosis and testing procedures. If not, go to Step 2

(2) Remove the heated seat switch (Refer to 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - REMOVAL). Check for continuity between the ground circuit cavity #5 of the heated seat switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit as required.

(3) Turn the ignition switch to the ON position. Check for battery voltage at the fused ignition switch output circuit cavity #1 of the heated seat switch connector. If OK, go to Step 4. If not OK, repair the open fused ignition switch output circuit as required.

(4) Check the continuity between pin #1 and pin #3 of the heated seat switch (Fig. 1). If the readings do not correspond to those in the Heated Seat Switch Continuity table below, replace the heated seat switch. If OK, and the heated seat system is still not operating properly refer to **Diagnosis and Testing the Heated Seat Module**.

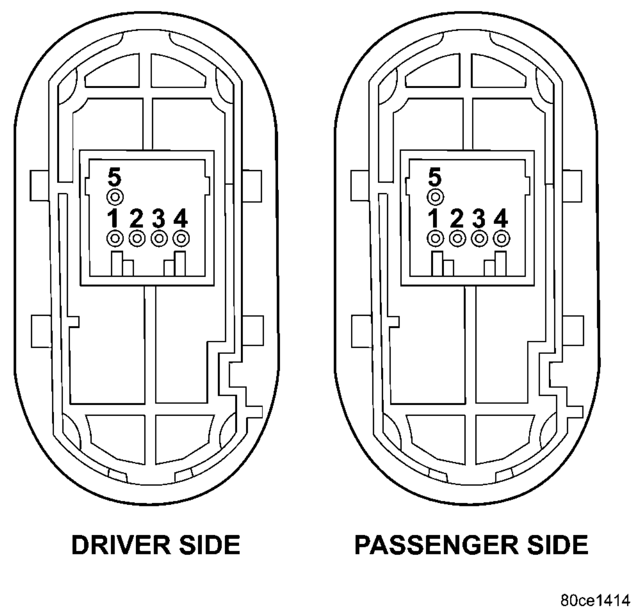

Fig. 1 Rear View of Heated Seat Switches

NOTE: Any resistance values (ohms Ω) given in the following text are supplied using the automatic range generated by a fluke® automotive meter. If another type of measuring device is used, the values generated may not be the same as the results shown here, or may have to be converted to the range used here.

DRIVER HEATED SEAT SWITCH (Continued)

TESTING HEATED SEAT SWITCH CONTINUITY

CONTINUITY BETWEEN	SWITCH POSITION	OHMS READING +/– 10%
PIN 1 AND 3	OFF	2.2 K (2200) OHMS
PIN 1 AND 3	LO	.415 K (415) OHMS
PIN 1 AND 3	HI	33 OHMS

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the appropriate seat cushion side shield (Refer to 23 - BODY/SEATS/SEAT CUSHION SIDE COVERS - REMOVAL).

(3) Disconnect the heated seat switch electrical connector. Depress the locking tab and pull straight apart.

(4) Working from the underside of the switch, gently rock the switch back and forth out of its mounting location.

INSTALLATION

(1) Gently rock the switch back and forth in to its mounting location.

(2) Connect the heated seat switch electrical connector.

(3) Install the appropriate seat cushion side shield. Refer to the Body section of the service manual for the procedure.

(4) Connect the negative battery cable.

PASSENGER HEATED SEAT SWITCH

DESCRIPTION

The heated seat switches are located on the outboard cushion side shield of the driver and passenger front seats. The two, three-position rocker type switches provide a resistor multiplexed signal to the Heated Seat Module through separate hard wired circuits. Each switch has an Off, Low and High setting. Each switch contains two light emitting diodes (LED), one for each High and Low setting to let the occupant know that the seat heater system is on.

The heated seat switches and their LED's cannot be repaired. If either switch is faulty or damaged the entire switch must be replaced.

OPERATION

There are three positions that can be selected with each of the heated seat switches: Off, Low, and High. When the front of the switch rocker is fully depressed, the High position is selected and the high position LED indicator illuminates. When the rear of the switch rocker is fully depressed, the Low position is selected and the low position LED indicator illuminates. When the switch rocker is depressed a second time in either direction, Off is selected and both LED indicators are extinguished.

Both switches provide separate resistor multiplexed hard wire inputs to the Heated Seat Module to indicate the selected switch position. The heated seat module monitors the switch inputs and responds to the heated seat switch status messages by controlling the output to the seat heater elements of the selected seat. The Low heat position set point is about 36° C (97° F), and the High heat position set point is about 41° C (105° F).

DIAGNOSIS AND TESTING - PASSENGER HEATED SEAT SWITCH

If a heated seat fails to heat and one or both of the indicator lamps on a heated seat switch flash, refer to **Heated Seat System Diagnosis and Testing** in this section for flashing LED failure identification. Refer to **Wiring Diagrams** for complete heated seat system wiring diagrams.

(1) If the problem being diagnosed involves a heated seat switch indicator lamp that remains illuminated after the heated seat has been turned Off, refer to **Diagnosis and Testing the Heated Seat Module** in the Electronic Control Modules section for heated seat module diagnosis and testing procedures. If not, go to Step 2

(2) Remove the heated seat switch (Refer to 8 - ELECTRICAL/HEATED SEATS/DRIVER HEATED SEAT SWITCH - REMOVAL). Check for continuity between the ground circuit cavity #5 of the heated seat switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit as required.

(3) Turn the ignition switch to the ON position. Check for battery voltage at the fused ignition switch output circuit cavity #1 of the heated seat switch connector. If OK, go to Step 4. If not OK, repair the open fused ignition switch output circuit as required.

PASSENGER HEATED SEAT SWITCH (Continued)

(4) Check the continuity between pin #1 and pin #3 of the heated seat switch (Fig. 2). If the readings do not correspond to those in the Heated Seat Switch Continuity table below, replace the heated seat switch. If OK, and the heated seat system is still not operating properly refer to **Diagnosis and Testing the Heated Seat Module** .

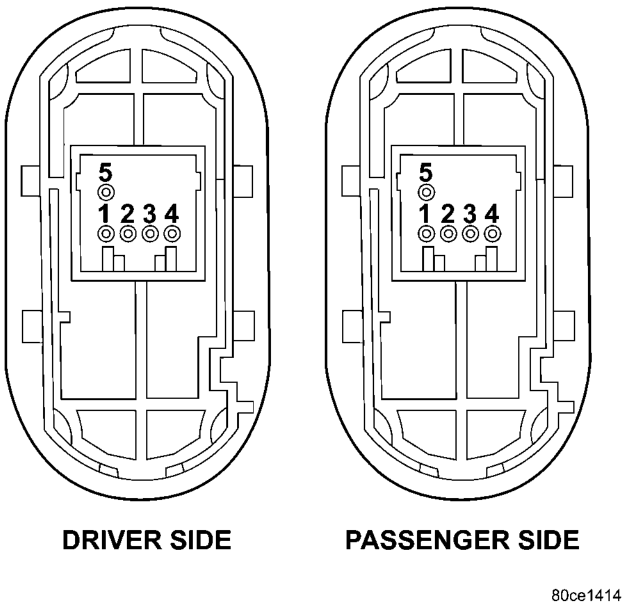

Fig. 2 Heated Seat Switch

NOTE: Any resistance values (ohms Ω) given in the following text are supplied using the automatic range generated by a fluke® automotive meter. If another type of measuring device is used, the values generated may not be the same as the results shown here, or may have to be converted to the range used here.

TESTING HEATED SEAT SWITCH CONTINUITY

CONTINUITY BETWEEN	SWITCH POSITION	OHMS READING +/– 10%
PIN 1 AND 3	OFF	2.2 K (2200) OHMS
PIN 1 AND 3	LO	.415 K (415) OHMS
PIN 1 AND 3	HI	33 OHMS

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the appropriate seat cushion side shield (Refer to 23 - BODY/SEATS/SEAT CUSHION SIDE COVERS - REMOVAL).

(3) Disconnect the heated seat switch electrical connector. Depress the locking tab and pull straight apart.

(4) Working from the underside of the switch, gently rock the switch back and forth out of its mounting location.

INSTALLATION

(1) Gently rock the switch back and forth in to its mounting location.

(2) Connect the heated seat switch electrical connector.

(3) Install the appropriate seat cushion side shield. Refer to the Body section of the service manual for the procedure.

(4) Connect the negative battery cable.

HEATED SEAT ELEMENT

DESCRIPTION

The heated seat system includes four seat heating elements. Two are located in each front seat, one for the seat cushion and the other for the seat back. All models use two resistor wire heating elements for each seat that are connected in series with the Heated Seat Module (HSM). The temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. One temperature sensor is used for each seat, and it is located on the seat cushion heating element for all models.

The seat heating elements are permanently attached to the seat cushions. The heated seat elements and the temperature sensor cannot be adjusted or repaired and, if faulty or damaged, the seat cushions must be replaced. Refer to the Body section for the seat cushion service procedures.

OPERATION

The heated seat elements resist the flow of electrical current. When battery current is passed through the elements, the energy lost by the resistance of the elements to the current flow is released in the form of heat. When the temperature of the seat cushion cover rises, the resistance of the sensor decreases. The Heated Seat Module supplies a five-volt current to one side of each sensor, and monitors the voltage drop through the sensor on a return circuit. The Heated Seat Module uses this temperature sensor input to monitor the temperature of the seat, and regulates the current flow to the seat heating elements accordingly.

HEATED SEAT ELEMENT (Continued)

DIAGNOSIS AND TESTING - HEATED SEAT ELEMENT

SEAT CUSHION ELEMENT

NOTE: When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as siting in the seat will eliminate the possibility of an intermittent open in the element which would only be evident if the element was in a certain position. Failure to check the element in various positions could result in an incomplete test.

(1) Disconnect and isolate the battery negative cable. Disconnect the green heated seat cushion element wire harness connector from the power seat wire harness. The power seat wire harness connectors for the seat cushion heating elements are secured to a bracket located under the seat cushion frame. Refer to **Wiring** for connector pin information.

(2) Check for continuity between the two heated seat element circuit cavities. There should be continuity. If OK, the elements within the seat assembly test OK, go to Step 3. If not OK, replace the faulty seat heating element and cushion assembly.

(3) Test the seat wire harness between the heated seat module connector and the heated seat wire harness element connector for a shorted or open circuit. If OK, element is OK, proceed with testing the heated seat sensor and module. If not OK, repair the shorted or open seat wire harness as required.

SEAT BACK ELEMENT

(1) Disconnect and isolate the battery negative cable. Disconnect the green heated seat back element wire harness connector from the power seat wire harness. The power seat wire harness connectors for the seat cushion heating elements are secured to a bracket located under the seat cushion frame. Refer to **Wiring** for connector pin information.

(2) Check for continuity between the two heated seat element circuit cavities. There should be continuity. If OK, the elements within the seat assembly test OK, go to Step 3. If not OK, replace the faulty seat heating element and cushion assembly.

(3) Test the seat wire harness between the heated seat module connector and the heated seat wire harness element connector for a shorted or open circuit. If OK, element is OK, proceed with testing the heated seat sensor and module. If not OK, repair the shorted or open seat wire harness as required.

HEATED SEAT SENSOR

DESCRIPTION

The heated seat temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. One temperature sensor is used for each seat. This temperature sensor is located in the seat cushion heating element on all models.

The heated seat temperature sensor cannot be repaired or adjusted and must be replaced if defective. The heated seat cushion element must be replaced if the temperature sensor is defective. Refer to the procedure in this section of the service manual.

OPERATION

When the temperature of the seat cushion cover rises, the resistance of the sensor decreases. The heated seat module supplies five-volts to one side of each sensor, and monitors the voltage drop through the sensor on a return circuit. The heated seat module uses this temperature sensor input to monitor the temperature of the seat, and regulates the current flow to the seat heating elements accordingly.

DIAGNOSIS AND TESTING - HEATED SEAT SENSOR

For complete circuit diagrams, refer to **WIRING**.

NOTE: Any resistance values (ohms Ω) given in the following text are supplied using the automatic range generated by a fluke® automotive meter. If another type of measuring device is used the values generated may not be the same as the results shown here, or may have to be converted to the range used here.

(1) Position the driver seat in the full rearward position.

(2) Unclip the heated seat module from the bottom of the drivers seat cushion pan.

(3) Back-probe the heated seat module wire harness connector, do not disconnect. Check cavity (#7 for passenger, #8 for driver seat) for a range in voltage from approx. 1.72 – 3.0 volts. It should be within this range, If OK check the heated seat element. If NOT OK, check for the proper 5 volt supply to the heated seat sensor, from the module. Refer to Wiring for specific information. If 5 volts is not being supplied to the sensor from the module, replace the heated seat module.

HEATED SEAT SENSOR (Continued)

(4) Test the seat wire harness between the heated seat module connector and the heated seat wire harness connector for shorted or open circuits. If OK, refer to **Diagnosis and Testing the Heated Seat Module** in Electronic Control Modules, for the proper heated seat module diagnosis and testing procedures. If not OK, repair the shorted or open heated seat wire harness as required.

REMOVAL

(1) For heated seat sensor replacement procedure (Refer to 8 - ELECTRICAL/HEATED SEATS/ HEATED SEAT ELEMENT - REMOVAL).

HORN

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HORN SYSTEM

DESCRIPTION

A dual-note electric horn system is standard factory-installed equipment on this model (Fig. 1).

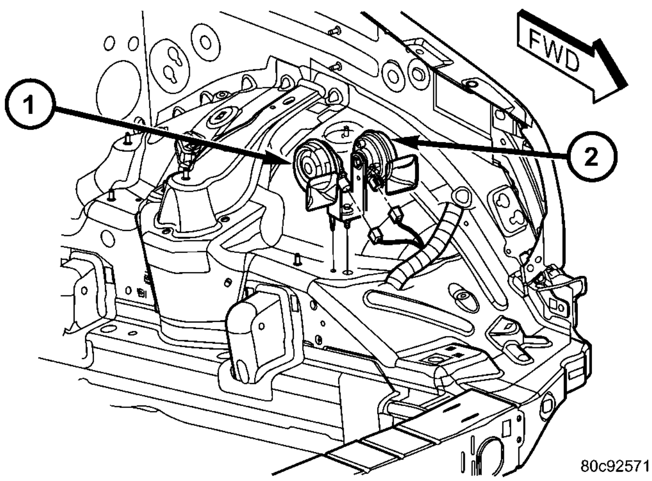

Fig. 1 HORN LOCATION

1 - HIGH NOTE HORN
2 - LOW NOTE HORN

The dual-note horn system features dual electromagnetic horn units. The horn system includes the following major components:

- **Horn** - The two horns are located below the Power Distribution Center (PDC).
- **Horn Relay** - The horn relay is located in the Junction Block (JB).
- **Horn Switch** - The horn switch is molded into the driver airbag assembly.

OPERATION

The horn system operates on battery current received through fuse 3 in the Junction Block (JB). The horn system circuit is designed so that the system will remain operational, regardless of the ignition switch position.

DIAGNOSIS AND TESTING - HORN SYSTEM

In most cases, any problem involving continually sounding horns can be quickly alleviated by removing the horn relay from the Junction Block (JB). Refer to horn relay for the removal procedure. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

HORN SYSTEM (Continued)

HORN SYSTEM DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
BOTH HORNS INOPERATIVE	1. Faulty fuse.	1. Check the fuse in the Junction Block (JB). Replace the fuse and repair the shorted circuit or component, if required.
	2. Faulty horn relay.	2. Refer to horn relay for the proper diagnosis and testing procedures. Replace the horn relay or repair the open horn relay circuit, if required.
	3. Faulty horn switch.	3. Refer to horn switch for the proper diagnosis and testing procedure. Replace the horn switch or repair the open horn switch circuit, if required.
	4. Faulty horns.	4. Refer to horn for the proper diagnosis and testing procedure. Replace the horns or repair the open horn circuit, if required.
ONE HORN INOPERATIVE	1. Faulty horn.	1. Refer to horn for the proper diagnosis and testing procedures. Replace the horn or repair the open horn circuit, if required.
HORN SOUNDS CONTINUOUSLY	1. Faulty horn relay.	1. Refer to horn relay for the proper diagnosis and testing procedure. Replace the horn relay or repair the shorted horn relay control circuit, if required.
	2. Faulty horn switch.	2. Refer to horn switch for the proper diagnosis and testing procedure. Replace the horn switch or repair the shorted horn switch circuit, if required.

HORN

DIAGNOSIS AND TESTING - HORN

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect the wire harness connector from the horn. Measure the resistance between the horn ground circuit cavity of the wire harness connector and a good ground. There should be no measurable resistance. If OK, go to Step 2. If not OK, replace wiring as necessary.

(2) Check for battery voltage at the horn relay output circuit cavity of the wire harness connector for the horn. There should be zero volts. If OK, go to Step 3. If not OK, refer to horn relay and horn relay circuit for the proper diagnosis and testing procedures.

(3) Depress the horn switch. There should now be battery voltage at the horn relay output circuit cavity of the wire harness connector for the horn. If OK, but the horn does not sound, replace the faulty horn. If not OK, refer to horn relay and horn relay circuit for the proper diagnosis and testing procedures.

HORN (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the electrical harness connector from the horns.

(3) Remove the mounting bolt (Fig. 2).

(4) Remove the horns.

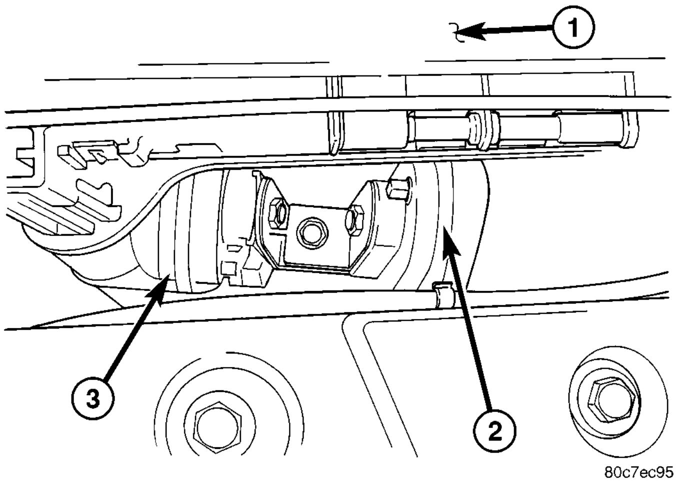

Fig. 2 HORN MOUNTING

1 - POWER DISTRIBUTION CENTER
2 - LOW NOTE HORN
3 - HIGH NOTE HORN

INSTALLATION

(1) Install the horns.

(2) Install the mounting bolt. Tighten bolt to 25 N·m (19 lb. ft.).

(3) Connect the electrical harness connector to the horns

(4) Connect the battery negative cable.

HORN RELAY

DIAGNOSIS AND TESTING - HORN RELAY

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove horn relay (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - REMOVAL).

(2) Using ohmmeter, test between relay connector terminals 85 to 86 for 75 ± 8 ohms resistance. If resistance not OK, replace relay (Fig. 3).

(3) Test for continuity between ground and terminal 85 of horn relay socket.

(a) When the horn switch is not depressed, no continuity should be present.

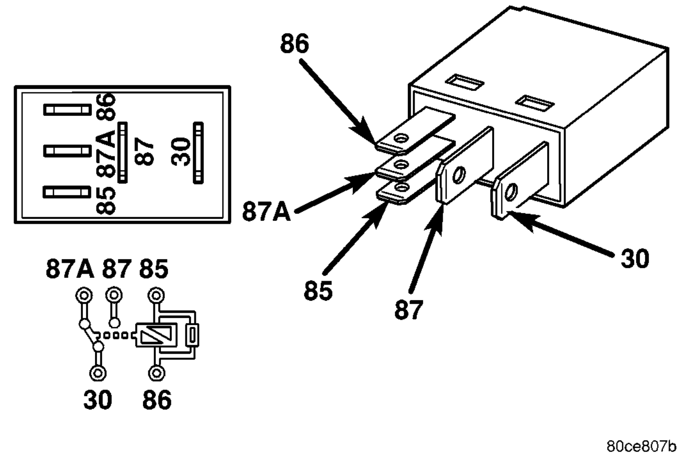

Fig. 3 Horn Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(b) Continuity to ground when horn switch is depressed.

(c) If continuity is not correct replace horn switch or wiring as necessary, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(4) Using voltmeter, test voltage at:

(a) Terminals 30 and 86 of the horn relay socket to body ground.

(b) If NO voltage check fuse 3 of the Junction Block (JB).

(c) If incorrect voltage, repair as necessary. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(5) Insert a jumper wire between terminal 30 and 87 of the Junction Block (JB).

(a) If horn sounds replace relay.

(b) If the horn does not sound, install horn relay and test horn (Refer to 8 - ELECTRICAL/HORN/HORN - DIAGNOSIS AND TESTING).

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel end cap.

(3) Locate and pull the horn relay from the Junction Block (JB).

INSTALLATION

(1) Locate proper connector, and press relay into position.

(2) Install instrument panel end cap.

(3) Connect battery negative cable.

HORN SWITCH

DESCRIPTION

The horn switch is molded into the driver airbag assembly. The horn switch can not be serviced separately. For service procedures, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

DIAGNOSIS AND TESTING - HORN SWITCH

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover.

(3) Check for continuity between the metal steering column jacket and a good ground. There should be continuity. If OK, go to Step 4. If not OK,(Refer to 19 - STEERING/COLUMN - INSTALLATION) for proper installation of the steering column.

(4) Remove the driver side airbag module from the steering wheel (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL). Disconnect the horn switch wire harness connectors from the driver side airbag module (Fig. 4).

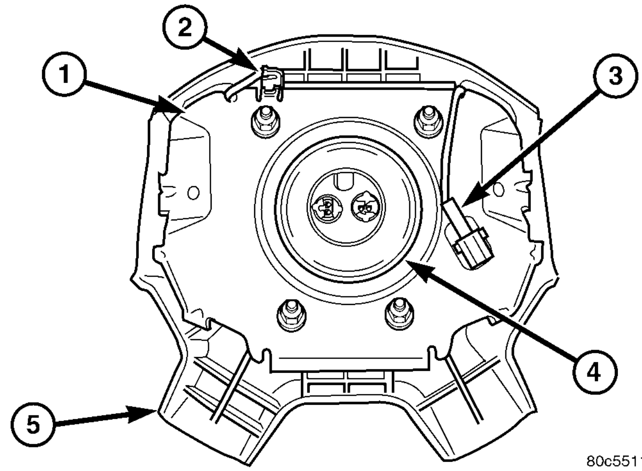
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Fig. 4 Driver Airbag Housing

1 - HOUSING
2 - HORN SWITCH GROUND WIRE
3 - HORN SWITCH FEED WIRE
4 - INFLATOR
5 - TRIM COVER

(5) Remove the horn relay from the Junction Block (JB). Check for continuity between the steering column half of the horn switch feed wire harness connector and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted horn relay control circuit to the horn relay in the Junction Block as required.

(6) Check for continuity between the steering column half of the horn switch feed wire harness connector and the horn relay control circuit cavity for the horn relay in the Junction Block. There should be continuity. If OK, go to Step 7. If not OK, repair the open horn relay control circuit to the horn relay in the Junction Block as required.

(7) Check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should be no continuity. If OK, go to Step 8. If not OK, replace the faulty horn switch.

(8) Depress the center of the driver side airbag module trim cover and check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should now be continuity. If not OK, replace the faulty horn switch (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

IGNITION CONTROL

TABLE OF CONTENTS

IGNITION CONTROL

DESCRIPTION

The ignition system consists of:
- Spark Plugs
- Ignition Coil(s)
- Powertrain Control Module (PCM)
- Crankshaft Position Sensor
- 2 Knock Sensors (3.7L only)
- Camshaft Position Sensor
- The MAP, TPS, IAC and ECT also have an effect on the control of the ignition system.

OPERATION

2.4L

A common ignition coil divided into 2 halves is used. Secondary, high-tension spark plug cables are also used. One half of the coil fires two spark plugs simultaneously (one plug is the cylinder under compression, and the other plug is the cylinder on the exhaust stroke). Coil half number one fires cylinders 1 and 4. Coil half number two fires cylinders 2 and 3. The PCM determines which of the coils to charge and fire at the correct time.

IGNITION CONTROL (Continued)

The Auto Shutdown (ASD) relay provides battery voltage to the ignition coil. The PCM provides a ground contact (circuit) for energizing the coil. When the PCM breaks the contact, the energy in the coil primary transfers to the secondary causing a spark. The PCM will de-energize the ASD relay if it does not receive inputs from either the crankshaft or camshaft position sensors.

A distributor is not used with the 2.4L engine.

3.7L

The 3.7L V6 engine uses a separate ignition coil for each cylinder. The one-piece coil bolts directly to the cylinder head. Rubber boots seal the secondary terminal ends of the coils to the top of all 6 spark plugs. A separate electrical connector is used for each coil.

Because of coil design, spark plug cables (secondary cables) are not used. A distributor is not used with the 3.7L engine.

Two knock sensors (one for each cylinder bank) are used to help control spark knock.

The Auto Shutdown (ASD) relay provides battery voltage to each ignition coil. The Powertrain Control Module (PCM) provides a ground contact (circuit) for energizing each coil. When the PCM breaks the contact, the energy in the coil primary transfers to the secondary causing a spark. The PCM will de-energize the ASD relay if it does not receive inputs from either the crankshaft or camshaft position sensors.

SPECIFICATIONS

SPECIFICATIONS - IGNITION TIMING

Ignition timing is not adjustable on any engine.

ENGINE FIRING ORDER - 2.4L 4-CYLINDER

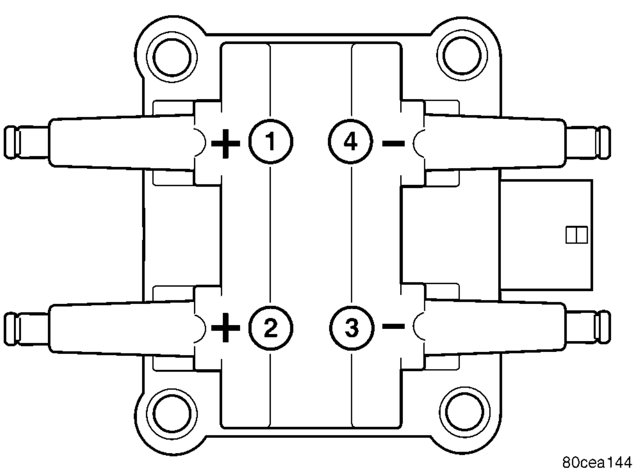
1 - 3 - 4 - 2

ENGINE FIRING ORDER - 3.7L V-6

1 - 6 - 5 - 4 - 3 - 2

IGNITION COIL RESISTANCE - 2.4L

Engine	Coil Manufacture	Primary Resistance at 21°C-27°C (70°F-80°F)	Secondary Resistance at 21°C-27°C (70°F-80°F)
2.4L	Toyodenso or Diamond	0.51 to 0.61 Ohms	11,500 to 13,500 Ohms



IGNITION COIL - 2.4L

IGNITION COIL RESISTANCE - 3.7L V-6

PRIMARY RESISTANCE 21-27°C (70-80°F)	SECONDARY RESISTANCE 21-27°C (70-80°F)
0.6 - 0.9 Ohms	6,000 - 9,000 Ohms

IGNITION CONTROL (Continued)

SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
2.4L	RE14MCC5 (Champion #)	1.24 to 1.37 mm (0.048 to 0.053 in.)
3.7L V-6	ZFR6F - 11G (NGK #)	1.1 mm (0.042 in.)

SPARK PLUG CABLE RESISTANCE - 2.4L

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

TORQUE - IGNITION SYSTEM

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Camshaft Position Sensor-2.4L	23	21	205
Camshaft Position Sensor–3.7L	12	-	106
Crankshaft Position Sensor Bolt-2.4L	12	-	106
Crankshaft Position Sensor Nut/Bolt-3.7L	23	21	205
* Knock Sensor Bolt - 3.7L	* 20	* 15	
Ignition Coil Mounting Bolts - 2.4L	11	-	105
Ignition Coil Mounting Nuts - 3.7L	8	-	70
Ignition Coil Capacitor Nuts- 3.7L	8	-	70
** Spark Plugs - 2.4L	** 15	** 11	-
Spark Plugs - 3.7L	27	20	-
* Do not apply any sealant, thread-locker or adhesive to bolts. Poor sensor performance may result.			
** Torque critical tapered design. Do not exceed 15 ft. lbs.			

AUTO SHUT DOWN RELAY

DESCRIPTION - PCM OUTPUT

The 5–pin, 12–volt, Automatic Shutdown (ASD) relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

OPERATION

OPERATION - ASD SENSE - PCM INPUT

A 12 volt signal at this input indicates to the PCM that the ASD has been activated. The relay is used to connect the oxygen sensor heater elements, oxygen sensor heater relay, ignition coil and fuel injectors to 12 volt + power supply.

This input is used only to sense that the ASD relay is energized. If the Powertrain Control Module (PCM) does not see 12 volts at this input when the ASD should be activated, it will set a Diagnostic Trouble Code (DTC).

OPERATION - PCM OUTPUT

The ASD relay supplies battery voltage (12+ volts) to the fuel injectors and ignition coil(s). With certain emissions packages it also supplies 12–volts to the oxygen sensor heating elements and the oxygen sensor heater relay.

The ground circuit for the coil within the ASD relay is controlled by the Powertrain Control Module (PCM). The PCM operates the ASD relay by switching its ground circuit on and off.

The ASD relay will be shut–down, meaning the 12–volt power supply to the ASD relay will be de-activated by the PCM if the ignition key is left in the ON position. This is if the engine has not been running for approximately 1.8 seconds.

DIAGNOSIS AND TESTING - ASD AND FUEL PUMP RELAYS

The following description of operation and tests apply only to the Automatic Shutdown (ASD) and fuel pump relays. The terminals on the bottom of each relay are numbered. Two different types of relays may be used, (Fig. 1) or (Fig. 2).

- Terminal number 30 is connected to battery voltage. For both the ASD and fuel pump relays, terminal 30 is connected to battery voltage at all times.
- The PCM grounds the coil side of the relay through terminal number 85.
- Terminal number 86 supplies voltage to the coil side of the relay.

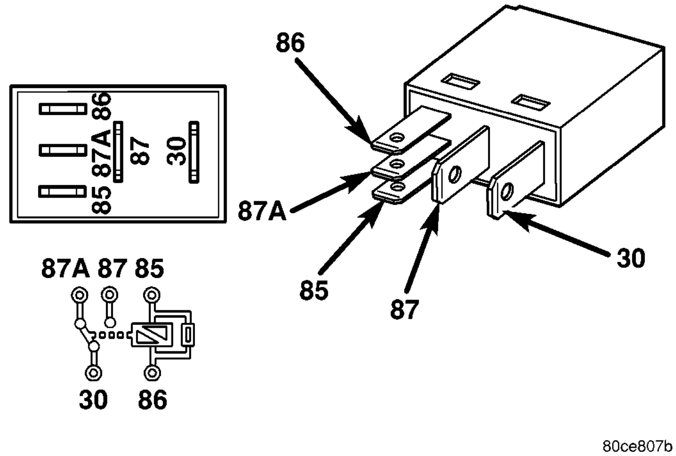


Fig. 1 TYPE 1 RELAY (ISO MICRO RELAY)

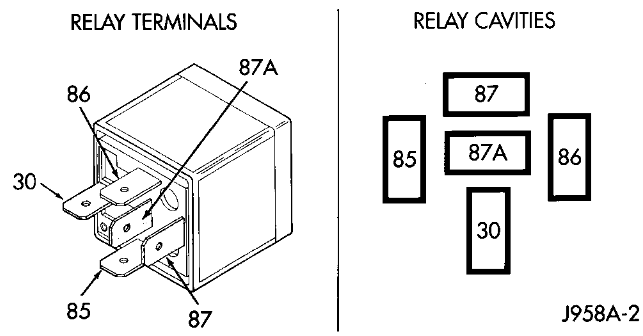


Fig. 2 ASD AND FUEL PUMP RELAY TERMINALS—TYPE 2

TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

- When the PCM de-energizes the ASD and fuel pump relays, terminal number 87A connects to terminal 30. This is the Off position. In the off position, voltage is not supplied to the rest of the circuit. Terminal 87A is the center terminal on the relay.
- When the PCM energizes the ASD and fuel pump relays, terminal 87 connects to terminal 30. This is the On position. Terminal 87 supplies voltage to the rest of the circuit.

AUTO SHUT DOWN RELAY (Continued)

The following procedure applies to the ASD and fuel pump relays.

(1) Remove relay from connector before testing.

(2) With the relay removed from the vehicle, use an ohmmeter to check the resistance between terminals 85 and 86. The resistance should be 75 ohms +/- 5 ohms.

(3) Connect the ohmmeter between terminals 30 and 87A. The ohmmeter should show continuity between terminals 30 and 87A.

(4) Connect the ohmmeter between terminals 87 and 30. The ohmmeter should not show continuity at this time.

(5) Connect one end of a jumper wire (16 gauge or smaller) to relay terminal 85. Connect the other end of the jumper wire to the ground side of a 12 volt power source.

(6) Connect one end of another jumper wire (16 gauge or smaller) to the power side of the 12 volt power source. **Do not attach the other end of the jumper wire to the relay at this time.**

WARNING: DO NOT ALLOW OHMMETER TO CONTACT TERMINALS 85 OR 86 DURING THIS TEST. DAMAGE TO OHMMETER MAY RESULT.

(7) Attach the other end of the jumper wire to relay terminal 86. This activates the relay. The ohmmeter should now show continuity between relay terminals 87 and 30. The ohmmeter should not show continuity between relay terminals 87A and 30.

(8) Disconnect jumper wires.

(9) Replace the relay if it did not pass the continuity and resistance tests. If the relay passed the tests, it operates properly. Check the remainder of the ASD and fuel pump relay circuits. Refer to 8, Wiring Diagrams.

REMOVAL

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 3). Refer to label on PDC cover for relay location.

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

The ASD relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

(1) Install relay to PDC.

(2) Install cover to PDC.

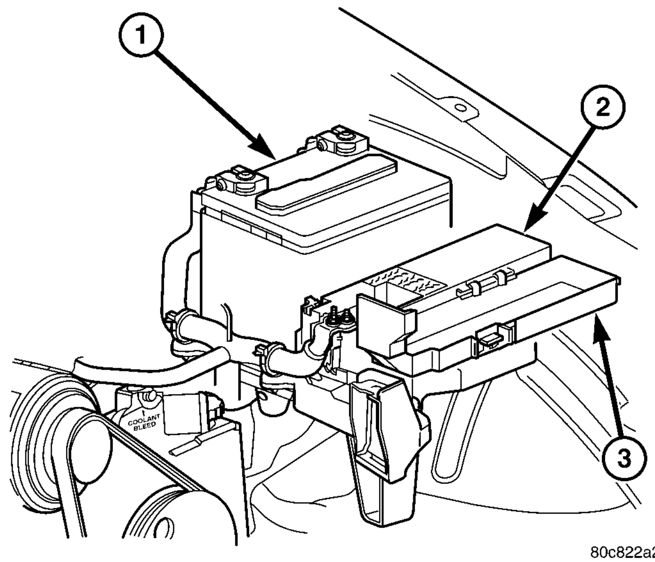


Fig. 3 POWER DISTRIBUTION CENTER (PDC)

1 - BATTERY
2 - PDC
3 - PDC COVER

CAMSHAFT POSITION SENSOR

DESCRIPTION

DESCRIPTION - 2.4L

The Camshaft Position Sensor (CMP) on the 2.4L 4–cylinder engine is bolted to the right-front side of the cylinder head (Fig. 4).

DESCRIPTION-3.7L

The Camshaft Position Sensor (CMP) on the 3.7L 6–cylinder engine is bolted to the right-front side of the right cylinder head (Fig. 5).

OPERATION

OPERATION - 2.4L

The Camshaft Position Sensor (CMP) sensor contains a hall effect device referred to as a sync signal generator. A rotating target wheel (tonewheel) for the CMP is located behind the exhaust valve-camshaft drive gear (Fig. 6). The target wheel is equipped with a cutout (notch) around 180 degrees of the wheel. The CMP detects this cutout every 180 degrees of camshaft gear rotation. Its signal is used in conjunction with the Crankshaft Position Sensor (CKP) to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

CAMSHAFT POSITION SENSOR (Continued)

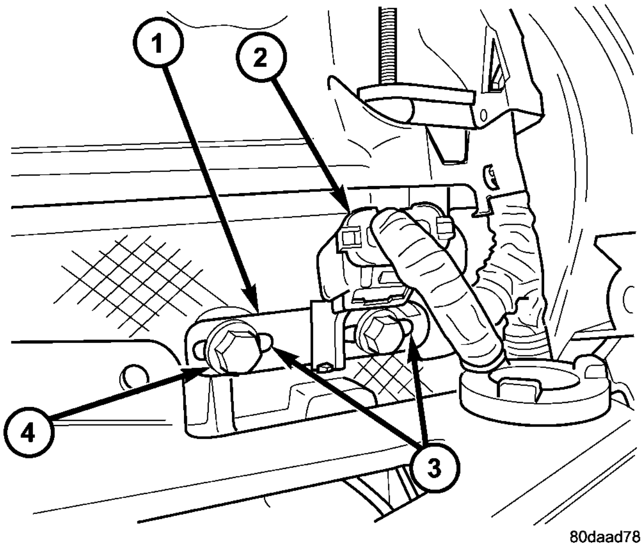


Fig. 4 CMP LOCATION - 2.4L

1 - CMP SENSOR
2 - ELECTRICAL CONNECTOR
3 - SLOTTED HOLES
4 - MOUNTING BOLTS (2)

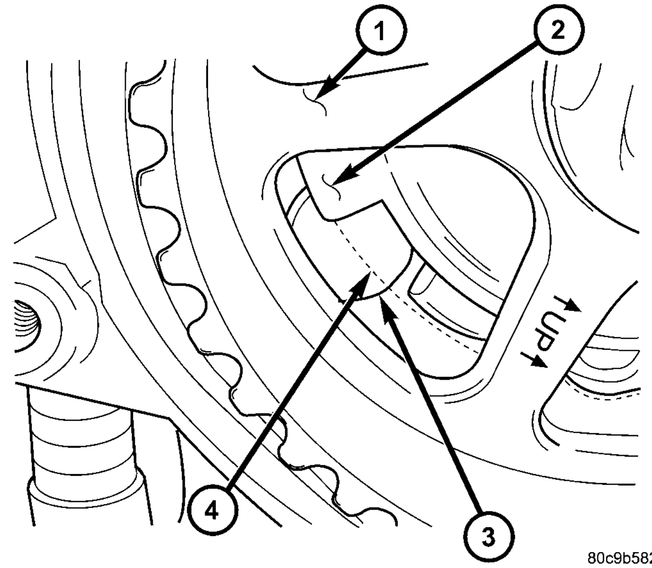


Fig. 6 CMP FACE AT TARGET WHEEL-2.4L

1 - CAMSHAFT DRIVE GEAR
2 - TARGETWHEEL (TONEWHEEL)
3 - FACE OF CMP SENSOR
4 - CUTOUT (NOTCH)

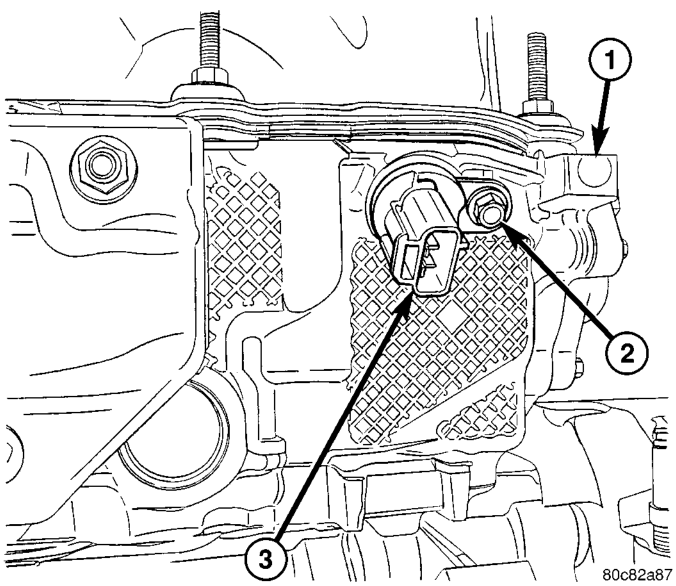


Fig. 5 CAMSHAFT POSITION SENSOR - 3.7L

1 - RIGHT/FRONT OF RIGHT CYLINDER HEAD
2 - CMP MOUNTING BOLT
3 - CMP LOCATION

When the leading edge of the target wheel cutout enters the tip of the CMP, the interruption of magnetic field causes the voltage to switch high, resulting in a sync signal of approximately 5 volts.

When the trailing edge of the target wheel cutout leaves the tip of the CMP, the change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

OPERATION - 3.7L

The Camshaft Position Sensor (CMP) sensor contains a hall effect device referred to as a sync signal generator. A rotating target wheel (tonewheel) for the CMP is located at the front of the camshaft for the right cylinder head (Fig. 7). This sync signal generator detects notches located on a tonewheel. As the tonewheel rotates, the notches pass through the sync signal generator. The signal from the CMP sensor is used in conjunction with the Crankshaft Position Sensor (CKP) to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

When the leading edge of the tonewheel notch enters the tip of the CMP, the interruption of magnetic field causes the voltage to switch high, resulting in a sync signal of approximately 5 volts.

When the trailing edge of the tonewheel notch leaves then tip of the CMP, the change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

REMOVAL

2.4L

The Camshaft Position Sensor (CMP) on the 2.4L 4–cylinder engine is bolted to the right-front side of the cylinder head (Fig. 8). Sensor position (depth) is adjustable.

(1) Disconnect electrical connector at CMP sensor.
(2) Remove 2 sensor mounting bolts.

CAMSHAFT POSITION SENSOR (Continued)

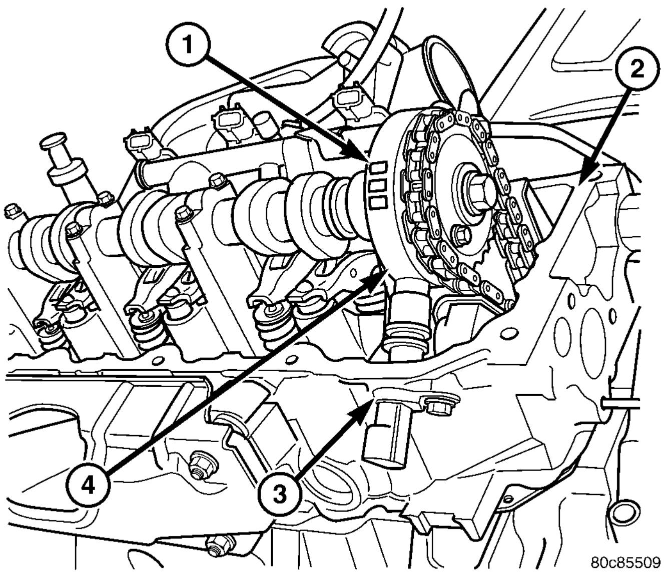


Fig. 7 CAMSHAFT POSITION SENSOR LOCATION - 3.7L

1 - NOTCHES
2 - RIGHT CYLINDER HEAD
3 - CMP
4 - TONEWHEEL (TARGET WHEEL)

(3) Remove sensor from cylinder head by sliding towards rear of engine.

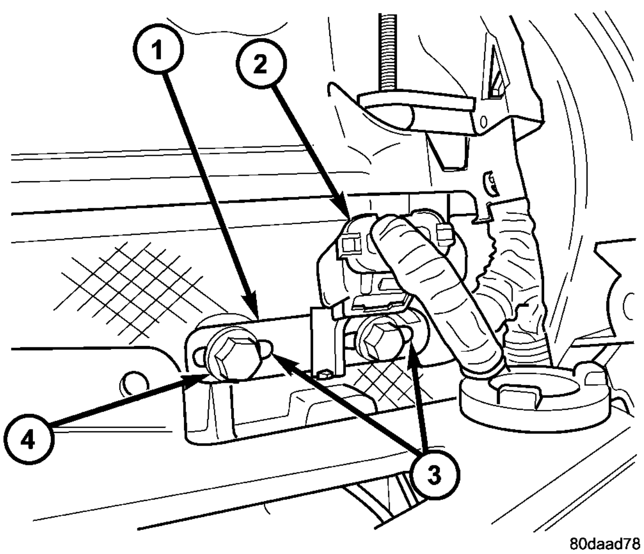


Fig. 8 CMP LOCATION - 2.4L

1 - CMP SENSOR
2 - ELECTRICAL CONNECTOR
3 - SLOTTED HOLES
4 - MOUNTING BOLTS (2)

3.7L

The Camshaft Position Sensor (CMP) on the 3.7L V-6 engine is bolted to the front/top of the right cylinder head (Fig. 9).

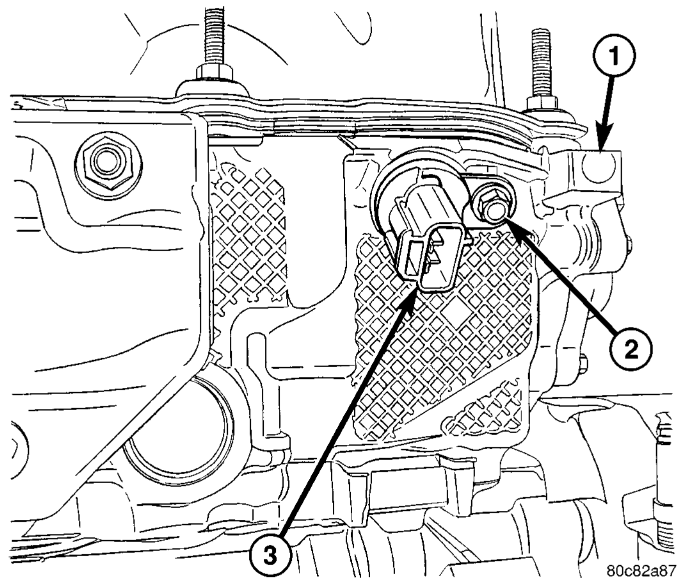


Fig. 9 CAMSHAFT POSITION SENSOR (CMP) - 3.7L

1 - RIGHT/FRONT OF RIGHT CYLINDER HEAD
2 - CMP MOUNTING BOLT
3 - CMP LOCATION

(1) Disconnect electrical connector at CMP sensor.
(2) Remove sensor mounting bolt (Fig. 9).
(3) Carefully twist sensor from cylinder head.
(4) Check condition of sensor o-ring.

INSTALLATION

2.4L

The Camshaft Position Sensor (CMP) on the 2.4L 4–cylinder engine is bolted to the right-front side of the cylinder head. **Sensor position (depth) is adjustable.**

(1) Remove plastic, upper timing belt cover (timing gear cover) (Fig. 10) by removing 3 bolts. Before attempting to remove cover, remove electrical connector from Engine Coolant Temperature (ECT) sensor (Fig. 10). This will prevent damage to sensor.

(2) Rotate (bump over) engine until camshaft timing gear and target wheel (tonewheel) are positioned and aligned to face of sensor as shown in (Fig. 11). **If not positioned as shown in (Fig. 11), damage to both sensor and target wheel will occur when attempting to start engine. Face of sensor MUST be behind target wheel while adjusting.**

CAMSHAFT POSITION SENSOR (Continued)

(3) Position sensor to cylinder head and install 2 sensor mounting bolts finger tight.

(4) **SENSOR AIR GAP: .030”** Set air gap between rear of target wheel and face of sensor to .030”. This can best be accomplished using an L-shaped, wire-type spark plug gapping gauge (Fig. 12). A piece of .030” brass shim stock may also be used.

(5) Gently push sensor forward until it contacts gapping gauge. **Do not push hard on sensor.** Tighten 2 sensor mounting bolts. Refer to torque specifications.

CAUTION: After tightening sensor mounting bolts, recheck air gap and adjust as necessary. Retorque bolts.

(6) Install upper timing belt cover and 3 bolts.

(7) Connect electrical connector to ECT sensor.

(8) Connect electrical connector to CMP sensor.

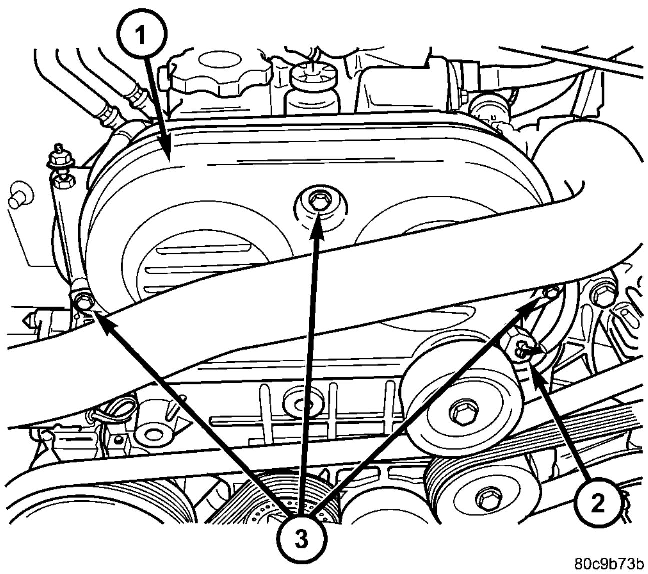


Fig. 10 UPPER TIMING BELT COVER/BOLTS-2.4L

1 - UPPER TIMING BELT COVER
2 - ELECTRICAL CONNECTOR (ECT)
3 - MOUNTING BOLTS (3)

3.7L

The Camshaft Position Sensor (CMP) on the 3.7L V-6 engine is bolted to the front/top of the right cylinder head.

(1) Clean out machined hole in cylinder head.

(2) Apply a small amount of engine oil to sensor o-ring.

(3) Install sensor into cylinder head with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder head. If sensor is not flush, damage to sensor mounting tang may result.

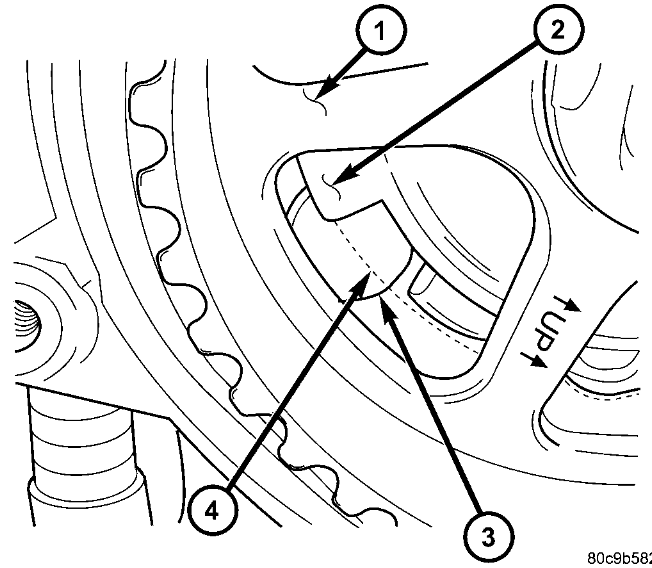


Fig. 11 CMP FACE AT TARGET WHEEL-2.4L

1 - CAMSHAFT DRIVE GEAR
2 - TARGETWHEEL (TONEWHEEL)
3 - FACE OF CMP SENSOR
4 - CUTOUT (NOTCH)

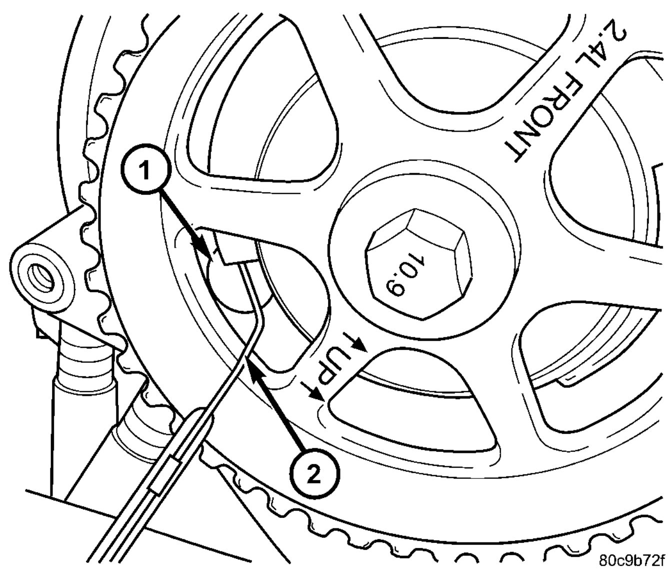


Fig. 12 CMP ADJUSTMENT - 2.4L

1 - FACE OF SENSOR
2 - WIRE GAPPING TOOL

(4) Install mounting bolt and tighten. Refer to torque specifications.

(5) Connect electrical connector to sensor.

IGNITION COIL

DESCRIPTION

2.4L

The coil assembly consists of 2 different coils molded together. The assembly is mounted to the top of the engine (Fig. 13).

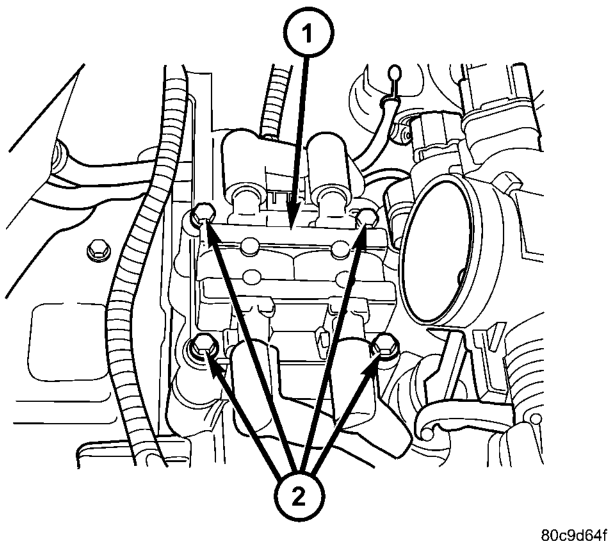


Fig. 13 IGNITION COIL - 2.4L

1 - IGNITION COIL
2 - MOUNTING BOLTS (4)

3.7L

The 3.7L V-6 engine uses 6 dedicated, and individually fired coil for each spark plug (Fig. 14). Each coil is mounted directly into the cylinder head and onto the top of each spark plug (Fig. 15).

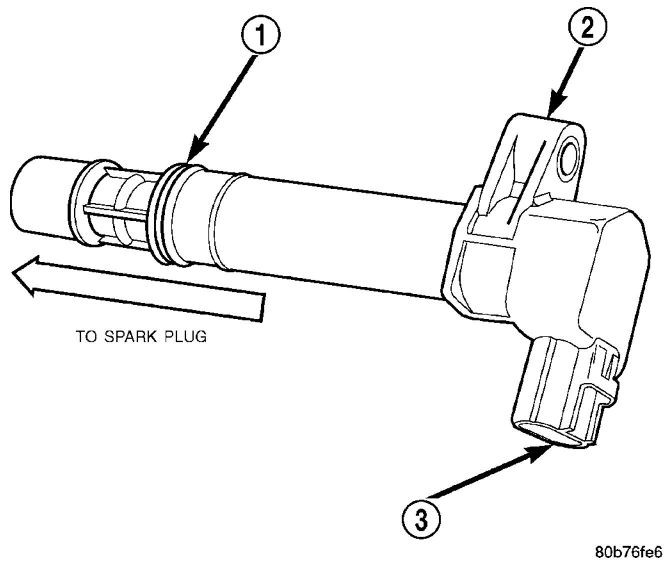


Fig. 14 IGNITION COIL - 3.7L

1 - O-RING
2 - IGNITION COIL
3 - ELECTRICAL CONNECTOR

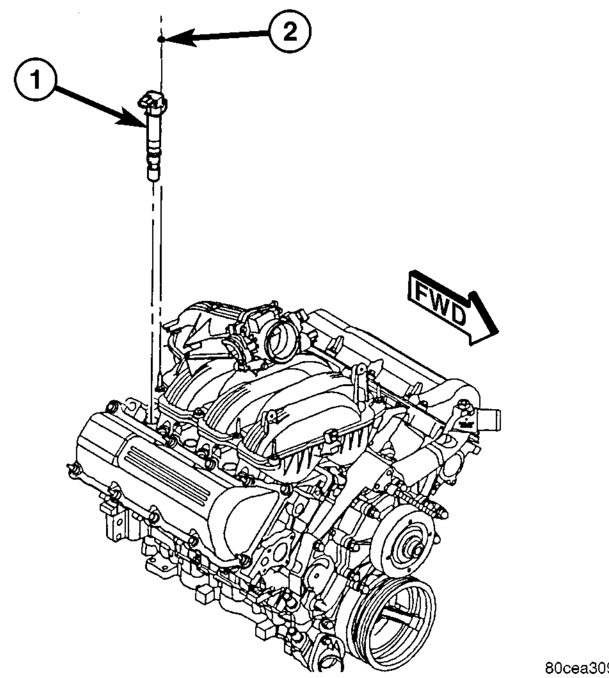


Fig. 15 IGNITION COIL LOCATION - 3.7L

1 - IGNITION COIL
2 - COIL MOUNTING NUT

OPERATION

2.4L

The coil fires two spark plugs simultaneously. One plug is under compression, the other plug fires on the exhaust stroke (lost spark). Coil number one fires cylinders 1 and 4, and coil number two fires cylinders 2 and 3.

The Auto Shutdown (ASD) relay provides battery voltage to the ignition coil. The PCM provides a ground contact (circuit) for energizing the coil(s). The PCM will de-energize the ASD relay if it does not receive the crankshaft position sensor and camshaft position sensor inputs.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

IGNITION COIL (Continued)

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Spark plug cables (secondary wires or cables) are used with the 2.4L engine.

3.7L

Battery voltage is supplied to the 6 ignition coils from the ASD relay. The Powertrain Control Module (PCM) opens and closes each ignition coil ground circuit at a determined time for ignition coil operation.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Because of coil design, spark plug cables (secondary cables) are not used with the 3.7L engine.

REMOVAL

2.4L

(1) Disconnect electrical connector at rear of coil.
(2) Remove all secondary cables from coil.
(3) Remove 4 coil mounting bolts (Fig. 16).
(4) Remove coil from vehicle.

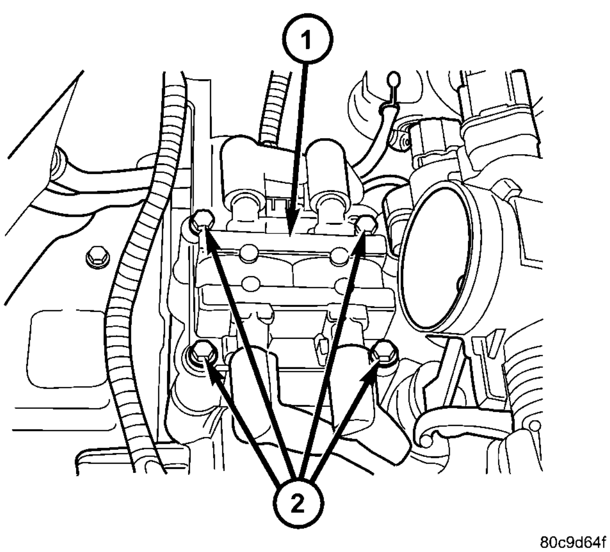


Fig. 16 IGNITION COIL - 2.4L

1 - IGNITION COIL
2 - MOUNTING BOLTS (4)

3.7L

An individual ignition coil is used for each spark plug (Fig. 18). The coil fits into machined holes in the cylinder head. A mounting stud/nut secures each coil to the top of the intake manifold (Fig. 17). The bottom of the coil is equipped with a rubber boot to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately. An o-ring (Fig. 18) is used to seal the coil at the opening into the cylinder head.

(1) Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.
(2) Disconnect electrical connector from coil by pushing downward on release lock on top of connector and pull connector from coil.
(3) Clean area at base of coil with compressed air before removal.
(4) Remove coil mounting nut from mounting stud (Fig. 17).
(5) Carefully pull up coil from cylinder head opening with a slight twisting action.
(6) Remove coil from vehicle.

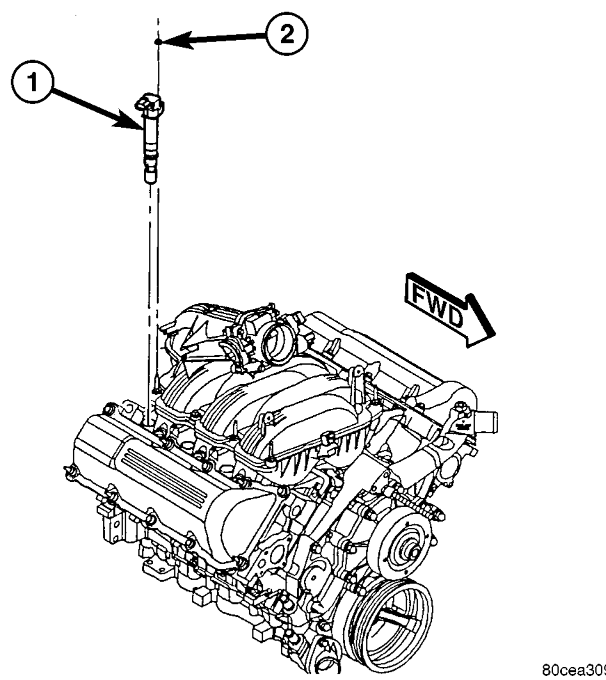


Fig. 17 IGNITION COIL LOCATION - 3.7L

1 - IGNITION COIL
2 - COIL MOUNTING NUT

IGNITION COIL (Continued)

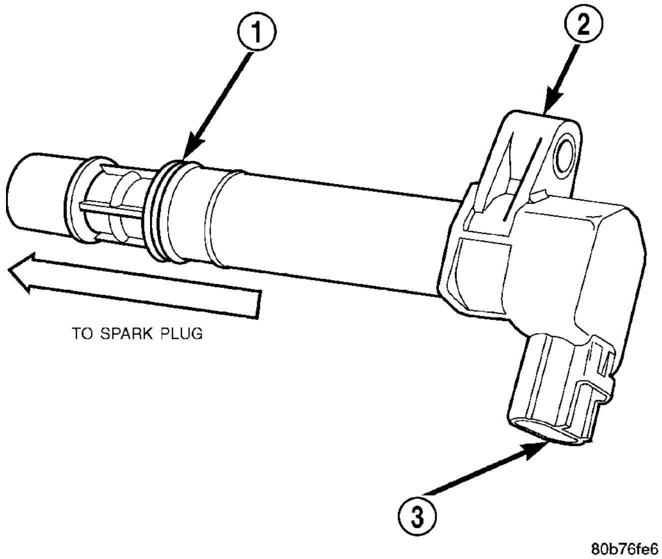


Fig. 18 IGNITION COIL - 3.7L

1 - O-RING
2 - IGNITION COIL
3 - ELECTRICAL CONNECTOR

INSTALLATION

2.4L

(1) Position coil to engine.

(2) Install 4 mounting bolts. Refer to torque specifications.

(3) Install secondary cables.

(4) Install electrical connector at rear of coil.

(5) Install air cleaner tube and housing.

3.7L

(1) Using compressed air, blow out any dirt or contaminants from around top of spark plug.

(2) Check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.

(3) Position ignition coil into cylinder head opening and push onto spark plug. Do this while guiding coil base over mounting stud.

(4) Install coil mounting stud nut. Refer to torque specifications.

(5) Connect electrical connector to coil by snapping into position.

(6) If necessary, install throttle body air tube or box.

KNOCK SENSOR

DESCRIPTION

The 2 knock sensors are bolted into the cylinder block under the intake manifold. The sensors are used only with the 3.7L engine.

OPERATION

Two knock sensors are used on the 3.7L V-6 engine; one for each cylinder bank. When the knock sensor detects a knock in one of the cylinders on the corresponding bank, it sends an input signal to the Powertrain Control Module (PCM). In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the PCM while the engine operates. As the intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

The voltage signal produced by the knock sensor increases with the amplitude of vibration. The PCM receives the knock sensor voltage signal as an input. If the signal rises above a predetermined level, the PCM will store that value in memory and retard ignition timing to reduce engine knock. If the knock sensor voltage exceeds a preset value, the PCM retards ignition timing for all cylinders. It is not a selective cylinder retard.

The PCM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Knock retard uses its own short term and long term memory program.

Long term memory stores previous detonation information in its battery-backed RAM. The maximum authority that long term memory has over timing retard can be calibrated.

Short term memory is allowed to retard timing up to a preset amount under all operating conditions (as long as rpm is above the minimum rpm) except at Wide Open Throttle (WOT). The PCM, using short term memory, can respond quickly to retard timing when engine knock is detected. Short term memory is lost any time the ignition key is turned off.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors.

REMOVAL

The 2 knock sensors are bolted into the cylinder block under the intake manifold (Fig. 19).

NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

KNOCK SENSOR (Continued)

(1) Disconnect knock sensor dual pigtail harness from engine wiring harness. this connection is made near rear of left valve cover (Fig. 19).

(2) Remove intake manifold. Refer to Engine section.

(3) Remove sensor mounting bolts (Fig. 19). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

(4) Remove sensors from engine.

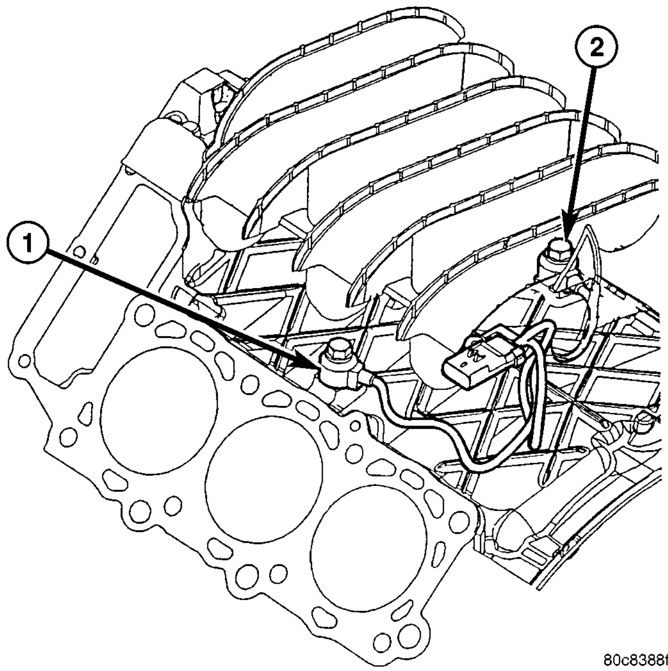


Fig. 19 KNOCK SENSOR LOCATION

1 - KNOCK SENSORS (2)
2 - MOUNTING BOLTS

INSTALLATION

NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

(1) Thoroughly clean knock sensor mounting holes.

(2) Install sensors into cylinder block.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors. The torque for the knock senor bolt is relatively light for an 8mm bolt.

NOTE: Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

(3) Install and tighten mounting bolts. Refer to torque specification.

(4) Install intake manifold. Refer to Engine section.

(5) Connect knock sensor wiring harness to engine harness at rear of intake manifold.

SPARK PLUG

DESCRIPTION

Resistor type spark plugs are used.

Spark plug resistance values range from 6,000 to 20,000 ohms (when checked with at least a 1000 volt spark plug tester). **Do not use an ohmmeter to check the resistance values of the spark plugs. Inaccurate readings will result.**

OPERATION

To prevent possible pre-ignition and/or mechanical engine damage, the correct type/heat range/number spark plug must be used.

Always use the recommended torque when tightening spark plugs. This is especially true when plugs are equipped with tapered seats. Incorrect torque can distort the spark plug and change plug gap. It can also pull the plug threads and do possible damage to both the spark plug and the cylinder head.

Remove the spark plugs and examine them for burned electrodes and fouled, cracked or broken porcelain insulators. Keep plugs arranged in the order in which they were removed from the engine. A single plug displaying an abnormal condition indicates that a problem exists in the corresponding cylinder. Replace spark plugs at the intervals recommended in the Lubrication and Maintenance section.

Spark plugs that have low mileage may be cleaned and reused if not otherwise defective, carbon or oil fouled. Also refer to Spark Plug Conditions.

CAUTION: Never use a motorized wire wheel brush to clean the spark plugs. Metallic deposits will remain on the spark plug insulator and will cause plug misfire.

SPARK PLUG (Continued)

DIAGNOSIS AND TESTING - SPARK PLUG CONDITIONS

NORMAL OPERATING

The few deposits present on the spark plug will probably be light tan or slightly gray in color. This is evident with most grades of commercial gasoline (Fig. 20). There will not be evidence of electrode burning. Gap growth will not average more than approximately 0.025 mm (.001 in) per 3200 km (2000 miles) of operation. Spark plugs that have normal wear can usually be cleaned, have the electrodes filed, have the gap set and then be installed.

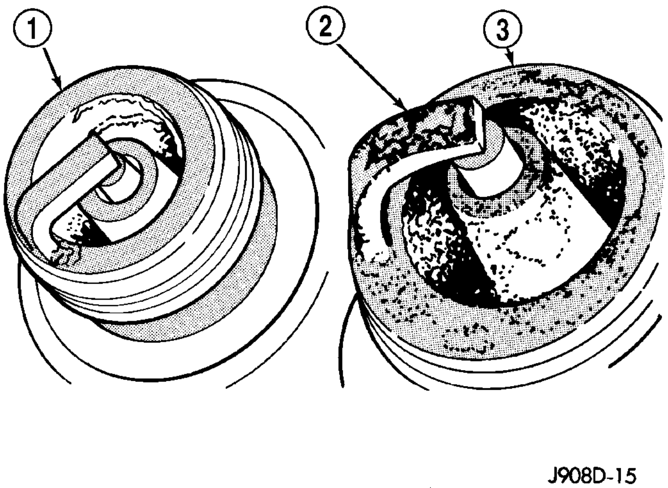


Fig. 20 Normal Operation and Cold (Carbon) Fouling

1 - NORMAL
2 - DRY BLACK DEPOSITS
3 - COLD (CARBON) FOULING

Some fuel refiners in several areas of the United States have introduced a manganese additive (MMT) for unleaded fuel. During combustion, fuel with MMT causes the entire tip of the spark plug to be coated with a rust colored deposit. This rust color can be misdiagnosed as being caused by coolant in the combustion chamber. Spark plug performance may be affected by MMT deposits.

COLD FOULING/CARBON FOULING

Cold fouling is sometimes referred to as carbon fouling. The deposits that cause cold fouling are basically carbon (Fig. 20). A dry, black deposit on one or two plugs in a set may be caused by sticking valves or defective spark plug cables. Cold (carbon) fouling of the entire set of spark plugs may be caused by a clogged air cleaner element or repeated short operating times (short trips).

WET FOULING OR GAS FOULING

A spark plug coated with excessive wet fuel or oil is wet fouled. In older engines, worn piston rings, leaking valve guide seals or excessive cylinder wear can cause wet fouling. In new or recently overhauled engines, wet fouling may occur before break-in (normal oil control) is achieved. This condition can usually be resolved by cleaning and reinstalling the fouled plugs.

OIL OR ASH ENCRUSTED

If one or more spark plugs are oil or oil ash encrusted (Fig. 21), evaluate engine condition for the cause of oil entry into that particular combustion chamber.

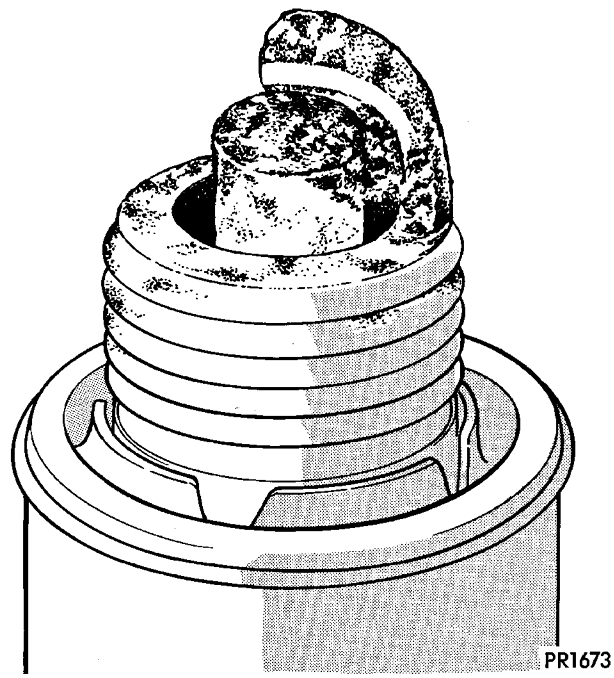


Fig. 21 Oil or Ash Encrusted

ELECTRODE GAP BRIDGING

Electrode gap bridging may be traced to loose deposits in the combustion chamber. These deposits accumulate on the spark plugs during continuous stop-and-go driving. When the engine is suddenly subjected to a high torque load, deposits partially liquefy and bridge the gap between electrodes (Fig. 22). This short circuits the electrodes. Spark plugs with electrode gap bridging can be cleaned using standard procedures.

SPARK PLUG (Continued)

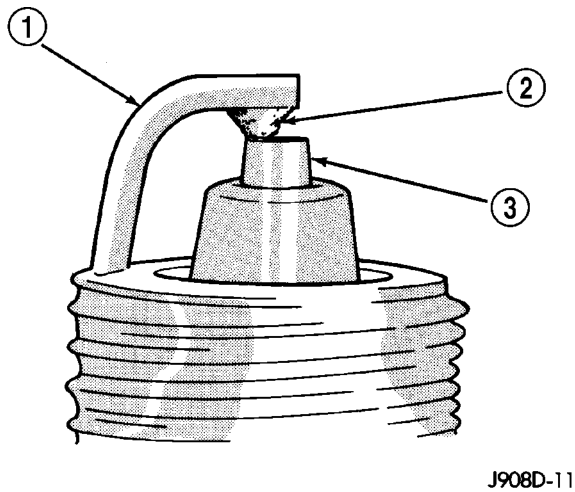


Fig. 22 Electrode Gap Bridging

1 - GROUND ELECTRODE
2 - DEPOSITS
3 - CENTER ELECTRODE

SCAVENGER DEPOSITS

Fuel scavenger deposits may be either white or yellow (Fig. 23). They may appear to be harmful, but this is a normal condition caused by chemical additives in certain fuels. These additives are designed to change the chemical nature of deposits and decrease spark plug misfire tendencies. Notice that accumulation on the ground electrode and shell area may be heavy, but the deposits are easily removed. Spark plugs with scavenger deposits can be considered normal in condition and can be cleaned using standard procedures.

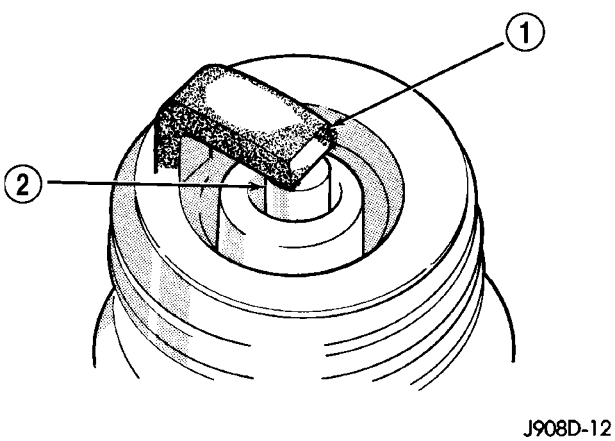


Fig. 23 Scavenger Deposits

1 - GROUND ELECTRODE COVERED WITH WHITE OR YELLOW DEPOSITS
2 - CENTER ELECTRODE

CHIPPED ELECTRODE INSULATOR

A chipped electrode insulator usually results from bending the center electrode while adjusting the spark plug electrode gap. Under certain conditions, severe detonation can also separate the insulator from the center electrode (Fig. 24). Spark plugs with this condition must be replaced.

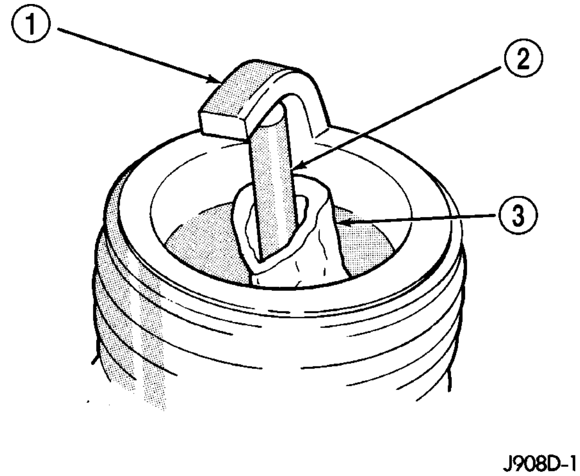


Fig. 24 Chipped Electrode Insulator

1 - GROUND ELECTRODE
2 - CENTER ELECTRODE
3 - CHIPPED INSULATOR

PREIGNITION DAMAGE

Preignition damage is usually caused by excessive combustion chamber temperature. The center electrode dissolves first and the ground electrode dissolves somewhat latter (Fig. 25). Insulators appear relatively deposit free. Determine if the spark plug has the correct heat range rating for the engine. Determine if ignition timing is over advanced or if other operating conditions are causing engine overheating. (The heat range rating refers to the operating temperature of a particular type spark plug. Spark plugs are designed to operate within specific temperature ranges. This depends upon the thickness and length of the center electrodes porcelain insulator.)

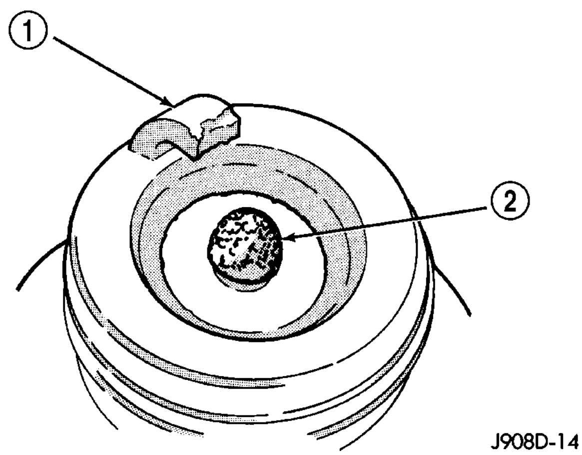


Fig. 25 Preignition Damage

1 - GROUND ELECTRODE STARTING TO DISSOLVE
2 - CENTER ELECTRODE DISSOLVED

SPARK PLUG (Continued)

SPARK PLUG OVERHEATING

Overheating is indicated by a white or gray center electrode insulator that also appears blistered (Fig. 26). The increase in electrode gap will be considerably in excess of 0.001 inch per 2000 miles of operation. This suggests that a plug with a cooler heat range rating should be used. Over advanced ignition timing, detonation and cooling system malfunctions can also cause spark plug overheating.

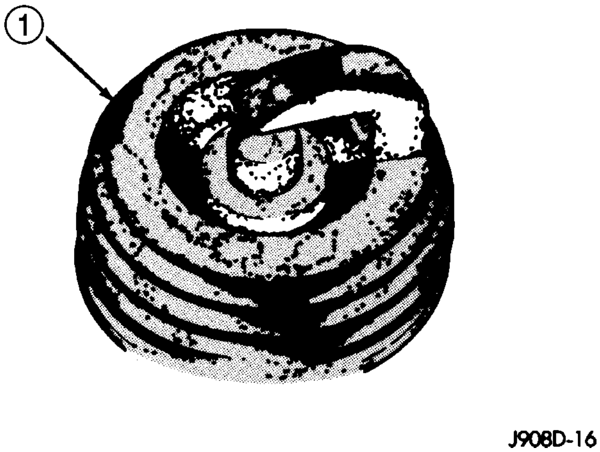


Fig. 26 Spark Plug Overheating

1 - BLISTERED WHITE OR GRAY COLORED INSULATOR

REMOVAL

2.4L

If spark plug for #2 or #3 cylinder is being removed, throttle body must be removed. Refer to Throttle Body Removal.

(1) Remove air cleaner tube and housing.

(2) Twist secondary cable at cylinder head to break loose at spark plug. Remove cable from plug.

(3) Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.

(4) Remove spark plug from cylinder head using a quality socket with a rubber or foam insert.

(5) Inspect spark plug condition. Refer to Spark Plug Conditions.

3.7L

Each individual spark plug is located under each ignition coil. Each individual ignition coil must be removed to gain access to each spark plug. Refer to Ignition Coil Removal/Installation.

(1) Prior to removing ignition coil, spray compressed air around coil base at cylinder head.

(2) Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.

(3) Remove spark plug from cylinder head using a quality socket with a rubber or foam insert. Also check condition of ignition coil o-ring and replace as necessary.

(4) Inspect spark plug condition. Refer to Spark Plug Conditions.

CLEANING

CLEANING SPARK PLUGS

The plugs may be cleaned using commercially available spark plug cleaning equipment. After cleaning, file the center electrode flat with a small point file or jewelers file before adjusting gap.

CAUTION: Never use a motorized wire wheel brush to clean the spark plugs. Metallic deposits will remain on the spark plug insulator and will cause plug misfire.

INSTALLATION

2.4L

CAUTION: Spark plug tightening on the 2.4L is torque critical. The plugs are equipped with tapered seats. Do not exceed 15 ft. lbs. torque.

Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap or a cracked porcelain insulator.

(1) Start the spark plug into the cylinder head by hand to avoid cross threading.

(2) Tighten spark plugs. Refer to torque specifications.

(3) Install throttle body. Refer to Throttle Body Installation.

(4) Install air cleaner tube and housing.

3.7L

Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap or a cracked porcelain insulator.

SPARK PLUG (Continued)

(1) Start the spark plug into the cylinder head by hand to avoid cross threading.

(2) Tighten spark plugs. Refer to torque specifications.

(3) Before installing coil(s), check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.

(4) Install ignition coil(s). Refer to Ignition Coil Removal/Installation.

IGNITION COIL CAPACITOR

DESCRIPTION

One coil capacitor is used. It is located in the engine compartment and attached (clipped) to a wiring trough near the brake power booster.

OPERATION

The coil capacitor(s) help dampen the amount of conducted electrical noise to the camshaft position sensor, crankshaft position sensor, and throttle position sensor. This noise is generated on the 12V supply wire to the ignition coils and fuel injectors.

REMOVAL

The coil capacitor is located in the engine compartment and is attached (clipped) to a wiring harness trough near the brake power booster (graphic not available).

(1) Unclip capacitor from wiring harness trough.

(2) Disconnect electrical connector at capacitor.

INSTALLATION

(1) Connect electrical connector to coil capacitor.

(2) Position capacitor into v-clip on wiring harness trough.

INSTRUMENT CLUSTER

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INSTRUMENT CLUSTER

DESCRIPTION

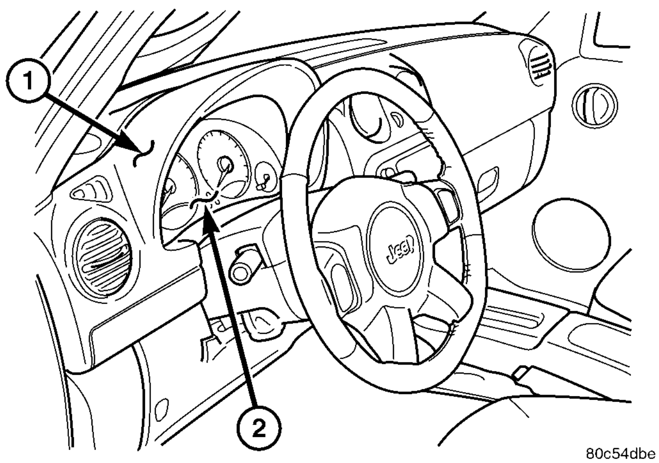

Fig. 1 Instrument Cluster

1 - INSTRUMENT PANEL
2 - INSTRUMENT CLUSTER

The instrument cluster for this model is an ElectroMechanical Instrument Cluster (EMIC) that is located in the instrument panel above the steering column opening, directly in front of the driver (Fig. 1). The remainder of the EMIC, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel. Besides analog gauges and indicators, the EMIC module incorporates a blue-green digital Vacuum Fluorescent Display (VFD) unit for displaying odometer/trip odometer information, some warning or reminder indications and certain diagnostic information.

The EMIC gauges and indicators are visible through a dedicated opening in the cluster bezel on the instrument panel and are protected by an integral clear plastic cluster lens (Fig. 2). Just behind the cluster lens is the cluster hood and an integral cluster mask, which are constructed of molded black plastic. Two cluster masks are used; a base black version is used on base models, while a premium black version features a chrome trim ring around the perimeter of each gauge opening and is used on premium models. The cluster hood serves as a visor and shields the face of the cluster from ambient light and reflections to reduce glare, while the cluster mask serves to separate and define the individual gauges and indicators of the EMIC. A black plastic odometer/trip odometer switch button protrudes through dedicated holes in the cluster mask and the cluster lens near the lower edge of the cluster just to the right of the speedometer. The molded plastic EMIC lens, hood and mask unit has three integral mounting tabs, one each on the lower outboard corners of the unit and one on the upper surface of the hood near the center. These mounting tabs are used to secure the EMIC to the molded plastic instrument panel cluster carrier with two screws at the top, and one screw at each outboard tab.

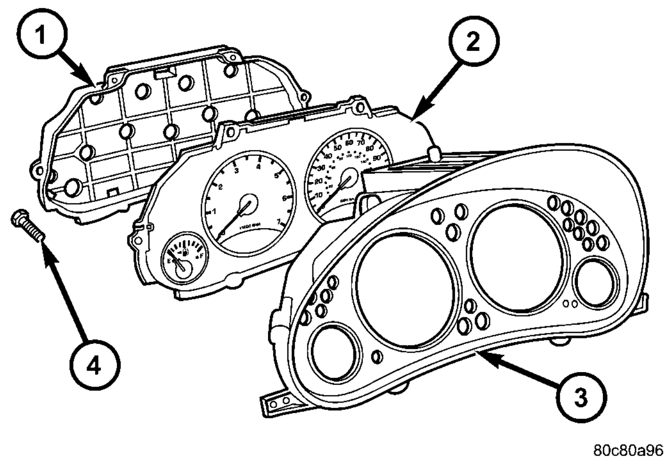

Fig. 2 Instrument Cluster Components

1 - REAR COVER
2 - CLUSTER HOUSING
3 - LENS, HOOD & MASK
4 - SCREW (6)

The rear of the cluster housing and the EMIC electronic circuitry are protected by a molded plastic rear cover. The rear cover is secured to the cluster lens, hood and mask unit with six screws. The rear cover includes clearance holes for service access to each of the nine incandescent bulb and bulb holder units installed on the cluster circuit board for general illumination lighting and for the cluster connector receptacle. The single connector receptacle on the back of

INSTRUMENT CLUSTER (Continued)

the cluster electronic circuit board connects the EMIC to the vehicle electrical system through a single dedicated take out and connector of the instrument panel wire harness.

Sandwiched between the rear cover and the lens, hood and mask unit is the cluster housing. The molded plastic cluster housing serves as the carrier for the cluster circuit board and circuitry, the cluster connector receptacle, the gauges, a Light Emitting Diode (LED) for each cluster indicator, the VFD unit, an audible tone generator, the cluster overlay, the gauge pointers, the odometer/trip odometer switch and the switch button. Behind the cluster lens, hood, and mask unit is the cluster overlay and gauges. The cluster overlay is a laminated plastic unit. The dark, visible, outer surface of the overlay is marked with all of the gauge dial faces and graduations, but this layer is also translucent. The darkness of this outer layer prevents the cluster from appearing cluttered or busy by concealing the cluster indicators that are not illuminated, while the translucence of this layer allows those indicators and icons that are illuminated to be readily visible. The underlying layer of the overlay is opaque and allows light from the various indicators and the incandescent illumination lamps behind it to be visible through the outer layer of the overlay only through predetermined stencil-like cutouts. A rectangular opening in the overlay at the base of the speedometer dial face has a smoked clear lens through which the illuminated VFD unit can be viewed.

Fourteen versions of the EMIC module are offered on this model, seven base and seven premium. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle will be offered. The microprocessor-based EMIC utilizes integrated circuitry and information carried on the Programmable Communication Interface (PCI) data bus network along with several hard wired analog and multiplexed inputs to monitor sensors and switches throughout the vehicle. In response to those inputs, the internal circuitry and programming of the EMIC allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the PCI data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - PCI BUS).

Besides typical instrument cluster gauge and indicator support, the electronic functions and features that the EMIC supports or controls include the following:

- **Audible Warnings -** The EMIC electronic circuit board is equipped with an audible tone generator and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones. (Refer to 8 - ELECTRICAL/CHIME WARNING SYSTEM - DESCRIPTION).
- **Panel Lamps Dimming Control -** The EMIC provides a hard wired 12-volt Pulse-Width Modulated (PWM) output that synchronizes the dimming level of all panel lamps dimmer controlled lamps with that of the cluster illumination lamps.

The EMIC houses four analog gauges and has provisions for up to twenty-four indicators (Fig. 3). The EMIC includes the following analog gauges:

- **Coolant Temperature Gauge**
- **Fuel Gauge**
- **Speedometer**
- **Tachometer**

Some of the EMIC indicators are automatically configured when the EMIC is connected to the vehicle electrical system for compatibility with certain optional equipment or equipment required for regulatory purposes in certain markets. While each EMIC may have provisions for indicators to support every available option, the configurable indicators will not be functional in a vehicle that does not have the equipment that an indicator supports. The EMIC includes provisions for the following indicators (Fig. 3):

- **Airbag Indicator (with Airbag System only)**
- **Antilock Brake System (ABS) Indicator (with ABS only)**
- **Brake Indicator**
- **Charging Indicator**
- **Coolant Low Indicator (with Diesel Engine only)**
- **Cruise Indicator (with Speed Control only)**
- **Four-Wheel Drive Full Time Indicator (with Selec-Trac Transfer Case only)**
- **Four-Wheel Drive Low Mode Indicator (with Four-Wheel Drive only)**
- **Four-Wheel Drive Part Time Indicator (with Four-Wheel Drive only)**
- **Front Fog Lamp Indicator (with Front Fog Lamps only)**
- **High Beam Indicator**
- **Light Bar Lamp Indicator (with Light Bar only)**
- **Low Fuel Indicator**
- **Low Oil Pressure Indicator**
- **Malfunction Indicator Lamp (MIL)**
- **Overdrive-Off Indicator (with Automatic Transmission only)**
- **Rear Fog Lamp Indicator (with Rear Fog Lamps only)**
- **Seatbelt Indicator**

INSTRUMENT CLUSTER (Continued)

- **Security Indicator (with Vehicle Theft Security System only)**
- **Sentry Key Immobilizer System (SKIS) Indicator (with SKIS only)**
- **Transmission Overtemp Indicator (with Automatic Transmission only)**
- **Turn Signal (Right and Left) Indicators**
- **Wait-To-Start Indicator (with Diesel Engine only)**
- **Water-In-Fuel Indicator (with Diesel Engine only)**

Each indicator in the EMIC is illuminated by a dedicated Light Emitting Diode (LED) that is soldered onto the EMIC electronic circuit board. The LED units are not available for service replacement and, if damaged or faulty, the entire EMIC must be replaced. Cluster illumination is accomplished by dimmable incandescent back lighting, which illuminates the gauges for visibility when the exterior lighting is turned on. Each of the incandescent bulbs is secured by an integral bulb holder to the electronic circuit board from the back of the cluster housing.

Hard wired circuitry connects the EMIC to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the EMIC through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring infor-

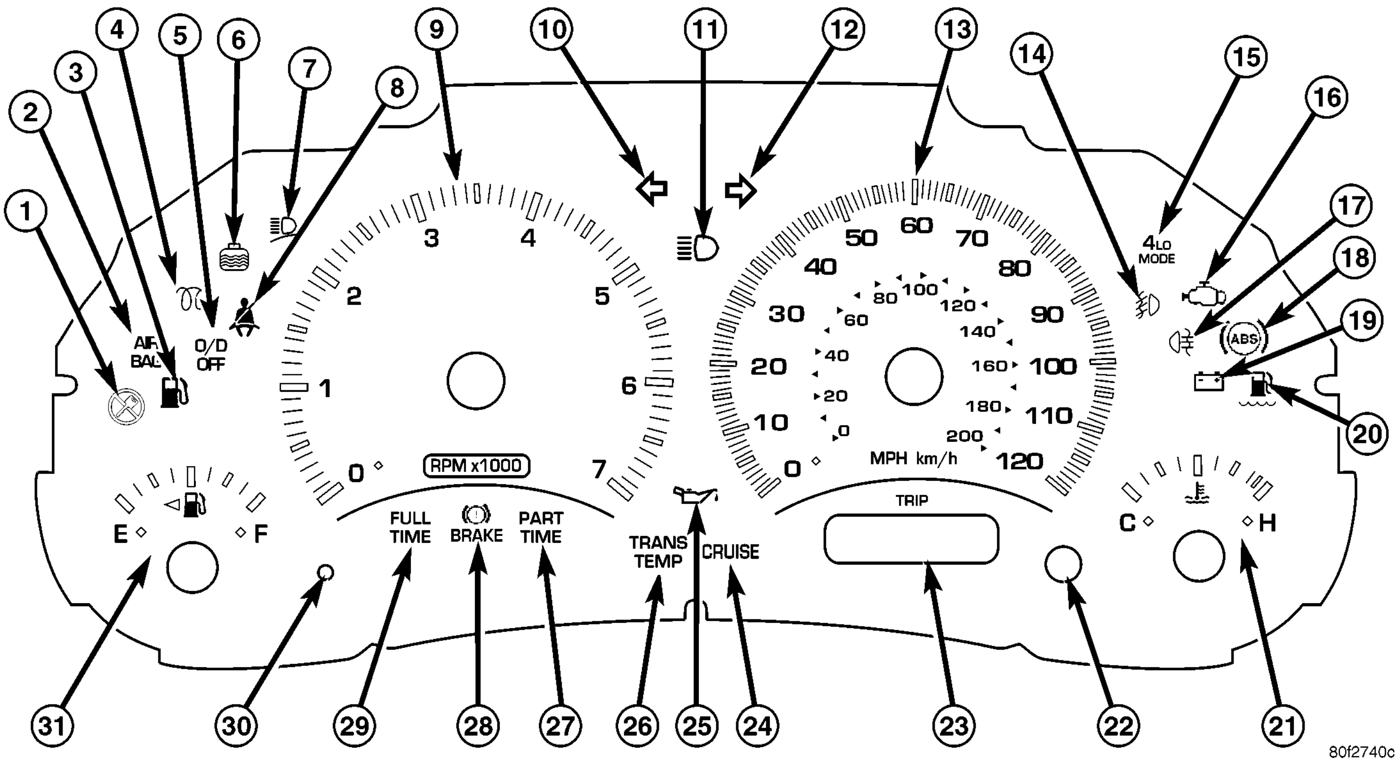

Fig. 3 Gauges & Indicators

1 - SKIS INDICATOR
2 - AIRBAG INDICATOR
3 - LOW FUEL INDICATOR
4 - WAIT-TO-START INDICATOR
5 - OVERDRIVE-OFF INDICATOR
6 - COOLANT LOW INDICATOR
7 - LIGHT BAR LAMP INDICATOR
8 - SEATBELT INDICATOR
9 - TACHOMETER
10 - LEFT TURN INDICATOR
11 - HIGH BEAM INDICATOR
12 - RIGHT TURN INDICATOR
13 - SPEEDOMETER
14 - FRONT FOG LAMP INDICATOR
15 - 4WD LOW MODE INDICATOR
16 - MALFUNCTION INDICATOR LAMP (MIL)
17 - REAR FOG LAMP INDICATOR
18 - ABS INDICATOR
19 - CHARGING INDICATOR
20 - WATER-IN-FUEL INDICATOR
21 - ENGINE TEMPERATURE GAUGE
22 - ODOMETER/TRIP ODOMETER SWITCH BUTTON
23 - ODOMETER/TRIP ODOMETER DISPLAY
24 - CRUISE INDICATOR
25 - LOW OIL PRESSURE INDICATOR
26 - TRANSMISSION OVERTEMP INDICATOR
27 - PART TIME 4WD INDICATOR
28 - BRAKE INDICATOR
29 - FULL TIME 4WD INDICATOR
30 - SECURITY INDICATOR
31 - FUEL GAUGE

INSTRUMENT CLUSTER (Continued)

mation. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

The EMIC modules for this model are serviced only as complete units. The EMIC module cannot be adjusted or repaired. If a gauge, an LED indicator, the VFD unit, the electronic circuit board, the circuit board hardware, the cluster overlay, or the EMIC housing are damaged or faulty, the entire EMIC module must be replaced. The cluster lens, hood and mask unit and the individual incandescent lamp bulbs with holders are available for individual service replacement.

OPERATION

The ElectroMechanical Instrument Cluster (EMIC) is designed to allow the vehicle operator to monitor the conditions of many of the vehicle components and operating systems. The gauges and indicators in the EMIC provide valuable information about the various standard and optional powertrains, fuel and emissions systems, cooling systems, lighting systems, safety systems and many other convenience items. The EMIC is installed in the instrument panel so that all of these monitors can be easily viewed by the vehicle operator when driving, while still allowing relative ease of access for service. The microprocessor-based EMIC hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Programmable Communication Interface (PCI) data bus network. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The EMIC microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during normal operation that are consistent with customer expectations. However, when abnormal conditions exist such as high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor can sound a chime through the on-board audible tone generator to provide distinct visual and audible indications of a problem to the vehicle operator. The instrument cluster circuitry may also produce audible warnings for other electronic modules in the vehicle based upon electronic tone request messages received over the PCI data bus. Each audible warning is intended to provide the vehicle operator with an audible alert to supplement a visual indication.

The EMIC circuitry operates on battery current received through a fused B(+) fuse in the Junction Block (JB) on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse in the JB on a fused ignition switch output (run-start) circuit. This arrangement allows the EMIC to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The EMIC receives a ground input from the BCM as a wake-up signal in order to provide the ignition-off features. The EMIC circuitry is grounded through a ground circuit and take out of the instrument panel wire harness with an eyelet terminal connector that is secured by a nut to a ground stud located on the left instrument panel end bracket.

The EMIC also has a self-diagnostic actuator test capability, which will test each of the PCI bus message-controlled functions of the cluster by lighting the appropriate indicators (except the airbag indicator), sweeping the gauge needles to several calibration points across the gauge faces, and stepping the odometer display sequentially from all ones through all nines. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). See the owner's manual in the vehicle glove box for more information on the features, use and operation of the EMIC.

GAUGES

All gauges receive battery current through the EMIC circuitry when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the EMIC circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

All of the EMIC gauges are air core magnetic units. Two fixed electromagnetic coils are located within each gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a pivot shaft, while the gauge needle is attached to the other end of the shaft. One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil is changed by the EMIC circuitry in response to messages received over the PCI data bus. The gauge needle moves as the movable permanent magnet aligns itself to the

INSTRUMENT CLUSTER (Continued)

changing magnetic fields created around it by the electromagnets.

The gauges are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic data bus message inputs to the EMIC that control each gauge require the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific operation details for each gauge may be found elsewhere in this service information.

VACUUM-FLUORESCENT DISPLAY

The Vacuum-Fluorescent Display (VFD) unit is soldered to the EMIC electronic circuit board. With the ignition switch in the Off or Accessory positions, the odometer display is activated when the driver door is opened (Rental Car mode) and is deactivated when the driver door is closed. Otherwise, the display unit is active when the ignition switch is in the On or Start positions, and inactive when the ignition switch is in the Off or Accessory positions.

The illumination intensity of the VFD unit is controlled by the EMIC circuitry based upon electronic dimming level messages received from the BCM over the PCI data bus, and is synchronized with the illumination intensity of other VFD units in the vehicle. The BCM provides dimming level messages based upon internal programming and inputs it receives from the circuitry of the multi-function switch on the steering column based upon the settings of the control knob and control ring on the left (lighting) control stalk that have been selected by the vehicle operator.

During normal operation, the EMIC VFD unit has several display capabilities including odometer, trip odometer, some warning or reminder indications, and various diagnostic information when certain fault conditions exist. On models equipped with the optional Electronic Vehicle Information Center (EVIC), most of the odometer VFD unit warning and reminder indications are suppressed so as not to duplicate indications that are provided by the EVIC. The odometer VFD warning and reminder messages include:

- **"door"** - indicating a door is ajar (on vehicles without the optional EVIC only).
- **"gate"** - indicating the tailgate is ajar (on vehicles without the optional EVIC only).
- **"glass"** - indicating the tailgate glass is ajar (on vehicles without the optional EVIC only).
- **"lowash"** - indicating that the washer fluid level is low (on vehicles without the optional EVIC only).
- **"no bus"** - indicating there is no PCI data bus communication detected.

An odometer/trip odometer switch on the EMIC circuit board is used to control some of the display modes. This switch is actuated manually by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just right of the speedometer. Actuating this switch momentarily with the ignition switch in the On position will toggle the VFD between the odometer and trip odometer modes. Depressing the switch button for about two seconds while the VFD is in the trip odometer mode will reset the trip odometer value to zero. Holding this switch depressed while turning the ignition switch from the Off position to the On position will initiate the EMIC self-diagnostic actuator test. The VFD will also display the cluster software version level near the completion of the EMIC self-diagnostic actuator test. Refer to the appropriate diagnostic information for additional details on this VFD function. The EMIC microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the display to that mode when the ignition switch is turned On again.

The VFD unit is diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic data bus message inputs to the EMIC that control some of the VFD functions requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific operation details for the odometer, the trip odometer, and the various warning and reminder indicator functions of the odometer VFD may be found elsewhere in this service information.

INDICATORS

Indicators are located in various positions within the EMIC and are all connected to the EMIC electronic circuit board. The turn signal indicators, security indicator, washer fluid indicator, and coolant low indicator (diesel engine only) use hard wired inputs to the EMIC. The brake indicator is controlled by PCI data bus messages from the Controller Antilock Brake (CAB) as well as by hard wired park brake switch and brake fluid level switch inputs to the EMIC. The Malfunction Indicator Lamp (MIL) is normally controlled by PCI data bus messages from the Powertrain Control Module (PCM); however, if the EMIC loses PCI data bus communication, the EMIC circuitry will automatically turn the MIL on until PCI data bus communication is restored. The EMIC uses PCI data bus messages from the Body Control Module (BCM), the PCM, the Airbag Control Module (ACM), and the CAB to control all of the remaining indicators.

INSTRUMENT CLUSTER (Continued)

The various EMIC indicators are controlled by different strategies; some receive fused ignition switch output from the EMIC circuitry and have a switched ground, others are grounded through the EMIC circuitry and have a switched battery feed, while still others are completely controlled by the EMIC microprocessor based upon various hard wired and electronic message inputs. Some indicators are illuminated at a fixed intensity, while the illumination intensity of others is synchronized with that of the EMIC general illumination lamps.

In addition, certain indicators in this instrument cluster are automatically configured or self-configured. This feature allows the configurable indicators to be enabled by the EMIC circuitry for compatibility with certain optional equipment. The ABS indicator, airbag indicator, and SKIS indicator are automatically configured by PCI data bus messages received by the EMIC from the CAB, ACM, or Sentry Key Immobilizer Module (SKIM) after the EMIC is installed in the vehicle. Once these configuration settings are learned by the EMIC, the DRBIII® scan tool must be used to remove these settings from the EMIC non-volatile memory. The automatically configured or self-configured indicators remain latent in each EMIC at all times and will be active only when the EMIC receives the appropriate PCI message inputs for the optional system or equipment.

The hard wired indicator inputs are diagnosed using conventional diagnostic methods. However, the EMIC circuitry and PCI bus message controlled indicators are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic message inputs to the EMIC that control an indicator requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific details of the operation for each indicator may be found elsewhere in this service information.

CLUSTER ILLUMINATION

The EMIC has several illumination lamps that are illuminated when the exterior lighting is turned on with the headlamp switch. The illumination intensity of these lamps is adjusted when the interior lighting control ring on the left control stalk of the multi-function switch is rotated (down to dim, up to brighten) to one of six available minor detent positions. The Body Control Module (BCM) monitors a resistor multiplexed input from the multi-function switch on a panel lamps dimmer switch mux circuit. In response to that input, the BCM provides a control output to energize the park lamp relay and an electronic dimming level message to the EMIC over the Programmable Communications Interface (PCI) data bus based upon internal programming.

The EMIC receives the electronic dimming level message from the BCM, and a battery current input from the energized park lamp relay on the hard wired fused park lamp relay output. Based upon the dimming level message, the EMIC then converts the battery current input to the appropriate 12-volt Pulse Width Modulated (PWM) output. This PWM output is used to illuminate the cluster illumination lamps and the VFD on the EMIC circuit board, and provides a PWM output on the hard wired fused panel lamps dimmer switch signal circuit to control and synchronize the illumination intensity of other incandescent illumination lamps in the vehicle. The cluster illumination lamps are grounded at all times.

The BCM also sends electronic dimming level messages over the PCI data bus to other electronic modules in the vehicle to control and synchronize the illumination intensity of their VFD units to that of the EMIC VFD unit. In addition, the control ring on the left (lighting) control stalk of the multi-function switch has a Parade Mode position to provide a parade mode. The BCM monitors the request for this mode from the multi-function switch, then sends an electronic dimming level message to the over the PCI data bus to illuminate all VFD units in the vehicle at full (daytime) intensity for easier visibility when driving in daylight with the exterior lighting turned on.

The hard wired multi-function switch and EMIC panel lamps dimmer inputs and outputs may be diagnosed using conventional diagnostic methods. However, proper testing of the PWM output of the EMIC and the electronic dimming level messages sent by the BCM over the PCI data bus requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

CHIME SERVICE

The EMIC is equipped with hardware and software to provide chime service for all available features in the chime warning system. Upon receiving the proper chime inputs, the EMIC activates an integral on-board audible tone generator to provide audible chime tones to the vehicle operator. The chime tone generator in the EMIC is capable of producing single chime tones or repeated chime tones at two different rates: a slow rate of about fifty chime tones per minute, and a fast rate of about 180 chime tones per minute. The internal programming of the EMIC determines the priority of each chime tone request input that is received, as well as the rate and duration of each chime tone that is to be generated.

INSTRUMENT CLUSTER (Continued)

The EMIC is programmed to provide chime service when certain indicators are illuminated. In addition, the EMIC is programmed to provide chime service for other electronic modules in the vehicle when it receives the proper electronic chime request messages over the Programmable Communications Interface (PCI) data bus. (Refer to 8 - ELECTRICAL/CHIME/BUZZER - OPERATION).

The hard wired chime inputs to the EMIC and the Body Control Module (BCM) may be diagnosed using conventional diagnostic methods. However, proper testing of the EMIC programming and the electronic chime request messages received by the EMIC over the PCI data bus requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

INPUT AND OUTPUT CIRCUITS

HARD WIRED INPUTS

The hard wired inputs to the EMIC include the following:

- **BCM Wake Up Input**
- **Fused B(+) - Ignition-Off Draw**
- **Fused Ignition Switch Output (Run-Start)**
- **Fused Park Lamp Relay Output**
- **Left Turn Signal**
- **Low Coolant Fluid Level Sense - with Diesel Engine**
- **Low Washer Fluid Sense**
- **Park Brake Switch Sense**
- **Red Brake Warning Indicator Driver**
- **Right Turn Signal**
- **VTSS Indicator Driver**

Refer to the appropriate wiring information for additional details.

HARD WIRED OUTPUTS

The hard wired outputs of the EMIC include the following:

- **Fused Panel Lamps Dimmer Switch Signal**

Refer to the appropriate wiring information for additional details.

GROUNDS

The EMIC receives a ground path through the following hard wired circuits:

- **Power Ground**

Refer to the appropriate wiring information for additional details.

COMMUNICATION

The EMIC has provisions for the following communication circuits:

- **PCI Data Bus**

Refer to the appropriate wiring information for additional details.

DIAGNOSIS AND TESTING - INSTRUMENT CLUSTER

If all of the instrument cluster gauges and/or indicators are inoperative, refer to PRELIMINARY DIAGNOSIS . If an individual gauge or Programmable Communications Interface (PCI) data bus message-controlled indicator is inoperative, refer to ACTUATOR TEST . If an individual hard wired indicator is inoperative, refer to the diagnosis and testing information for that specific indicator. If the instrument cluster illumination lighting is inoperative, refer to CLUSTER ILLUMINATION DIAGNOSIS .

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

NOTE: The practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. If the instrument cluster has been replaced, certain indicators in this instrument cluster will be automatically configured when the cluster is connected to the electrical system of the vehicle. This feature allows those indicators to be activated for compatibility with certain optional equipment. Some other indicators may require manual intervention to obtain proper configuration for the equipment in the specific vehicle. If the problem being diagnosed involves erroneous illumination of the ABS indicator, the airbag indicator, the Part Time indicator, the Full Time indicator, or the SKIS indicator when the vehicle does not have the appropriate equipment, a DRBIII® scan tool must be used to manually enable or disable the correct indicator(s). Refer to the appropriate diagnostic information.

INSTRUMENT CLUSTER (Continued)

PRELIMINARY DIAGNOSIS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check the fused B(+) fuse (Fuse 34 - 15 ampere) in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse (Fuse 34 - 15 ampere) in the JB. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit between the JB and the Power Distribution Center (PDC) as required.

(3) Disconnect and isolate the battery negative cable. Remove the instrument cluster. Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the instrument cluster. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the instrument cluster and the JB as required.

(4) Check the fused ignition switch output (run-start) fuse (Fuse 13 - 10 ampere) in the JB. If OK, go to Step 5. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(5) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-start) fuse (Fuse 13 - 10 ampere) in the JB. If OK, go to Step 6. If not OK, repair the open fused ignition switch output (run-start) circuit between the JB and the ignition switch as required.

(6) With the ignition switch still in the On position, check for battery voltage at the fused ignition switch output (run-start) circuit cavity of the instrument panel wire harness connector for the instrument cluster. If OK, go to Step 7. If not OK, repair the open fused ignition switch output circuit (run-start) between the instrument cluster and the JB as required.

(7) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Check for continuity between the ground circuit cavity of the instrument panel wire harness connector for the instrument cluster and a good ground. There should be continuity. If OK, refer to ACTUATOR TEST . If not OK, repair the open ground circuit between the instrument cluster and ground (G202) as required.

ACTUATOR TEST

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, the PCI data bus message controlled indicators, and the chime tone generator are capable of operating as designed. During the actuator test the instrument cluster circuitry will sound the audible tone generator, position each of the gauge needles at various calibration points, illuminate each of the segments in the Vacuum-Fluorescent Display (VFD), and turn all of the PCI data bus message-controlled indicators on and off again.

Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the PCI data bus, the Powertrain Control Module (PCM), the Airbag Control Module (ACM), the Body Control Module (BCM), the Sentry Key Immobilizer Module (SKIM), or the inputs to one of these electronic control modules. Use a DRBIII® scan tool to diagnose these components. Refer to the appropriate diagnostic information.

(1) Begin the test with the ignition switch in the Off position.

(2) Depress the odometer/trip odometer switch button.

INSTRUMENT CLUSTER (Continued)

(3) While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.

(4) Release the odometer/trip odometer switch button.

(5) The instrument cluster will automatically begin the actuator test sequence, as follows:

(a) The cluster will turn on, then off again each of the PCI data bus message controlled indicators to confirm the functionality of the indicator and the cluster control circuitry:

(b) The cluster will sweep the needles for each of the gauges to several calibration points in sequence to confirm the functionality of the gauge and the cluster control circuitry:

(c) The cluster will sequentially step the odometer/trip odometer VFD display from all ones (111111) through all nines (999999) to confirm the functionality of all VFD segments and their control circuitry, then display the software version number.

(d) The cluster will generate five (5) chime tones to confirm the functionality of the audible tone generator and the control circuitry.

(6) The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test, if the ignition switch is turned to the Off position during the test, or if an engine rpm message indicating that the engine is running is received from the PCM over the PCI data bus during the test.

(7) Go back to Step 1 to repeat the test, if required.

CLUSTER ILLUMINATION DIAGNOSIS

If the problem being diagnosed is a single inoperative illumination lamp, be certain that the bulb and bulb holder unit are properly installed in the instrument cluster electronic circuit board. If no installation problems are found, replace the faulty bulb and bulb holder unit. If all of the cluster illumination lamps are inoperative, the most reliable, efficient, and accurate means to diagnose the cluster illumination function of the instrument cluster requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).

(3) Remove the four screws that secure the instrument cluster to the instrument panel (Fig. 4).

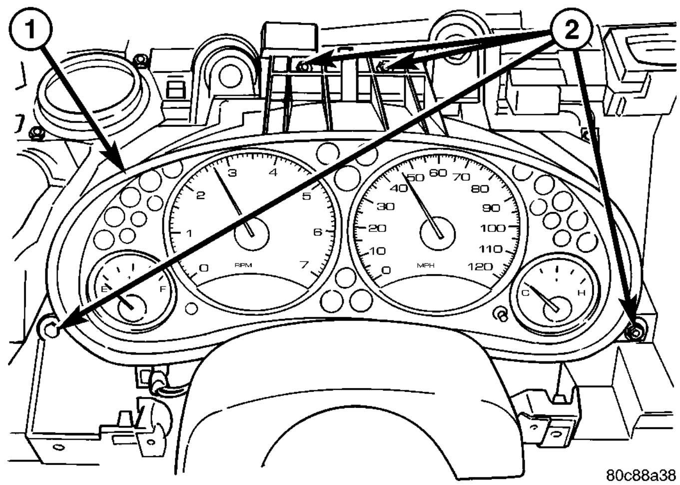

Fig. 4 Instrument Cluster Remove/Install

1 - INSTRUMENT CLUSTER
2 - SCREW (4)

(4) Pull the instrument cluster rearward far enough to access and disconnect the instrument panel wire harness connector for the cluster from the cluster connector receptacle.

(5) Remove the instrument cluster from the instrument panel.

DISASSEMBLY

Some of the components for the instrument cluster used in this vehicle are serviced individually. The serviced components include the incandescent instrument cluster illumination lamp bulbs (including the integral bulb holders), and the cluster lens, hood and mask unit. Following are the procedures for disassembling these components from the instrument cluster unit.

INSTRUMENT CLUSTER (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CLUSTER BULB

This procedure applies to each of the incandescent cluster illumination lamp and bulb holder units.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) Turn the bulb holder counterclockwise about sixty degrees on the cluster electronic circuit board (Fig. 5).

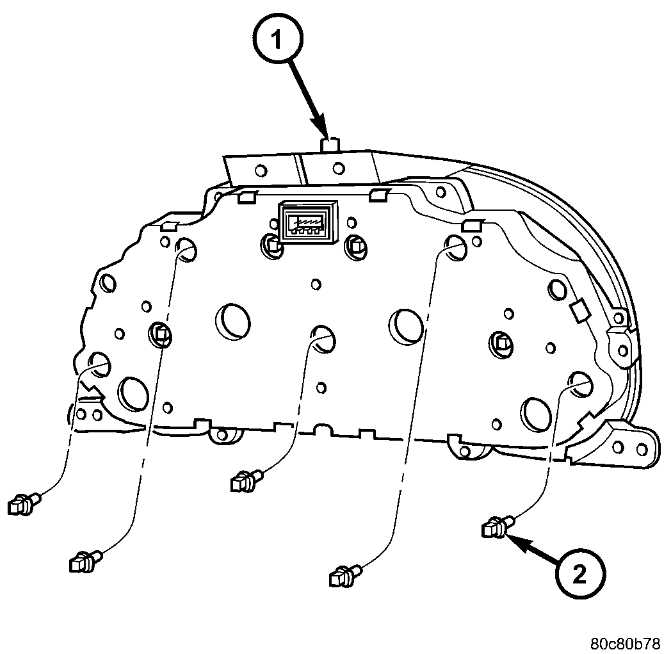

Fig. 5 Cluster Bulb Remove/Install

1 - INSTRUMENT CLUSTER
2 - BULB & HOLDER (9)

(4) Pull the bulb and bulb holder unit straight back to remove it from the bulb mounting hole in the cluster electronic circuit board.

CLUSTER LENS, HOOD, AND MASK

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) From the back of the instrument cluster, remove the six screws that secure the rear cover and the lens, hood, and mask unit to the cluster housing (Fig. 6).

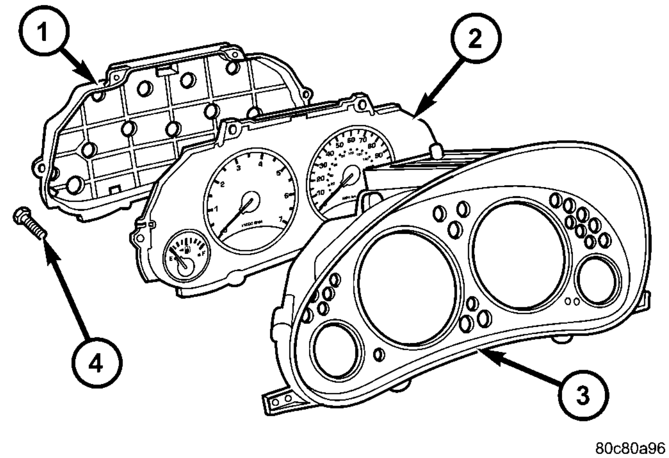

Fig. 6 Instrument Cluster Components

1 - REAR COVER
2 - CLUSTER HOUSING
3 - LENS, HOOD & MASK
4 - SCREW (6)

(4) Remove the lens, hood, and mask unit from the face of the instrument cluster.

INSTRUMENT CLUSTER (Continued)

ASSEMBLY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CLUSTER BULB

This procedure applies to each of the incandescent cluster illumination lamp and bulb holder units.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the instrument cluster, the electronic circuit board and/or the gauges.

(1) Insert the bulb and bulb holder unit straight into the correct bulb mounting hole in the cluster electronic circuit board (Fig. 5).

(2) With the bulb holder fully seated against the cluster electronic circuit board, turn the bulb holder clockwise about sixty degrees to lock it into place.

(3) Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(4) Reconnect the battery negative cable.

CLUSTER LENS, HOOD, AND MASK

(1) Position the cluster lens, hood, and mask unit over the face of the instrument cluster (Fig. 6). Be certain that the odometer/trip odometer switch button is inserted through the proper clearance holes in the mask and the lens.

(2) From the back of the instrument cluster, install and tighten the six screws that secure the rear cover and the lens, hood, and mask unit to the cluster housing. Tighten the screws to 1 N·m (10 in. lbs.).

(3) Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(4) Reconnect the battery negative cable.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the instrument cluster to the instrument panel.

(2) Reconnect the instrument panel wire harness connector for the cluster to the cluster connector receptacle.

(3) Position the instrument cluster into the instrument panel.

(4) Install and tighten the four screws that secure the instrument cluster to the instrument panel (Fig. 4). Tighten the screws to 2 N·m (17 in. lbs.).

(5) Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(6) Reconnect the battery negative cable.

NOTE: If the instrument cluster has been replaced, certain indicators in this instrument cluster will be automatically configured when the cluster is connected to the electrical system of the vehicle. This feature allows those indicators to be activated for compatibility with certain optional equipment. Some other indicators may require manual intervention to obtain proper configuration for the equipment in the specific vehicle. If a problem is noted involving erroneous illumination of the ABS indicator, the airbag indicator, the Part Time indicator, the Full Time indicator, or the SKIS indicator when the vehicle does not have the appropriate equipment, a DRBIII® scan tool must be used to manually enable or disable the correct indicator(s). Refer to the appropriate diagnostic information.

ABS INDICATOR

DESCRIPTION

An Antilock Brake System (ABS) indicator is standard equipment on all instrument clusters. However, the instrument cluster is programmed to automatically enable this indicator only on vehicles equipped with the optional antilock brake system. The ABS indicator is located above the engine temperature gauge and to the right of the speedometer in the instrument cluster. The ABS indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Failure of Anti-lock Braking System” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The ABS indicator is serviced as a unit with the instrument cluster.

OPERATION

The ABS indicator gives an indication to the vehicle operator when the ABS system is faulty or inoperative. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Programmable Communications Interface (PCI) data bus. The ABS indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ABS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ABS indicator is illuminated by the cluster for about three seconds as a bulb test.
- **ABS Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the ABS indicator will be illuminated. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no lamp-on or lamp-off messages from the CAB for six consecutive seconds, the ABS indicator is illuminated. The indicator remains illuminated until the cluster receives a valid message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the ABS indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.
- **ABS Diagnostic Test** - The ABS indicator is blinked on and off by lamp-on and lamp-off messages from the CAB during the performance of the ABS diagnostic tests.

The CAB continually monitors the ABS circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ABS indicator fails to light due to an open or short in the cluster ABS indicator circuit, the cluster sends a message notifying the CAB of the condition, then the instrument cluster and the CAB will each store a DTC. For proper diagnosis of the antilock brake system, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the ABS indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

AIRBAG INDICATOR

DESCRIPTION

An airbag indicator is standard equipment on all instrument clusters. However, the instrument cluster is programmed to automatically enable this indicator only on vehicles equipped with the airbag system, which is not available in some markets. The airbag indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The airbag indicator consists of a stencil-like cutout of the words “AIR BAG” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “AIR BAG” text to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by

AIRBAG INDICATOR (Continued)

the LED, which is soldered onto the instrument cluster electronic circuit board. The airbag indicator is serviced as a unit with the instrument cluster.

OPERATION

The airbag indicator gives an indication to the vehicle operator when the airbag system is faulty or inoperative. The airbag indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Airbag Control Module (ACM) over the Programmable Communications Interface (PCI) data bus. The airbag indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the airbag indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the airbag indicator is illuminated for about six seconds. The entire six second bulb test is a function of the ACM.
- **ACM Lamp-On Message** - Each time the cluster receives a lamp-on message from the ACM, the airbag indicator will be illuminated. The indicator remains illuminated for about twelve seconds or until the cluster receives a lamp-off message from the ACM, whichever is longer.
- **Communication Error** - If the cluster receives no airbag messages for six consecutive seconds, the airbag indicator is illuminated. The indicator remains illuminated until the cluster receives a single lamp-off message from the ACM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the airbag indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the airbag indicator is a function of the instrument cluster.

The ACM continually monitors the airbag system circuits and sensors to decide whether the system is in good operating condition. The ACM then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the ACM sends a lamp-on message after the bulb test, it indicates that the ACM has detected a system malfunction and/or that the airbags and driver seat belt tensioner may not deploy when required, or may deploy when not required. The ACM will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the airbag indicator fails to illuminate due to an open or short in the cluster airbag indicator circuit, the cluster sends a message notifying the ACM of the condition, then the instrument cluster and the ACM will each store a DTC. For proper diagnosis of the airbag system, the ACM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the airbag indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

BRAKE/PARK BRAKE INDICATOR

DESCRIPTION

A brake indicator is standard equipment on all instrument clusters. The brake indicator is located near the lower edge of the tachometer dial face in the instrument cluster. The brake indicator consists of stencil-like cutouts of the word “BRAKE” and the International Control and Display Symbol icon for “Brake Failure” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “BRAKE” text and the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The brake indicator is serviced as a unit with the instrument cluster.

OPERATION

The brake indicator gives an indication to the vehicle operator when the parking brake is applied, when there are certain brake hydraulic system malfunctions as indicated by a low brake hydraulic fluid level condition, or when the brake fluid level switch is disconnected. On models equipped with an optional Antilock Brake System (ABS), the brake indicator can also give an indication when certain faults are detected in the ABS. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Programmable Communications Interface (PCI) data bus (ABS only), and hard wired inputs from the park brake switch and the brake fluid level switch. The brake indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the

BRAKE/PARK BRAKE INDICATOR (Continued)

fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the brake indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the brake indicator is illuminated by the instrument cluster for about three seconds as a bulb test.
- **Brake Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the brake indicator will be illuminated. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Park Brake Switch Input** - Each time the cluster detects ground on the park brake switch sense circuit (park brake switch closed = park brake applied or not fully released) while the ignition switch is in the On position, the brake indicator is illuminated. The indicator remains illuminated until the park brake switch sense input to the cluster is an open circuit (park brake switch open = park brake fully released), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Brake Fluid Level Switch Input** - Each time the cluster detects ground on the red brake warning indicator driver circuit (brake fluid level switch closed = brake hydraulic system fluid level low) while the ignition switch is in the On position, the brake indicator is illuminated. The indicator remains illuminated until the status of the red brake warning indicator driver input to the cluster is off (brake fluid level switch off = brake hydraulic system fluid level is not low), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Brake Fluid Level Switch Input Fault** - The brake fluid level switch also features a 1 kilohm diagnostic resistor connected in parallel between the switch input and output to provide the cluster with verification that the red brake warning indicator driver circuit is not open. If the cluster does not see a proper input on the red brake warning indicator driver circuit while the ignition switch is in the On position, it will turn on the brake indicator. The indicator remains illuminated until the red brake warning indicator driver circuit fault is resolved, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the brake indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The park brake switch on the park brake pedal mechanism provides a hard wired ground input to the instrument cluster circuitry through the park brake switch sense circuit whenever the park brake is applied or not fully released. The brake fluid level switch on the brake master cylinder reservoir provides a hard wired ground input to the instrument cluster circuitry through the red brake warning indicator driver circuit whenever the fluid level in the reservoir becomes low. On models equipped with the optional ABS system, the CAB continually monitors the ABS system circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a brake hydraulic system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects.

For further diagnosis of the brake indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The park brake switch input to the instrument cluster may be diagnosed using conventional diagnostic tools and methods. For proper diagnosis of the brake fluid level switch input to the instrument cluster, the ABS, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the brake indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - BRAKE INDICATOR

The diagnosis found here addresses an inoperative brake indicator condition. If there are problems with several indicators in the instrument cluster, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the brake indicator stays on with the ignition switch in the On position and the park brake released, or comes on while driving, the brake system must be diagnosed and repaired prior to performing the following tests. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING). If no brake system problem is found, the following procedures will help to locate a shorted or open circuit, or a faulty park brake switch input. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

BRAKE/PARK BRAKE INDICATOR (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

INDICATOR ILLUMINATES DURING BULB TEST, BUT DOES NOT WHEN PARK BRAKE APPLIED

(1) Disconnect and isolate the battery negative cable. Disconnect the front body wire harness connector for the park brake switch from the switch terminal. Apply the parking brake. Check for continuity between the park brake switch terminal and a good ground. There should be continuity. If OK, go to Step 2. If not OK, replace the faulty park brake switch.

(2) Disconnect the instrument panel wire harness connector for the instrument cluster from the cluster connector receptacle. Check for continuity between the park brake switch sense circuit cavities of the front body wire harness connector for the park brake switch and the instrument panel wire harness connector for the instrument cluster. There should be continuity. If not OK, repair the open park brake switch sense circuit between the park brake switch and the instrument cluster as required.

INDICATOR REMAINS ILLUMINATED - BRAKE SYSTEM CHECKS OK

(1) Disconnect and isolate the battery negative cable. Disconnect the front body wire harness connector for the park brake switch from the switch terminal. Check for continuity between the terminal of the park brake switch and a good ground. There should be no continuity with the park brake released, and continuity with the park brake applied. If OK, go to Step 2. If not OK, replace the faulty park brake switch.

(2) Disconnect the instrument panel wire harness connector for the instrument cluster from the cluster connector receptacle. Check for continuity between the park brake switch sense circuit cavity of the front body wire harness connector for the park brake switch and a good ground. There should be no continuity. If not OK, repair the shorted park brake switch sense circuit between the park brake switch and the instrument cluster as required.

CHARGING INDICATOR

DESCRIPTION

A charging indicator is standard equipment on all instrument clusters. The charging indicator is located above the engine temperature gauge and to the right of the speedometer in the instrument cluster. The charging indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Battery Charging Condition” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The charging indicator is serviced as a unit with the instrument cluster.

OPERATION

The charging indicator gives an indication to the vehicle operator when the electrical system voltage is too low or too high. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The charging indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the charging indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the charging indicator is illuminated by the instrument cluster for about three seconds as a bulb test.
- **Charge Fail Message** - Each time the cluster receives a charge fail message from the PCM (system voltage is nine volts or lower), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating there is no charge fail condition (sys-

CHARGING INDICATOR (Continued)

tem voltage is twelve volts or higher, but lower than sixteen volts), or until the ignition switch is turned to the Off position, whichever occurs first.

- **Voltage High Message** - Each time the cluster receives a message from the PCM indicating a voltage high condition (system voltage is sixteen volts or higher), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating there is no voltage high condition (system voltage is lower than sixteen volts, but higher than nine volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the charging indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the electrical system voltage to control the generator output. The PCM then sends the proper system voltage messages to the instrument cluster. If the instrument cluster turns on the indicator after the bulb test, it may indicate that the charging system requires service. For further diagnosis of the charging indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the charging system, the PCI data bus, or the electronic message inputs to the instrument cluster that control the charging indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

COOLANT LOW INDICATOR

DESCRIPTION

A coolant low indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The coolant low indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The coolant low indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "Low Engine Coolant" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The coolant low indicator is serviced as a unit with the instrument cluster.

OPERATION

The coolant low indicator gives an indication to the vehicle operator when the diesel engine coolant level is low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the engine coolant level switch. The coolant low indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the coolant low indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the coolant low indicator is illuminated for about three seconds as a bulb test.
- **Engine Coolant Level Switch Input** - Each time the cluster detects ground on the low coolant fluid level sense circuit (engine coolant level switch closed = engine coolant level low) while the ignition switch is in the On position, the cluster applies an algorithm to confirm that the input is correct and not the result of coolant sloshing in the coolant bottle. The cluster tests the status of the circuit about seven milliseconds after ignition On, and about once every second thereafter, then uses an internal counter to count up or down. When the counter accumulates thirty ground inputs on the circuit, the coolant low indicator will be illuminated. The indicator remains illuminated until the low coolant fluid level sense input to the cluster is an open circuit (engine coolant level switch open = engine coolant level full), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Coolant Level Switch Input Fault** - The engine coolant level switch also features a 3.3 kilohm diagnostic resistor connected in parallel between the switch input and output to provide the cluster with verification that the low coolant fluid level sense circuit is not open or shorted. If the cluster does not see a proper input on the low coolant fluid level sense circuit, it will suspend coolant low indicator operation. The indicator operation remains suspended until the low coolant fluid level sense circuit fault is resolved.
- **Actuator Test** - Each time the cluster is put through the actuator test, the coolant low indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

COOLANT LOW INDICATOR (Continued)

The engine coolant level switch on the coolant bottle provides a hard wired ground input to the instrument cluster circuitry through the low coolant fluid level sense circuit whenever the level of the coolant in the bottle is low. For further diagnosis of the coolant low indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the engine coolant level switch input to the instrument cluster that controls the coolant low indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

CRUISE INDICATOR

DESCRIPTION

A cruise indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional speed control system, this indicator is electronically disabled. The cruise indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer. The cruise indicator consists of a stencil-like cutout of the word “CRUISE” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A green Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “CRUISE” text to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the cruise indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The cruise indicator is serviced as a unit with the instrument cluster.

OPERATION

The cruise indicator gives an indication to the vehicle operator when the speed control system is turned On, regardless of whether the speed control is engaged. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The cruise indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the cruise indicator for the following reasons:

- **Cruise Lamp-On Message** - Each time the cluster receives a cruise lamp-on message from the PCM indicating the speed control system has been turned On, the cruise indicator is illuminated. The indicator remains illuminated until the cluster receives a cruise lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the cruise indicator will be turned on, then off again during the bulb check portion of the test in order to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the speed control switches to determine the proper outputs to the speed control servo. The PCM then sends the proper cruise indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the cruise indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the speed control system, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the cruise indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

DOOR AJAR INDICATOR

DESCRIPTION

A door ajar indicator is standard equipment on all instrument clusters. However, on models equipped with the optional Electronic Vehicle Information Center (EVIC) the door ajar indicator in the cluster is electronically suppressed so as not to duplicate indications that are provided by the EVIC. The door ajar indicator consists of the word “door”, which appears in place of the odometer/trip odometer information in the Vacuum-Fluorescent Display (VFD) of the instrument cluster. The VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located near the lower edge of the speedometer dial face of the cluster overlay. The dark lens over the window prevents the VFD from being clearly visible when it is not illuminated. The word “door” appears in the same blue-green color and at the same lighting level as the

DOOR AJAR INDICATOR (Continued)

odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The door ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The door ajar indicator gives an indication to the vehicle operator that one or more of the passenger compartment doors may be open or not completely latched. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The door ajar indicator function of the Vacuum Fluorescent Display (VFD) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the VFD door ajar indication will always be off when the ignition switch is in any position except On or Start. The instrument cluster will turn on the door ajar indicator for the following reasons:

- **Door Ajar Lamp-On Message** - Each time the cluster receives a door ajar lamp-on message from the BCM indicating that a door is open or not completely latched, the door ajar indicator will be illuminated. If the ignition switch is in the On position and the vehicle is not moving when the door ajar lamp-on message is received, the VFD will repeatedly and sequentially cycle the door ajar indication in two second intervals with the odometer/trip odometer information and any other active warnings including: gate ajar, glass ajar, and low washer fluid. If the vehicle is moving, or once the cluster of a non-moving vehicle receives an electronic vehicle speed message from the Powertrain Control Module (PCM) indicating a speed greater than zero, the warning sequence will consist of three complete display cycles with an audible single chime tone accompanying each cycle, then revert to only the visual door ajar indication and odometer/trip odometer display cycling until the door ajar switch is cycled. The door ajar indicator will also be extinguished when the cluster receives a door ajar lamp-off message from the BCM, or if the ignition switch is turned to the Off position, whichever occurs first.

The BCM continually monitors the door ajar switches that are integral to each door latch to determine the status of the doors. The BCM then sends the proper door ajar lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the door ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the door ajar switches and circuits, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the door ajar indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

ENGINE TEMPERATURE GAUGE

DESCRIPTION

An engine coolant temperature gauge is standard equipment on all instrument clusters. The engine coolant temperature gauge is located in the lower right corner of the instrument cluster, to the right of the speedometer. The engine coolant temperature gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from “C” (or Cold) to “H” (or Hot) for all engines. An International Control and Display Symbol icon for “Engine Coolant Temperature” is located on the cluster overlay, in the center of the gauge directly above the hub of the gauge needle. The engine coolant temperature gauge graphics are dark blue and black against a beige field, except for a single light blue graduation at the far left (Cold) end of the gauge scale and a single red graduation at the far right (Hot) end of the gauge scale, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the blue graphics appear blue and the red graphics appear red. The orange gauge needle is internally illuminated. Gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. The engine coolant temperature gauge is serviced as a unit with the instrument cluster.

OPERATION

The engine coolant temperature gauge gives an indication to the vehicle operator of the engine coolant temperature. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The engine coolant temperature gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Temperature Normal Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is within the normal operating range [up to about 124° C (255° F) for gasoline engines, or about 110° C (230° F) for diesel engines], the gauge needle is moved to the actual relative temperature position on the gauge scale.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is high [above about 127° C (260° F) for gasoline engines, or 112° C (233° F) for diesel engines], the gauge needle is moved into the center of the red warning zone on the gauge scale.
- **Engine Temperature Critical Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is critical [above about 132° C (269° F) for gasoline engines, or 115° C (239° F) for diesel engines], the gauge needle is moved to the high end of the red warning zone on the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine coolant temperature gauge needle will be swept to several gauge calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine coolant temperature gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster moves the engine coolant temperature gauge needle to indicate a high or critical engine temperature, it may indicate that the engine or the engine cooling system requires service. For proper diagnosis of the engine coolant temperature sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the engine coolant temperature gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

FRONT FOG LAMP INDICATOR

DESCRIPTION

A front fog lamp indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional front fog lamps, this indicator is electronically disabled. The front fog lamp indicator is located above the engine temperature gauge and to the right of the speedometer in the instrument cluster. The front fog lamp indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Front Fog Light” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A green Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the front fog lamp indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The front fog lamp indicator is serviced as a unit with the instrument cluster.

OPERATION

The front fog lamp indicator gives an indication to the vehicle operator whenever the front fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communication Interface (PCI) data bus. The front fog lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the front fog lamp indicator for the following reasons:

- **Front Fog Lamp-On Message** - Each time the cluster receives a front fog lamp-on message from the BCM indicating the front fog lamps are turned On, the front fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a front fog lamp-off message from the BCM.

FRONT FOG LAMP INDICATOR (Continued)

• **Actuator Test** - Each time the cluster is put through the actuator test, the front fog lamp indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The BCM continually monitors the exterior lighting (multi-function) switch to determine the proper outputs to the front fog lamp relay. The BCM then sends the proper front fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the front fog lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the front fog lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the front fog lamp indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

FUEL GAUGE

DESCRIPTION

A fuel gauge is standard equipment on all instrument clusters. The fuel gauge is located in the lower left corner of the instrument cluster, to the left of the tachometer. The fuel gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from “E” (or Empty) to “F” (or Full). An International Control and Display Symbol icon for “Fuel” is located on the cluster overlay, in the center of the gauge directly above the hub of the gauge needle. An arrowhead pointed to the left side of the vehicle is imprinted on the cluster overlay next to the “Fuel” icon in the fuel gauge to provide the driver with a reminder as to the location of the fuel filler access. The fuel gauge graphics are dark blue and black against a beige field, except for a single red graduation at the far left (Empty) end of the gauge scale, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the blue graphics appear blue and the red graphics appear red. The orange gauge needle is internally illuminated. Gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. The fuel gauge is serviced as a unit with the instrument cluster.

OPERATION

The fuel gauge gives an indication to the vehicle operator of the level of fuel in the fuel tank. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The fuel gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

• **Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full, the cluster moves the gauge needle to the proper relative position on the gauge scale. The PCM applies an algorithm to the input from the fuel tank sending unit to dampen gauge needle movement against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs to the PCM.

• **Less Than 15 Percent Tank Full Message** - Each time the cluster receives messages from the PCM indicating the percent tank full is less than 15, the gauge needle is moved to below the one-eighth position on the gauge scale and the low fuel indicator is illuminated. The low fuel indicator remains illuminated until the cluster receives messages from the PCM indicating that the percent tank full is greater than 15 (one-eighth), or until the ignition switch is turned to the Off position, whichever occurs first.

• **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is less than empty, the gauge needle is moved to the far left (low) end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sending unit input to the PCM is a short circuit.

• **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is more than full, the gauge needle is moved to the far left (low) end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sending unit input to the PCM is an open circuit.

• **Actuator Test** - Each time the cluster is put through the actuator test, the fuel gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the fuel tank sending unit input to determine the level of fuel in the fuel tank. The PCM then applies an algorithm to the input and sends the proper percent tank full messages to the instrument cluster. For further diagnosis of the fuel gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the fuel tank sending unit, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the fuel gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

GATE AJAR INDICATOR

DESCRIPTION

A gate ajar indicator is standard equipment on all instrument clusters. However, on models equipped with the optional Electronic Vehicle Information Center (EVIC) the gate ajar indicator in the cluster is electronically suppressed so as not to duplicate indications that are provided by the EVIC. The gate ajar indicator consists of the word “gate”, which appears in place of the odometer/trip odometer information in the Vacuum-Fluorescent Display (VFD) of the instrument cluster. The VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located near the lower edge of the speedometer dial face of the cluster overlay. The dark lens over the window prevents the VFD from being clearly visible when it is not illuminated. The word “gate” appears in the same blue-green color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The gate ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The gate ajar indicator gives an indication to the vehicle operator that the rear tailgate may be open or not completely latched. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The gate ajar indicator function of the Vacuum Fluorescent Display (VFD) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the VFD gate ajar indicator will always be off when the ignition switch is in any position except On or Start. The instrument cluster will turn on the gate ajar indicator for the following reasons:

- **Gate Ajar Lamp-On Message** - Each time the cluster receives a gate ajar lamp-on message from the BCM indicating that the rear tailgate is open or not completely latched, the gate ajar indicator will be illuminated. If the ignition switch is in the On position and the vehicle is not moving when the gate ajar lamp-on message is received, the VFD will repeatedly and sequentially cycle the gate ajar indication in two second intervals with the odometer/trip odometer information and any other active warnings including: door ajar, glass ajar, and low washer fluid. If the vehicle is moving, or once the cluster of a non-moving vehicle receives an electronic vehicle speed message from the Powertrain Control Module (PCM) indicating a speed greater than zero, the warning sequence will consist of three complete display cycles with an audible single chime tone accompanying each cycle, then revert to only the visual gate ajar indication and odometer/trip odometer display cycling until the tailgate ajar switch is cycled. The gate ajar indicator will also be extinguished when the cluster receives a gate ajar lamp-off message from the BCM, or if the ignition switch is turned to the Off position, whichever occurs first.

The BCM continually monitors the tailgate ajar switch that is integral to the tailgate latch to determine the status of the rear tailgate. The BCM then sends the proper gate ajar lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the gate ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the tailgate ajar switch and circuit, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the gate ajar indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

GLASS AJAR INDICATOR

DESCRIPTION

A glass ajar indicator is standard equipment on all instrument clusters. However, on models equipped with the optional Electronic Vehicle Information Center (EVIC) the glass ajar indicator in the cluster is electronically suppressed so as not to duplicate indications that are provided by the EVIC. The glass ajar

GLASS AJAR INDICATOR (Continued)

indicator consists of the word “glass”, which appears in place of the odometer/trip odometer information in the Vacuum-Fluorescent Display (VFD) of the instrument cluster. The VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located near the lower edge of the speedometer dial face of the cluster overlay. The dark lens over the window prevents the VFD from being clearly visible when it is not illuminated. The word “glass” appears in the same blue-green color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The glass ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The glass ajar indicator gives an indication to the vehicle operator that the rear flip-up glass may be open or not completely latched. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The glass ajar indicator function of the Vacuum Fluorescent Display (VFD) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the VFD glass ajar indicator will always be off when the ignition switch is in any position except On or Start. The instrument cluster will turn on the glass ajar indicator for the following reasons:

- **Glass Ajar Lamp-On Message -** Each time the cluster receives a glass ajar lamp-on message from the BCM indicating that the rear flip-up glass is open or not completely latched, the glass ajar indicator will be illuminated. If the ignition switch is in the On position and the vehicle is not moving when the glass ajar lamp-on message is received, the VFD will repeatedly and sequentially cycle its glass ajar indication in two second intervals with the odometer/trip odometer information and any other active warnings including: door ajar, gate ajar, and low washer fluid. If the vehicle is moving, or once the cluster of a non-moving vehicle receives an electronic vehicle speed message from the Powertrain Control Module (PCM) indicating a speed greater than zero, the warning sequence will consist of three complete display cycles with an audible single chime tone accompanying each of the first two cycles, then revert to only the visual glass ajar indication and odometer/trip odometer display cycling until the glass ajar switch is cycled. The glass ajar indicator will also be extinguished when the cluster receives a glass ajar lamp-off message from the BCM, or if the ignition switch is turned to the Off position, whichever occurs first.

The BCM continually monitors the glass ajar switch that is integral to the flip-up glass latch to determine the status of the rear flip-up glass. The BCM then sends the proper glass ajar lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the glass ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the glass ajar switch and circuit, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the glass ajar indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

HIGH BEAM INDICATOR

DESCRIPTION

A high beam indicator is standard equipment on all instrument clusters. The high beam indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer. The high beam indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “High Beam” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A blue Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in blue through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The high beam indicator is serviced as a unit with the instrument cluster.

OPERATION

The high beam indicator gives an indication to the vehicle operator whenever the headlamp high beams are illuminated. In certain markets where required, the high beam indicator also gives an indication when the optional light bar lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The high beam indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the

HIGH BEAM INDICATOR (Continued)

fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the high beam indicator for the following reasons:

- **High Beam Headlamps-On Message** - Each time the cluster receives a high beam headlamps-on message from the BCM indicating the headlamp high beams are turned On, the high beam indicator will be illuminated. The indicator remains illuminated until the cluster receives a high beam headlamps-off message from the BCM.
- **Light Bar Lamps-On Message** - This function of the high beam indicator applies only to vehicles equipped with the optional light bar lamps and manufactured for certain markets where it is required. Each time the cluster receives a light bar lamps-on message from the BCM indicating the light bar lamps are turned On, the high beam indicator will be illuminated. The indicator remains illuminated until the cluster receives a light bar lamps-off message from the BCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the high beam indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The BCM continually monitors the exterior lighting (multi-function) switch and the optional light bar lamp switch to determine the proper outputs to the headlamp low beam, headlamp high beam, and light bar lamp relays. The BCM then sends the proper high beam indicator and light bar lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the high beam indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the headlamp system, the light bar lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the high beam indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

LIGHT BAR LAMP INDICATOR

DESCRIPTION

A light bar lamp indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with the optional light bar. The light bar lamp indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The light bar lamp indicator consists of a stencil-like cutout of an icon in the opaque layer of the instrument cluster overlay. This icon is similar in appearance to the International Control and Display Symbol icon for “High Beam”, but has an additional curved line beneath it to represent the forward roofline of the vehicle. The dark outer layer of the overlay prevents the indicator from being clearly visible when the it is not illuminated. An amber or blue Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber or blue through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The color of the LED used is determined by the requirements of the market for which the vehicle is manufactured. When the exterior lighting is turned On, the illumination intensity of the light bar lamp indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The light bar lamp indicator is serviced as a unit with the instrument cluster.

OPERATION

The light bar lamp indicator gives an indication to the vehicle operator whenever the light bar lamps are illuminated. In certain markets where required, the high beam indicator also gives an indication when the optional light bar lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The light bar lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the light bar lamp indicator for the following reasons:

- **Light Bar Lamps-On Message** - Each time the cluster receives a light bar lamps-on message from the BCM indicating the light bar lamps are turned On, the light bar lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a light bar lamps-off message from the BCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the light bar lamp indicator will be turned on, then off again during the bulb

LIGHT BAR LAMP INDICATOR (Continued)

check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The BCM continually monitors the light bar lamp switch to determine the proper outputs to the light bar lamp relay. The BCM then sends the proper light bar lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the light bar lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the light bar lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the light bar lamp indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

LOW FUEL INDICATOR

DESCRIPTION

A low fuel indicator is standard equipment on all instrument clusters. The low fuel indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The low fuel indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Fuel” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The low fuel indicator is serviced as a unit with the instrument cluster.

OPERATION

The low fuel indicator gives an indication to the vehicle operator when the level of fuel in the fuel tank becomes low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The low fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low fuel indicator for the following reasons:

- **Bulb Test -** Each time the ignition switch is turned to the On position the low fuel indicator is illuminated for about three seconds as a bulb test.
- **Less Than 15 Percent Tank Full Message -** Each time the cluster receives messages from the PCM indicating that the percent tank full is less than 15, the low fuel indicator is illuminated. The indicator remains illuminated until the cluster receives messages from the PCM indicating that the percent tank full has increased to greater than 15. The PCM applies an algorithm to the input from the fuel tank sending unit to dampen the illumination of the low fuel indicator against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs to the PCM.
- **Less Than Empty Percent Tank Full Message -** Each time the cluster receives a message from the PCM indicating the percent tank full is less than empty, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sending unit input to the PCM is a short circuit.
- **More Than Full Percent Tank Full Message -** Each time the cluster receives a message from the PCM indicating the percent tank full is more than full, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sending unit input to the PCM is an open circuit.
- **Communication Error -** If the cluster fails to receive a percent tank full message for more than about twelve seconds, the cluster control circuitry will illuminate the low fuel indicator until a new percent tank full message is received, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test -** Each time the cluster is put through the actuator test, the low fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the fuel tank sending unit input to determine the level of fuel in the fuel tank. The PCM then applies an algorithm to the input and sends the proper percent tank full messages to the instrument cluster. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the fuel tank sending unit, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the low fuel indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

LOW OIL PRESSURE INDICATOR

DESCRIPTION

A low oil pressure indicator is standard equipment on all instrument clusters. The low oil pressure indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer. The low oil pressure indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine Oil” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The low oil pressure indicator is serviced as a unit with the instrument cluster.

OPERATION

The low oil pressure indicator gives an indication to the vehicle operator when the engine oil pressure is low. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The low oil pressure indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low oil pressure indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the low oil pressure indicator is illuminated as a bulb test. The indicator will remain illuminated until the engine is started (engine speed is greater than 450 rpm), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Oil Pressure Low Message** - Once the engine has been started (engine speed has been greater than 450 rpm), each time the cluster receives three consecutive messages from the PCM indicating that the engine oil pressure is about 4 kPa or lower (about 0.6 psi or lower), the low oil pressure indicator is illuminated. The indicator remains illuminated until the cluster receives a single message from the PCM indicating that the engine oil pressure is about 76 kPa or higher (about 11 psi or higher), or until the ignition switch is turned to the Off position, whichever occurs first. Once the cluster monitors an engine speed of greater than 450 rpm, the cluster logic will ignore engine speed in determining low oil pressure indicator operation for the remainder of the current ignition cycle.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low oil pressure indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine oil pressure sensor to determine the engine oil pressure. The PCM then sends the proper engine oil pressure messages to the instrument cluster. For further diagnosis of the low oil pressure indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the indicator after the bulb test, it may indicate that the engine or the engine oiling system requires service. For proper diagnosis of the engine oil pressure sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the low oil pressure indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

MALFUNCTION INDICATOR LAMP (MIL)

DESCRIPTION

A Malfunction Indicator Lamp (MIL) is standard equipment on all instrument clusters. The MIL is located above the coolant temperature gauge and to the right of the speedometer in the instrument cluster. The MIL consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The MIL is serviced as a unit with the instrument cluster.

MALFUNCTION INDICATOR LAMP (MIL) (Continued)

OPERATION

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. The MIL is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the PCM over the Programmable Communications Interface (PCI) data bus. The MIL Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the MIL is illuminated for about seven seconds as a bulb test.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. For some DTC's, if a problem does not recur, the PCM will send a lamp-off message automatically. Other DTC's may require that a fault be repaired and the PCM be reset before a lamp-off message will be sent. For more information on the PCM and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).
- **Communication Error** - If the cluster receives no lamp-on or lamp-off message from the PCM for twenty consecutive seconds, the MIL is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid lamp-on or lamp-off message is received from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the MIL will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the MIL or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the MIL after the bulb test, it may indicate that a malfunction has occurred and that the fuel and emissions systems may require service. For proper diagnosis of the fuel and emissions systems, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the MIL, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

ODOMETER

DESCRIPTION

An odometer and trip odometer are standard equipment in all instrument clusters. The odometer and trip odometer information are displayed in a common electronic, blue-green Vacuum Fluorescent Display (VFD). The VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located in the lower edge of the speedometer dial face of the cluster overlay. The dark lens over the VFD prevents it from being clearly visible when it is not illuminated. However, the odometer and trip odometer information are not displayed simultaneously. The trip odometer reset switch on the instrument cluster circuit board toggles the display between odometer and trip odometer modes by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just right of the odometer VFD. When the trip odometer information is displayed, the word “TRIP” is also illuminated near the bottom of the VFD in a blue-green color and at the same lighting level as the trip odometer information.

All odometer and trip odometer distance information is stored in the instrument cluster memory. This information can be increased when the proper inputs are provided to the instrument cluster, but the information cannot be decreased. The odometer can display values up to 864,004 kilometers (536,870 miles). The odometer latches at these values, and will not roll over to zero. The trip odometer can display values up to 9,999.9 kilometers (9,999.9 miles) before it rolls over to zero. The odometer display does not have a decimal point and will not show values less than a full unit (kilometer or mile), while the trip odometer display does have a decimal point and will show tenths of a unit (kilometer or mile). The unit of measure (kilometers or miles) for the odometer and trip odometer display is not shown in the VFD. The unit of measure for the instrument cluster odometer/trip odometer is selected at the time that it is manufactured, and cannot be changed. If the instrument cluster has a kilometers-per-hour primary speedome-

ODOMETER (Continued)

ter scale, the odometer/trip odometer registers kilometers; and if the cluster features a miles-per-hour primary speedometer scale, the odometer/trip odometer registers miles.

The odometer/trip odometer has a “Rental Car” mode, which will illuminate the odometer information in the VFD whenever the driver side front door is opened with the ignition switch in the Off or Accessory positions. During daylight hours (exterior lamps Off) the VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On) the VFD lighting level is adjusted with the other cluster illumination lamps using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. However, a “Parade” mode position of the panel lamps dimmer control ring allows the VFD to be illuminated at full brightness if the exterior lamps are turned On during daylight hours.

The VFD, the trip odometer switch, and the trip odometer switch button are serviced as a unit with the instrument cluster.

OPERATION

The odometer and trip odometer give an indication to the vehicle operator of the distance the vehicle has traveled. This indicator is controlled by the instrument cluster circuitry based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The odometer and trip odometer information is displayed by the instrument cluster Vacuum Fluorescent Display (VFD). The VFD will display the odometer information whenever the driver side front door is opened with the ignition switch in the Off or Accessory positions, and will display the last previously selected odometer or trip odometer information when the ignition switch is turned to the On or Start positions. The instrument cluster circuitry controls the VFD and provides the following features:

- **Odometer/Trip Odometer Display Toggling** - Actuating the trip odometer reset switch button momentarily with the VFD illuminated will toggle the display between the odometer and trip odometer information. Each time the VFD is illuminated with the ignition switch in the On or Start positions, the display will automatically return to the last mode previously selected (odometer or trip odometer).
- **Trip Odometer Reset** - When the trip odometer reset switch button is pressed and held for longer than about two seconds with the ignition switch in the On or Start positions, the trip odometer will be reset to 0.0 kilometers (miles). The VFD must be displaying the trip odometer information in order for the trip odometer information to be reset.
- **Communication Error** - If the cluster fails to receive a distance message during normal operation, it will hold and display the last data received until the ignition switch is turned to the Off position. If the cluster does not receive a distance message within one second after the ignition switch is turned to the On position, it will display the last distance message stored in the cluster memory. If the cluster is unable to display distance information due to an error internal to the cluster, the word “error” will be displayed in the VFD.
- **Actuator Test** - Each time the cluster is put through the actuator test, the VFD will step sequentially through a display of “111111” through “999999”, then display the cluster software version number to confirm the functionality of each of the VFD segments and the cluster control circuitry.

The PCM continually monitors the vehicle speed pulse information received from the Body Control Module (BCM), then sends the proper distance messages to the instrument cluster. For further diagnosis of the odometer/trip odometer or the instrument cluster circuitry that controls these functions, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the vehicle speed sensor, the BCM, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the odometer/trip odometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

OVERDRIVE OFF INDICATOR

DESCRIPTION

An overdrive off indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional overdrive automatic transmission, this indicator is electronically disabled. The overdrive off indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The overdrive off indicator consists of a stencil-like cutout of the words “O/D OFF” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the text from being clearly visible when the indicator is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “O/D OFF” text to appear in amber through the translucent outer layer of the overlay when it is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the overdrive off indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer

OVERDRIVE OFF INDICATOR (Continued)

control ring on the left control stalk of the multi-function switch. The overdrive off indicator is serviced as a unit with the instrument cluster.

OPERATION

The overdrive off indicator gives an indication to the vehicle operator when the Off position of the overdrive off switch has been selected, disabling the electronically controlled overdrive feature of the automatic transmission. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The overdrive off indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the overdrive off indicator for the following reasons:

- **Overdrive Off Lamp-On Message** - Each time the cluster receives an overdrive off lamp-on message from the PCM indicating that the Off position of the overdrive off switch has been selected, the overdrive off indicator will be illuminated. The indicator remains illuminated until the cluster receives an overdrive off lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the overdrive off indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the overdrive off switch to determine the proper outputs to the automatic transmission. The PCM then sends the proper overdrive off lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the overdrive off indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the overdrive control system, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the overdrive off indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

REAR FOG LAMP INDICATOR

DESCRIPTION

A rear fog lamp indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional rear fog lamps, which are available only in certain markets where they are required, this indicator is electronically disabled. The rear fog lamp indicator is located above the engine temperature gauge and to the right of the speedometer in the instrument cluster. The rear fog lamp indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Rear Fog Light” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the rear fog lamp indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The rear fog lamp indicator is serviced as a unit with the instrument cluster.

OPERATION

The rear fog lamp indicator gives an indication to the vehicle operator whenever the rear fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon the cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The rear fog lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the rear fog lamp indicator for the following reasons:

- **Rear Fog Lamp-On Message** - Each time the cluster receives a rear fog lamp-on message from the BCM indicating the rear fog lamps are turned On, the rear fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a rear fog lamp-off message from the BCM.

REAR FOG LAMP INDICATOR (Continued)

• **Actuator Test** - Each time the cluster is put through the actuator test, the rear fog lamp indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The BCM continually monitors the exterior lighting (multi-function) switch to determine the proper outputs to the rear fog lamp relay. The BCM then sends the proper rear fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the rear fog lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the rear fog lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the rear fog lamp indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SEATBELT INDICATOR

DESCRIPTION

A seatbelt indicator is standard equipment on all instrument clusters. The seatbelt indicator is located above the fuel gauge and to the right of the tachometer in the instrument cluster. The seatbelt indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Seat Belt” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The seatbelt indicator is serviced as a unit with the instrument cluster.

OPERATION

The seatbelt indicator gives an indication to the vehicle operator of the status of the driver side front seatbelt. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming. On models equipped with airbags the indicator is also controlled by electronic messages received by the cluster from the Airbag Control Module (ACM) over the Programmable Communications Interface (PCI) data bus. The seatbelt indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the seatbelt indicator for the following reasons:

• **Seatbelt Reminder Function** - Each time the cluster receives a battery current input on the fused ignition switch output (run-start) circuit, the indicator will be illuminated as a seatbelt reminder for about seven seconds, or until the ignition switch is turned to the Off position, whichever occurs first. This reminder function will occur regardless of the status of the electronic seat belt lamp-on or lamp-off messages received by the cluster from the ACM.

• **Seat Belt Lamp-On Message** - On models equipped with airbags, following the seatbelt reminder function, each time the cluster receives a seat belt lamp-on message from the ACM indicating that the driver side front seat belt is not fastened with the ignition switch in the Start or On positions, the seatbelt indicator will be illuminated. The indicator remains illuminated until the cluster receives a seat belt lamp-off message, or until the ignition switch is turned to the Off position, whichever occurs first.

• **Actuator Test** - Each time the cluster is put through the actuator test, the seatbelt indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The ACM continually monitors the status of both front seat belt switches to determine the proper airbag system response to a vehicle frontal impact. The ACM then sends the proper seatbelt indicator lamp-on and lamp-off messages to the instrument cluster based upon the status of the driver side front seat belt switch input. For further diagnosis of the seatbelt indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the seatbelt switches, the ACM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the seatbelt indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SECURITY INDICATOR

DESCRIPTION

A security indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional Vehicle Theft Security System (VTSS), this indicator is electronically disabled. The security indicator is located near the lower edge of the instrument cluster below the tachometer and to the right of the fuel gauge. The security indicator consists of a small round cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the indicator to appear in red through the translucent outer layer of the overlay when it is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The security indicator is serviced as a unit with the instrument cluster.

OPERATION

The security indicator gives an indication to the vehicle operator when the Vehicle Theft Alarm (VTA) portion of the Vehicle Theft Security System (VTSS) is arming or is armed. This indicator is controlled on the instrument cluster circuit board based upon a hard wired input to the cluster from the Body Control Module (BCM) on the VTSS indicator driver circuit. The security indicator Light Emitting Diode (LED) receives battery current on the instrument cluster electronic circuit board through the fused B(+) circuit at all times; therefore, the LED will remain functional regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the BCM. The security indicator will be illuminated for the following reasons:

- **VTSS Indication** - During the sixteen second VTA pre-arming function, the BCM will flash the security indicator on and off repeatedly at a steady, fast rate to indicate that the VTA is in the process of arming. Following successful VTA arming, the BCM flashes the security indicator on and off continuously at a slower rate to indicate that the VTA is armed. The security indicator continues flashing at the slower rate until the VTA is disarmed.

The BCM provides a hard wired ground input to the instrument cluster circuitry through the VTSS indicator driver circuit whenever the ignition switch is in the Off position and the VTA is arming, armed, or triggered. The VTSS indicator driver circuit between the BCM and the instrument cluster can be diagnosed using conventional diagnostic tools and methods. However, for proper diagnosis of the VTA and the BCM, or the hard wired inputs to the instrument cluster that control the security indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SHIFT INDICATOR (TRANSFER CASE)

DESCRIPTION

DESCRIPTION - PART TIME INDICATOR

A part time indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with an optional four-wheel drive system, this indicator is electronically disabled. The part time indicator is located near the lower edge of the tachometer dial face in the instrument cluster. The part time indicator consists of a stencil-like cutout of the words “PART TIME” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “PART TIME” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the part time indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The part time indicator is serviced as a unit with the instrument cluster.

DESCRIPTION - FULL TIME INDICATOR

A full time indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional Selec-Trac four-wheel drive system, this indicator is electronically disabled. The full time indicator is located near the lower edge of the tachometer dial face in the instrument cluster. The full time indicator consists of a stencil-like cutout of the words “FULL TIME” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A green Light Emitting Diode (LED) behind the cutout in the opaque layer of the cluster overlay causes the “FULL TIME” text to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is sol-

SHIFT INDICATOR (TRANSFER CASE) (Continued)

dered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the full time indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The full time indicator is serviced as a unit with the instrument cluster.

DESCRIPTION - FOUR LOW MODE INDICATOR

A four low mode indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional four-wheel drive system, this indicator is electronically disabled. The four low mode indicator is located above the coolant temperature gauge and to the right of the speedometer in the instrument cluster. The four low mode indicator consists of a stencil-like cutout of the words “4 LO MODE” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “4 LO MODE” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the four low mode indicator is dimmable, which is adjusted along with the cluster illumination lighting using the panel lamps dimmer control ring on the left control stalk of the multi-function switch. The four low mode indicator is serviced as a unit with the instrument cluster.

OPERATION

OPERATION - PART TIME INDICATOR

The part time indicator gives an indication to the vehicle operator whenever a part time operating mode of the four-wheel drive transfer case is selected. On vehicles equipped with the Command-Trac four-wheel drive system, the part time indicator lights when the transfer case is engaged in the “4H” or “4L” positions. On vehicles equipped with the Selec-Trac four-wheel drive system, the part time indicator lights when the transfer case is engaged in the “4 X 4 Part Time” position. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The instrument cluster must be electronically configured for the type of transfer case in the vehicle using a DRBIII® scan tool in order to provide proper operation of the part time indicator. The part time indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the part time indicator for the following reasons:

- **Part Time Lamp-On Message** - Each time the cluster receives a part time lamp-on message from the PCM indicating that a part time position of the four-wheel drive transfer case has been selected, the part time indicator will be illuminated. The indicator remains illuminated until the cluster receives a part time lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the part time indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the transfer case switch to determine the driveline operating mode. The PCM then sends the proper part time lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the part time indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the transfer case switch, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the part time indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

OPERATION - FULL TIME INDICATOR

The full time indicator gives an indication to the vehicle operator whenever a full time operating mode of the four-wheel drive transfer case is selected. On vehicles equipped with the Selec-Trac four-wheel drive system, the full time indicator lights when the transfer case is engaged in the “4 X 4 Full Time” position. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The instrument cluster must be electronically configured for the type of transfer case in the vehicle using a DRBIII® scan

SHIFT INDICATOR (TRANSFER CASE) (Continued)

tool in order to provide proper operation of the full time indicator. The full time indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the full time indicator for the following reasons:

- **Full Time Lamp-On Message** - Each time the cluster receives a full time lamp-on message from the PCM indicating that a full time position of the four-wheel drive transfer case has been selected, the full time indicator will be illuminated. The indicator remains illuminated until the cluster receives a full time lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the full time indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the transfer case switch to determine the driveline operating mode. The PCM then sends the proper full time lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the full time indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the transfer case switch, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the full time indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

OPERATION - FOUR LOW MODE INDICATOR

The four low mode indicator gives an indication to the vehicle operator that a low operating mode of the four-wheel drive transfer case is selected. On vehicles equipped with the Command-Trac four-wheel drive system, the four low mode indicator lights when the transfer case is engaged in the “4L” position. On vehicles equipped with the Selec-Trac four-wheel drive system, the four low mode indicator lights when the transfer case is engaged in the “4 Lo” position. This indicator is controlled by a transistor on the instrument cluster circuit board based upon the cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The instrument cluster must be electronically configured for the type of transfer case in the vehicle using a DRBIII® scan tool in order to provide proper operation of the four low mode indicator. The four low mode indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the four low mode indicator for the following reasons:

- **Four Low Mode Lamp-On Message** - Each time the cluster receives a four low mode lamp-on message from the PCM indicating that a low range position of the four-wheel drive transfer case has been selected, the four low mode indicator will be illuminated. The indicator remains illuminated until the cluster receives a four low mode lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the four low mode indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the transfer case switch to determine the driveline operating mode. The PCM then sends the proper four low mode lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the four low mode indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the transfer case switch, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the four low mode indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SKIS INDICATOR

DESCRIPTION

A Sentry Key Immobilizer System (SKIS) indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional SKIS, this indicator is electronically disabled. The SKIS indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The SKIS indicator consists of a stencil-like cutout of

SKIS INDICATOR (Continued)

an icon that represents a key that is circled and crossed-out in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The SKIS indicator is serviced as a unit with the instrument cluster.

OPERATION

The Sentry Key Immobilizer System (SKIS) indicator gives an indication to the vehicle operator of the status of the SKIS. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Sentry Key Immobilizer Module (SKIM) over the Programmable Communications Interface (PCI) data bus. The SKIS indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provide a path to ground by the instrument cluster transistor. The instrument cluster will turn on the SKIS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position, the SKIM tells the cluster to illuminate the SKIS indicator for about three seconds as a bulb test.
- **SKIS Lamp-On Message** - Each time the cluster receives a SKIS lamp-on message from the SKIM, the SKIS indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the SKIM message. For more information on the SKIS and the SKIS indicator control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - OPERATION). The indicator remains illuminated until the cluster receives a SKIS lamp-off message from the SKIM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no SKIS lamp-on or lamp-off messages from the SKIM for twenty consecutive seconds, the SKIS indicator is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid SKIS lamp-on or lamp-off message is received from the SKIM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the SKIS indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The SKIM performs a self-test each time the ignition switch is turned to the On position to decide whether the system is in good operating condition and whether a valid key is present in the ignition lock cylinder. The SKIM then sends the proper SKIS lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the SKIS indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster flashes the SKIS indicator upon ignition On, or turns on the SKIS indicator solid after the bulb test, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative. For proper diagnosis of the SKIS, the PCI data bus, or the electronic message inputs to the instrument cluster that control the SKIS indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SPEEDOMETER

DESCRIPTION

A speedometer is standard equipment on all instrument clusters. The speedometer is located next to the tachometer, just to the right of center in the instrument cluster. The speedometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry, and a fixed 255 degree primary scale on the gauge dial face that reads left-to-right either from “0” to “120” mph, or from “0” to “240” km/h, depending upon the market for which the vehicle is manufactured. Most versions also have a secondary inner scale on the gauge dial face that provides the equivalent opposite measurement units from the primary scale. Text appearing on the cluster overlay just below the hub of the speedometer needle abbreviates the unit of measure for the primary scale (i.e.: MPH or km/h), followed by the unit of measure for the secondary scale (i.e.: MPH or km/h). The speedometer graphics are dark blue (primary scale) and light blue (secondary scale) against a beige field, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, both the dark blue and light blue graphics retain their blue colors. The orange gauge needle is internally illuminated. Gauge illumination is provided by replaceable incandescent bulb and bulb holder units

SPEEDOMETER (Continued)

located on the instrument cluster electronic circuit board. The speedometer is serviced as a unit with the instrument cluster.

OPERATION

The speedometer gives an indication to the vehicle operator of the vehicle road speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The speedometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Vehicle Speed Message** - Each time the cluster receives a vehicle speed message from the PCM it will calculate the correct vehicle speed reading and position the gauge needle at that speed position on the gauge scale. The cluster will receive a new vehicle speed message and reposition the gauge pointer accordingly about every 86 milliseconds. The gauge needle will continue to be positioned at the actual vehicle speed position on the gauge scale until the ignition switch is turned to the Off position.
- **Communication Error** - If the cluster fails to receive a speedometer message, it will hold the gauge needle at the last indication for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After six seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the speedometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the vehicle speed information received from the Body Control Module (BCM) to determine the vehicle road speed. The PCM then sends the proper vehicle speed messages to the instrument cluster. For further diagnosis of the speedometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the BCM, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the speedometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TACHOMETER

DESCRIPTION

A tachometer is standard equipment on all instrument clusters. The tachometer is located to the left of the speedometer, just to the left of center in the instrument cluster. The tachometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 255 degree scale on the gauge dial face that reads left-to-right from “0” to “7” for gasoline engines. On vehicles with a diesel engine, the scale reads from “0” to “5”. The text “RPM X 1000” imprinted on the cluster overlay directly below the hub of the tachometer needle identifies that each number on the tachometer scale is to be multiplied by 1000 rpm. The gasoline engine tachometer has a red zone beginning at 5800 RPM, while the red zone for the diesel engine tachometer begins at 4300 RPM. The tachometer graphics are dark blue and red against a beige field, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the dark blue graphics appear blue and the red graphics appear red. The orange gauge needle is internally illuminated. Gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. The tachometer is serviced as a unit with the instrument cluster.

OPERATION

The tachometer gives an indication to the vehicle operator of the engine speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The tachometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Speed Message** - Each time the cluster receives an engine speed message from the PCM it will calculate the correct engine speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new engine speed message and reposition the gauge pointer accordingly about every 86 milliseconds. The

TACHOMETER (Continued)

gauge needle will continually be repositioned at the relative engine speed position on the gauge scale until the engine stops running, or until the ignition switch is turned to the Off position, whichever occurs first.

• **Communication Error** - If the cluster fails to receive an engine speed message, it will hold the gauge needle at the last indication for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After six seconds, the gauge needle will return to the left end of the gauge scale.

• **Actuator Test** - Each time the cluster is put through the actuator test, the tachometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the crankshaft position sensor to determine the engine speed, then sends the proper engine speed messages to the instrument cluster. For further diagnosis of the tachometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the crankshaft position sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the tachometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TRANS TEMP INDICATOR

DESCRIPTION

A transmission over-temperature indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with an optional automatic transmission. The transmission over-temperature indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer. The transmission over-temperature indicator consists of a stencil-like cutout of the words “TRANS TEMP” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “TRANS TEMP” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The transmission over-temperature indicator is serviced as a unit with the instrument cluster.

OPERATION

The transmission over-temperature indicator gives an indication to the vehicle operator when the transmission fluid temperature is excessive, which may lead to accelerated transmission component wear or failure. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The transmission over-temperature indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the transmission over-temperature indicator for the following reasons:

• **Bulb Test** - Each time the ignition switch is turned to the On position the transmission over-temperature indicator is illuminated for about three seconds as a bulb test.

• **Trans Over-Temp Lamp-On Message** - Each time the cluster receives a trans over-temp lamp-on message from the PCM indicating that the transmission fluid temperature is 135° C (275° F) or higher, the indicator will be illuminated. The indicator remains illuminated until the cluster receives a trans over-temp lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first.

• **Actuator Test** - Each time the cluster is put through the actuator test, the transmission over-temperature indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the transmission temperature sensor to determine the transmission operating condition. The PCM then sends the proper transmission temperature messages to the instrument cluster. If the instrument cluster turns on the transmission over-temperature indicator due to a high transmission oil temperature condition, it may indicate that the transmission and/or the transmission cooling system are being overloaded or that they require service. For further diagnosis of the transmission over-temperature indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the

TRANS TEMP INDICATOR (Continued)

transmission temperature sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the transmission over-temperature indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TURN SIGNAL INDICATOR

DESCRIPTION

Two turn signal indicators, one right and one left, are standard equipment on all instrument clusters. The turn signal indicators are located near the upper edge of the instrument cluster, between the speedometer and the tachometer. Each turn signal indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Turn Warning” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents these icons from being clearly visible when they are not illuminated. A green Light-Emitting Diode (LED) behind each cutout in the opaque layer of the cluster overlay causes the icon to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The turn signal indicators are serviced as a unit with the instrument cluster.

OPERATION

The turn signal indicators give an indication to the vehicle operator that the turn signal (left or right indicator flashing) or hazard warning (both left and right indicators flashing) have been selected and are operating. These indicators are controlled by two individual hard wired inputs from the combination flasher circuitry within the hazard switch to the instrument cluster electronic circuit board. Each turn signal indicator Light Emitting Diode (LED) is grounded on the instrument cluster electronic circuit board at all times; therefore, these indicators remain functional regardless of the ignition switch position. Each LED will only illuminate when it is provided battery current by the combination flasher circuitry of the hazard switch.

The turn signal indicators are connected in parallel with the other turn signal circuits. This arrangement allows the turn signal indicators to remain functional, regardless of the condition of the other circuits in the turn signal and hazard warning systems. The combination flasher outputs of the hazard switch to the instrument cluster turn signal indicator inputs can be diagnosed using conventional diagnostic tools and methods. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HAZARD SWITCH - DESCRIPTION) for more information on the combination flasher and hazard switch operation.

WAIT-TO-START INDICATOR

DESCRIPTION

A wait-to-start indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The wait-to-start indicator is located above the fuel gauge and to the left of the tachometer in the instrument cluster. The wait-to-start indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Diesel Preheat” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The wait-to-start indicator is serviced as a unit with the instrument cluster.

OPERATION

The wait-to-start indicator gives an indication to the vehicle operator when the diesel engine glow plugs are energized in their pre-heat operating mode. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The wait-to-start indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the wait-to-start indicator for the following reasons:

- **Wait-To-Start Lamp-On Message** - Each time the cluster receives a wait-to-start lamp-on message from the PCM indicating that the glow plugs are heating and are too cool for efficient and reliable engine starting, the wait-to-start indicator will be illuminated. The indicator remains illuminated until the cluster receives a wait-to-start lamp-off message

WAIT-TO-START INDICATOR (Continued)

or until the ignition switch is turned to the Off position, whichever occurs first.

• **Actuator Test** - Each time the cluster is put through the actuator test, the wait-to-start indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the ambient air temperature and the glow plug pre-heater circuits to determine how long the glow plugs should be energized in their pre-heat operating mode. The PCM then sends the proper wait-to-start lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the wait-to-start indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the glow plug pre-heater control circuits, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the wait-to-start indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

WASHER FLUID INDICATOR

DESCRIPTION

A washer fluid indicator is standard equipment on all instrument clusters. However, on models equipped with the optional Electronic Vehicle Information Center (EVIC) the washer fluid indicator in the cluster is electronically suppressed so as not to duplicate indications that are provided by the EVIC. The washer fluid indicator consists of the word “lowash”, which appears in place of the odometer/trip odometer information in the Vacuum-Fluorescent Display (VFD) of the instrument cluster. The VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located near the lower edge of the speedometer dial face of the cluster overlay. The dark lens over the window prevents the VFD from being clearly visible when it is not illuminated. The word “lowash” appears in the same blue-green color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The washer fluid indicator is serviced as a unit with the instrument cluster.

OPERATION

The washer fluid indicator gives an indication to the vehicle operator that the fluid level in the washer reservoir is low. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the washer fluid level switch mounted on the washer reservoir. The washer fluid indicator function of the Vacuum Fluorescent Display (VFD) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the VFD washer fluid indicator will always be off when the ignition switch is in any position except On or Start. The instrument cluster will turn on the washer fluid indicator for the following reasons:

• **Washer Fluid Level Switch Input** - Each time the cluster detects ground on the low washer fluid sense circuit (washer fluid level switch closed = washer fluid level low) the cluster applies an algorithm to confirm that the input is correct and not the result of fluid sloshing in the washer reservoir. The cluster tests the status of the circuit about seven milliseconds after the ignition switch is turned to the On position, and about once every second thereafter, then uses an internal counter to count up or down. When the counter accumulates thirty ground inputs on the circuit, the washer fluid indicator will be illuminated. If the vehicle is not moving when the washer fluid level switch input counter reaches thirty, the VFD will repeatedly and sequentially cycle its low washer fluid indication in two second intervals with the odometer/trip odometer information and any other active warnings including: door ajar, gate ajar, and glass ajar. If the vehicle is moving, or once the cluster of a non-moving vehicle receives an electronic vehicle speed message from the Powertrain Control Module (PCM) indicating a speed greater than zero, the warning sequence will consist of fifteen complete display cycles with an audible single chime tone accompanying the first cycle, then revert to only the odometer/trip odometer display. Once the washer fluid indicator warning has completed, the washer fluid indicator is extinguished and will not repeat until the ignition switch is cycled.

The instrument cluster continually monitors the washer fluid level switch in the washer reservoir to determine the status of the washer fluid level. For further diagnosis of the washer fluid indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The washer fluid level switch and circuits can be diagnosed using conventional diagnostic tools and methods. The washer fluid level switch also features a 3.3 kilohm diagnostic resistor connected in parallel between the switch input and output to provide the cluster with verification that the low washer fluid sense circuit is not open or shorted. This input can

WASHER FLUID INDICATOR (Continued)

be monitored using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - WASHER FLUID INDICATOR

The diagnosis found here addresses an inoperative washer fluid indicator condition. If the problem being diagnosed is related to indicator accuracy, be certain to confirm that the problem is with the indicator or washer fluid level switch input and not with a damaged or empty washer fluid reservoir, or inoperative instrument cluster indicator control circuitry. Inspect the washer fluid reservoir for proper fluid level and signs of damage or distortion that could affect washer fluid level switch performance and perform the instrument cluster actuator test before you proceed with the following diagnosis. If no washer fluid reservoir or instrument cluster control circuitry problem is found, the following procedure will help to locate a short or open in the washer fluid switch sense circuit. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

INDICATOR DOES NOT ILLUMINATE WITH WASHER RESERVOIR EMPTY

(1) Disconnect and isolate the battery negative cable. Disconnect the headlamp and dash wire harness connector for the washer fluid level switch from the washer fluid level switch connector receptacle. Check for continuity between the ground circuit cavity of the headlamp and dash wire harness connector for the washer fluid level switch and a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open ground circuit to ground (G111) as required.

(2) Remove the instrument cluster from the instrument panel. Check for continuity between the washer fluid sense circuit cavities of the headlamp and dash wire harness connector for the washer fluid level switch and the instrument panel wire harness connector (Connector C2) for the instrument cluster. If OK, replace the faulty washer fluid level switch. If not OK, repair the open washer fluid switch sense circuit between the washer fluid level switch and the instrument cluster as required.

INDICATOR STAYS ILLUMINATED WITH WASHER RESERVOIR FULL

(1) Disconnect and isolate the battery negative cable. Disconnect the headlamp and dash wire harness connector for the washer fluid level switch from the washer fluid level switch connector receptacle. Check for continuity between the ground circuit terminal and the washer fluid sense terminal in the washer fluid level switch connector receptacle. There should be no continuity. If OK, go to Step 2. If not OK, replace the faulty washer fluid level switch.

(2) Remove the instrument cluster from the instrument panel. Check for continuity between the washer fluid sense circuit cavity of the headlamp and dash wire harness connector for the washer fluid level switch and a good ground. There should be no continuity. If not OK, repair the shorted washer fluid switch sense circuit between the washer fluid level switch and the instrument cluster as required.

WATER-IN-FUEL INDICATOR

DESCRIPTION

A water-in-fuel indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The water-in-fuel indicator is located above the coolant temperature gauge and to the right of the speedometer in the instrument cluster. The water-in-fuel indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Water In Fuel” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The water-in-fuel indicator is serviced as a unit with the instrument cluster.

WATER-IN-FUEL INDICATOR (Continued)

OPERATION

The water-in-fuel indicator gives an indication to the vehicle operator when there is excessive water in the fuel system. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The water-in-fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the water-in-fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the water-in-fuel indicator is illuminated for about three seconds as a bulb test.
- **Water-In-Fuel Lamp-On Message** - Each time the cluster receives a water-in-fuel lamp-on message from the PCM indicating there is excessive water in the diesel fuel system, the water-in-fuel indicator will be illuminated. The indicator remains illuminated until the cluster receives a water-in-fuel lamp-off message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the water-in-fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the water-in-fuel sensor to determine whether there is excessive water in the diesel fuel. The PCM then sends the proper water-in-fuel lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the water-in-fuel indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the water-in-fuel-sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the water-in-fuel indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

LAMPS

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LAMPS/LIGHTING - EXTERIOR

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LAMPS/LIGHTING - EXTERIOR

DESCRIPTION

The exterior lighting system for this model includes the following exterior lamps (Fig. 1):

- **Backup Lamps -** The backup (or reverse) lamps are integral to the rear lamp units mounted to the back of the quarter panel on each side of the tailgate at the rear of the vehicle.
- **Brake Lamps -** The brake (or stop) lamps include a lamp that is integral to the rear lamp units mounted to the back of the quarter panel on each side of the tailgate, and the Center High Mounted Stop Lamp (CHMSL) that is centered on the rear edge of the roof panel above the flip-up glass opening at the rear of the vehicle.

LAMPS/LIGHTING - EXTERIOR (Continued)

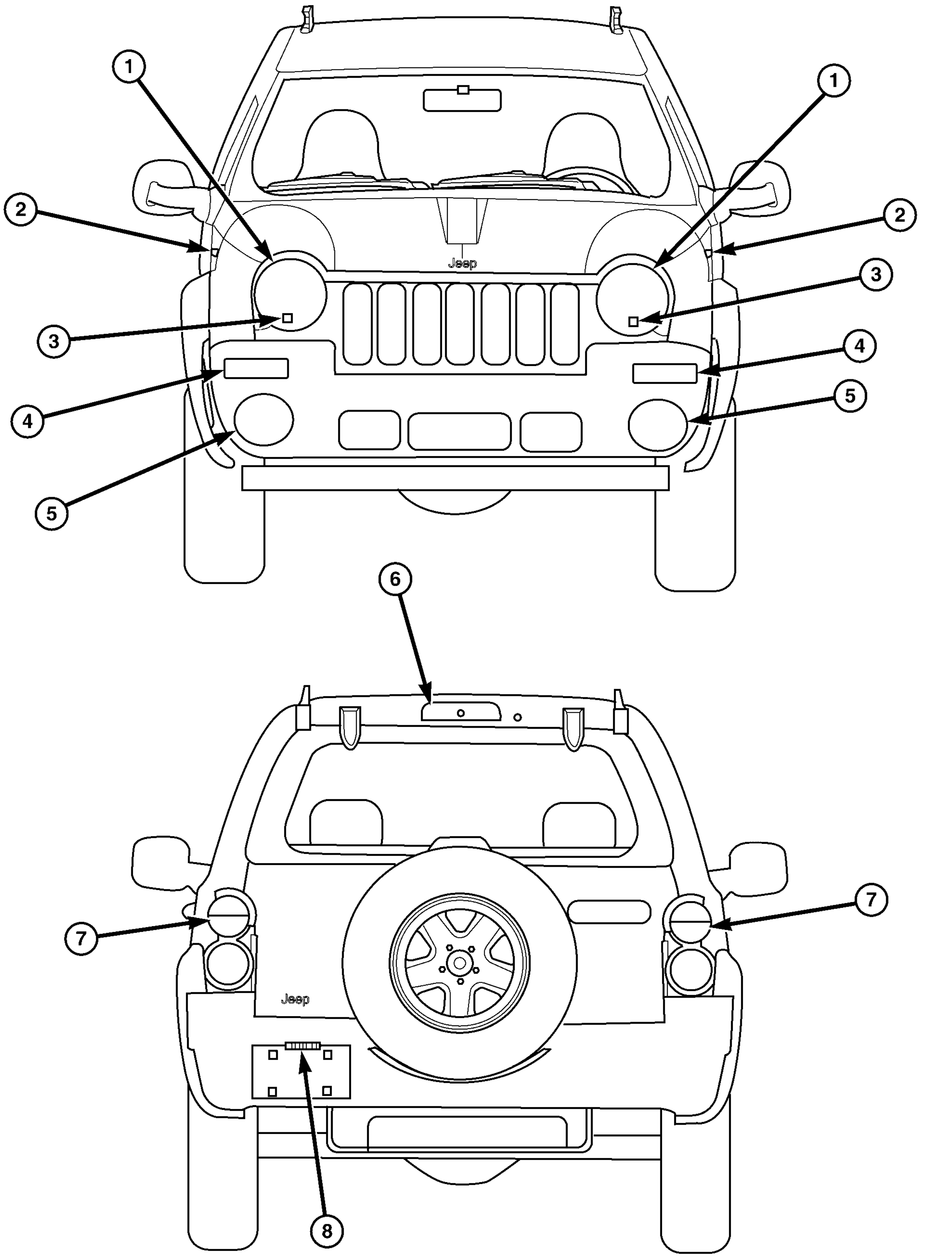

Fig. 1 Exterior Lamps

LAMPS/LIGHTING - EXTERIOR (Continued)

1 - HEADLAMP UNIT (2)
2 - REPEATER LAMP UNIT (2)
3 - FRONT POSITION LAMP (2)
4 - FRONT LAMP UNIT (2)
5 - FRONT FOG LAMP (2)
6 - CENTER HIGH MOUNTED STOP LAMP UNIT
7 - REAR LAMP UNIT
8 - LICENSE PLATE LAMP UNIT

- **Daytime Running Lamps** - Vehicles manufactured for sale in Canada illuminate the high beam filament in each headlamp bulb serves as the Daytime Running Lamps (DRL).
- **Front Fog Lamps** - Optional front fog lamps include a single round fog lamp unit with an adjustable reflector and a removable bulb that is secured behind a dedicated opening on each end of the front bumper fascia.
- **Hazard Warning Lamps** - The hazard warning lamps include all of the right and left turn signal lamps.
- **Headlamps** - A round headlamp housing with a fixed lens, an adjustable reflector, and a single removable halogen bulb is secured to the grille opening panel on each side of the front grille opening. In certain markets where required, a headlamp leveling actuator motor is included on each headlamp.
- **Park Lamps** - The park lamps include the front park lamps and front side marker lamps that are integral to the front lamp units mounted at each end of the front bumper, as well as the rear park lamps and rear side marker lamps that are integral to the rear lamp units mounted to the back of the quarter panel on each side of the tailgate. The park lamps include a license plate lamp or lamps, depending upon the requirements of the market for which the vehicle is manufactured. Vehicles with a license plate tub located near the left end of the rear bumper fascia have a single lamp, while vehicles with a license plate module located on the spare tire carrier have two license plate lamps. In certain markets where required, a front position lamp that is integral to each headlamp is illuminated instead of the front park lamps and front side marker lamps in the park lamps circuit; and, a rectangular, red reflector is located on the rear bumper fascia just inboard and below each rear lamp unit.
- **Rear Fog Lamps** - Rear fog lamps are available only in certain markets where they are required equipment. The rear fog lamps are integral to the rear lamps, mounted to the back of the quarter panel, on each side of the tailgate, at the rear of the vehicle.
- **Turn Signal Lamps** - The turn signal lamps include the front turn signal and front side marker lamps that are integral to the front lamp units, as well as rear turn signal lamps that are integral to the rear lamps. In certain markets where required, a repeater lamp, mounted to each front fender just behind the front wheel is illuminated instead of the front side marker lamp.

Other components of the exterior lighting system for this model include:

- **Combination Flasher** - An electronic combination flasher is integral to the hazard warning switch in the center of the instrument panel.
- **Backup Lamp Switch** - Vehicles equipped with a manual transmission have a plunger-type backup lamp switch located on the transmission housing. A Transmission Range Sensor (TRS) integral to the solenoid pack on the valve body of the optional electronic automatic transmission performs the backup lamp switch function on models that are so equipped.
- **Brake Lamp Switch** - A plunger-type brake lamp switch is located on the steering column support bracket under the instrument panel and actuated by the brake pedal arm.
- **Body Control Module** - The Body Control Module (BCM) is located on the Junction Block (JB) under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL MODULE - DESCRIPTION).
- **Daytime Running Lamp Relay** - Vehicles manufactured for sale in Canada use a solid state Daytime Running Lamps (DRL) relay installed in the Junction Block (JB) instead of the conventional high beam relay.
- **Front Fog Lamp Relay** - Vehicles equipped with the optional front fog lamps have a front fog lamp relay located in the Junction Block (JB).
- **Hazard Switch** - The hazard switch is located near the center of the instrument panel and includes the electronic combination flasher circuitry for the hazard warning system and the turn signal system.
- **Headlamp Leveling Motor** - A headlamp leveling actuator motor is located on the back of each headlamp housing of vehicles manufactured for certain markets where this equipment is required.
- **Headlamp Leveling Switch** - A thumbwheel actuated headlamp leveling switch is mounted in the driver side instrument panel bezel of vehicles manufactured for certain markets where this equipment is required.
- **High Beam Relay** - A high beam relay is located in the Junction Block (JB) of all vehicles except those that are manufactured for sale in Canada. Canadian vehicles have a solid state Daytime Running Lamps (DRL) relay in the JB instead of the high beam relay.

LAMPS/LIGHTING - EXTERIOR (Continued)

- **Low Beam Relay** - A low beam relay is located in the Junction Block (JB) of all vehicles.
- **Multi-Function Switch** - The multi-function switch is located on the top of the steering column, just below the steering wheel. The multi-function switch includes a left (lighting) control stalk and a right (wiper) control stalk. The left control stalk is dedicated to providing almost all of the driver controls for both the exterior and interior lighting systems.
- **Park Lamp Relay** - A park lamp relay is located in the Junction Block (JB) of all vehicles.
- **Rear Fog Lamp Relay** - Vehicles manufactured for certain markets where rear fog lamps are required equipment have a rear fog lamp relay located in the Junction Block (JB).
- **Trailer Tow Adapter** - Vehicles equipped with a factory-installed trailer towing package have an adapter provided that adapts the factory-installed heavy duty 7-way trailer tow connector to a conventional 4-way light duty connector.
- **Trailer Tow Connector** - Vehicles equipped with a factory-installed trailer towing package have a heavy duty 7-way trailer tow connector installed in a bracket on the trailer hitch receiver.
- **Trailer Tow Relays** - Vehicles equipped with a factory-installed trailer towing package have a connector bank containing four relays located behind the right quarter trim panel. The four relays are used to supply fused ignition switch output (run), brake lamps, right turn signal, and left turn signal outputs to a trailer through the trailer tow wiring and connectors. Refer to the appropriate wiring information.

OPERATION

Following are paragraphs that briefly describe the operation of each of the major exterior lighting systems. The hard wired circuits and components of the exterior lighting systems may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), the Powertrain Control Module (PCM), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, the PCM, and the PCI data bus network inputs and outputs related to the various exterior lighting systems requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

BACKUP LAMPS

The backup (or reverse) lamps have a path to ground at all times through the rear lighting wire harness at the base of the right D-pillar behind the quarter trim panel. The backup lamps receive battery voltage from a fused ignition switch output (run) fuse on the back-up lamp supply circuit only when the backup lamp switch (manual transmission), or backup lamp switch circuit of the Transmission Range Sensor (TRS - electronic automatic transmission) is closed by the gear shift mechanism.

BRAKE LAMPS

The brake (or stop) lamps have a path to ground at all times through the rear lighting wire harness at base of the right D-pillar behind the quarter trim panel. The Center High Mounted Stop Lamp (CHMSL) has a path to ground at all times through the rear body wire harness at the driver side D-pillar (left side D-pillar for left-hand drive, right side D-pillar for right-hand drive) behind the quarter trim panel. The brake lamps and CHMSL receive battery voltage from a fuse in the Junction Block (JB) on the brake lamp switch output circuit when the brake lamp switch is closed by the brake pedal arm.

DAYTIME RUNNING LAMPS

Vehicles manufactured for sale in Canada illuminate the high beam filament at a reduced intensity when the engine is running and the exterior lamps are turned off. This feature is enabled by the Body Control Module (BCM) and a solid state Daytime Running Lamps (DRL) relay, which is installed in the Junction Block (JB). The high beam relay is omitted. When the BCM monitors an engine speed signal of greater than 450 RPM and the status of the exterior lighting switch input is Off, the BCM duty cycles the DRL relay to produce illumination at a reduced intensity. The BCM also provides normal headlamp high beam operation through the DRL relay on vehicles so equipped. When the DRL relay is energized, it provides battery voltage from a fused B(+) fuse in the JB to the headlamp high beam through the DRL relay output circuit.

FRONT FOG LAMPS

Vehicles equipped with optional front fog lamps have a premium Body Control Module (BCM), a front fog lamp relay installed in the Junction Block (JB), and a front fog lamp switch integral to the left control stalk of the multi-function switch. The front fog lamps have a path to ground at all times through their connection to the front fascia wire harness to the left inner fender shield in the engine compartment. The BCM controls front fog lamp operation by monitoring the exterior lighting switch, then energizing or de-energizing the front fog lamp relay control coil. The BCM also sends the appropriate electronic message to the instrument cluster over the Programmable Communications Interface (PCI) data bus to

LAMPS/LIGHTING - EXTERIOR (Continued)

illuminate or extinguish the front fog lamp indicator. When the front fog lamp relay is energized, it provides battery voltage from a fused B(+) fuse in the JB to the fog lamps through the fog lamp relay output circuit. The BCM provides a battery saver (load shedding) feature for the front fog lamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position. In certain markets where required, the front fog lamps are also turned off by the BCM whenever the headlamp high beams are selected. Each front fog lamp includes an integral adjustment screw to be used for static aiming the fog lamp beams.

HAZARD WARNING LAMPS

With the hazard switch in the On position, the hazard switch button illuminates and the right and left turn signal indicators, and the right and left turn signal lamps begin to flash on and off. When the hazard warning system is activated, the circuitry within the hazard switch and electronic combination flasher will repeatedly energize and de-energize two internal relays that switch battery voltage from a fused B(+) fuse in the Junction Block (JB) to the turn signal indicators, and turn signal lamps. The flashing of the hazard switch button illumination lamp is performed internally by the hazard switch and combination flasher circuit board. The hazard warning lamps can also be energized by the Body Control Module (BCM) through a hazard lamp control circuit input to the hazard switch and combination flasher.

HEADLAMPS

The headlamp system includes the Body Control Module (BCM), a low beam relay installed in the Junction Block (JB), a high beam relay installed in the JB (except Canada), a solid state Daytime Running Lamps (DRL) relay installed in the JB (Canada only), and the exterior lighting switches integral to the left (lighting) control stalk of the multi-function switch. The headlamps have a path to ground at all times through the left inner fender shield in the engine compartment. The BCM controls the headlamp operation by monitoring the exterior lighting switch inputs from the multi-function switch, then energizing or de-energizing the low beam relay, the high beam relay, or the DRL relay. It also sends an electronic message to the instrument cluster over the Programmable Communications Interface (PCI) data bus to turn the high beam indicator on or off. When each respective relay is energized, it provides battery voltage from a fuse in the Power Distribution Center (PDC) through a relay (low beam, high beam, or DRL) output circuit. The BCM provides a battery saver (load shedding) feature for the headlamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position; and, a headlamp delay feature with a DRBIII® scan tool programmable delay interval. Each headlamp includes an integral adjustment screw to be used for static aiming of the headlamp beams.

HEADLAMP LEVELING

The headlamp leveling system includes unique headlamps equipped with a leveling actuator motor, and a rotary thumbwheel actuated headlamp leveling switch on the instrument panel. The headlamp leveling system allows the headlamp beams to be adjusted to one of four vertical positions to compensate for changes in inclination caused by the loading of the vehicle suspension. The actuator motors are mechanically connected through an integral pushrod to an adjustable headlamp reflector. The headlamp leveling switch is a resistor multiplexed unit that provides one of four voltage outputs to the headlamp leveling motors. The headlamp leveling motors will move the headlamps to the selected position based upon the voltage input received from the switch. The headlamp leveling motors and switch have a path to ground at all times. The headlamp leveling components operate on battery voltage received through the park lamp relay output circuit so that the system will only operate when the exterior lighting is turned on.

PARK LAMPS

The park lamps system includes the Body Control Module (BCM), a park lamp relay installed in the Junction Block (JB), and the exterior lighting switch integral to the left (lighting) control stalk of the multi-function switch. The front park lamp, side marker, or if equipped, the front position lamp bulbs each have a path to ground at all times through the left inner fender shield in the engine compartment. The rear park lamp bulbs and license plate lamp have a path to ground at all times through the base of the right D-pillar behind the quarter trim panel. The BCM controls the park lamp operation by monitoring the exterior lighting switch inputs from the multi-function switch, then energizing or de-energizing the park lamp relay. When the park lamp relay is energized, it provides battery voltage from a fuse in the Power Distribution Center (PDC) through a park lamp relay output circuit to the appropriate lamp bulbs. The BCM provides a battery saver (load shedding) feature for the park lamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position.

LAMPS/LIGHTING - EXTERIOR (Continued)

REAR FOG LAMPS

Rear fog lamps are installed on vehicles manufactured for certain markets where they are required. The rear fog lamp system includes a premium Body Control Module (BCM), a rear fog lamp relay installed in the Junction Block (JB), and a rear fog lamp switch integral to the left (lighting) control stalk of the multi-function switch. The rear fog lamps have a path to ground at all times through their connection to the rear lighting wire harness from a take out of the rear body wire harness with an eyelet terminal connector that is secured by a ground screw to the base of the right D-pillar behind the quarter trim panel. The BCM controls rear fog lamp operation by monitoring the exterior lighting switch input from the multi-function switch, then energizing or de-energizing the rear fog lamp relay control coil; and, by sending the appropriate electronic message to the instrument cluster over the Programmable Communications Interface (PCI) data bus to turn the rear fog lamp indicator on or off. When the rear fog lamp relay is energized, it provides battery current from a fused B(+) fuse in the JB to the rear fog lamps through the rear fog lamp relay output circuit. The BCM provides a battery saver (load shedding) feature for the rear fog lamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position.

TURN SIGNAL LAMPS

When the left control stalk of the multi-function switch is activated, the turn signal system illuminates the selected right or left turn signal indicator, and the turn signal lamp begin to flash. When the turn signal system is activated, the turn signal switch and the hazard switch/electronic combination flasher will repeatedly energize and de-energize one of two internal relays that switch battery voltage from a fused ignition switch output (run) fuse in the Junction Block (JB) to the appropriate turn signal indicator and turn signal lamps. The ElectroMechanical Instrument Cluster (EMIC) chime tone generator will generate an audible turn signal cancel warning each time the vehicle is driven for a distance of about 3.2 kilometers (about two miles) with a turn signal indicator flashing. The EMIC uses Programmable Communications Interface (PCI) data bus distance messages from the Powertrain Control Module (PCM) and a hard wired input from the turn signal switch, to determine when to sound the turn signal cancel warning.

DIAGNOSIS AND TESTING - LAMPS/LIGHTING - EXTERIOR

The hard wired circuits and components of the exterior lighting systems may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), the Powertrain Control Module (PCM), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, the PCM, and the PCI data bus network related to the various exterior lighting systems requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

When diagnosing the exterior lighting circuits, remember that high generator output can burn out bulbs rapidly and repeatedly; and, that dim or flickering bulbs can be caused by low generator output or poor battery condition. If one of these symptoms is a problem on the vehicle, be certain to diagnose and repair the battery and charging system. Also, a good ground is necessary for proper lighting operation. If a lighting problem is being diagnosed that involves multiple symptoms, systems, or components, the problem can often be traced to a loose, corroded, or open ground. For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

LAMPS/LIGHTING - EXTERIOR (Continued)

BACKUP LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BACKUP LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace backup lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace backup lamp bulb as required.
	3. Faulty switch.	3. Test and replace backup lamp switch (manual transmission) or transmission range sensor (automatic transmission) as required.
	4. Faulty ground circuit.	4. Test and repair backup lamp ground circuit as required.
	5. Faulty supply circuit.	5. Test and repair open back-up lamp supply circuit as required.
BACKUP LAMP DOES NOT EXTINGUISH	1. Faulty switch.	1. Test and replace backup lamp switch (manual transmission) or transmission range sensor (automatic transmission) as required.
	2. Faulty supply circuit.	2. Test and repair shorted back-up lamp supply circuit as required.

BRAKE LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKE LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace brake lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace brake lamp bulb as required.
	3. Faulty switch.	3. Test and replace brake lamp switch as required.
	4. Faulty ground circuit.	4. Test and repair brake lamp ground circuit as required.
	5. Faulty supply circuit.	5. Test and repair open brake lamp switch output circuit as required.
BRAKE LAMP DOES NOT EXTINGUISH	1. Faulty switch.	1. Test and replace brake lamp switch as required.
	2. Faulty supply circuit.	2. Test and repair shorted brake lamp switch output circuit as required.

LAMPS/LIGHTING - EXTERIOR (Continued)

DAYTIME RUNNING LAMPS

Before performing the following tests, determine whether the headlamp low and high beams operate. If the headlamp high and low beams are also inoperative, diagnose and repair that problem before attempting to repair the Daytime Running Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
DAYTIME RUNNING LAMPS WILL NOT ILLUMINATE	1. High beam relay installed.	1. Remove high beam relay as required.
	2. Faulty or missing DRL relay.	2. Replace DRL relay with a known good unit and check operation. Replace DRL relay as required.
	3. Incorrect BCM programming.	3. Use a DRBIII® scan tool to check and program correct country code into BCM as required.
	4. Faulty BCM inputs or outputs.	4. Use a DRBIII® scan tool to test the BCM inputs or outputs. Refer to the appropriate diagnostic information.

FRONT FOG LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT FOG LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace front fog lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace front fog lamp bulb as required.
	3. Faulty or missing relay.	3. Test and replace front fog lamp relay as required.
	4. Faulty switch.	4. Test and replace multi-function switch as required.
	5. Faulty ground circuit.	5. Test and repair front fog lamp ground circuit as required.
	6. Faulty supply circuit.	6. Test and repair open front fog lamp relay output circuit as required.
	7. Faulty BCM inputs or outputs.	7. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
FRONT FOG LAMP DOES NOT EXTINGUISH	1. Faulty relay.	1. Test and replace front fog lamp relay as required.
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty supply circuit.	3. Test and repair shorted front fog lamp relay output circuit as required.
	4. Faulty BCM inputs or outputs.	4. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

LAMPS/LIGHTING - EXTERIOR (Continued)

HAZARD WARNING LAMPS

Before performing the following tests, confirm whether the left and right turn signals operate satisfactorily. If the turn signals are inoperative or operate improperly, diagnose and repair that problem before attempting to repair the Hazard Warning Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
HAZARD WARNING LAMPS DO NOT FLASH	1. Faulty or missing fuse.	1. Test and replace hazard warning fuse as required.
	2. Faulty ground circuit.	2. Test and repair hazard switch ground circuit as required.
	3. Faulty supply circuit.	3. Test and repair open hazard switch fused B(+) circuit as required.
	4. Faulty switch/flasher.	4. Test and replace hazard switch/ combination flasher if required.

HEADLAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace headlamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace headlamp bulb as required.
	3. Faulty or missing relay.	3. Test and replace low beam or high beam relay as required. (Note: Vehicles with a DRL relay do not use a high beam relay. The DRL relay cannot be tested. Replace DRL relay with a known good unit and check operation. Replace DRL relay as required.)
	4. Faulty switch.	4. Test and replace multi-function switch as required.
	5. Faulty ground circuit.	5. Test and repair open headlamp ground circuit as required.
	6. Faulty supply circuit.	6. Test and repair open headlamp low beam, high beam, or DRL relay output circuit as required.
	7. Faulty BCM inputs or outputs.	7. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

LAMPS/LIGHTING - EXTERIOR (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMP DOES NOT EXTINGUISH	1. Faulty relay.	1. Test and replace low beam or high beam relay as required. (Note: Vehicles with a DRL relay do not use a high beam relay. The DRL relay cannot be tested. Replace DRL relay with a known good unit and check operation. Replace DRL relay as required.)
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty supply circuit.	3. Test and repair shorted headlamp low beam, high beam, or DRL relay output circuit as required.
	4. Faulty BCM inputs or outputs.	4. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
HEADLAMPS WILL NOT SWITCH FROM HIGH TO LOW BEAMS, OR FROM LOW TO HIGH BEAMS	1. Faulty relay.	1. Test and replace low beam or high beam relay as required. (Note: Vehicles with a DRL relay do not use a high beam relay. The DRL relay cannot be tested. Replace DRL relay with a known good unit and check operation. Replace DRL relay as required.)
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty BCM inputs or outputs.	3. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

HEADLAMP LEVELING

Before performing the following tests, confirm whether the park lamps operate properly. If the park lamps are inoperative, diagnose and repair that problem before attempting to repair the Headlamp Leveling System.

CONDITION	POSSIBLE CAUSES	CORRECTION
ONE LEVELING MOTOR IS INOPERATIVE	1. Faulty ground circuit.	1. Test and repair open leveling motor ground circuit as required.
	2. Faulty supply circuit.	2. Test and repair open leveling motor feed circuit as required.
	3. Faulty signal circuit.	3. Test and repair open headlamp adjust signal circuit as required.
	4. Faulty motor.	4. Test and replace headlamp leveling motor as required.

LAMPS/LIGHTING - EXTERIOR (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BOTH LEVELING MOTORS ARE INOPERATIVE	1. Faulty switch ground circuit.	1. Test and repair open leveling switch ground circuit as required.
	2. Faulty motor ground circuit.	2. Test and repair open leveling motor ground circuit as required.
	3. Faulty switch supply circuit.	3. Test and repair open leveling switch feed circuit as required.
	4. Faulty motor feed circuit.	4. Test and repair open leveling motor feed circuit as required.
	5. Faulty signal circuit.	5. Test and repair open or shorted leveling motor signal circuit as required.
	6. Faulty switch.	6. Test and replace leveling switch as required.
	7. Faulty motors.	7. Test and replace leveling motors as required.

PARK LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
PARK LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace park lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace park lamp bulb as required.
	3. Faulty or missing relay.	3. Test and replace park lamp relay as required.
	4. Faulty switch.	4. Test and replace multi-function switch as required.
	5. Faulty ground circuit.	5. Test and repair open park lamp ground circuit as required.
	6. Faulty supply circuit.	6. Test and repair open park lamp relay output circuit as required.
	7. Faulty BCM inputs or outputs.	7. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
PARK LAMP DOES NOT EXTINGUISH	1. Faulty relay.	1. Test and replace park lamp relay as required.
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty supply circuit.	3. Test and repair shorted park lamp relay output circuit as required.
	4. Faulty BCM inputs or outputs.	4. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

LAMPS/LIGHTING - EXTERIOR (Continued)

REAR FOG LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
REAR FOG LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace rear fog lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace rear fog lamp bulb as required.
	3. Faulty or missing relay.	3. Test and replace rear fog lamp relay as required.
	4. Faulty switch.	4. Test and replace multi-function switch as required.
	5. Faulty ground circuit.	5. Test and repair open rear fog lamp ground circuit as required.
	6. Faulty supply circuit.	6. Test and repair open rear fog lamp relay output circuit as required.
	7. Faulty BCM inputs or outputs.	7. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.
REAR FOG LAMP DOES NOT EXTINGUISH	1. Faulty relay.	1. Test and replace rear fog lamp relay as required.
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty supply circuit.	3. Test and repair shorted rear fog lamp relay output circuit as required.
	4. Faulty BCM inputs or outputs.	4. Use a DRBIII® scan tool to test the BCM inputs and outputs. Refer to the appropriate diagnostic information.

TURN SIGNAL LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
ONE TURN SIGNAL LAMP DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace turn signal bulb as required.
	2. Faulty ground circuit.	2. Test and repair open ground circuit as required.
	3. Faulty supply circuit.	3. Test and repair open right or left turn signal circuit as required.

LAMPS/LIGHTING - EXTERIOR (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
ALL RIGHT SIDE AND/OR ALL LEFT SIDE TURN SIGNAL LAMPS DO NOT FLASH	1. Faulty sense circuit.	1. Test and repair open right or left turn switch sense circuit as required.
	2. Faulty switch.	2. Test and replace multi-function switch as required.
	3. Faulty flasher.	3. Replace hazard switch/combination flasher with a known good unit and check operation. Replace hazard switch/ combination flasher unit as required.
	4. Faulty signal circuit.	4. Test and repair open right or left turn signal circuit as required.
ALL RIGHT SIDE OR ALL LEFT SIDE TURN SIGNALS FLASH TOO RAPIDLY (MORE THAN 100 FLASHES PER MINUTE)	1. Faulty or missing bulb.	1. Test and replace faulty bulb as required.
	2. Faulty ground circuit.	2. Test and repair open ground circuit as required.
	3. Faulty signal circuit	3. Test and repair open right or left turn signal circuit as required.
	4. Faulty flasher.	4. Replace hazard switch/combination flasher with a known good unit and check operation. Replace hazard switch/ combination flasher unit as required.

SPECIFICATIONS - LAMPS/LIGHTING - EXTERIOR

BULB SPECIFICATIONS

LAMP	BULB
Backup	3157 P27/7W
Brake	3157 P27/7W
Center High Mounted Stop	921/W16W
Front Fog	9145
Front Park	3157 P27/7W
Front Position	W5W
Front Side Marker	168
Front Turn	3157 P27/7W
Headlamp (North America)	9007QL
Headlamp (Export)	H-4 W0W6
License Plate (North America)	168
License Plate (Rest-Of-World)	W5W
Rear Fog	3157 P27/7W
Rear Park/Tail	3157 P27/7W
Rear Turn	3157 P27/7W
Side Repeater	W5W

BACKUP LAMP SWITCH

DESCRIPTION

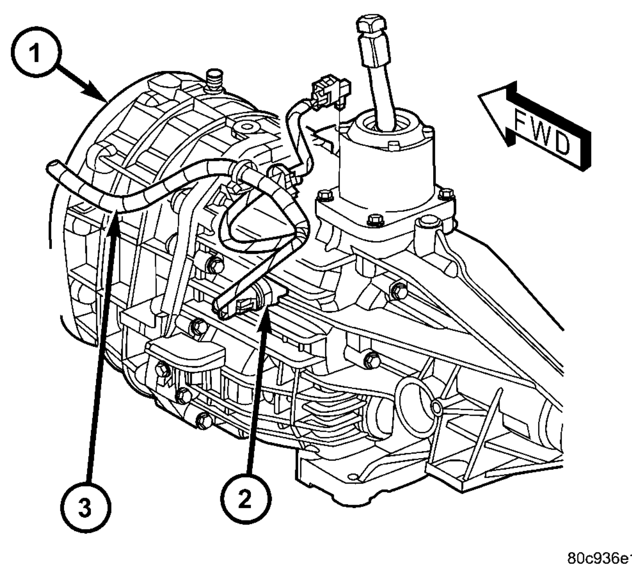

Fig. 2 Backup Lamp Switch - Typical

1 - MANUAL TRANSMISSION
2 - BACKUP LAMP SWITCH
3 - ENGINE WIRE HARNESS

BACKUP LAMP SWITCH (Continued)

Vehicles equipped with a manual transmission have a normally open, spring-loaded plunger style back-up lamp switch (Fig. 2). The backup lamp switch is located in the side of the manual transmission housing. Vehicles with an optional electronic automatic transmission have a Transmission Range Sensor (TRS) that is used to perform several functions, including that of the backup lamp switch. The TRS is described in further detail elsewhere in this service information. The backup lamp switch cannot be adjusted or repaired and, if faulty or damaged, the entire switch must be replaced.

OPERATION

The backup lamp switch controls the flow of battery voltage to the backup lamp bulbs through an output on the back-up lamp supply circuit. The switch plunger is mechanically actuated by the gearshift mechanism within the transmission, which will depress the switch plunger and close the switch contacts whenever the reverse gear has been selected. The switch receives battery voltage through a fuse in the Junction Block (JB) whenever the ignition switch is in the On position.The backup lamp switch and circuits can be tested using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - BACKUP LAMP SWITCH

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Disconnect the backup lamp switch harness connector.

(4) Check for continuity between the two terminal pins in the backup lamp switch connector.

(a) With the gear selector lever in the Reverse position, there should be continuity.

(b) With the gear selector lever in any position other than Reverse, there should be no continuity.

BRAKE LAMP SWITCH

DESCRIPTION

The brake lamp switch is a three circuit, spring-loaded plunger actuated switch that is secured to the steering column support bracket under the driver side of the instrument panel (Fig. 3). The brake lamp switch has six terminal pins and a Connector Position Assurance (CPA) lock. The switch is connected to the vehicle electrical system through the instrument panel wire harness. The switch plunger extends through a mounting collar on one end of the switch housing. The plunger has a one time telescoping self-adjustment feature that is achieved after the switch is installed by moving an adjustment release lever on the opposite end of the switch housing clockwise, until it locks in a position that is parallel to the connector.

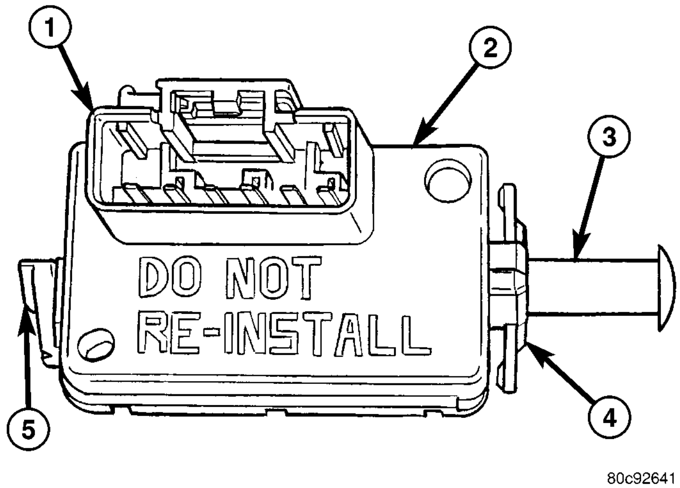

Fig. 3 Brake Lamp Switch

1 - CONNECTOR RECEPTACLE
2 - BRAKE LAMP SWITCH
3 - PLUNGER
4 - COLLAR
5 - LEVER

An installed brake lamp switch cannot be readjusted or repaired. If the switch is damaged, faulty, or removed from its mounting position for any reason, it must be replaced.

OPERATION

The brake lamp switch controls three different circuits, one normally open and two normally closed. These circuits are described as follows:

- **Brake Lamp Switch Circuit** - A normally open brake lamp switch circuit receives battery voltage from a fuse in the Junction Block (JB), and supplies battery voltage to the brake lamps and the Controller Antilock Brake (CAB) on a brake lamp switch output circuit when the brake pedal is depressed (brake lamp switch plunger released).
- **Brake Lamp Switch Signal Circuit** - A normally closed brake lamp switch signal circuit receives a path to ground through a splice block located in the instrument panel wire harness near the Junction Block (JB). This circuit supplies a ground input to the Powertrain Control Module (PCM) on a brake lamp switch sense circuit when the brake pedal is released (brake lamp switch plunger is depressed).
- **Speed Control Circuit** - A normally closed speed control circuit receives battery voltage from the Powertrain Control Module on a speed control supply circuit, and supplies battery voltage to the speed control servo solenoids (dump, vacuum, and vent) on a speed control brake switch output circuit when the

BRAKE LAMP SWITCH (Continued)

speed control system is turned on and the brake pedal is released (brake lamp switch plunger is depressed).

The components of the self-adjusting brake switch plunger consist of a two-piece telescoping plunger, a split plunger locking collar, and a release wedge. The release lever has a shaft with a wedge that spreads the plunger locking collar to an open or released position. After the switch is installed and the brake pedal is released, the plunger telescopes to the correct adjustment position. When the release lever is moved to the release position, the wedge is disengaged from the locking collar causing the collar to apply a clamping pressure to the two plunger halves fixing the plunger length.

The brake lamp switch can be diagnosed using conventional diagnostic tools and methods.

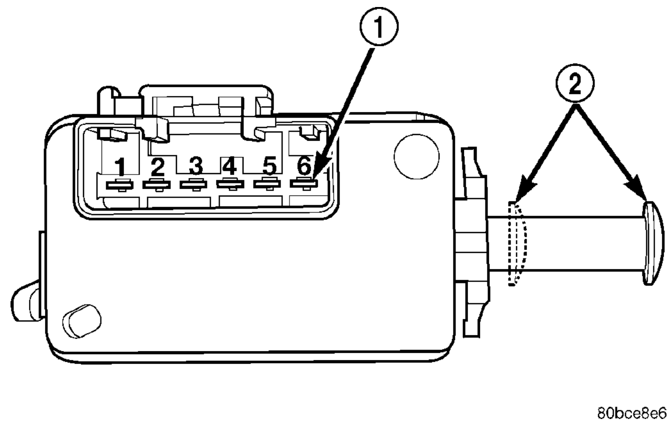

Fig. 4 Brake Lamp Switch Terminal Identification

1 - TERMINAL PINS
2 - PLUNGER TEST POSITIONS

DIAGNOSIS AND TESTING - BRAKE LAMP SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the brake lamp switch.

(2) Using an ohmmeter, perform the continuity tests at the terminal pins in the brake lamp switch (Fig. 4) as shown in the Brake Lamp Switch Tests table.

BRAKE LAMP SWITCH TESTS	
PLUNGER POSITION	CONTINUITY BETWEEN
Released (Extended)	Pins 1 & 2
Compressed (Retracted)	Pins 3 & 4, 5 & 6

(3) If the switch fails any of the continuity tests, replace the faulty brake lamp switch as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the brake lamp switch harness connector (Fig. 5).

(3) Rotate the brake lamp switch housing counterclockwise about 30 degrees to align the tabs on the locking collar with the keyed mounting hole in the steering column support bracket.

(4) Pull the switch straight back from the mounting hole to remove it from the steering column support bracket.

(5) Discard the brake lamp switch.

CAUTION: The brake lamp switch is One Time Only component and is not intended for reinstallation.

BRAKE LAMP SWITCH (Continued)

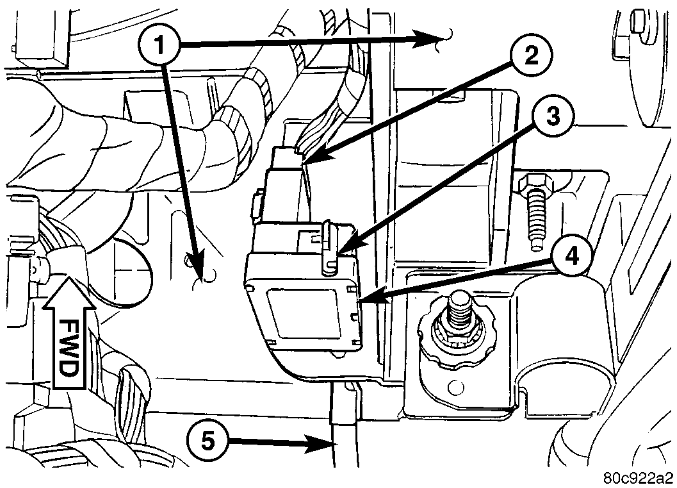

Fig. 5 Brake Lamp Switch Remove/Install

1 - STEERING COLUMN SUPPORT
2 - WIRE HARNESS CONNECTOR
3 - LEVER
4 - BRAKE LAMP SWITCH
5 - BRAKE PEDAL ARM

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: The Brake Lamp Switch is a One Time Only component and is not intended for reinstallation.

(1) Apply and hold the brake pedal, align the tabs on the brake lamp switch locking collar with the keyed mounting hole in the support bracket (Fig. 5).

(2) Insert the tabs on the brake lamp switch housing through the keyed mounting hole in the support bracket until the switch is firmly seated against the bracket.

(3) Rotate the switch clockwise about 30 degrees to lock the tabs on the switch locking collar to the keyed mounting hole in the support bracket.

(4) Release the brake pedal.

CAUTION: Do not pull up on the brake pedal before the switch plunger adjustment has been completed.

(5) Rotate the plunger adjustment release lever clockwise until it locks into place parallel to the brake lamp switch connector. This action will set the switch plunger length to a final adjustment position and cannot be undone. If not performed properly the first time, a new brake lamp switch **must** be installed.

(6) Reconnect the harness connector for the brake lamp switch.

(7) Reconnect the battery negative cable.

CENTER HIGH MOUNTED STOP LAMP BULB

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the Center High Mounted Stop Lamp (CHMSL) from the roof panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP UNIT - REMOVAL).

(3) Grasp the socket on the back of the CHMSL housing.

(4) Rotate the socket counterclockwise about 30 degrees (Fig. 6).

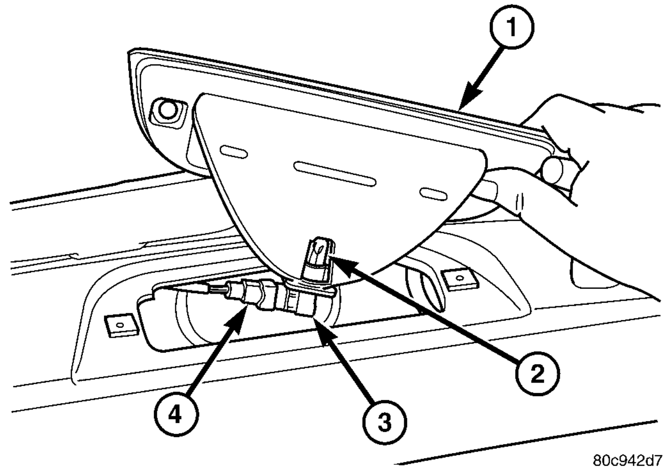

Fig. 6 Center High Mounted Stop Lamp Bulb Remove/Install

1 - CHMSL UNIT
2 - BULB
3 - SOCKET
4 - BODY WIRE HARNESS CONNECTOR

(5) Remove the socket and bulb from the CHMSL housing.

CENTER HIGH MOUNTED STOP LAMP BULB (Continued)

(6) Pull the bulb straight out of the CHMSL socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Push the bulb straight into the CHMSL harness socket until it is firmly seated.
(2) Align the socket and bulb with the opening on the back of CHMSL.
(3) Firmly seat the socket and bulb into the CHMSL housing (Fig. 6).
(4) Rotate the socket clockwise about 30 degrees.
(5) Reinstall the CHMSL onto the roof panel, tighten retaining screws to 2N·m (21 lbs.in.). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP UNIT - INSTALLATION).
(6) Reconnect the battery negative cable.

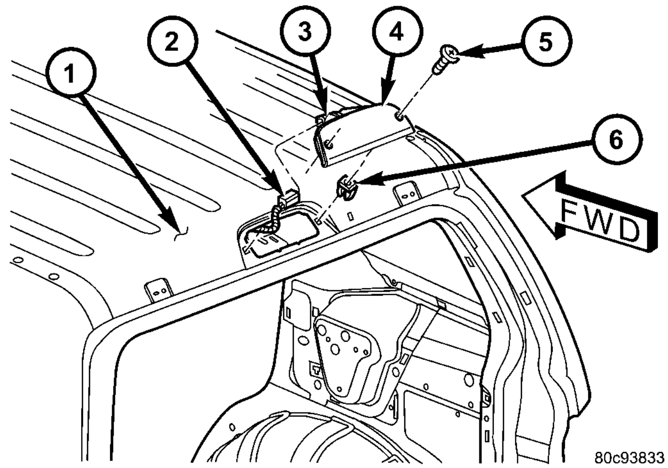

Fig. 7 Center High Mounted Stop Lamp Remove/ Install

1 - ROOF PANEL
2 - BODY WIRE HARNESS CONNECTOR
3 - BULB SOCKET
4 - CHMSL
5 - SCREW (2)
6 - PLASTIC NUT (2)

CENTER HIGH MOUNTED STOP LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Remove the screws that secure the Center High Mounted Stop Lamp (CHMSL) to the rear of the roof panel (Fig. 7).
(3) Pull the CHMSL away from the roof panel far enough to access and disconnect the wire harness.
(4) Remove the CHMSL from the roof panel.

INSTALLATION

(1) Position the Center High Mounted Stop Lamp (CHMSL) to the roof panel opening.
(2) Reconnect the wire harness (Fig. 7).
(3) Install and tighten the screws that secure the CHMSL to the roof panel. Tighten the screws to 2 N·m (21 in. lbs.).
(4) Reconnect the battery negative cable.

COMBINATION FLASHER

DESCRIPTION

The combination flasher is integral to the hazard switch. The combination flasher is a smart relay that functions as both the turn signal system and the hazard warning system flasher. The combination flasher contains active electronic Integrated Circuitry (IC) elements. This flasher is designed to handle the current flow requirements of the factory-installed lighting. If supplemental lighting is added to the turn signal lamp circuits, such as when towing a trailer with lights, the combination flasher will automatically try to compensate to keep the flash rate the same.

The combination flasher cannot be repaired or adjusted and, if faulty or damaged, the hazard switch unit must be replaced.

OPERATION

The combination flasher has the following inputs and outputs: fused B(+), fused ignition switch output, right turn signal sense, left turn signal sense, and one output each for the right and left turn signal circuits. The combination flasher also receives an internal input through the hazard switch and, on vehicles equipped with the optional Vehicle Theft Security System (VTSS), receives an input from the Body Control Module (BCM) in order to flash the turn signal lamps as an optical alert feature of that system. Battery positive voltage is supplied to the flasher so that it can perform the hazard warning function, and ignition positive voltage is supplied for the turn signal function. The Integrated Circuit (IC) within the combination flasher contains the logic that controls the flasher operation and the flash rate. The IC receives separate sense ground inputs from the multi-function switch for the right and left turn signals, and from the hazard switch contacts or the BCM for the hazard warning signals. A special design feature of the combination flasher allows it to ″sense″ that a turn

COMBINATION FLASHER (Continued)

signal circuit or bulb is not operating, and provide the driver an indication of the condition by flashing the remaining bulbs in the affected circuit at a higher rate (120 flashes-per-minute or higher).

Because of the active electronic elements within the combination flasher, it cannot be tested with conventional automotive electrical test equipment. If the combination flasher is believed to be faulty, test the turn signal and hazard warning system before replacing the flasher.

DAYTIME RUNNING LAMP RELAY

DESCRIPTION

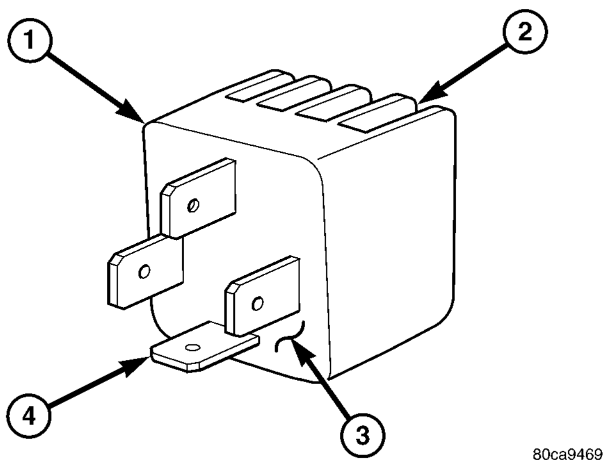

Fig. 8 Daytime Running Lamp Relay

1 - DRL RELAY
2 - HEAT SINK
3 - POTTING MATERIAL
4 - TERMINAL (4)

The Daytime Running Lamp (DRL) relay (Fig. 8) is a solid state relay that is used only on vehicles manufactured for sale in Canada.The DRL relay has four terminals that are laid out in a footprint that is similar to that of a conventional relay, a standard ISO relay should never be installed in place of the DRL relay. The DRL relay is installed in the Junction Block (JB). Vehicles equipped with this relay **do not** have a headlamp high beam relay installed in the JB.

The DRL relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The Daytime Running Lamp (DRL) relay is a solid state relay that controls the flow of battery voltage to the high beam filaments of both headlamp bulbs based upon a duty cycled input received from the Body Control Module (BCM) of vehicles equipped with the DRL feature. By cycling the DRL relay output, the BCM controls the illumination intensity of the high beams. The inputs and outputs of the DRL relay include:

- **Battery Voltage Input -** The DRL relay receives battery voltage on a fused B(+) circuit from a fuse in the Power Distribution Center (PDC).
- **Ground Input -** The DRL relay receives a path to ground through the driver side instrument panel end bracket near the Junction Block (JB).
- **Control Input -** The DRL relay control input is received from the BCM and/or the momentary optical horn (flash-to-pass) output of the multi-function switch through a high beam relay control circuit.
- **Control Output -** The DRL relay supplies battery voltage to the headlamp high beam filaments through the high beam relay output circuit.

Because of active electronic elements within the DRL relay, it cannot be tested with conventional automotive electrical test equipment. If the DRL relay is believed to be faulty, test the headlamp system before replacing the DRL relay.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the end cap from the driver side of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).

DAYTIME RUNNING LAMP RELAY (Continued)

(3) Remove the Daytime Running Lamp (DRL) relay by firmly pulling it straight out from the Junction Block (JB) (Fig. 9).

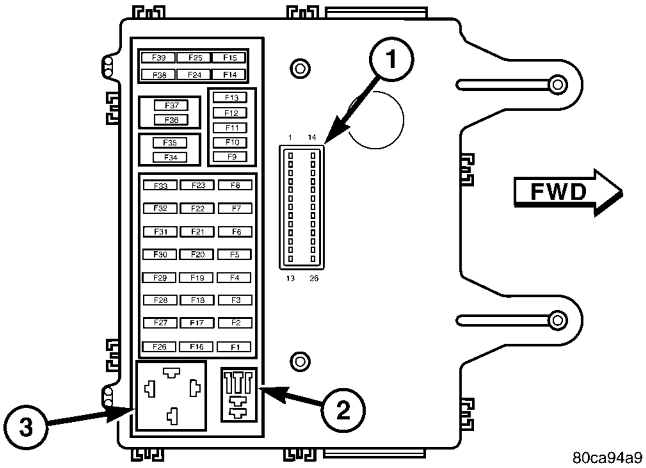

Fig. 9 Junction Block - Outboard Side (RHD Shown - Rotate 180° for LHD)

1 - JB/BCM CONNECTOR
2 - HIGH BEAM RELAY
3 - DRL RELAY

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the Daytime Running Lamp (DRL) relay to the Junction Block (JB) (Fig. 9).

(2) Align the DRL relay terminals with the JB.

(3) Push firmly and evenly on the top of the DRL relay until the terminals are fully seated.

(4) Reinstall the end cap onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

(5) Reconnect the battery negative cable.

FRONT FOG LAMP BULB

REMOVAL

(1) Turn the front wheels full lock in the direction of the fog lamp bulb that is to be changed.

(2) Disconnect and isolate the battery negative cable.

(3) Reach into the front wheel opening, unsnap and lift the cover over the access hole at the front of the wheelhouse splash shield (Fig. 10).

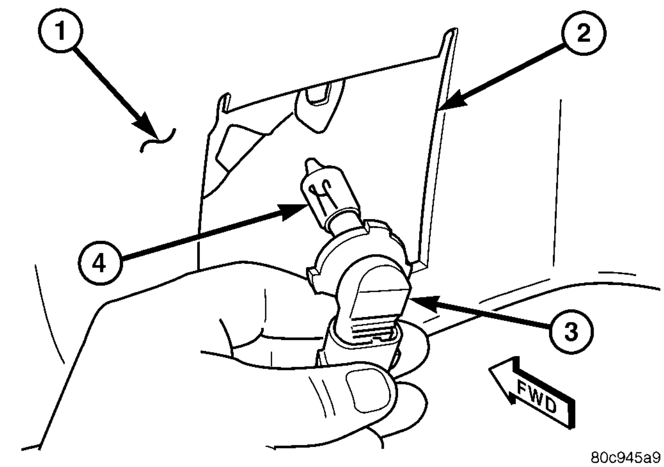

Fig. 10 Front Fog Lamp Bulb Remove/Install

1 - FRONT WHEELHOUSE SPLASH SHIELD
2 - ACCESS HOLE
3 - SOCKET
4 - BULB

(4) Reach through and rotate the socket on the back of the front fog lamp housing counterclockwise about 30 degrees.

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

(5) Pull the socket and bulb straight out of the front fog lamp housing and through the access hole into the front wheel opening area.

(6) Pull the bulb straight out of the front fog lamp socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

FRONT FOG LAMP BULB (Continued)

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

(1) Align the base of the bulb with the front fog lamp socket.

(2) Push the bulb straight into the front fog lamp socket until it is firmly seated.

(3) Position the socket and bulb through the access hole in the front wheelhouse shield and align it with the socket opening on the back of the front fog lamp housing (Fig. 10).

(4) Push the socket and bulb straight into the front fog lamp housing until it is firmly seated.

(5) Rotate the socket about 30 degrees to lock into place.

(6) Lower and snap shut the access cover of the front wheelhouse shield.

(7) Reconnect the battery negative cable.

FRONT FOG LAMP RELAY

DESCRIPTION

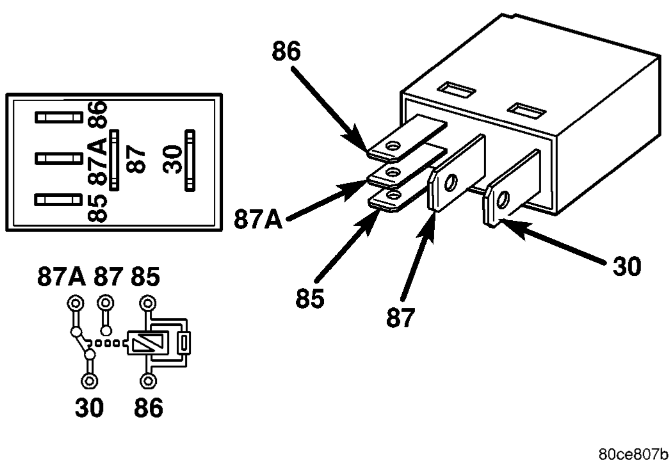

Fig. 11 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The front fog lamp relay is located in the Junction Block (JB). The front fog lamp relay is a International Standards Organization (ISO) micro relay (Fig. 11).

The front fog lamp relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The front fog lamp relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the front fog lamps. The movable common supply contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This field draws the movable relay contact point away from the fixed closed contact point, and holds it against the fixed open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed closed contact point. A resistor is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the field of the relay coil collapses.

The front fog lamp relay terminals are connected to the vehicle electrical system through the Junction Block (JB). The inputs and outputs of the front fog lamp relay include:

- **Common Supply Terminal** - The common supply terminal receives battery voltage at all times from a fuse in the JB.
- **Coil Ground Terminal** - The coil ground terminal is connected to a control output of the premium Body Control Module (BCM) through a front fog lamp relay control circuit. The BCM controls front fog lamp operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal receives battery voltage at all times from a fuse in the JB.
- **Normally Open Terminal** - The normally open terminal is connected to the front fog lamps through a front fog lamp relay output circuit and provides battery voltage to the front fog lamps whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal is not connected in this application.

The front fog lamp relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - FRONT FOG LAMP RELAY

The front fog lamp relay (Fig. 12) is located in the Junction Block (JB). Refer to the appropriate wiring information.

FRONT FOG LAMP RELAY (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

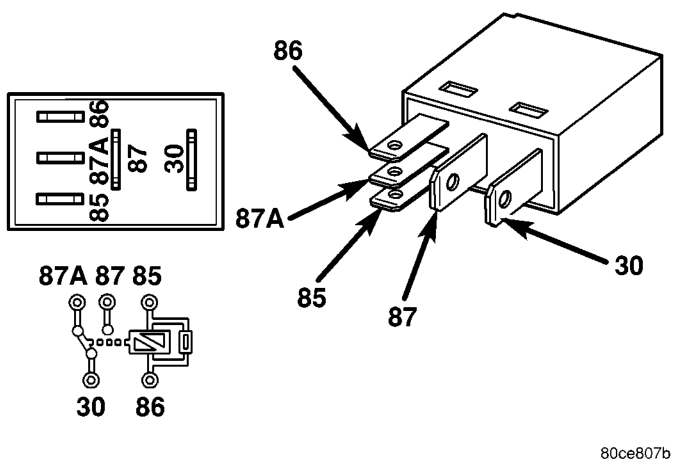

Fig. 12 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the front fog lamp relay from the JB. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT FOG LAMP RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL).

(3) Remove the front fog lamp relay by firmly pulling it straight out from the Junction Block (JB) (Fig. 13).

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the front fog lamp relay to the proper receptacle in the Junction Block (JB) (Fig. 13).

(2) Push firmly and evenly on the top of the front fog lamp relay until the terminals are fully seated in the JB.

FRONT FOG LAMP RELAY (Continued)

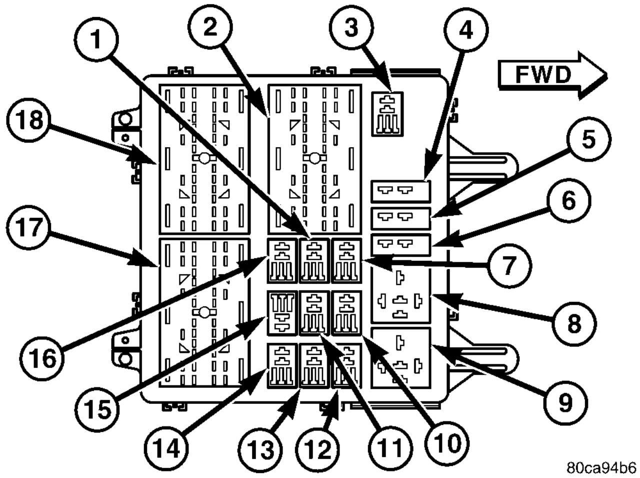

Fig. 13 Junction Block - Inboard Side (LHD Shown - Rotate 180° for RHD)

1 - PASSENGER DOOR UNLOCK RELAY
2 - JB C3 CONNECTOR RECEPTACLE
3 - LOW BEAM RELAY
4 - CIRCUIT BREAKER #1
5 - CIRCUIT BREAKER #2
6 - CIRCUIT BREAKER #3
7 - DOOR LOCK RELAY
8 - DEFOGGER RELAY
9 - SPARE
10 - FRONT FOG LAMP RELAY
11 - HORN RELAY
12 - SPARE
13 - SPARE
14 - REAR FOG LAMP RELAY
15 - PARK LAMP RELAY
16 - DRIVER DOOR UNLOCK RELAY
17 - JB C1 CONNECTOR RECEPTACLE
18 - JB C2 CONNECTOR RECEPTACLE

(3) Reinstall the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

(4) Reconnect the battery negative cable.

FRONT FOG LAMP UNIT

REMOVAL

(1) Turn the front wheels full lock in the direction of the fog lamp bulb that is to be changed.

(2) Disconnect the battery negative cable.

(3) Reach into the front wheel opening, unsnap and lift the cover over the access hole at the front of the wheelhouse splash shield (Fig. 14).

(4) Reach through the access hole to remove the three screws that secure the front fog lamp unit to the front bumper fascia.

(5) From the front of the vehicle, pull the front fog lamp out of the front bumper fascia far enough to access and disconnect the wire harness connector. (Fig. 15).

(6) Remove the front fog lamp from the front bumper fascia.

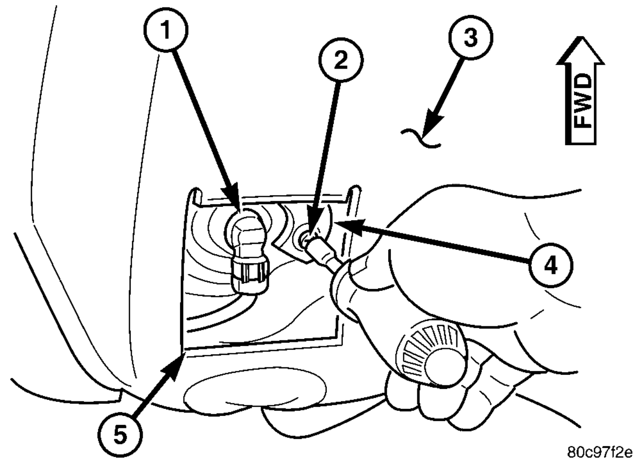

Fig. 14 Front Fog Lamp Unit Remove/Install

1 - FRONT FOG LAMP UNIT
2 - SCREW (3)
3 - FRONT WHEELHOUSE SPLASH SHIELD
4 - FRONT BUMPER FASCIA
5 - ACCESS HOLE

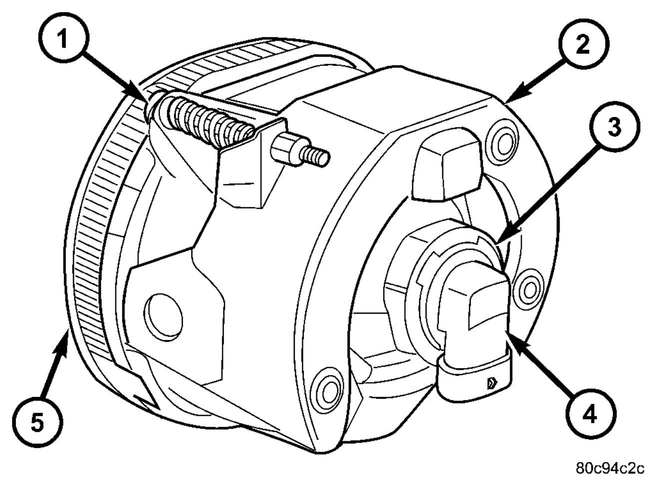

Fig. 15 Front Fog Lamp Unit

1 - ADJUSTING SCREW
2 - MOUNTING BRACKET
3 - HOUSING
4 - SOCKET & BULB
5 - LENS

INSTALLATION

(1) Position the front fog lamp to the front bumper fascia.

(2) Reconnect the wire harness connector. (Fig. 15).

(3) Position the front fog lamp into the front bumper fascia.

(4) Reach into the front wheel opening and through the access hole to install and tighten the screws that secure the front fog lamp housing to the front bumper fascia (Fig. 14). Tighten the screws to 3 N·m (25 in. lbs.).

FRONT FOG LAMP UNIT (Continued)

(5) Lower and snap shut the cover at the front of the front wheelhouse shield.

(6) Reconnect the battery negative cable.

(7) Confirm proper front fog lamp alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT FOG LAMP UNIT - ADJUSTMENTS).

ADJUSTMENTS

ADJUSTMENT - FRONT FOG LAMP UNIT

VEHICLE PREPARATION FOR FOG LAMP ALIGNMENT

(1) Repair or replace any faulty or damaged components that could hinder proper lamp alignment.

(2) Verify proper tire inflation.

(3) Clean the front fog lamp lenses.

(4) Verify that the cargo area is not heavily loaded.

(5) The fuel tank should be Full. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.

FOG LAMP ALIGNMENT

Prepare an alignment screen as illustrated. A properly aligned front fog lamp will project a pattern on the alignment screen 100 millimeters (4 inches) below the fog lamp centerline and straight ahead of the lamp.

(1) Position the vehicle on a level surface perpendicular to a flat wall 7.62 meters (25 feet) away from the front of the front fog lamp lens (Fig. 16). If necessary, tape a line on the floor 7.62 meters (25 feet) away from and parallel to the wall.

(2) Measure up on the wall 1.27 meters (5 feet) from the floor and tape a vertical line on the alignment screen at the centerline of the vehicle. Sight along the centerline of the vehicle (from the rear of the vehicle forward) to verify the accuracy of the centerline placement.

(3) Rock the vehicle from side-to-side three times to allow the suspension to stabilize, then jounce the front suspension three times by pushing downward on the front bumper and releasing. Measure the distance from the center of the front fog lamp lens to the floor. Transfer this measurement to the alignment screen and tape a horizontal line on the wall at this mark. This line will be used for up-and-down adjustment reference.

(4) Measure the distance from the centerline of the vehicle to the center of each front fog lamp being aligned. Transfer these measurements to the alignment screen and tape a vertical line this distance to each side of the vehicle centerline. These lines will be used for left/right reference.

(5) Rotate the front fog lamp adjusting screws to adjust the beam height as required (Fig. 17).

FRONT LAMP BULB

REMOVAL

The front lamp may contain either one or two bulbs, depending upon the market for which the vehicle was manufactured. The service procedures for one bulb or for both bulbs is the same, only the bulb sizes and types may differ. Be certain any removed bulb is replaced with the same bulb size and type that was removed.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the front lamp from the front bumper fascia. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL).

(3) Rotate the socket on the back of the front lamp housing counterclockwise about 30 degrees. (Fig. 18).

(4) Pull the socket and bulb straight out of the back of the front lamp housing.

(5) Pull the bulb straight out of the front lamp socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the bulb with the front lamp socket.

(2) Push the bulb straight into the front lamp socket until it is firmly seated.

(3) Align the socket and bulb with the opening on the back of the front lamp housing (Fig. 18).

(4) Push the socket and bulb into the front lamp housing.

(5) Rotate the socket clockwise about 30 degrees to seat.

(6) Reinstall the front lamp into the front bumper fascia. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION).

(7) Reconnect the battery negative cable.

FRONT LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the retaining screw (Fig. 19).

(3) Pull the outboard end of the front lamp away from the front bumper fascia far enough to disengage the tab on the inboard end of the front lamp housing.

FRONT LAMP UNIT (Continued)

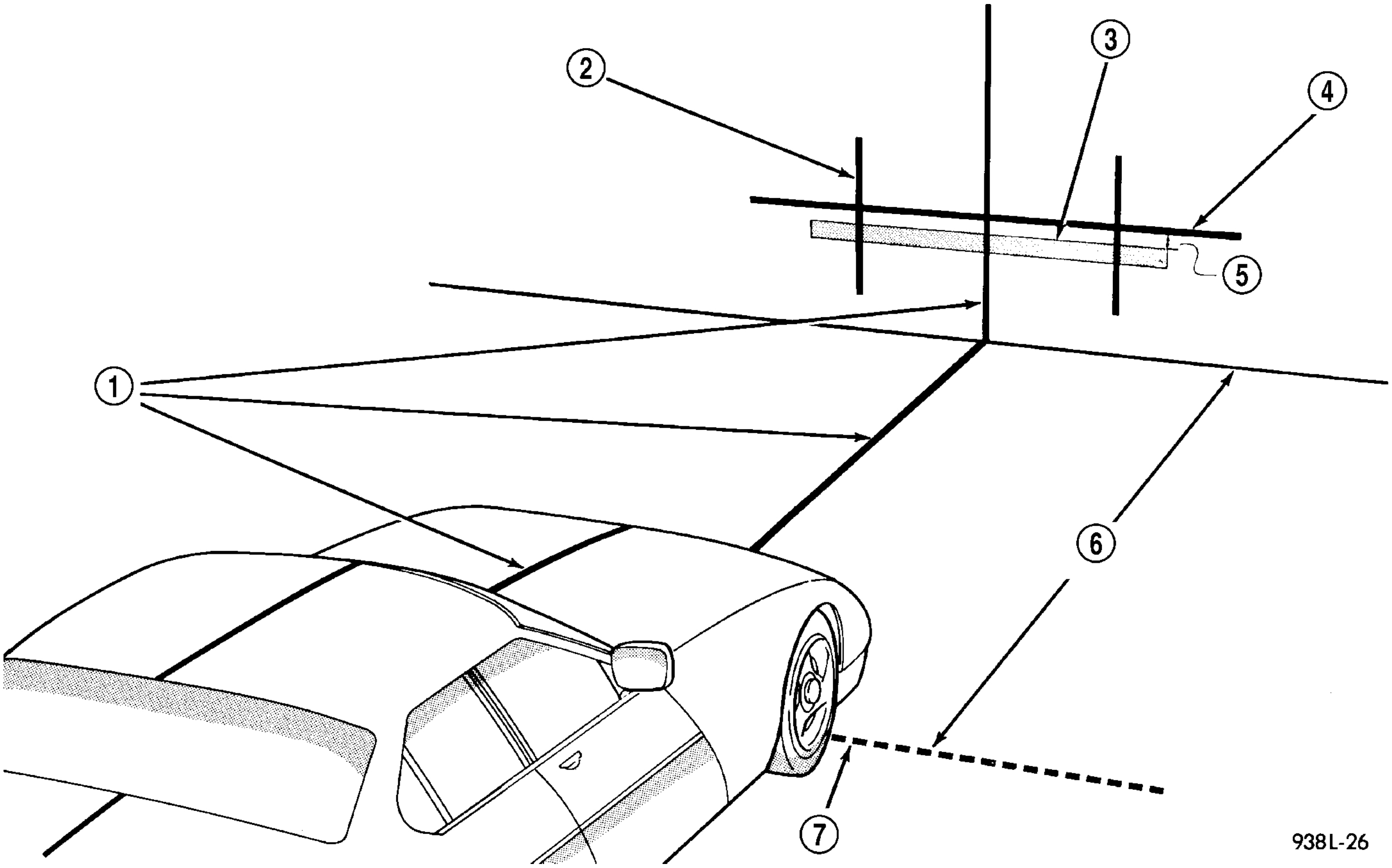

Fig. 16 Front Fog Lamp Alignment - Typical

1 - VEHICLE CENTERLINE
2 - CENTER OF VEHICLE TO CENTER OF FOG LAMP LENS
3 - HIGH-INTENSITY AREA
4 - FLOOR TO CENTER OF FOG LAMP LENS
5 - 100 MILLIMETERS (4 INCHES)
6 - 7.62 METERS (25 FEET)
7 - FRONT OF FOG LAMP

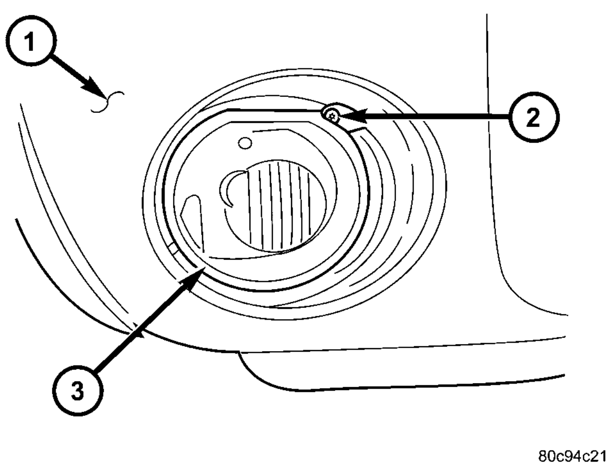

Fig. 17 Front Fog Lamp Adjusting Screw

1 - FRONT BUMPER FASCIA
2 - ADJUSTING SCREW
3 - FRONT FOG LAMP UNIT

(4) Access and disconnect the wire harness connector(s).

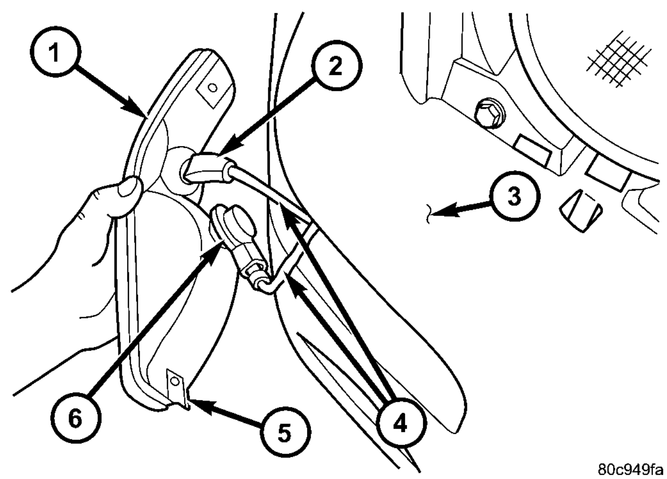

Fig. 18 Front Lamp Bulb Remove/Install

1 - FRONT LAMP UNIT
2 - SIDE MARKER SOCKET
3 - FRONT FASCIA
4 - HEADLAMP & DASH WIRE HARNESS
5 - MOUNTING TAB
6 - PARK/TURN SIGNAL SOCKET

FRONT LAMP UNIT (Continued)

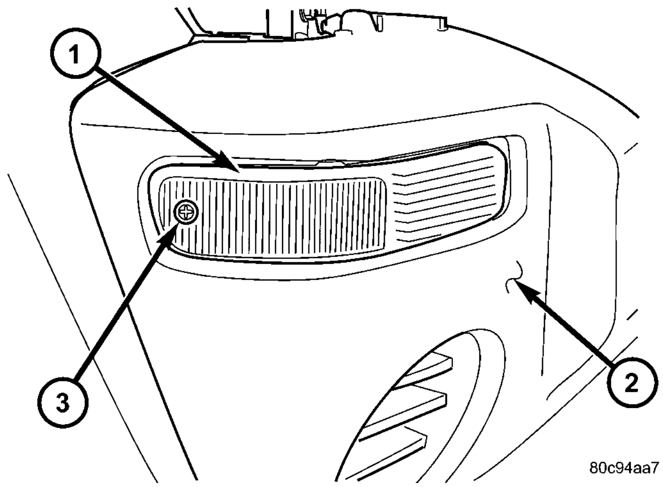

Fig. 19 Front Lamp Unit Remove/Install

1 - FRONT LAMP UNIT
2 - FRONT BUMPER FASCIA
3 - SCREW (1)

(5) Remove the front lamp.

INSTALLATION

(1) Position the front lamp to the front bumper fascia.

(2) Reconnect the wire harness connector(s).

(3) Engage the tab on the inboard end of the front lamp housing into the front bumper fascia.

(4) Position the outboard end of the front lamp housing to the front bumper fascia and install screw. Tighten the screw to 2 N·m (20 in. lbs.) (Fig. 19).

(5) Reconnect the battery negative cable.

FRONT POSITION LAMP BULB

REMOVAL

The front position lamps are integral to the headlamps on vehicles manufactured for certain markets where these lamps are required.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the headlamp from the front grille opening reinforcement. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).

(3) Rotate the front position lamp socket near the bottom of the headlamp housing counterclockwise about 30 degrees (Fig. 20).

(4) Pull the socket and bulb straight out of the headlamp.

(5) Pull the bulb straight out of the socket.

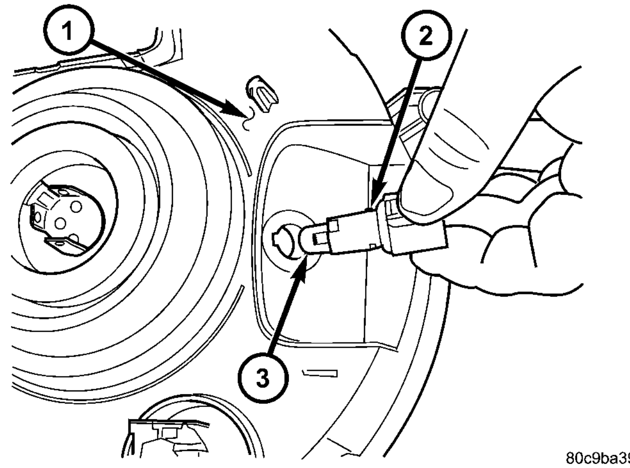

Fig. 20 Front Position Lamp Bulb Remove/Install

1 - HEADLAMP HOUSING
2 - SOCKET
3 - BULB

INSTALLATION

The front position lamps are integral to the headlamp units on vehicles manufactured for certain markets where these lamps are required.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Push the bulb straight into the front position lamp socket until it is firmly seated.

(2) Align the socket and bulb with the headlamp (Fig. 20).

(3) Push the socket and bulb into the headlamp housing until it is firmly seated.

(4) Rotate the lamp socket clockwise about 30 degrees.

(5) Reinstall the headlamp onto the grille opening reinforcement. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).

(6) Reconnect the battery negative cable.

(7) Confirm proper headlamp unit alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - ADJUSTMENTS).

HAZARD SWITCH

DESCRIPTION

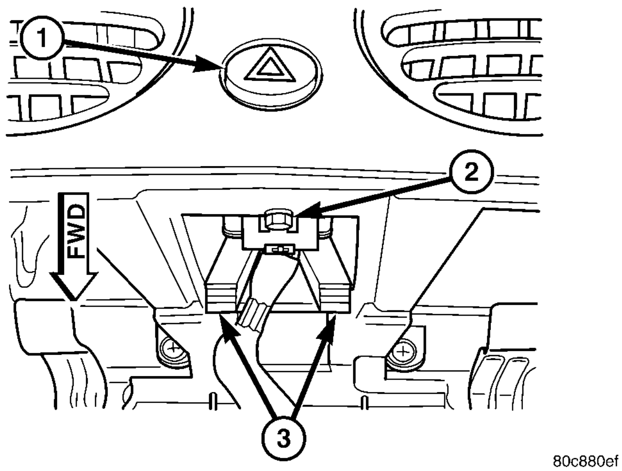

Fig. 21 Hazard Switch

1 - HAZARD SWITCH BUTTON
2 - SCREW (1)
3 - MOUNTING BRACKET TABS

The hazard switch is integral to the hazard switch module, which is secured near the center of instrument panel just above the radio (Fig. 21). The hazard switch button is visible through a opening on the instrument panel. The switch module is connected to the vehicle electrical system through the instrument panel wire harness. Within the hazard switch module is the hazard switch circuitry, and an electronic circuit board with the combination flasher circuitry. The combination flasher circuitry performs both the hazard flasher and turn signal flasher functions.

The hazard switch module cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The hazard switch button is slightly recessed in the instrument panel when the switch is in the Off position, and latches at a position that is flush with the outer surface of the instrument panel when in the On position. The hazard switch module produces an audible clicking sound that emulates the sound of a conventional flasher whenever the turn signals or the hazard warning system are activated. The hazard switch module receives battery voltage from a fuse in the Junction Block (JB) at all times for operation of the hazard warning, and on a ignition switch output (run) circuit from another fuse in the JB whenever the ignition switch is in the On position for operation of the turn signals. The module receives a path to ground through the driver side instrument panel end bracket near the JB. Inputs to and outputs from the hazard switch module include:

- **Panel Lamps Dimmer Input** - A non-serviceable incandescent bulb soldered onto the hazard switch module provides illumination of the switch button when the exterior lighting is turned On through the fused panel lamps dimmer switch signal circuit. This bulb flashes on and off at full intensity whenever the hazard switch button is activated, regardless of the status of the exterior lighting.
- **Hazard Switch Input** - The combination flasher receives an internal ground input from the hazard switch to request operation.
- **Multi-Function Switch Input** - The combination flasher receives separate ground inputs from the multi-function switch on right and left turn switch sense circuits to request signal flasher operation.
- **Body Control Module Input** - The Body Control Module (BCM) can request hazard flasher operation by providing a ground path to the combination flasher through a hazard lamp control circuit.
- **Turn Signal Output** - The combination flasher responds to the flasher inputs by energizing and de-energizing two miniature relays on the module circuit board. These relays control the switch output through the right and left turn signal circuits. One relay controls the right lamps, while the other controls the left.

Because of active electronic elements within the hazard switch module, it cannot be tested with conventional automotive electrical test equipment. If the hazard switch module is believed to be faulty, testing of the hazard and turn signal circuits is required before replacement.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

HAZARD SWITCH (Continued)

(2) Remove the radio from the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).

(3) Remove the screw at the top of the instrument panel radio opening that secures the hazard switch to the instrument panel (Fig. 22).

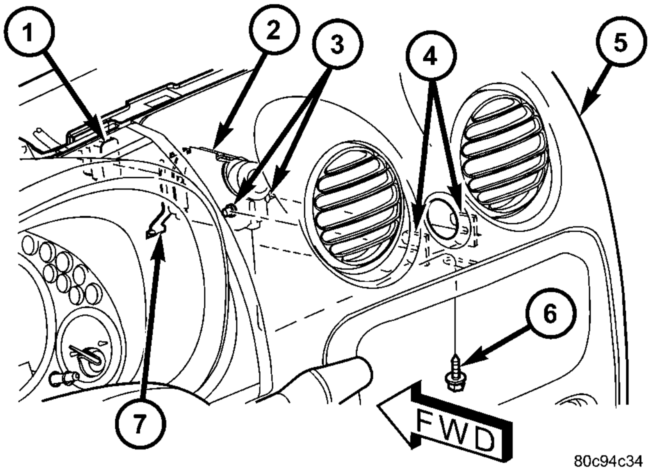

Fig. 22 Hazard Switch Remove/Install

1 - WIRE HARNESS CONNECTOR
2 - HAZARD SWITCH
3 - ALIGNMENT PIN (2)
4 - STANCHION (2)
5 - INSTRUMENT PANEL
6 - SCREW (1)
7 - MOUNTING BRACKET LATCH TAB (2)

(4) Access the two latch tabs of the stamped metal hazard switch mounting bracket.

(5) Pull rearward and downward on the latch tabs of the hazard switch until it is disengaged from the instrument panel trim.

(6) Push the hazard switch button through the button opening far enough to disengage the alignment pins on each side of the switch housing.

(7) Disconnect the instrument panel wire harness connector for the hazard switch.

(8) Remove the hazard switch.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the hazard switch through the instrument panel radio opening.

(2) Reconnect the instrument panel wire harness connector.

(3) Position the hazard switch for installation.

(4) Guide the hazard switch button through the button opening of the instrument panel, which will engage the alignment pins on each side of the switch housing.

(5) Press upward on the back of the hazard switch until the latch tabs of the mounting bracket are both engaged with the instrument panel trim (Fig. 22).

(6) Install and tighten the screw at the top of the instrument panel radio opening. Tighten the screw to 2 N·m (17 in. lbs.).

(7) Reinstall the radio into the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).

(8) Reconnect the battery negative cable.

HEADLAMP BULB

REMOVAL

NORTH AMERICA

(1) Disconnect and isolate the battery negative cable.

(2) Reach behind the headlamp from the engine compartment side of the upper radiator crossmember to access the headlamp bulb lock ring (Fig. 23).

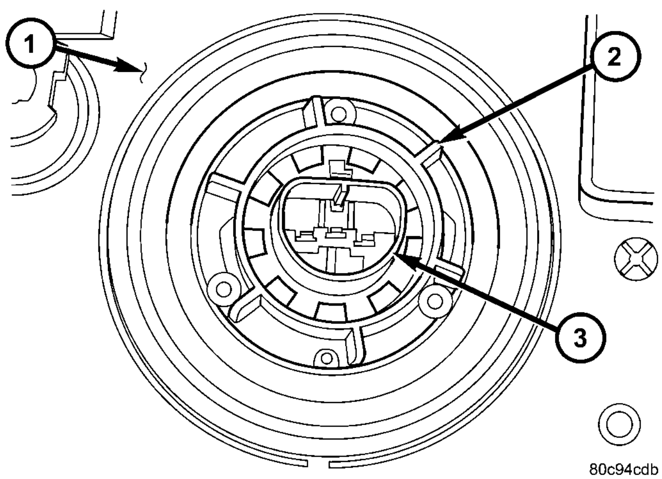

Fig. 23 Headlamp Bulb Lock Ring

1 - HEADLAMP UNIT HOUSING
2 - LOCK RING
3 - SOCKET & BULB

HEADLAMP BULB (Continued)

(3) Grasp the lock ring on the back of the headlamp unit housing.

(4) Rotate the lock ring on the back of the headlamp housing counterclockwise about 30 degrees.

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

(5) Pull the lock ring, socket, and bulb straight out of the headlamp housing and up from behind the upper radiator crossmember (Fig. 24).

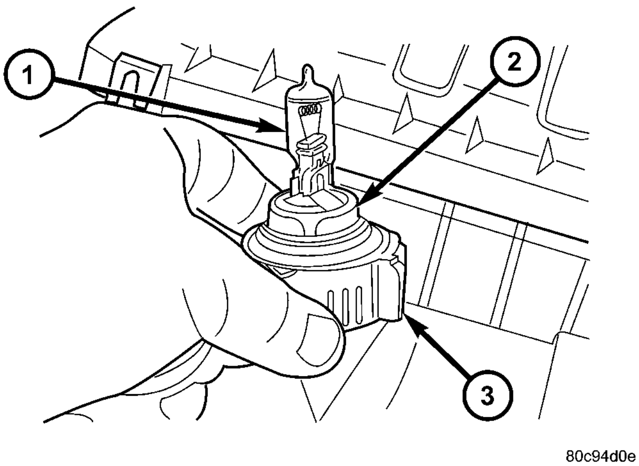

Fig. 24 Headlamp Bulb Remove/Install

1 - HEADLAMP BULB
2 - SOCKET
3 - LOCK RING

(6) Disconnect the harness connector from the connector on the bulb socket.

(7) Remove the bulb and bulb socket from the lock ring.

EXPORT

(1) Disconnect and isolate the battery negative cable.

(2) Remove the headlamp from the grille opening reinforcement. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).

(3) Grasp the tab of the headlamp boot seal on the back of the headlamp housing (Fig. 25).

(4) Pull the tab away from the back of the headlamp housing to remove the boot seal.

(5) Pinch the two hooked ends of the wire headlamp bulb retainer clip together and disengage them from the flange of the reflector (Fig. 26).

(6) Pivot the headlamp bulb retainer clip up off of the bulb flange and out of the way.

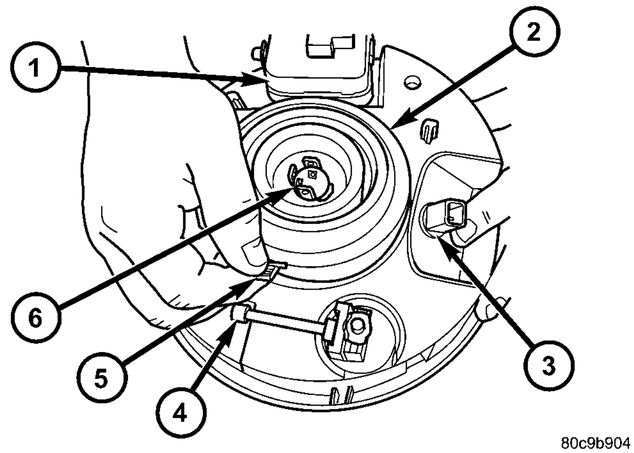

Fig. 25 Headlamp Bulb Boot Seal Remove

1 - LEVELING MOTOR (IF EQUIPPED)
2 - BOOT SEAL
3 - FRONT POSITION LAMP
4 - ADJUSTING SCREW
5 - TAB
6 - BULB BASE

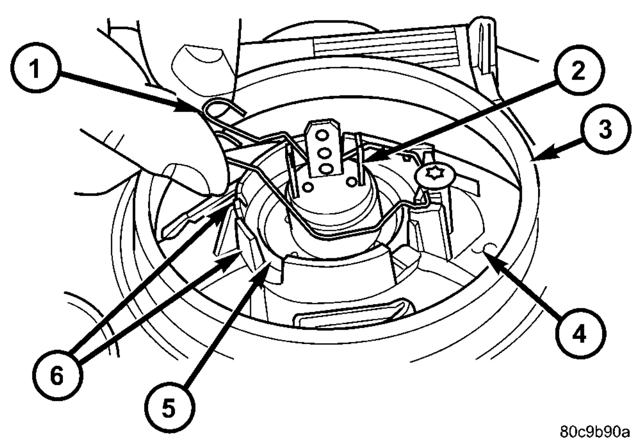

Fig. 26 Headlamp Bulb Retainer Clip Engage/ Disengage

1 - RETAINER CLIP
2 - BULB BASE
3 - HEADLAMP HOUSING
4 - REFLECTOR
5 - BULB FLANGE
6 - RETAINER SLOTS

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

HEADLAMP BULB (Continued)

(7) Pull the bulb straight out of the headlamp reflector (Fig. 27).

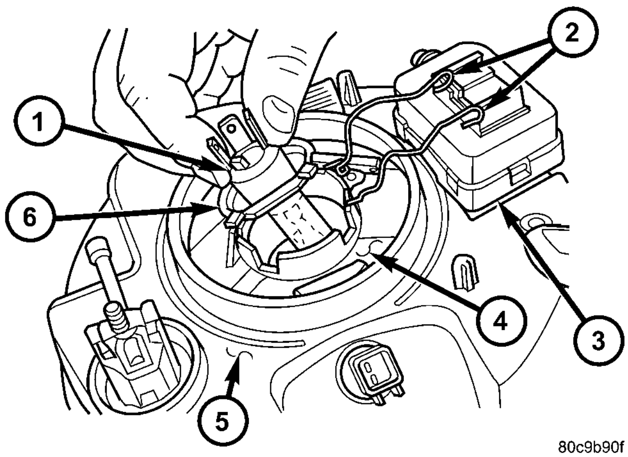

Fig. 27 Headlamp Bulb Remove/Install

1 - BULB BASE
2 - RETAINER CLIP
3 - LEVELING MOTOR (IF EQUIPPED)
4 - REFLECTOR
5 - HEADLAMP HOUSING
6 - BULB FLANGE

INSTALLATION

NORTH AMERICA

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

(1) Position the headlamp bulb and socket into the lock ring (Fig. 24).

(2) Reconnect the wire harness connector for the headlamp bulb to the connector on the bulb socket.

(3) Position the lock ring, socket, and bulb down behind the upper radiator crossmember and align them with the socket opening on the back of the headlamp housing.

(4) Push the socket and bulb straight into the headlamp housing until they are firmly seated.

(5) Position the lock ring over the socket and engage it with the flange on the back of the headlamp housing (Fig. 23).

(6) Rotate the lock ring on the back of the headlamp housing clockwise about 30 degrees.

(7) Reconnect the battery negative cable.

EXPORT

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

(1) Position the bulb into the headlamp reflector (Fig. 27).

(2) Pivot the headlamp bulb retainer clip back over the bulb flange.

(3) Pinch the two hooked ends of the wire headlamp bulb retainer clip together and engage them into the flange of the reflector (Fig. 26).

(4) Position the center opening of the boot seal over the base of the headlamp bulb and pull it downward until the seal is fully engaged over the bulb base (Fig. 25).

(5) Position the outer circumference of the boot seal over the flange on the back of the headlamp housing and pull it downward until the seal is fully engaged over the flange.

(6) Reinstall the headlamp onto the grille opening reinforcement. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).

(7) Reconnect the battery negative cable.

(8) Confirm proper headlamp unit alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - ADJUSTMENTS).

HEADLAMP HIGH BEAM RELAY

DESCRIPTION

The headlamp high beam relay is located in the Junction Block (JB). The headlamp high beam relay is omitted from vehicles manufactured for sale in Canada, which have a Daytime Running Lamp (DRL) relay installed in the JB that performs the function. The headlamp high beam relay is a conventional International Standards Organization (ISO) micro relay (Fig. 28).

The headlamp high beam relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

HEADLAMP HIGH BEAM RELAY (Continued)

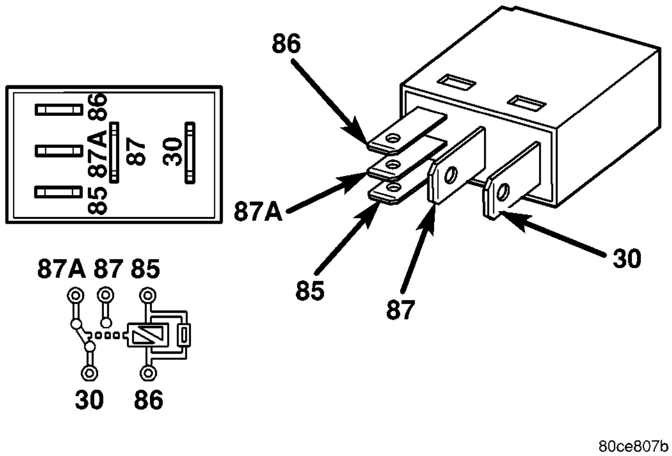

Fig. 28 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

OPERATION

The headlamp high beam relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high voltage output to the headlamp high beam filaments. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The inputs and outputs of the headlamp high beam relay include:

- **Common Supply Terminal** - The common supply terminal receives battery voltage at all times from a fuse in the Power Distribution Center (PDC).
- **Coil Ground Terminal** - The coil ground terminal is connected to a control output of the Body Control Module (BCM) through a head lamp relay control circuit. The BCM controls head lamp operation by controlling a ground path through this circuit
- **Coil Battery Terminal** - The coil battery terminal is connected to a control output of the Body Control Module (BCM) and to the momentary optical horn (flash-to-pass) output of the multi-function switch through a high beam relay control circuit. The BCM and/or the multi-function switch controls headlamp high beam operation by controlling a ground path through this circuit.
- **Normally Open Terminal** - The normally open terminal is connected to the headlamp high beam filaments through the high beam relay output circuit and provides battery voltage to the headlamp high beams whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal is not connected in this application.

The headlamp high beam relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - HEADLAMP HIGH BEAM RELAY

The headlamp high beam relay (Fig. 29) is located in the Junction Block (JB. Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

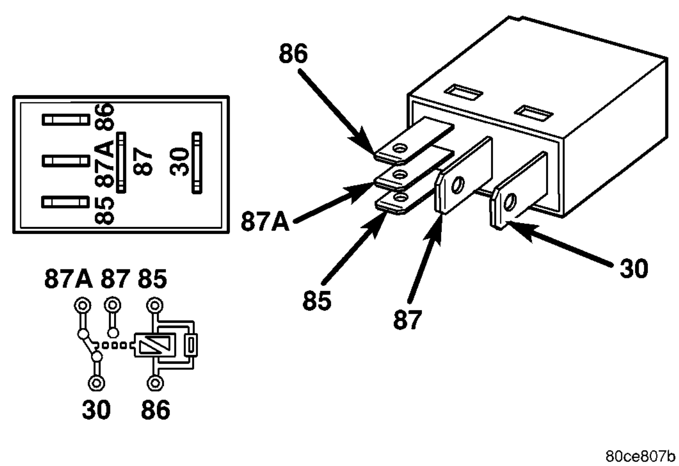

Fig. 29 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

HEADLAMP HIGH BEAM RELAY (Continued)

(1) Remove the headlamp high beam relay from the JB. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP HIGH BEAM RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

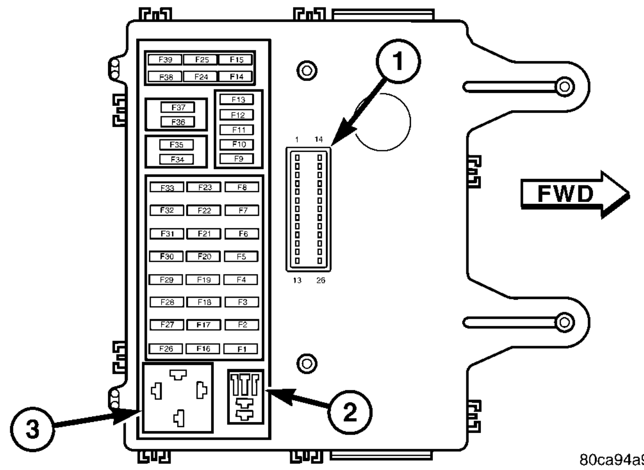

Fig. 30 Junction Block - Outboard Side (RHD Shown - Rotate 180° for LHD)

1 - JB/BCM CONNECTOR
2 - HIGH BEAM RELAY
3 - DRL RELAY

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the end cap from the driver side outboard end of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).

(3) Grasp the headlamp high beam relay and firmly pull it straight out from the Junction Block (JB) (Fig. 30).

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the headlamp high beam relay terminals with the terminals in the JB. (Fig. 30).

(2) Push firmly and evenly on the top of the headlamp high beam relay until the terminals are fully seated in the JB.

(3) Reinstall the end cap onto the driver side outboard end of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

(4) Reconnect the battery negative cable.

HEADLAMP LEVELING MOTOR

DESCRIPTION

The headlamp leveling motor is located on the rear inboard side of each headlamp on models equipped with the headlamp leveling system, (Fig. 31). The motor is encased within a molded plastic housing and is secured to a flange on the back of the headlamp housing. A rubber seal around the circumference of the mounting boss seals the motor to the headlamp. The outside of the motor housing features an integral molded connector on its rearward surface, a hex-headed adjusting screw extends from the top of the

HEADLAMP LEVELING MOTOR (Continued)

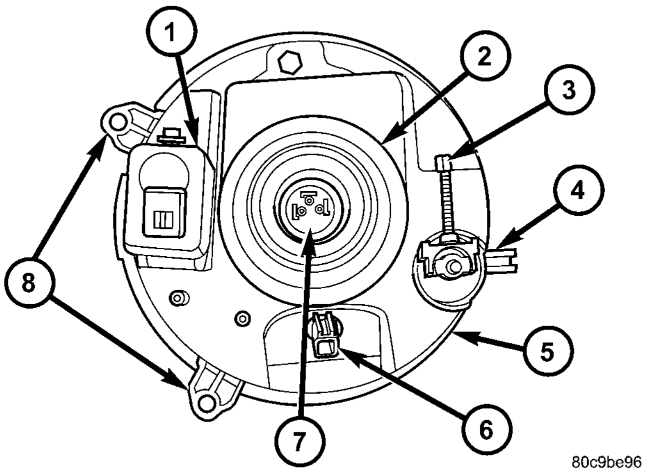

Fig. 31 Headlamp Unit - With Leveling

1 - LEVELING MOTOR (IF EQUIPPED)
2 - BOOT SEAL
3 - ADJUSTING SCREW
4 - LOCATOR TAB
5 - HOUSING
6 - FRONT POSITION LAMP SOCKET & BULB
7 - HEADLAMP BULB
8 - MOUNTING TAB (2)

housing, and a plastic pushrod with a ball formation on its free end. Within the motor housing is a 12-volt Direct Current (DC) servo motor, an electronic controller board that includes the motor logic circuits, and an integral screw-drive transmission. The headlamp leveling motor is connected to the vehicle electrical system through the front fascia wire harness.

The headlamp leveling motor cannot be repaired and, if faulty or damaged, must be replaced.

OPERATION

The controller board and logic circuitry of the headlamp leveling motor will energize the motor and extend or retract the motor pushrod through the integral screw-drive transmission based upon the voltage signal input received from the resistor multiplexed headlamp leveling switch. The ball on the end of the headlamp leveling motor pushrod is snapped into a socket on the back of the movable reflector within the headlamp housing. The headlamp leveling motors and switch have a path to ground at all times. The headlamp leveling components operate on battery voltage received through the fused park lamp relay output circuit so that the system will only operate when the exterior lighting is turned On.

Because of active electronic elements within the headlamp leveling motor, it cannot be tested with conventional automotive electrical test equipment. If the headlamp leveling motor is believed to be faulty, the headlamp wiring harness and switch must be tested before replacing the motor.

REMOVAL

The headlamp leveling motors are integral to the headlamp on vehicles manufactured for certain markets where headlamp leveling is required.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the headlamp bulb from the headlamp housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP BULB - REMOVAL).

(3) Rotate the headlamp leveling motor on the back of the headlamp housing counterclockwise about 30 degrees (Fig. 32).

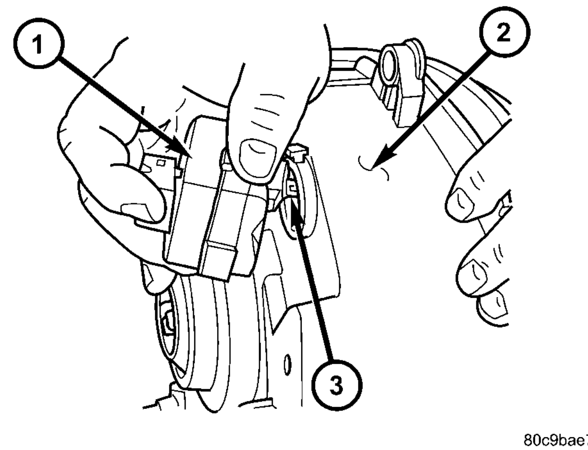

Fig. 32 Headlamp Leveling Motor Remove/Install

1 - LEVELING MOTOR
2 - HEADLAMP HOUSING
3 - PUSHROD

(4) Grasp the motor with one hand while stabilizing the headlamp housing with the other.

(5) Firmly and steadily, pull the headlamp leveling motor straight away from the back of the headlamp housing to unsnap the ball on the end of the motor pushrod from the socket on the headlamp reflector (Fig. 33).

(6) Remove the headlamp leveling motor and pushrod from the back of the headlamp housing.

INSTALLATION

The headlamp leveling motors are integral to the headlamp on vehicles manufactured for markets where headlamp leveling is required.

(1) Position the headlamp leveling motor and pushrod to the mounting hole on the back of the headlamp housing.

(2) Insert two fingers through the bulb mounting hole in the center of the headlamp reflector and pull the reflector upwards toward the headlamp leveling motor.

HEADLAMP LEVELING MOTOR (Continued)

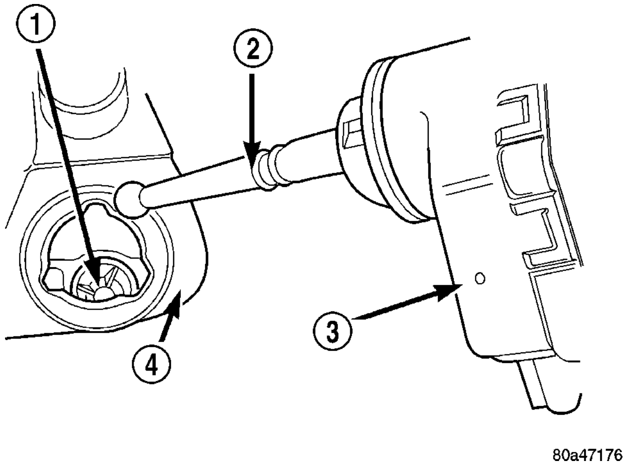

Fig. 33 Leveling Motor Pushrod - Typical

1 - REFLECTOR PUSHROD SOCKET
2 - PUSHROD
3 - LEVELING MOTOR
4 - HEADLAMP HOUSING

(3) Align the ball on the end of the leveling motor pushrod with the socket on the headlamp reflector (Fig. 33).

(4) While continuing to pulling the reflector toward the motor, firmly and steadily, push the headlamp leveling motor straight into the back of the headlamp housing to snap the ball on the end of the motor pushrod into the socket on the headlamp reflector.

(5) After the pushrod is engaged to the reflector, remove your fingers from the headlamp reflector and thoroughly clean any fingerprints.

(6) Push the mounting flange of the headlamp leveling motor into the mounting hole on the back of the headlamp housing until the motor is firmly seated (Fig. 32).

(7) Rotate the headlamp leveling motor clockwise about 30 degrees.

(8) Reinstall the headlamp bulb into the headlamp housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP BULB - INSTALLATION).

(9) Reconnect the battery negative cable.

HEADLAMP LEVELING SWITCH

DESCRIPTION

The headlamp leveling switch (Fig. 34) is used only on vehicles manufactured for markets where the headlamp leveling system is required. The headlamp leveling switch is mounted in the driver side trim bezel on the instrument panel. Only the switch bezel and thumbwheel are visible on the outer surface of the instrument panel trim bezel. The black plastic switch thumbwheel is marked with white numbers "0," "1," "2," and "3," each of which indicates one of the four switch detent positions. Each higher number represents a lower aiming position of the headlamp beam relative to the road surface. The switch is connected to the vehicle electrical system through the instrument panel wire harness. Within the switch housing is the leveling switch circuitry including the switch contacts and a series resistor configuration.

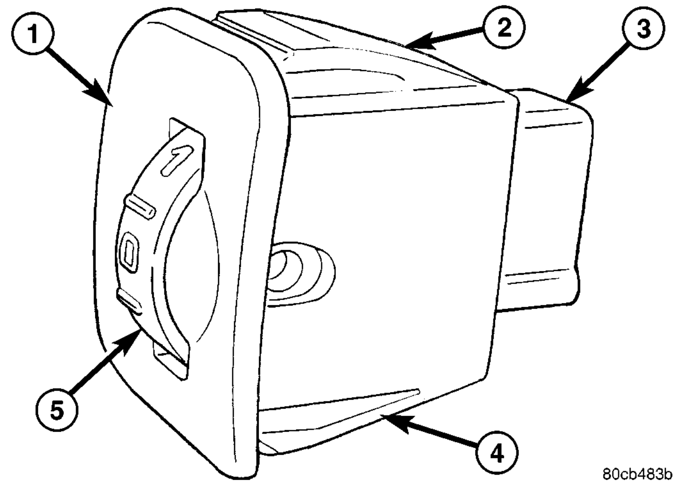

Fig. 34 Headlamp Leveling Switch

1 - SWITCH
2 - UPPER LATCH FEATURE (1)
3 - CONNECTOR RECEPTACLE
4 - LOWER LATCH FEATURE (2)
5 - THUMBWHEEL

The headlamp leveling switch cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The headlamp leveling switch receives battery voltage on a fused park lamp relay output circuit from a fuse in the Junction Block (JB). The switch receives a path to ground through a ground stud on the driver side instrument panel end bracket near the JB. The only output from the switch is a voltage signal that it provides to the headlamp leveling motors. Each switch position selects a different tap on a series resistor within the switch to provide a different voltage signal to the leveling motors. The higher the switch position number, the higher the output voltage level.

The headlamp leveling switch can be tested using conventional diagnostic tools and methods.

HEADLAMP LEVELING SWITCH (Continued)

DIAGNOSIS AND TESTING - HEADLAMP LEVELING SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the headlamp leveling switch.

(2) Using an ohmmeter, perform the resistance tests at the terminal pins in the headlamp leveling switch connector (Fig. 35) as shown in the Headlamp Leveling Switch Tests table.

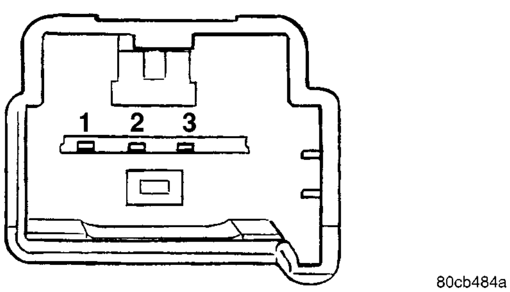

Fig. 35 Headlamp Leveling Switch Connector Receptacle

HEADLAMP LEVELING SWITCH TESTS	
SWITCH POSITION	RESISTANCE (OHMS) BETWEEN PINS 1 & 3
0	0.5 ± 0.5
1	301 ± 1
2	595 ± 1
3	739 ± 1

(3) If the switch fails any of the resistance tests, replace the faulty headlamp leveling switch as required.

REMOVAL

The headlamp leveling switch is used only on vehicles manufactured for markets where headlamp leveling is required.

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the driver side inboard bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DRIVER SIDE BEZEL - REMOVAL).

(3) Disconnect the instrument panel wire harness connector for the headlamp leveling switch. (Fig. 36).

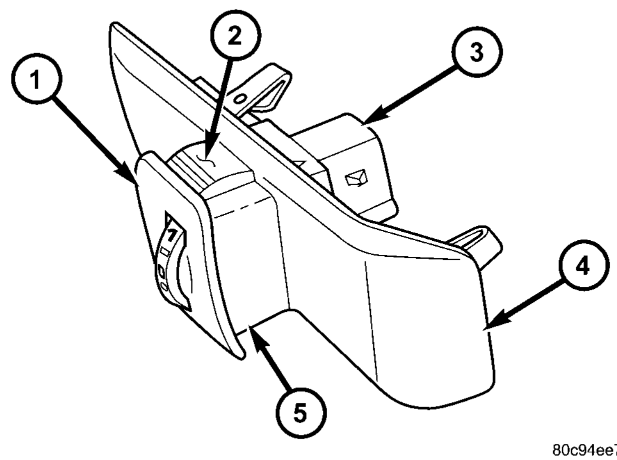

Fig. 36 Headlamp Leveling Switch Remove/Install

1 - HEADLAMP LEVELING SWITCH
2 - UPPER LATCH TAB
3 - RECEPTACLE
4 - DRIVER SIDE INBOARD BEZEL
5 - LOWER LATCH TAB (2)

HEADLAMP LEVELING SWITCH (Continued)

(4) From the back of the trim bezel, depress the two lower latch features on the headlamp leveling switch housing and rock the bottom of the switch out through the face of the bezel.

(5) From the back of the trim bezel, depress the upper latch feature on the headlamp leveling switch housing and push the switch out through the face of the bezel.

INSTALLATION

The headlamp leveling switch is used only on vehicles manufactured for markets where headlamp leveling is required.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) From the face of the driver side inboard bezel, align the headlamp leveling switch housing to the mounting hole in the bezel (Fig. 36).

(2) Push the headlamp leveling switch into the mounting hole until it is fully seated.

(3) Position the switch and bezel to the instrument panel.

(4) Reconnect the instrument panel wire harness connector.

(5) Reinstall the switch bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DRIVER SIDE BEZEL - INSTALLATION).

(6) Reconnect the battery negative cable.

HEADLAMP LOW BEAM RELAY

DESCRIPTION

The headlamp low beam relay is located in the Junction Block (JB). The headlamp low beam relay is a conventional International Standards Organization (ISO) micro relay (Fig. 37).

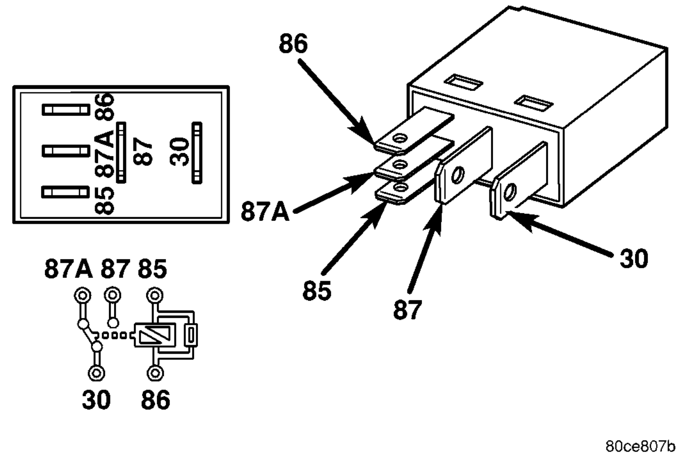

Fig. 37 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The headlamp low beam relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The headlamp low beam relay is an electromechanical switch that uses a low voltage input from the Body Control Module (BCM) to control a high voltage output to the headlamp low beam filaments. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The inputs and outputs of the headlamp low beam relay include:

• **Common Supply Terminal** - The common supply terminal receives battery voltage at all times from a fuse in the Power Distribution Center (PDC).

• **Coil Ground Terminal** - The coil ground terminal is connected to a control output of the BCM through a headlamp relay control circuit. the BCM controls the headlamp operation by controlling a path to ground through this circuit.

• **Coil Battery Terminal** - The coil battery terminal receives battery voltage from a terminal in the JB at all times.

HEADLAMP LOW BEAM RELAY (Continued)

• **Normally Open Terminal** - The normally open terminal is connected to the headlamp low beam filaments through the low beam relay output circuit and provides battery voltage to the headlamp low beams whenever the relay is energized.

• **Normally Closed Terminal** - The normally closed terminal is not connected in this application.

The headlamp low beam relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - HEADLAMP LOW BEAM RELAY

The headlamp low beam relay (Fig. 38) is located in the Junction Block (JB). Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

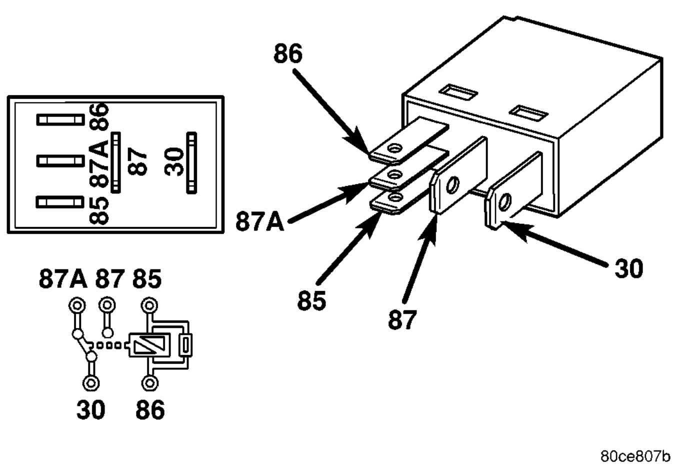

Fig. 38 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the headlamp low beam relay from the JB. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP LOW BEAM RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(3) Remove the headlamp low beam relay by firmly pulling it straight out from the Junction Block (JB) (Fig. 39).

HEADLAMP LOW BEAM RELAY (Continued)

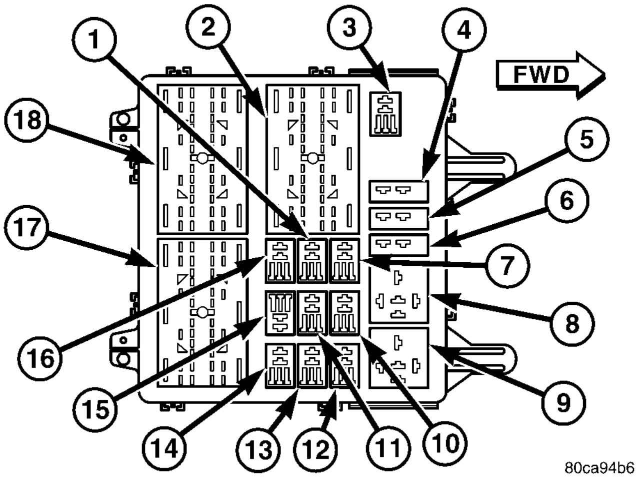

Fig. 39 Junction Block - Inboard Side (LHD Shown - Rotate 180° for RHD)

1 - PASSENGER DOOR UNLOCK RELAY
2 - JB C3 CONNECTOR RECEPTACLE
3 - LOW BEAM RELAY
4 - CIRCUIT BREAKER #1
5 - CIRCUIT BREAKER #2
6 - CIRCUIT BREAKER #3
7 - DOOR LOCK RELAY
8 - DEFOGGER RELAY
9 - SPARE
10 - FRONT FOG LAMP RELAY
11 - HORN RELAY
12 - SPARE
13 - SPARE
14 - REAR FOG LAMP RELAY
15 - PARK LAMP RELAY
16 - DRIVER DOOR UNLOCK RELAY
17 - JB C1 CONNECTOR RECEPTACLE
18 - JB C2 CONNECTOR RECEPTACLE

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the headlamp low beam relay terminals with the terminal cavities in the JB (Fig. 39).

(2) Push firmly and evenly on the top of the headlamp low beam relay until the terminals are fully seated.

(3) Reinstall the steering column opening cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(4) Reconnect the battery negative cable.

HEADLAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the grille panel from the grille opening reinforcement. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).

(3) Remove the screws that secure the mounting tabs on the inboard side of the headlamp housing to the grille opening reinforcement (Fig. 40).

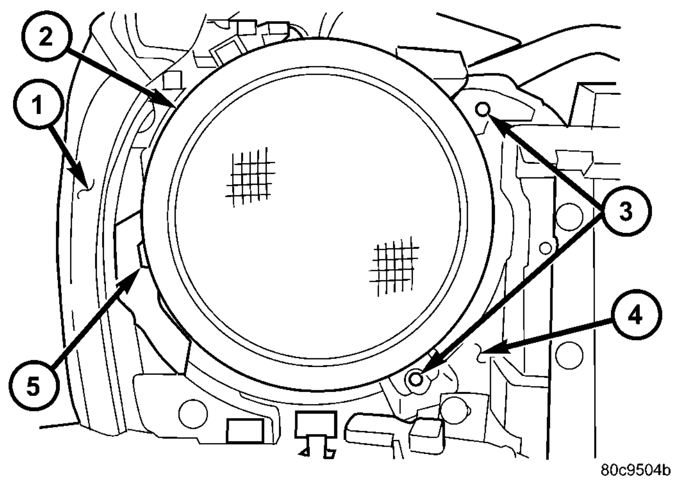

Fig. 40 Headlamp Unit Remove/Install

1 - FENDER PANEL
2 - HEADLAMP UNIT
3 - MOUNTING TAB (2)
4 - MOUNTING PANEL
5 - LOCATOR TAB

(4) Pull the inboard side of the headlamp away from the grille opening reinforcement far enough to disengage the locator tab on the outboard side (Fig. 41) or (Fig. 42) from the engagement slot in the outboard edge of the reinforcement.

(5) Pull the headlamp away from the grille opening reinforcement far enough to disconnect the wire harness connectors from the headlamp bulb socket (North America), the headlamp bulb base (Export), the front position lamp socket (if equipped), and the headlamp leveling motor (if equipped).

(6) Remove the headlamp from the grille opening reinforcement.

HEADLAMP UNIT (Continued)

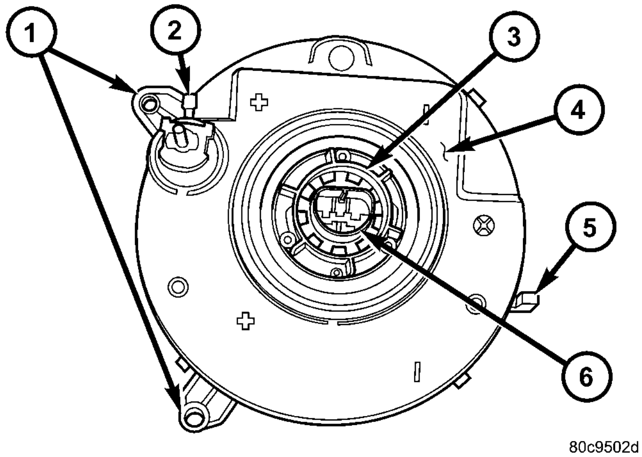

Fig. 41 Headlamp Unit - North America

1 - MOUNTING TAB (2)
2 - ADJUSTING SCREW
3 - LOCK RING
4 - HOUSING
5 - LOCATOR TAB
6 - SOCKET & BULB

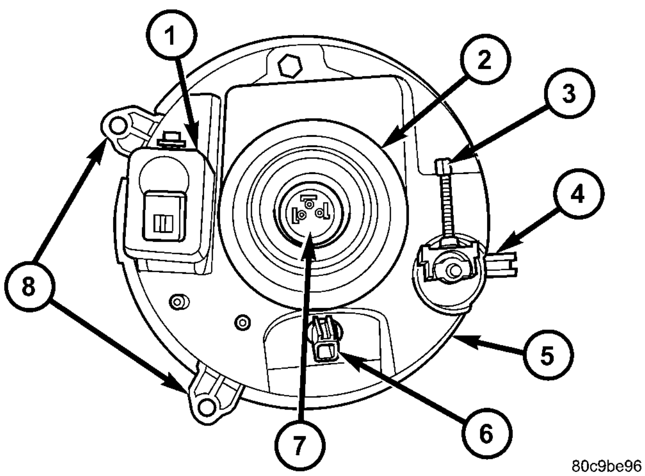

Fig. 42 Headlamp Unit - Rest-Of-World

1 - LEVELING MOTOR (IF EQUIPPED)
2 - BOOT SEAL
3 - ADJUSTING SCREW
4 - LOCATOR TAB
5 - HOUSING
6 - FRONT POSITION LAMP SOCKET & BULB
7 - HEADLAMP BULB
8 - MOUNTING TAB (2)

INSTALLATION

(1) Position the headlamp to the grille opening reinforcement.

(2) Reconnect the wire harness connectors to the headlamp bulb socket (North America), the headlamp bulb base (Exprot), the front position lamp socket (if equipped), and the headlamp leveling motor (if equipped) (Fig. 41) or (Fig. 42).

(3) Engage the locator tab on the outboard side of the headlamp into the engagement slot in the outboard edge of the grille opening reinforcement.

(4) Align the two mounting tabs on the inboard side of the headlamp housing to the mounting holes in the grille opening reinforcement (Fig. 40).

(5) Install and tighten the screws that secure the mounting tabs on the inboard side of the headlamp housing to the grille opening reinforcement. Tighten the screws to 3 N·m (30 in. lbs.).

(6) Reinstall the grille panel onto the grille opening reinforcement. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).

(7) Reconnect the battery negative cable.

(8) Confirm proper headlamp alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - ADJUSTMENTS).

ADJUSTMENTS

ADJUSTMENT - HEADLAMP UNIT

VEHICLE PREPARATION FOR HEADLAMP ALIGNMENT

(1) Verify headlamp dimmer (multi-function) switch and high beam indicator operation.

(2) If the vehicle is equipped with headlamp leveling, be certain that the headlamp leveling switch is in the “0” position.

(3) Repair or replace any faulty or damaged components that could hinder proper lamp alignment.

(4) Verify proper tire inflation.

(5) Clean headlamp lenses.

(6) Verify that cargo area is not heavily loaded.

(7) The fuel tank should be Full. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.

HEADLAMP ALIGNMENT SCREEN PREPARATION

Prepare an alignment screen as illustrated.

(1) Position the vehicle on a level surface perpendicular to a flat wall 7.62 meters (25 feet) away from the front of the headlamp lens for North American vehicles, or 10.0 meters (32.81 feet) away from the front of the headlamp lens for Export vehicles (Fig. 43). If necessary, tape a line on the floor at the appropriate distance away from and parallel to the wall.

(2) Measure up on the wall 1.27 meters (5 feet) from the floor and tape a vertical line on the alignment screen at the centerline of the vehicle. Sight along the centerline of the vehicle (from the rear of the vehicle forward) to verify the accuracy of the centerline placement.

HEADLAMP UNIT (Continued)

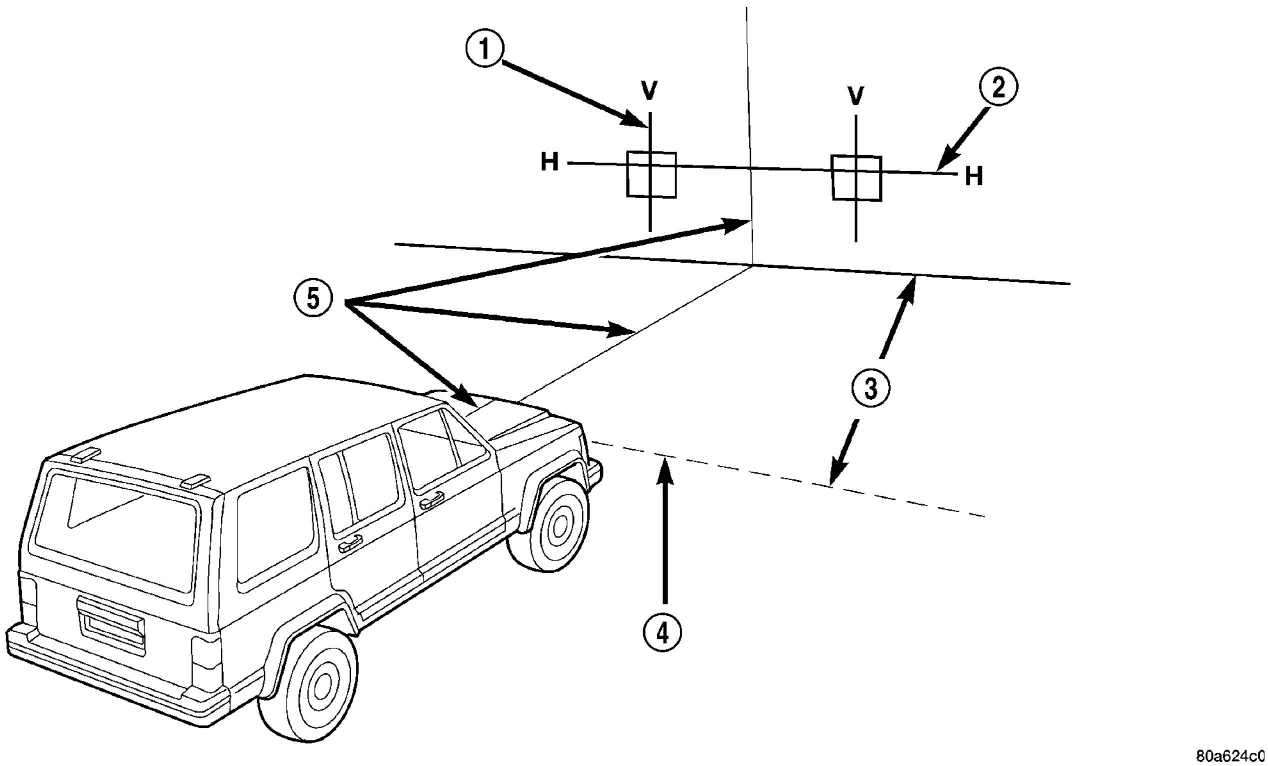

Fig. 43 Headlamp Alignment Screen - Typical

1 - CENTER OF VEHICLE TO CENTER OF HEADLAMP LENS
2 - FLOOR TO CENTER OF HEADLAMP LENS
3 - 7.62 METERS (25 FEET) NORTH AMERICA/10.0 METERS (32.81 FEET) REST-OF-WORLD
4 - FRONT OF HEADLAMP
5 - VEHICLE CENTERLINE

(3) Rock the vehicle from side-to-side three times to allow the suspension to stabilize, then jounce the front suspension three times by pushing downward on the front bumper and releasing. Measure the distance from the center of the headlamp lens to the floor. Transfer this measurement to the alignment screen and tape a horizontal line on the wall at this mark. This line will be used for up-and-down adjustment reference.

(4) Measure the distance from the centerline of the vehicle to the center of each headlamp being aligned. Transfer these measurements to the alignment screen and tape a vertical line this distance to each side of the vehicle centerline. These lines will be used for left/right reference.

HEADLAMP ADJUSTMENT

A properly aligned headlamp will project a pattern on the alignment screen from just below horizontal to 75 millimeters (3 inches) below the headlamp centerline for vehicles in North America, or from just below horizontal to 125 millimeters (5 inches) below the headlamp horizontal centerline for vehicles in Export.

(1) Vehicles for all markets except Japan should have the headlamp low beams selected with the dimmer (multi-function) switch during the adjustment procedure. Vehicles for the Japanese market should have the headlamp high beams selected.

(2) Cover the lens of the headlamp that is not being adjusted.

HEADLAMP UNIT (Continued)

(3) Turn the adjusting screw (Fig. 44) until the top edge of the beam intensity pattern is positioned from just below horizontal to 75 millimeters (3 inches) below the headlamp horizontal centerline for vehicles in North America, or from just below horizontal to 125 millimeters (5 inches) below the headlamp horizontal centerline for vehicles in Export.

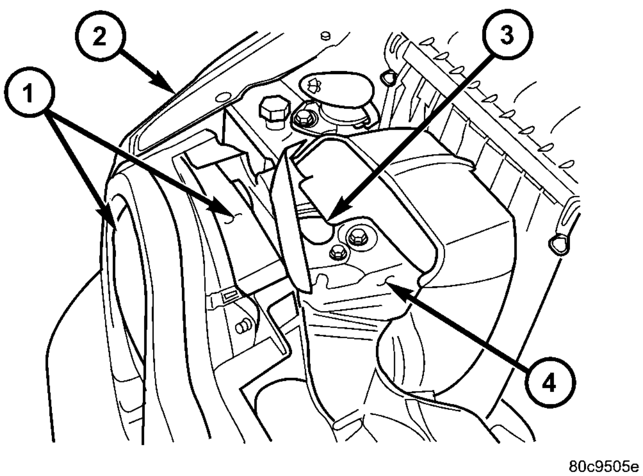

Fig. 44 Headlamp Adjusting Screw

1 - HEADLAMP UNIT
2 - FENDER PANEL
3 - ADJUSTING SCREW ACCESS HOLE
4 - UPPER RADIATOR CROSSMEMBER

(4) Repeat the adjustment procedure for the opposite headlamp.

LAMP BAR

DESCRIPTION

The lamp bar is used to better illuminate the drivers field of vision under certain driving conditions. It consists of a cover, two or four lamp assemblies (depending upon which market), and a wiring harness. These components are mounted to a reinforcement, then sealed and secured to the roof panel. Lamp bar illumination is controlled by a manually operated momentary rocker switch, mounted to the instrument panel. The lamps are adjustable in the vertical position only.

OPERATION

Battery and ignition voltage are supplied to the lamp bar switch assembly. When the switch is in the ON position the internal relay contacts close, completing the circuit through the lamp bar bulbs, to ground. The lamp bar assembly is grounded to the chassis. The hard wired circuits of the lamp bar may be diagnosed and tested using conventional methods and procedures.

DIAGNOSIS AND TESTING - LAMP BAR

CONDITION	POSSIBLE CAUSES	CORRECTION
LAMP BAR LAMPS INOPERATIVE	Faulty or missing fuse	Test and replace lamp bar fuse as required
	Faulty supply circuit	Test and repair open battery or ignition supply circuit.
	Faulty ground circuit	Test and repair high resistance or open lamp bar ground circuit
	Faulty lamp bar sense circuit	Test and repair short to voltage in lamp bar sense circuit
	Faulty switch	Test and replace lamp bar switch
LAMP BAR LAMPS ON AT ALL TIMES	Faulty switch	Test and replace lamp bar switch
	Lamp bar supply circuit	Test and repair short to voltage in lamp bar supply circuit
ONE OR MORE LAMPS INOPERATIVE	Faulty or missing bulb	Test and repair lamp bar lamp bulb(s) as required
	Faulty lamp bar wiring harness	Test and repair short/open lamp bar wiring harness

LAMP BAR (Continued)

STANDARD PROCEDURE - LAMP BAR AIMING

NOTE: The lamp bar lamps are adjustable to the vertical position only.

(1) Using a fairly dark and level area, drive the vehicle perpendicular to and 25 ft. away from a wall.
(2) Measure up the wall 7ft. 9in. and place tape on the wall parallel to the ground.
(3) Turn on the lamp bar lamps.
(4) Using the adjustment screw in the rear of each lamp, adjust the lamp beam to the center of the tape.

REMOVAL

REMOVAL - LAMP BAR

(1) Disconnect the negative battery cable.
(2) Remove the lamp bar cover retaining screws, slide the cover forward and up to remove.
(3) Disconnect lamp electrical connector.
(4) Remove the lamp bar reinforcement to roof stud retainers.

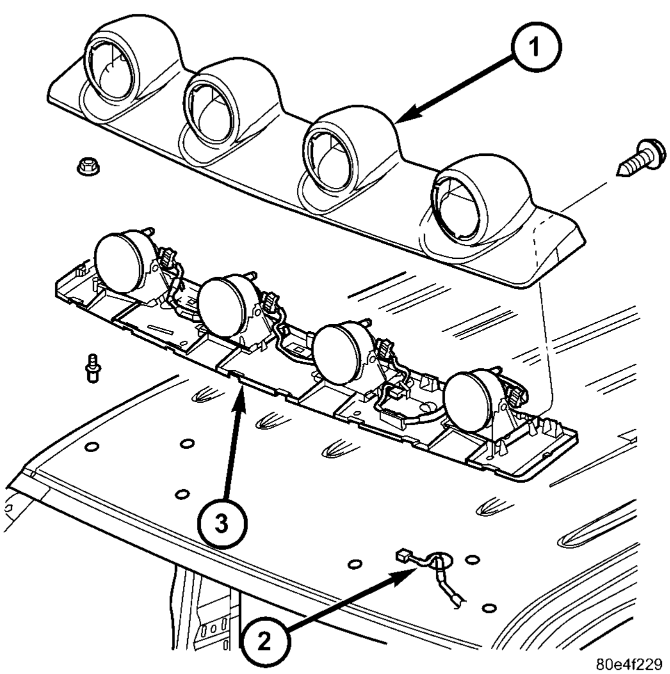

Fig. 45 LAMP BAR

1 - Cover
2 - Electrical Connector
3 - Lamp Bar

CAUTION: The reinforcement is held to the roof by protective tape. Remove the tape carefully to prevent damage to roof panel. After removal, the area must be cleaned with the appropriate solvent.

(5) Remove lamp bar reinforcement from roof.

REMOVAL - LAMP

(1) Disconnect negative battery cable.
(2) Remove the lamp bar cover screws, slide the cover forward and up to remove (Fig. 45).

NOTE: There is a hook arrangement for the forward lamp attachment. Pick the lamp up by the bulb connector.

(3) Remove the lamp to base retaining screws.
(4) Lift the lamp up and slide backward to remove.

INSTALLATION

INSTALLATION - LAMP BAR

NOTE: Lamp bar is held to roof by protective tape. Mounting area must be clean and dry before installation.

(1) Remove tape protective strips on new lamp bar.
(2) Position lamp bar over roof studs (Fig. 45).
(3) Press the lamp bar reinforcement into place making sure the tape strips are securely seated on roof.
(4) Install the reinforcement nuts and tighten to 20 lbs. in.
(5) Connect electrical connector.
(6) Reconnect negative battery cable.
(7) Aim lamps (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LAMP BAR - STANDARD PROCEDURE).
(8) Position the cover over lamp bar, slide rearward and secure with screws.

INSTALLATION - LAMP

NOTE: There is a hook arrangement for the forward lamp attachment. Pick the lamp up by the bulb connector.

(1) Position the lamp assembly on the base (Fig. 45).
(2) Slide the lamp forward and seat.
(3) Install the lamp retaining screws.
(4) Reconnect negative battery cable.
(5) Align the lamps (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LAMP BAR - STANDARD PROCEDURE).
(6) Install the lamp bar cover.

LAMP BAR SWITCH

DESCRIPTION

The lamp bar switch is intended to close the electrical circuit which supplies the lamp bar. The switch assembly contains a relay unit that is energized or de-energized by a manually operated momentary rocker switch. The switch is mounted on the instrument panel left of the steering wheel.

REMOVAL

CAUTION: Care must be taken not to damage the dash or instrument panel when removing the lamp bar switch bezel.

(1) Disconnect negative battery cable.
(2) Using a suitable pry tool, carefully remove the lamp bar switch bezel from the instrument panel.

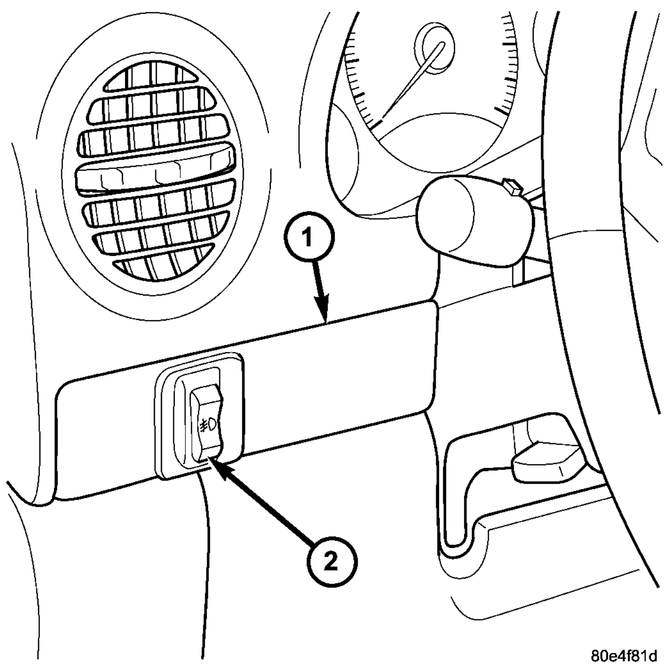

Fig. 46 LAMP BAR SWITCH

1 - Bezel
2 - Lamp Bar Switch

(3) Disconnect the electrical connector.
(4) Depress the lamp bar switch retaining tabs and remove the switch from the bezel.

INSTALLATION

(1) Press the lamp bar switch into the instrument panel bezel and assure that the switch is seated properly (Fig. 46).
(2) Connect the electrical connector.
(3) Press the instrument panel bezel into position and seat the bezal retaining clips.
(4) Reconnect negative battery cable.

LICENSE PLATE LAMP BULB

REMOVAL

NORTH AMERICA

(1) Disconnect and isolate the battery negative cable.
(2) Reach through the opening in the rear bumper fascia between the license plate and the lamp to access the socket on the back of the license plate lamp housing (Fig. 47).

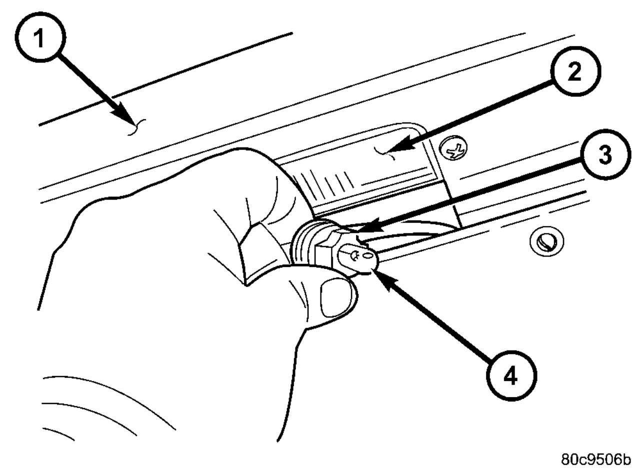

Fig. 47 License Plate Lamp Bulb Remove/Install - North America

1 - REAR BUMPER FASCIA
2 - LICENSE PLATE LAMP
3 - SOCKET
4 - BULB

(3) Pull the socket and bulb straight out of the back of the license plate lamp housing.
(4) Pull the bulb straight out of the license plate lamp socket.

LICENSE PLATE LAMP BULB (Continued)

EXPORT

(1) Disconnect and isolate the battery negative cable.

(2) Unsnap and lift up the bottom of the license mounting plate far enough to access and remove the screws that secure the license plate bracket to the special lug nuts on the spare tire (Fig. 48).

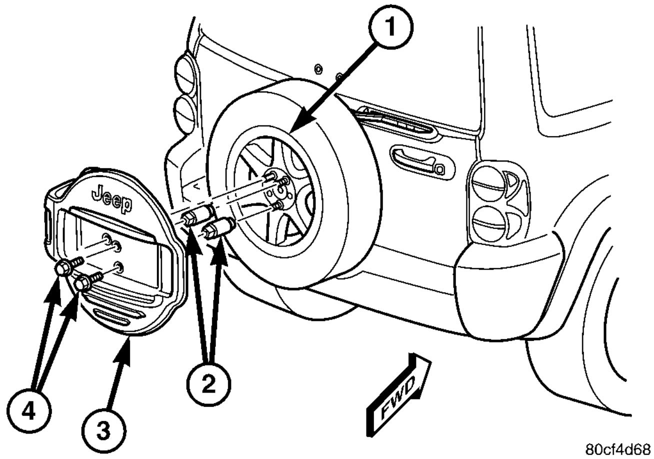

Fig. 48 License Plate Bracket - Rest-Of-World

1 - SPARE TIRE
2 - SPECIAL LUG NUT (2)
3 - LICENSE PLATE BRACKET
4 - SCREW (2)

(3) Swing the license plate bracket away from the spare tire far enough to access the license plate lamp bulb sockets.

(4) Grasp the socket on the top of the license plate lamp housing for the bulb that is being removed (Fig. 49).

(5) Rotate the socket on the top of the license plate lamp housing counterclockwise about 30 degrees.

(6) Pull the socket and bulb straight out of the top of the license plate lamp housing.

(7) Pull the bulb straight out of the license plate lamp socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

NORTH AMERICA

(1) Align the base of the bulb with the license plate lamp socket.

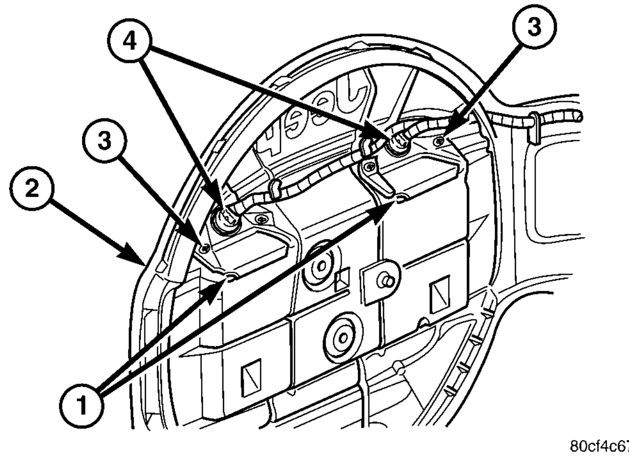

Fig. 49 License Plate Lamp Bulb Remove/Install - Export

1 - LAMP UNIT (2)
2 - LICENSE PLATE BRACKET
3 - SCREW (4)
4 - BULB & SOCKET (2)

(2) Push the bulb straight into the license plate lamp socket.

(3) Reach through the opening in the rear bumper fascia between the license plate and the lamp to align the socket with the back of the lamp housing (Fig. 47).

(4) Push the socket and bulb straight into the license plate lamp housing until it is firmly seated.

(5) Reconnect the battery negative cable.

EXPORT

(1) Align the base of the bulb with the license plate lamp socket.

(2) Push the bulb straight into the license plate lamp socket.

(3) Align the socket with the top of the license plate lamp housing (Fig. 49).

(4) Push the socket and bulb straight into the license plate lamp housing.

(5) Rotate the socket on the top of the license plate lamp housing clockwise about 30 degrees.

(6) Swing the license plate bracket back against the spare tire (Fig. 48).

(7) Lift up the bottom of the license mounting plate far enough to install and tighten the screws that secure the license plate bracket to the special lug nuts on the spare tire. Tighten the screws to 28 N·m (21 ft. lbs.).

(8) Lower the bottom of the license mounting plate and snap it into place on the license plate bracket.

(9) Reconnect the battery negative cable.

LICENSE PLATE LAMP UNIT

REMOVAL

NORTH AMERICA

(1) Disconnect and isolate the battery negative cable.

(2) Remove the screws that secure the license plate lamp assembly to the rear bumper fascia (Fig. 50).

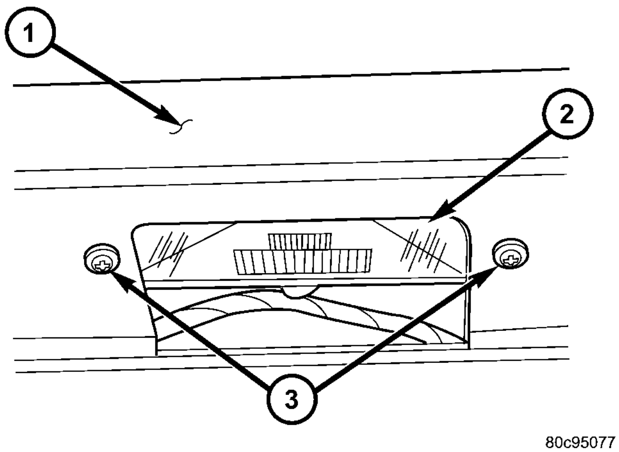

Fig. 50 License Plate Lamp Unit Remove/Install

1 - REAR BUMPER FASCIA
2 - LICENSE PLATE LAMP UNIT
3 - SCREW (2)

(3) Pull the license plate lamp assembly down and out through the mounting hole in the rear bumper fascia far enough to access and disconnect the wire harness connector.

(4) Remove the license plate lamp assembly from the rear bumper fascia.

EXPORT

(1) Disconnect and isolate the battery negative cable.

(2) Remove the bulb and socket from the license plate lamp housing that is being removed. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP BULB - REMOVAL - REST-OF-WORLD).

(3) Remove the screws that secure the license plate lamp assembly to the back of the license plate bracket (Fig. 51).

(1) Remove the license plate lamp assembly from the back of the license plate bracket.

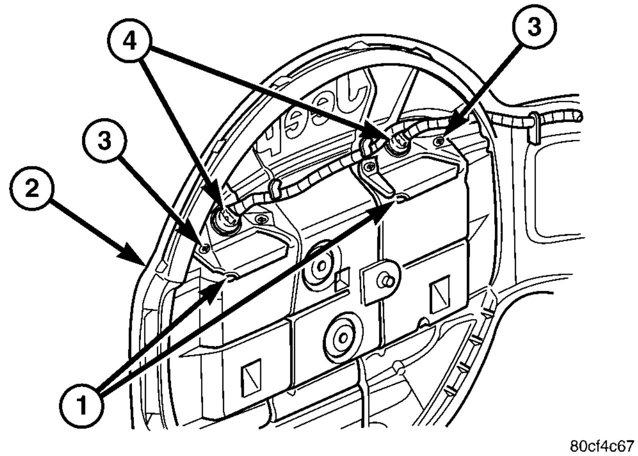

Fig. 51 License Plate Lamp Bulb Remove/Install - Export

1 - LAMP UNIT (2)
2 - LICENSE PLATE BRACKET
3 - SCREW (4)
4 - BULB & SOCKET (2)

INSTALLATION

NORTH AMERICA

(1) Position the license plate lamp assembly to the rear bumper fascia.

(2) Reconnect the wire harness connector for the license plate lamp assembly.

(3) Position the license plate lamp assembly into the mounting hole in the rear bumper fascia (Fig. 50).

(4) Install and tighten the screws that secure the license plate lamp assembly. Tighten the screws to 2 N·m (20 in. lbs.).

(5) Reconnect the battery negative cable.

EXPORT

(1) Position the license plate lamp assembly onto the back of the license plate bracket (Fig. 51).

(2) Install and tighten the screws that secure the license plate lamp assembly to the back of the license plate bracket. Tighten the screws to 2 N·m (20 in. lbs.).

(3) Reinstall the bulb and socket into the license plate lamp housing that is being replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP BULB - INSTALLATION - REST-OF-WORLD).

(4) Reconnect the battery negative cable.

MULTI-FUNCTION SWITCH

DESCRIPTION

The multi-function switch is located on the steering column, just below the steering wheel (Fig. 52). The only visible components of the multi-function switch are two control stalks that extend through each side of the steering column. The multi-function switch housing straddles the steering column tube just below the column lock housing.

There are several versions of the multi-function switch to support both optional equipment and equipment that is required only in other markets. Each multi-function switch control stalk has both white nomenclature and International Control and Display Symbol graphics applied to it, which clearly identify its many functions. Each control stalk has a control knob on its end with a flattened face to allow it to be easily rotated. On vehicles equipped with optional front fog lamps, the knob on the end of left control stalk can also be pulled outward to select those lamps. Each control stalk also features a knurled control ring located just below the control knob. The left control stalk is dedicated to providing driver controls for the interior and exterior lighting systems, while the right control stalk is dedicated to providing driver controls for the front and rear wiper systems. Two connectors on the multi-function switch housing connect the switch two the vehicle electrical system through the instrument panel wire harness. The left connector contains nine terminal pins for the lighting control circuits of the switch, while the right connector contains six terminal pins for the wiper control circuits of the switch. The multi-function switch cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

LEFT CONTROL STALK The left control stalk of the multi-function switch supports the following functions and features:

• **Front Fog Lamps -** For vehicles so equipped, the left multi-function switch control stalk provides detent switching for the optional front fog lamps.

• **Headlamps -** The left multi-function switch control stalk provides detent switching for the headlamps.

• **Headlamp Beam Selection -** The left multi-function switch control stalk provides detent switching for selection of the headlamp high or low beams.

• **Headlamp Optical Horn -** The left multi-function switch control stalk includes momentary switching of the headlamp high beam circuits to provide an optical horn feature (sometimes referred to as flash-to-pass), which allows the vehicle operator to momentarily flash the headlamp high beams as an optical signalling device.

• **Interior Lamps Defeat -** The left multi-function switch control stalk provides detent switching to defeat the illumination of all interior courtesy lamps when a door, the rear flip-up glass, or the tailgate are opened.

• **Interior Lamps On -** The left multi-function switch control stalk provides detent switching to

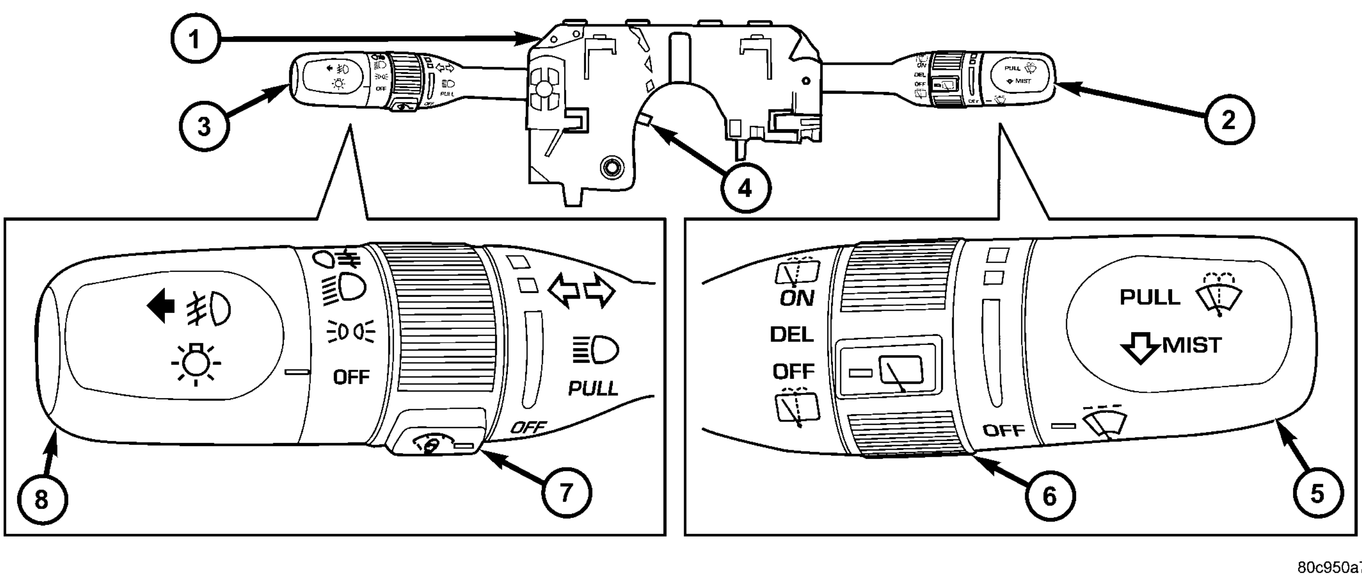

Fig. 52 Multi-Function Switch

1 - MULTI-FUNCTION SWITCH
2 - RIGHT (WIPER) CONTROL STALK
3 - LEFT (LIGHTING) CONTROL STALK
4 - TURN SIGNAL CANCEL ACTUATOR
5 - RIGHT (WIPER) CONTROL KNOB
6 - RIGHT (WIPER) CONTROL RING
7 - LEFT (LIGHTING) CONTROL RING
8 - LEFT (LIGHTING) CONTROL KNOB

MULTI-FUNCTION SWITCH (Continued)

simultaneously illuminate all interior courtesy lamps.

• **Panel Lamps Dimming** - The left multi-function switch control stalk provides simultaneous adjustable control of the illumination intensity of all instrument panel lighting at one of six available illumination intensity levels.

• **Parade Mode** - The left multi-function switch control stalk provides detent switching for a parade mode that maximizes the illumination intensity of all instrument panel lighting for visibility when driving in daylight with the exterior lamps turned on.

• **Park Lamps** - The left multi-function switch control stalk provides detent switching for the park lamps.

• **Rear Fog Lamps** - For vehicles so equipped, the left multi-function switch control stalk provides detent switching for the optional rear fog lamps. Rear fog lamps are optional only for vehicles manufactured for markets, where they are required.

• **Turn Signal Control** - The left multi-function switch control stalk provides both momentary non-detent switching and detent switching with automatic cancellation for both the left and right turn signal lamps.

RIGHT CONTROL STALK The right control stalk of the multi-function switch supports the following functions and features:

• **Continuous Front Wipe Modes** - The right multi-function switch control stalk provides two continuous front wipe switch positions, low speed or high speed.

• **Continuous Rear Wipe Mode** - The right multi-function switch control stalk provides one continuous rear wipe switch position.

• **Front Washer Mode** - The right multi-function switch control stalk provides front washer system operation.

• **Front Wipe-After-Wash Mode** - The right multi-function switch control stalk provides a wipe-after-wash mode.

• **Front Wiper Mist Mode** - The right multi-function switch control stalk provides a front wiper system mist mode.

• **Intermittent Front Wipe Mode** - The right multi-function switch control stalk provides an intermittent front wipe mode with five delay interval positions.

• **Intermittent Rear Wipe Mode** - The right multi-function switch control stalk provides one fixed interval intermittent rear wipe mode switch position.

• **Rear Washer Mode** - The right multi-function switch control stalk provides rear washer system operation.

OPERATION

The multi-function switch uses a combination of resistor multiplexed and conventionally switched outputs to control the many functions and features it provides. The switch receives battery voltage on a fused ignition switch output (run-acc) circuit from a fuse in the Junction Block (JB) whenever the ignition switch is in the On or Accessory positions. The switch receives a path to ground at all times through a ground stud on the driver side instrument panel end bracket near the Junction Block (JB). Following are descriptions of how each of the two multi-function switch control stalks operate to control the functions and features they provide.

LEFT CONTROL STALK The left control stalk of the multi-function switch operates as follows:

• **Front Fog Lamps** - For vehicles so equipped, the control knob on the end of the multi-function switch left control stalk is pulled outward to activate the optional front fog lamps. The control knob is mechanically keyed so that it cannot be pulled outward unless it is first rotated to turn ON the exterior lighting. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a fog lamp switch sense circuit, and the BCM responds by energizing or de-energizing the front fog lamp relay in the Junction Block (JB).

• **Headlamps** - The control knob on the end of the multi-function switch left control stalk is rotated forward to its second detent position to activate the headlamps. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a headlamp switch sense circuit, and the BCM responds by energizing or de-energizing the selected low or high beam relay (Daytime Running Lamp relay in Canadian vehicles) in the Junction Block (JB).

• **Headlamp Beam Selection** - The left control stalk of the multi-function switch is pulled towards the steering wheel past a detent to actuate the integral beam select switch circuitry. Each time the control stalk is activated in this manner, the opposite headlamp beam from what is currently selected will be energized. The multi-function switch provides a ground output to the Body Control Module (BCM) on a high beam switch sense circuit, and the BCM responds by energizing or de-energizing the selected low or high beam relay (Daytime Running Lamp relay in Canadian vehicles) in the Junction Block (JB).

• **Headlamp Optical Horn** - The left control stalk of the multi-function switch is pulled towards the steering wheel to just before a detent, to momentarily activate the headlamp optical horn feature. The high beams will remain illuminated until the control stalk is released. The multi-function switch

MULTI-FUNCTION SWITCH (Continued)

provides a ground output on a high beam relay control circuit to energize the headlamp high beam relay (Daytime Running Lamp relay in Canadian vehicles) in the Junction Block (JB).

- **Interior Lamps Defeat** - The control ring on the multi-function switch left (lighting) control stalk is rotated to a full rearward (clockwise) detent to defeat the illumination of all interior courtesy lamps. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a panel lamps dimmer switch circuit, and the BCM responds by de-energizing its internal courtesy lamp driver circuit.
- **Interior Lamps On** - The control ring on the multi-function switch left control stalk is rotated to a full forward detent to illuminate all interior courtesy lamps. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a panel lamps dimmer switch circuit, and the BCM responds by energizing its internal courtesy lamp driver circuit.
- **Panel Lamps Dimming** - The control ring on the multi-function switch left control stalk is rotated to one of six minor intermediate detents to simultaneously select the desired illumination intensity of all adjustable instrument panel and instrument cluster lighting. The control ring is rotated rearward to dim, or forward to brighten. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a panel lamps dimmer switch circuit, and the BCM responds by sending an electronic panel lamps dimming level message to the ElectroMechanical Instrument Cluster (EMIC) over the Programmable Communications Interface (PCI) data bus. The EMIC electronic circuitry then provides the proper PWM output to the cluster illumination lamps and the Vacuum Florescent Display (VFD) on the EMIC circuit board, then provides a matching Pulse Width Modulation (PWM) output on the hard wired fused panel lamps dimmer switch signal circuit.
- **Parade Mode** - The control ring on the multi-function switch left control stalk is rotated to an intermediate detent that is one detent rearward from the full forward detent to select the Parade mode. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a panel lamps dimmer switch circuit, and the BCM responds by sending an electronic panel lamps dimming level message to the ElectroMechanical Instrument Cluster (EMIC) over the Programmable Communications Interface (PCI) data bus. The EMIC electronic circuitry then provides the proper PWM output to the cluster illumination lamps and the VFD on the EMIC circuit board, then provides a matching PWM output on the hard wired fused panel lamps dimmer switch signal circuit to illuminate all lamps at full (daylight) intensity with the exterior lamps turned On.
- **Park Lamps** - The control knob on the end of the multi-function switch left control stalk is rotated forward to its first detent from the Off position to activate the park lamps. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a headlamp switch sense circuit, and the BCM responds by energizing or de-energizing the park lamp relay in the Junction Block (JB).
- **Rear Fog Lamps** - For vehicles so equipped, the control knob on the end of the multi-function switch left control stalk is rotated forward to its third detent position to activate the rear fog lamps. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a headlamp switch sense circuit, and the BCM responds by energizing or de-energizing the rear fog lamp relay in the Junction Block (JB). Rear fog lamps are optional only for vehicles manufactured for markets, where they are required.
- **Turn Signal Control** - The left control stalk of the multi-function switch is moved upward to activate the right turn signal circuitry, and, downward to activate the left turn signal circuitry. The turn signal switch has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary position in each direction that provides turn signals only until the left multi-function switch control stalk is released. When the control stalk is moved to a turn signal switch detent position, the cancel actuator extends toward the center of the steering column. A turn signal cancel cam that is integral to the clockspring rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the left multi-function switch. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. If the left turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral Off position. When a turn signal is activated, the multi-function switch provides a ground output on a right or left turn switch sense circuit to the combination flasher circuitry within the hazard switch, and the combination flasher flashes the turn signal lamps.

MULTI-FUNCTION SWITCH (Continued)

RIGHT CONTROL STALK The right control stalk of the multi-function switch operates as follows:

- **Continuous Front Wipe Modes** - The control knob on the end of the multi-function switch right control stalk is rotated to an intermediate detent that is one detent rearward from the full forward detent to select the low speed continuous front wiper mode, or to its full forward detent to select the high speed continuous front wiper mode. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a front wiper switch circuit, and the BCM responds by energizing the wiper on/off relay in the Power Distribution Center (PDC) for the front low speed continuous wipe mode, or the wiper on/off relay and the wiper high/low relay in the PDC for the front high speed continuous wipe mode as required.
- **Continuous Rear Wipe Mode** - The control ring on the multi-function switch right control stalk is rotated to the most forward detent to select the continuous rear wiper mode. The multi-function switch provides a battery voltage output to the rear wiper motor on a rear wiper on driver circuit to signal the rear wiper motor to operate in the continuous wipe mode.
- **Front Washer Mode** - The right control stalk of the multi-function switch is pulled towards the steering wheel to momentarily activate the washer pump in the front washer mode. The washer pump will continue to operate in the front washer mode until the control stalk is released. The multi-function switch provides a ground output on a washer pump sense circuit, and battery voltage on a washer pump driver circuit to energize the washer pump in the front washer mode.
- **Front Wiper Mist Mode** - The right control stalk of the multi-function switch is pushed towards the floor to momentarily activate the front wiper motor in the mist mode. The front wiper motor will continue to operate in the mist mode until the control stalk is released. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a front wiper switch circuit, and the BCM responds by energizing the wiper on/off relay in the Power Distribution Center (PDC) to operate the front wiper motor momentarily at low speed to provide the front wiper mist mode.
- **Intermittent Front Wipe Mode** - The control knob on the end of the multi-function switch right control stalk is rotated to one of five minor intermediate detents to select the desired intermittent front wipe delay interval. The control knob is rotated rearward to increase the delay, or forward to decrease the delay. The multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a front wiper switch circuit, and the BCM responds by energizing the wiper on/off relay in the Power Distribution Center (PDC) to operate the front wiper motor at the selected delay intervals.
- **Intermittent Rear Wipe Mode** - The control ring on the multi-function switch right control stalk is rotated to the center detent to select the intermittent rear wiper mode. The multi-function switch provides a battery voltage output to the rear wiper motor on a rear wiper intermittent driver circuit to signal the rear wiper motor to operate in the intermittent wipe mode.
- **Rear Washer Mode** - The control ring on the multi-function switch right control stalk is rotated to either the full forward or full rearward momentary positions to activate the washer pump in the rear washer mode. The washer pump will continue to operate in the rear washer mode until the control ring is released. The multi-function switch provides a ground output on a washer pump driver circuit, and battery voltage on a washer pump sense circuit to energize the washer pump in the rear washer mode.

DIAGNOSIS AND TESTING - MULTI-FUNCTION SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the multi-function switch from the steering column. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - REMOVAL).

(3) Using an ohmmeter, perform the continuity and resistance tests at the terminals (Fig. 53) in the multi-function switch connector as shown in the Multi-Function Switch Tests table.

MULTI-FUNCTION SWITCH (Continued)

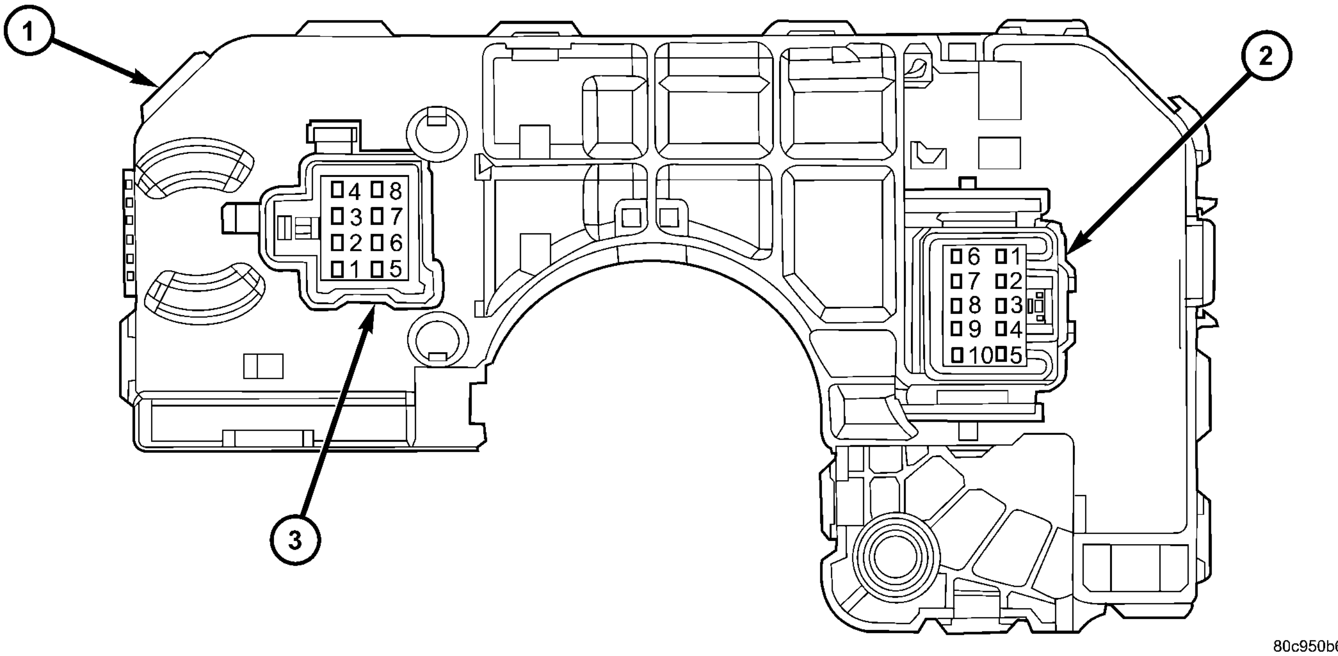

Fig. 53 Multi-Function Switch Connector Receptacle Pin-Out

1 - MULTI-FUNCTION SWITCH
2 - C-1 (LIGHTING) CONNECTOR RECEPTACLE
3 - C-2 (WIPER) CONNECTOR RECEPTACLE

MULTI-FUNCTION SWITCH TESTS		
EXTERIOR LIGHTING FUNCTIONS		
SWITCH POSITION	CONNECTOR C-1 PINS	RESISTANCE (OHMS) ±10%
Off	4 & 5	3781
Park Lamps On	4 & 5	911
Headlamp Low Beams On	4 & 5	349
Rear Fog Lamps On	4 & 5	75
Headlamp High Beams On	8 & 9	0 - 1
Front Fog Lamps On	2 & 4	0 - 1
Optical Horn (Flash-to-Pass) On	7 & 8	0 - 1
Turn Signal Neutral	6 & 8, 8 & 10	Infinite (Open)
Turn Signal Left	6 & 8	0 - 1
Turn Signal Right	8 & 10	0 - 1
INTERIOR LIGHTING FUNCTIONS		
SWITCH POSITION	CONNECTOR C-1 PINS	RESISTANCE (OHMS) ±10%
Off (Courtesy Disable)	1 & 4	63
Dimming 1	1 & 4	200
Dimming 2	1 & 4	557
Dimming 3	1 & 4	914
Dimming 4	1 & 4	1271

MULTI-FUNCTION SWITCH (Continued)

MULTI-FUNCTION SWITCH TESTS		
Dimming 5	1 & 4	1628
Dimming 6	1 & 4	1985
Parade Mode On	1 & 4	3565
Courtesy On	1 & 4	7885
FRONT WIPER FUNCTIONS		
SWITCH POSITION	CONNECTOR C-1 & C-2 PINS	RESISTANCE (OHMS) ±10%
Front Wiper Off	C-1 Pin 4 & C-2 Pin 4	4587
Delay 1	C-1 Pin 4 & C-2 Pin 4	1267
Delay 2	C-1 Pin 4 & C-2 Pin 4	792
Delay 3	C-1 Pin 4 & C-2 Pin 4	531
Delay 4	C-1 Pin 4 & C-2 Pin 4	369
Delay 5	C-1 Pin 4 & C-2 Pin 4	262
Front Wiper Low	C-1 Pin 4 & C-2 Pin 4	125
Front Wiper High	C-1 Pin 4 & C-2 Pin 4	38
Front Wiper Mist	C-1 Pin 4 & C-2 Pin 4	125
Front Washer On	C-2 Pins 5 & 7	0 - 1
REAR WIPER FUNCTIONS		
SWITCH POSITION	CONNECTOR C-2 PINS	RESISTANCE (OHMS) ±10%
Rear Wiper Off	1 & 5, 2 & 5	Infinite (Open)
Rear Wiper Intermittent	2 & 5	0 - 1
Rear Wiper On	1 & 5	0 - 1
Rear Washer On	2 & 5, 3 & 5	0 - 1

(4) If the multi-function switch fails any of the continuity or resistance tests, replace the faulty switch.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column to the fully lowered position and leave the tilt release lever in the released (down) position.

(3) From below the steering column, remove the screws that secure the lower shroud to the upper shroud (Fig. 54).

(4) Push inward on both sides of the upper shroud near the parting line between the upper and lower shrouds to release the snap features that secure the two halves to each other.

(5) Remove both of the shrouds from the steering column.

(6) Disconnect the two instrument panel wire harness connectors for the multi-function switch from the two connector on the back of the switch housing.

(7) Remove the multi-function switch from the steering column lock housing by carefully rocking the switch and pulling the switch housing upward far enough to disengage its alignment posts and locator tabs from the lock housing.

MULTI-FUNCTION SWITCH (Continued)

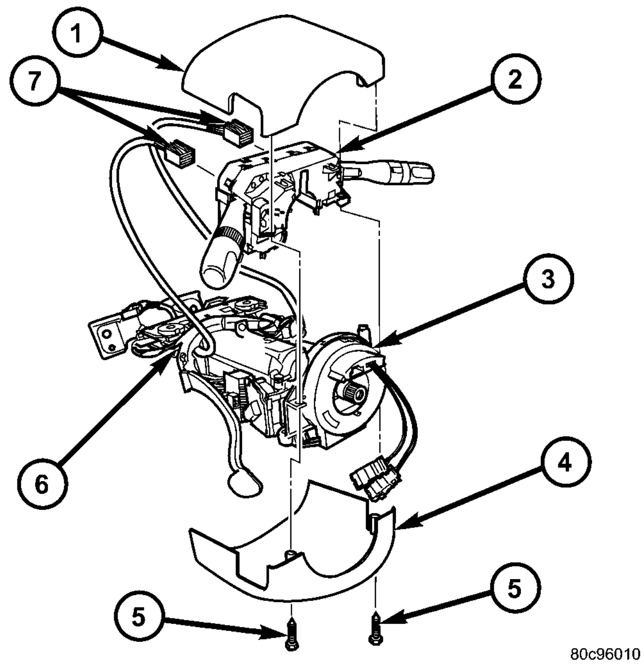

Fig. 54 Multi-Function Switch Remove/Install

1 - UPPER SHROUD
2 - MULTI-FUNCTION SWITCH
3 - CLOCKSPRING
4 - LOWER SHROUD
5 - SCREW (2)
6 - STEERING COLUMN
7 - WIRE HARNESS CONNECTOR (2)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Before attempting to install the multifunction switch, be certain that the left control stalk is in the neutral turn signal position and the turn signal cancel actuator is in the retracted (neutral) position.

(1) Position the multi-function switch to the steering column.

(2) Reconnect the two instrument panel wire harness connectors for the multi-function switch to the two connector on the back of the switch housing (Fig. 54).

(3) Position the multi-function switch onto the steering column lock housing. Be certain that the switch alignment posts and locator tabs are fully seated on the lock housing.

(4) Position the upper and lower shrouds onto the steering column.

(5) Align the snap features on the lower shroud with the upper shroud and apply pressure to snap them together.

(6) Install and tighten the screws that secure the lower shroud to the upper shroud. Tighten the screws to 2 N·m (20 in. lbs.).

(7) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column back to the fully raised position and move the tilt release lever into the locked (up) position.

(8) Reconnect the battery negative cable.

PARK LAMP RELAY

DESCRIPTION

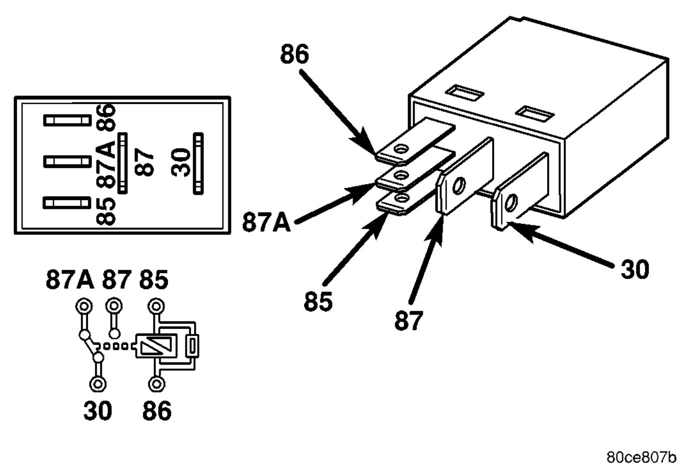

Fig. 55 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The park lamp relay is located in the Junction Block (JB). The park lamp relay is a conventional International Standards Organization (ISO) micro relay (Fig. 55).

PARK LAMP RELAY (Continued)

The park lamp relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The park lamp relay is an electromechanical switch that uses a low voltage input from the Body Control Module (BCM) to control a high voltage output to the park lamps. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The inputs and outputs of the park lamp relay include:

- **Common Supply Terminal** - The common supply terminal is connected to the park lamps through the park lamp relay output circuit and provides ground to the park lamps when the relay is de-energized, and battery voltage to the park lamps whenever the relay is energized.
- **Coil Ground Terminal** - The coil ground terminal is connected to a control output of the Body Control Module (BCM) through a park lamp relay control circuit. The BCM controls park lamp operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal receives battery voltage at all times from a fuse in the PDC.
- **Normally Open Terminal** - The normally open terminal receives battery voltage at all times from a fuse in the Power Distribution Center (PDC).
- **Normally Closed Terminal** - The normally closed terminal is connected to ground at all times through a ground stud on the driver side instrument panel end bracket near the Junction Block (JB).

The park lamp relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - PARK LAMP RELAY

The park lamp relay (Fig. 56) is located in the Junction Block (JB). refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

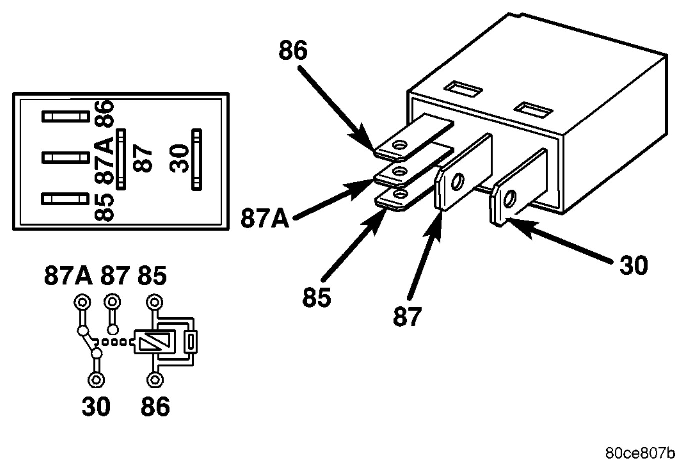

Fig. 56 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the park lamp relay from the JB. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/PARK LAMP RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

PARK LAMP RELAY (Continued)

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(3) Remove the park lamp relay by firmly pulling it straight out from the Junction Block (JB) (Fig. 57).

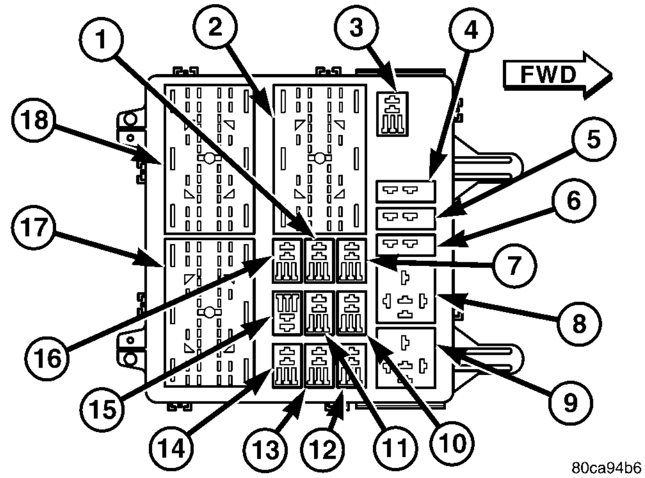

Fig. 57 Junction Block - Inboard Side (LHD Shown - Rotate 180° for RHD)

1 - PASSENGER DOOR UNLOCK RELAY
2 - JB C3 CONNECTOR RECEPTACLE
3 - LOW BEAM RELAY
4 - CIRCUIT BREAKER #1
5 - CIRCUIT BREAKER #2
6 - CIRCUIT BREAKER #3
7 - DOOR LOCK RELAY
8 - DEFOGGER RELAY
9 - SPARE
10 - FRONT FOG LAMP RELAY
11 - HORN RELAY
12 - SPARE
13 - SPARE
14 - REAR FOG LAMP RELAY
15 - PARK LAMP RELAY
16 - DRIVER DOOR UNLOCK RELAY
17 - JB C1 CONNECTOR RECEPTACLE
18 - JB C2 CONNECTOR RECEPTACLE

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the park lamp relay terminals with the terminal in the JB (Fig. 57).

(2) Push firmly and evenly on the top of the park lamp relay until the terminals are fully seated in the JB.

(3) Reinstall the steering column opening cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(4) Reconnect the battery negative cable.

REAR FOG LAMP RELAY

DESCRIPTION

The rear fog lamp relay is located in the Junction Block (JB) The rear fog lamp relay is a conventional International Standards Organization (ISO) micro relay (Fig. 58).

The rear fog lamp relay cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

REAR FOG LAMP RELAY (Continued)

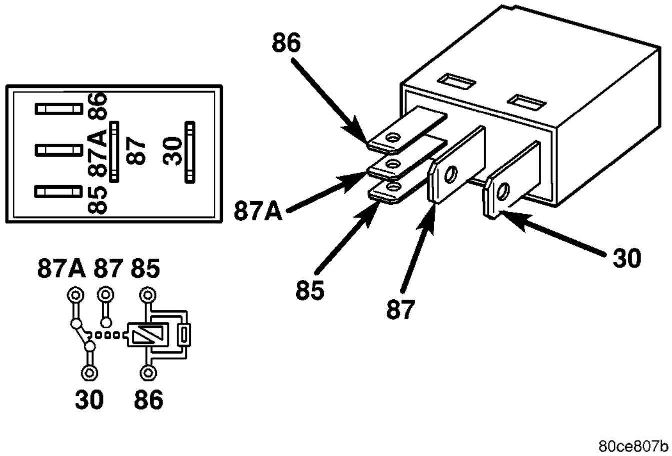

Fig. 58 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

OPERATION

The rear fog lamp relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the rear fog lamps. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The inputs and outputs of the rear fog lamp relay include:

- **Common Supply Terminal** - The common supply terminal receives battery voltage at all times from a fuse in the JB.
- **Coil Ground Terminal** - The coil ground terminal is connected to a control output of the premium Body Control Module (BCM) through a rear fog lamp relay control circuit. The BCM controls rear fog lamp operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal receives battery voltage at all times from a fuse in the JB.
- **Normally Open Terminal** - The normally open terminal is connected to the rear fog lamps through a rear fog lamp relay output circuit and provides battery voltage to the rear fog lamps whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal is not connected in this application.

The rear fog lamp relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - REAR FOG LAMP RELAY

The rear fog lamp relay (Fig. 59) is located in the Junction Block (JB). Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

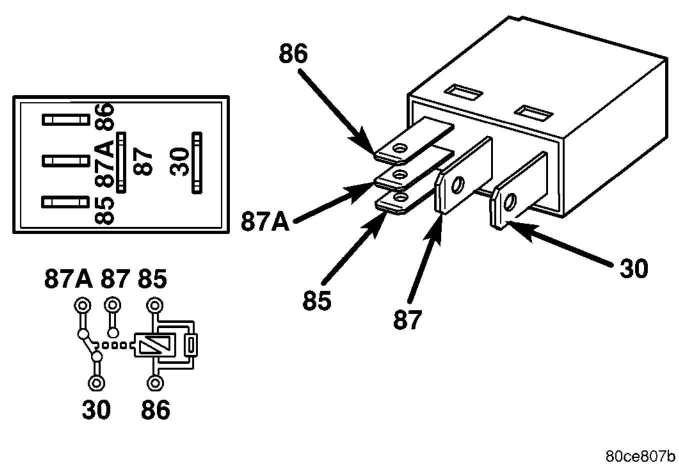

Fig. 59 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

REAR FOG LAMP RELAY (Continued)

(1) Remove the rear fog lamp relay from the JB. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR FOG LAMP RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL)

(3) Remove the rear fog lamp relay by firmly pulling it straight out from the Junction Block (JB) (Fig. 60).

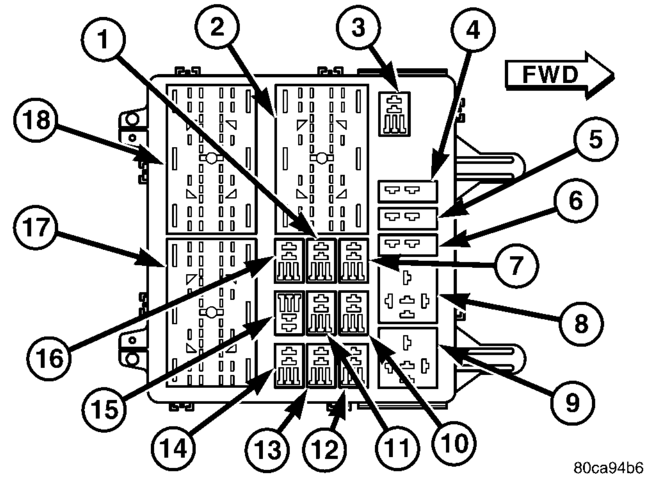

Fig. 60 Junction Block - Inboard Side (LHD Shown - Rotate 180° for RHD)

1 - PASSENGER DOOR UNLOCK RELAY
2 - JB C3 CONNECTOR RECEPTACLE
3 - LOW BEAM RELAY
4 - CIRCUIT BREAKER #1
5 - CIRCUIT BREAKER #2
6 - CIRCUIT BREAKER #3
7 - DOOR LOCK RELAY
8 - DEFOGGER RELAY
9 - SPARE
10 - FRONT FOG LAMP RELAY
11 - HORN RELAY
12 - SPARE
13 - SPARE
14 - REAR FOG LAMP RELAY
15 - PARK LAMP RELAY
16 - DRIVER DOOR UNLOCK RELAY
17 - JB C1 CONNECTOR RECEPTACLE
18 - JB C2 CONNECTOR RECEPTACLE

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the rear fog lamp relay terminals with the terminal in the JB (Fig. 60)..

(2) Push firmly and evenly on the top of the rear fog lamp relay until the terminals are fully seated in the JB.

(3) Reinstall the steering column opening cover onto the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

(4) Reconnect the battery negative cable.

REAR LAMP BULB

REMOVAL

The rear lamp may contain up to four bulbs, depending upon the market for which the vehicle was manufactured. The service procedures for each bulb is the same, only the bulb sizes and types may differ. Be certain any removed bulb is replaced with the same bulb size and type that was removed.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the rear lamp from the end of the quarter panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR LAMP UNIT - REMOVAL).

(3) Grasp the socket on the socket plate at the back of the rear lamp housing for the bulb that is being removed (Fig. 61).

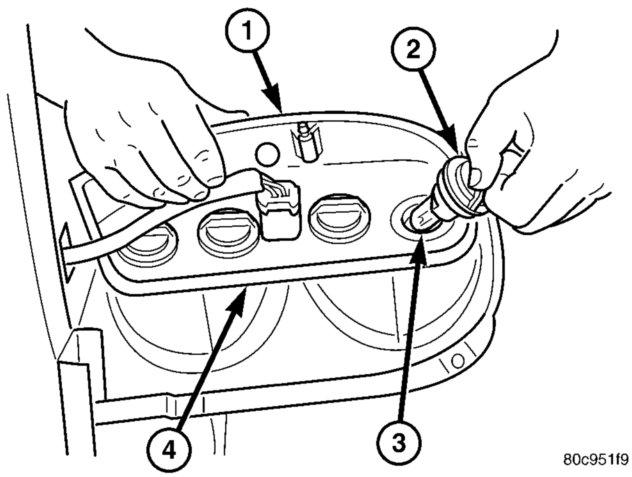

Fig. 61 Rear Lamp Bulb Remove/Install

1 - REAR LAMP HOUSING
2 - BULB HOLDER
3 - BULB
4 - SOCKET PLATE

(4) Rotate the socket at the back of the rear lamp housing counterclockwise about 30 degrees.

(5) Pull the socket and bulb straight out of the back of the rear lamp housing.

(6) Pull the bulb straight out of the rear lamp socket.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the bulb with the rear lamp socket.

(2) Push the bulb straight into the rear lamp socket until it is firmly seated.

(3) Align the socket and bulb with the opening in the socket plate on the back of the rear lamp unit housing (Fig. 61).

(4) Push the socket and bulb straight into the rear lamp housing until the socket is firmly seated against the socket plate.

(5) Rotate the socket clockwise about 30 degrees.

(6) Reinstall the rear lamp onto the end of the quarter panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR LAMP UNIT - INSTALLATION).

(7) Reconnect the battery negative cable.

REAR LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Open the tailgate to access and remove the screws that secure the rear lamp unit to the side jamb of the tailgate opening (Fig. 62).

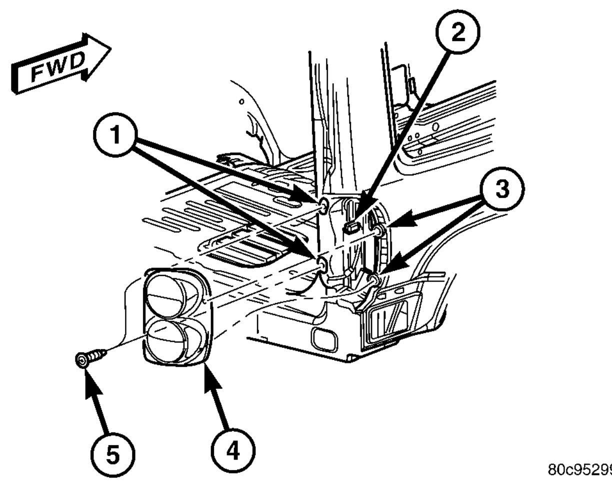

Fig. 62 Rear Lamp Unit Remove/Install

1 - PLASTIC NUT (2)
2 - WIRE HARNESS CONNECTOR
3 - PLASTIC NUT (2)
4 - REAR LAMP UNIT
5 - SCREW (2)

(3) Pull the outboard side of the rear lamp rearward far enough to unsnap the two ball studs on the outboard side of the lamp housing from the quarter panel.

(4) Disconnect the wire harness connector for the lamp from the connector on the lamp socket plate.

(5) Remove the rear lamp from the quarter panel.

(6) Remove the plastic nuts from the quarter panel and discard.

REAR LAMP UNIT (Continued)

INSTALLATION

(1) Install new plastic nuts into the quarter panel (Fig. 62).

(2) Position the rear lamp to the quarter panel.

(3) Reconnect the wire harness connector.

(4) Align the two ball studs on the outboard side of the rear lamp housing with the plastic nuts in the quarter panel.

(5) Push the outboard side of the rear lamp forward far enough to snap the two ball studs into the plastic nuts in the quarter panel.

(6) Install and tighten the screws that secure the inboard side of the rear lamp housing to the plastic nuts in the side jamb of the tailgate opening. Tighten the screws to 2 N·m (20 in. lbs.).

(7) Reconnect the battery negative cable.

REPEATER LAMP BULB

REMOVAL

Side repeater lamps are used only on vehicles manufactured for markets where these lamps are required.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the repeater lamp from the front fender panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REPEATER LAMP UNIT - REMOVAL).

(3) Rotate the repeater lamp socket in the lamp lens counterclockwise about 30 degrees (Fig. 63).

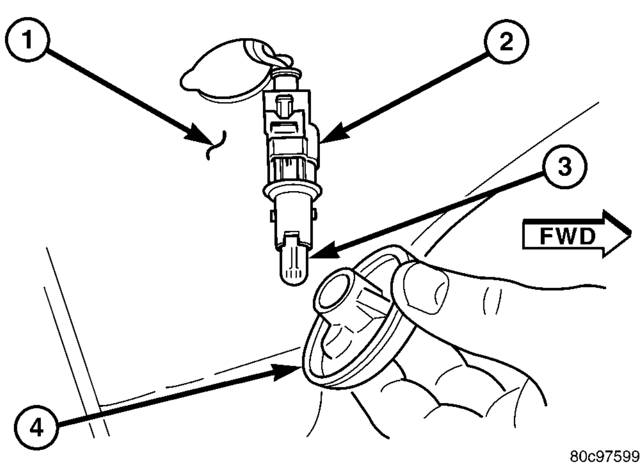

Fig. 63 Repeater Lamp Bulb Remove/Install

1 - FRONT FENDER
2 - SOCKET
3 - BULB
4 - LENS

(4) Pull the socket and bulb straight out of the lamp lens.

(5) Pull the bulb straight out of the lamp socket.

INSTALLATION

Side repeater lamps are used only on vehicles manufactured for certain markets where these lamps are required.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the bulb with the receptacle in the repeater lamp socket.

(2) Push the bulb straight into the repeater lamp socket until it is firmly seated.

(3) Align the socket and bulb with the socket opening in the repeater lamp lens (Fig. 63).

(4) Push the socket and bulb straight into the repeater lamp lens until it is firmly seated

(5) Rotate the repeater lamp socket in the lamp lens clockwise about 30 degrees.

(6) Reinstall the repeater lamp unit onto the front fender panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REPEATER LAMP UNIT - INSTALLATION).

(7) Reconnect the battery negative cable.

REPEATER LAMP UNIT

REMOVAL

Side repeater lamps are used only on vehicles manufactured for markets where these lamps are required.

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, carefully pry at the clearance notch in the lower edge of the repeater lamp lens to disengage the snap features of the lens from the mounting hole in the front fender panel (Fig. 64).

(3) Pull the repeater lamp out from the front fender panel far enough to access and disconnect the wire harness connector from the connector on the back of the repeater lamp socket.

(4) Remove the repeater lamp from the front fender panel.

INSTALLATION

Side repeater lamps are used only on vehicles manufactured for markets where these lamps are required.

REPEATER LAMP UNIT (Continued)

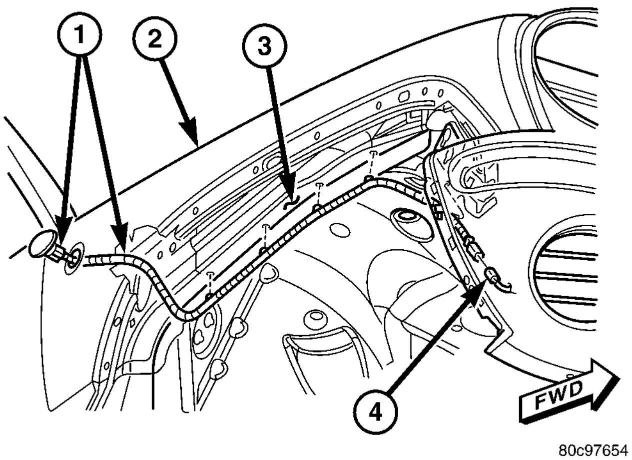

Fig. 64 Repeater Lamp Unit Remove/Install

1 - REPEATER LAMP UNIT
2 - FRONT FENDER PANEL
3 - INNER FENDER
4 - FRONT FASCIA WIRE HARNESS

(1) Position the repeater lamp to the front fender panel (Fig. 64).

(2) Reconnect the repeater lamp wire harness.

(3) Position the repeater lamp into the mounting hole in the front fender panel. Be certain that the clearance notch on the edge of the repeater lamp lens is oriented toward the bottom.

(4) Press on the repeater lamp firmly and evenly until the snap features of the lens are fully engaged in the mounting hole of the front fender panel.

(5) Reconnect the battery negative cable.

TRAILER TOW CONNECTOR

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the screws that secure the trailer tow connector to the bracket on the trailer hitch receiver (Fig. 65).

(3) Pull the trailer tow connector rearward from the bracket on the trailer hitch receiver far enough to access and disconnect the rear body wire harness connector.

(4) Remove the trailer tow connector from the trailer hitch receiver.

INSTALLATION

(1) Position the trailer tow connector to the trailer hitch receiver (Fig. 65).

(2) Reconnect the rear body wire harness connector.

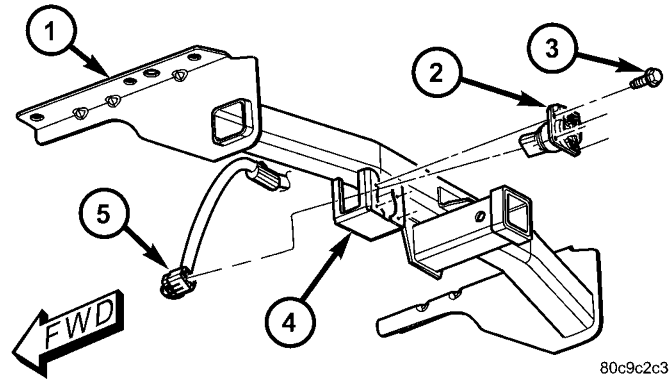

Fig. 65 Trailer Tow Connector Remove/Install

1 - HITCH RECEIVER
2 - 7-WAY TRAILER TOW CONNECTOR
3 - SCREW (4)
4 - BRACKET
5 - WIRE HARNESS CONNECTOR

(3) Position the trailer tow connector into the bracket on the trailer hitch receiver.

(4) Install and tighten the screws that secure the trailer tow connector to the bracket on the trailer hitch receiver. Tighten the screws to 4 N·m (35 in. lbs.).

(5) Reconnect the battery negative cable.

TRAILER TOW RELAY

DESCRIPTION

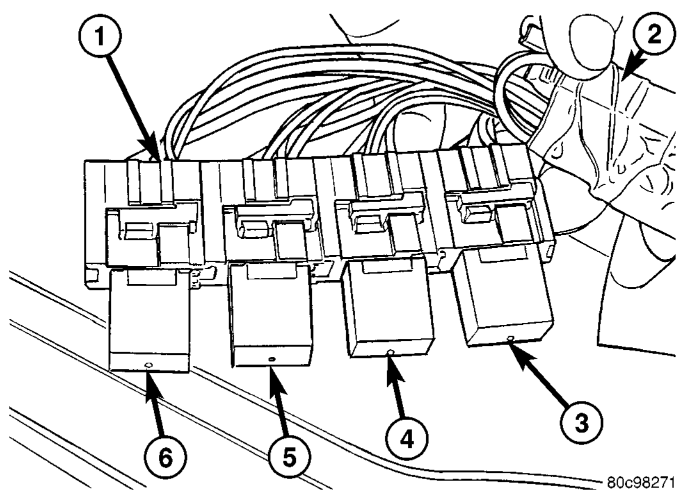

Fig. 66 Trailer Tow Relays

1 - RELAY CONNECTOR BANK
2 - REAR BODY WIRE HARNESS
3 - LEFT TURN RELAY
4 - RIGHT TURN RELAY
5 - BRAKE LAMP RELAY
6 - FUSED IGNITION SWITCH OUTPUT (RUN) RELAY

TRAILER TOW RELAY (Continued)

The trailer tow relays are located in a connector bank above the right rear wheelhouse and behind the quarter trim panel on vehicles equipped with the optional factory-installed trailer towing package. Four individual relays are used, one each for fused ignition switch output (run), brake lamps, right turn signal, and left turn signal outputs to a trailer through the rear body wiring and connectors. The trailer tow relays are conventional International Standards Organization (ISO) micro relays (Fig. 66).

The trailer tow relays cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The trailer tow relays are electromechanical switches. The relays each use an input from the circuit that they isolate from the trailer wiring to control a high current output to the trailer. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The terminals of each trailer tow relay are connected to the vehicle electrical system through the rear lighting wire harness above the right rear wheelhouse. Refer to the appropriate wiring information.The trailer tow relays can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - TRAILER TOW RELAY

The trailer tow relays (Fig. 67) are located in a connector bank above the right rear wheelhouse. Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

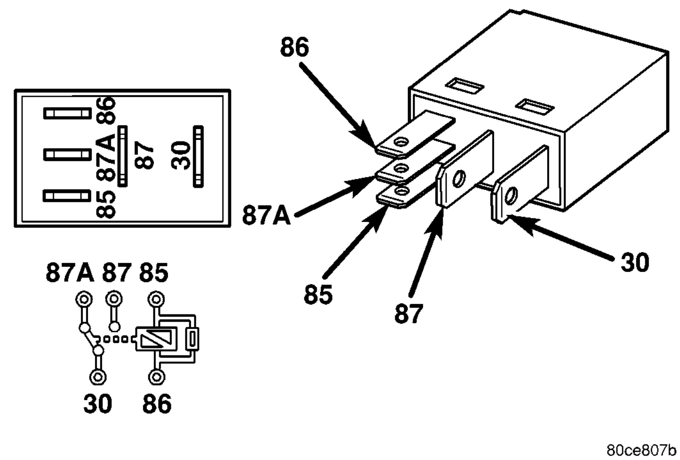

Fig. 67 ISO Micro Relay

30 - COMMON SUPPLY
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the trailer tow relay from the connector bank. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TRAILER TOW RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, test the input and output circuits of the relay. Refer to the appropriate wiring information.

REMOVAL

The trailer tow relay bank contains four relays. The service procedures for each relay are the same. Be certain any removed relay is replaced with the same relay size and type that was removed.

TRAILER TOW RELAY (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim from the right side quarter inner panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).

(3) Reach through the access hole in the quarter inner panel behind the right rear wheelhouse to locate and retrieve the trailer tow relay connector bank, which is enveloped in foam rubber and placed on the top of the right rear wheelhouse between the quarter inner and outer panels (Fig. 68).

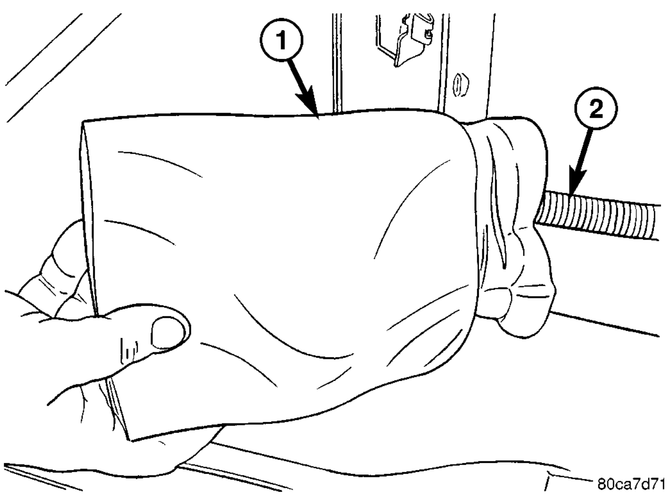

Fig. 68 Trailer Tow Relay Wrap

1 - FOAM WRAP
2 - REAR BODY WIRE HARNESS

(4) Pull the trailer tow relay connector bank into the cargo area far enough to access for service.

(5) Carefully remove the trailer tow relay connector bank from the foam wrap.

(6) Remove the trailer tow relay by pulling it straight out from the connector bank (Fig. 69).

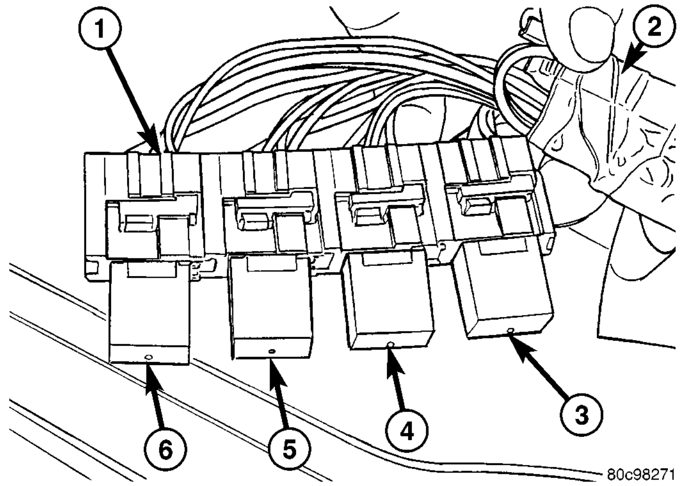

Fig. 69 Trailer Tow Relay Remove/Install

1 - RELAY CONNECTOR BANK
2 - REAR BODY WIRE HARNESS
3 - LEFT TURN RELAY
4 - RIGHT TURN RELAY
5 - BRAKE LAMP RELAY
6 - FUSED IGNITION SWITCH OUTPUT (RUN) RELAY

INSTALLATION

The trailer tow relay bank contains four relays. The service procedures for each relay are the same. Be certain any removed relay is replaced with the same relay size and type that was removed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

TRAILER TOW RELAY (Continued)

(1) Position the trailer tow relay to the proper connector in the connector bank (Fig. 69).

(2) Align the trailer tow relay terminals with the terminal in the connector.

(3) Push firmly and evenly on the top of the trailer tow relay until the terminals are fully seated in the connector.

(4) Carefully restore the foam wrap around the trailer tow relay connector bank (Fig. 68).

(5) Reach through the access hole in the quarter inner panel behind the right rear wheelhouse to place the trailer tow relay connector bank on the top of the right rear wheelhouse between the quarter inner and outer panels.

(6) Reinstall the trim onto the right side quarter inner panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).

(7) Reconnect the battery negative cable.

TRAILER TOW WIRING

DESCRIPTION

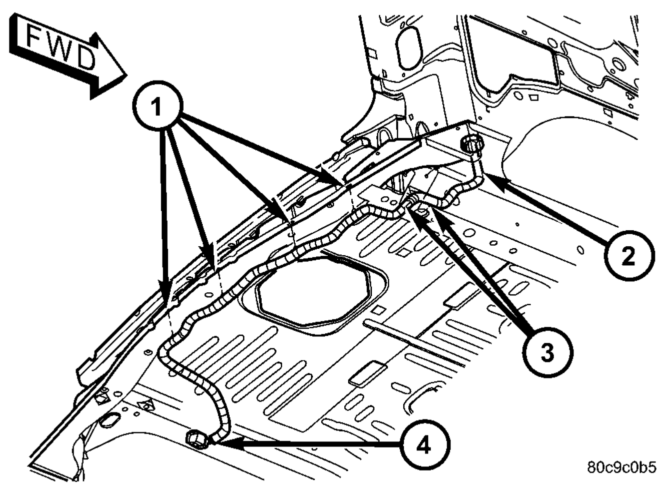

Fig. 70 Trailer Tow Wiring

1 - RETAINER CLIP (4)
2 - REAR BODY HARNESS (TRAILER TOW TAKE OUT)
3 - RETAINER CLIP (2)
4 - WIRE HARNESS CONNECTOR

Vehicles equipped with an optional factory-installed trailer towing package have a rear body wire harness that includes an trailer tow wiring take out that connects to a heavy duty, sealed, 7-pin trailer tow connector located on a bracket on the trailer hitch receiver (Fig. 70). This harness includes a second take out with a trailer tow relay connector bank and four trailer tow relays that isolate the right turn signal, left turn signal, and brake lamp circuits of the vehicle from the electrical system of the trailer. The fourth relay in the connector bank provides a fused ignition switch output (run) source of battery voltage to the trailer tow connector through a trailer tow relay output circuit. The package also includes an adapter harness (stored beneath the left rear seat cushion of the vehicle when it is shipped from the factory) that adapts the 7-pin trailer tow connector to a standard, light-duty, 4-pin trailer tow connector. Refer to the appropriate wiring information.

LAMPS/LIGHTING - INTERIOR

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LAMPS/LIGHTING - INTERIOR

DESCRIPTION

The interior lighting system (Fig. 1) for this model includes the following incandescent interior lamps:

- **Ash Receiver Lamp** - An available ash receiver lamp is located above the ash receiver housing behind the instrument panel center bezel, and is controlled by the panel lamps dimmer circuit.
- **Cargo Lamp** - An available cargo lamp with an integral lens-actuated courtesy disable switch is located in the headliner near the rear roof header, and is controlled by the courtesy lamp circuit.
- **Courtesy Lamps** - Available courtesy lamps are located below both the right and left side of the instrument panel, and are controlled by the courtesy lamp circuit.
- **Compass Mini-Trip Control Illumination Lamps** - The optional Compass Mini-Trip Computer (CMTC) has three replaceable control illumination bulb/bulb holder units on its circuit board that are controlled by the panel lamps dimmer circuit.
- **Dome Lamp** - A standard front dome lamp that does not include an on-off switch is located in the headliner near the windshield header, and is controlled by the courtesy lamp circuit.
- **Hazard Switch Illumination/Indicator Lamp** - The hazard switch control button has a non-replaceable illumination/indicator bulb soldered onto its circuit board that is controlled by both the hazard switch circuitry and the panel lamps dimmer circuit. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HAZARD SWITCH - DESCRIPTION).

LAMPS/LIGHTING - INTERIOR (Continued)

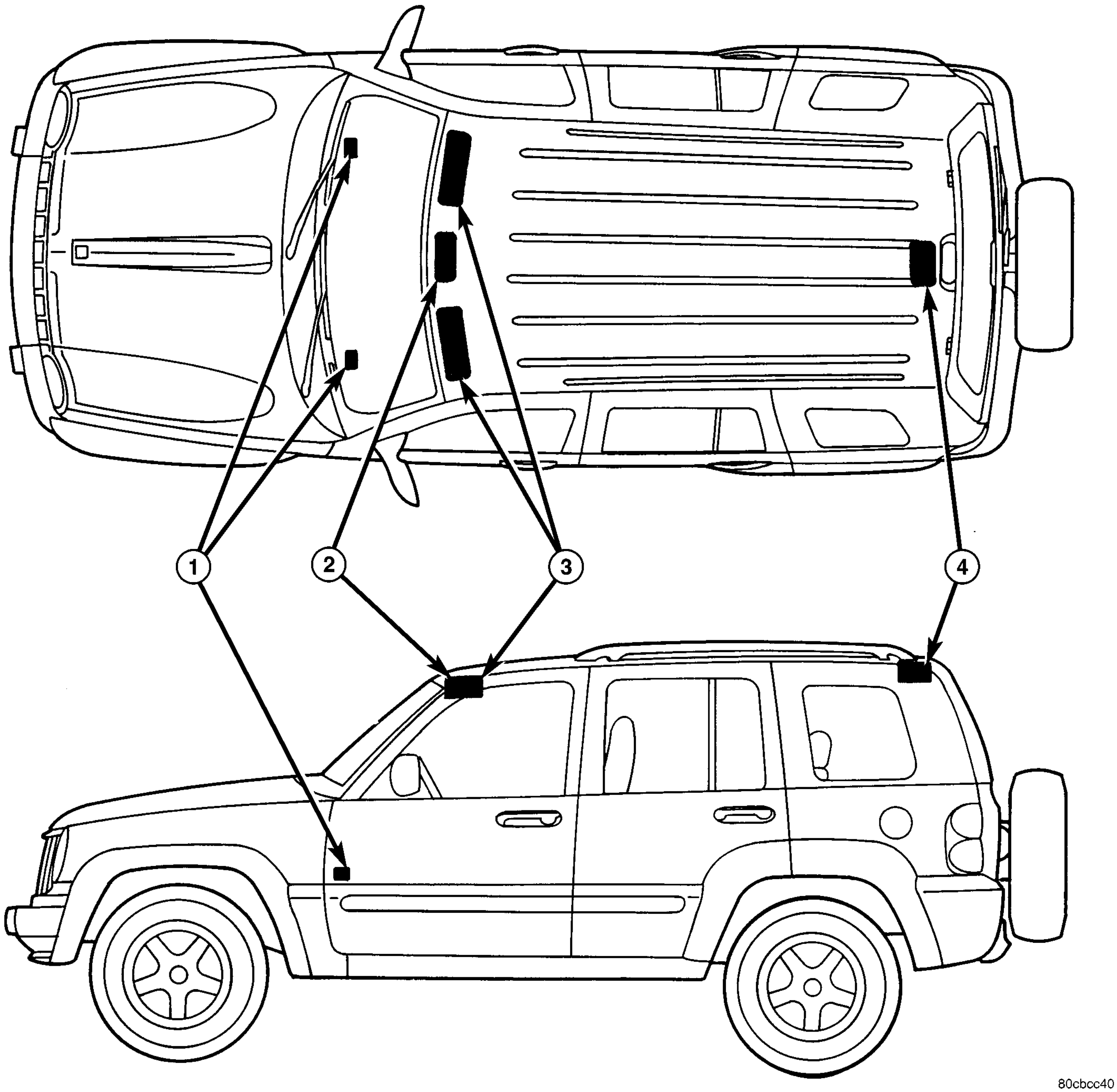

Fig. 1 Courtesy Lamps

1 - COURTESY LAMP (2)
2 - DOME OR READING LAMP
3 - VANITY LAMP (2)
4 - CARGO LAMP

• **Heater-Air Conditioner Control Illumination Lamps** - The heater-air conditioner control has two replaceable control illumination bulb/bulb holder units on its circuit board that are controlled by the panel lamps dimmer circuit.

• **Instrument Cluster Illumination Lamps** - The ElectroMechanical Instrument Cluster (EMIC) has nine replaceable general illumination bulb/bulb holder units on its circuit board that are controlled by the panel lamps dimmer circuit. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).

• **Reading Lamps** - Available front seat driver side and passenger side reading lamps located in the headliner near the windshield header are controlled by both the courtesy lamp circuit and independent lens-actuated switches.

LAMPS/LIGHTING - INTERIOR (Continued)

- **Transmission Range Indicator Illumination Lamp** - Vehicles equipped with an automatic transmission have an illuminated transmission range indicator integral to the console mounted gearshift mechanism, and controlled by the panel lamps dimmer circuit.
- **Vanity Lamps** - Available single intensity vanity lamps are located on each side of a covered mirror on both the right and left sun visors, and are controlled by an integral vanity mirror cover-actuated switch on the courtesy lamp circuit.

Other components of the interior lighting system for this model include:

- **Body Control Module** - The Body Control Module (BCM) is located on the Junction Block (JB) under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL MODULE - DESCRIPTION).
- **Door Ajar Switches** - A door ajar switch is integral to the door latch mechanism of each front and rear door.
- **Flip-Up Glass Ajar Switch** - A flip-up glass ajar switch is integral to the flip-up glass latch mechanism on the top of the tailgate inner panel.
- **Multi-Function Switch** - The multi-function switch is located on the top of the steering column, just below the steering wheel. The multi-function switch includes a left and right control stalk. The left control stalk is dedicated to providing almost all of the driver controls for both the exterior and interior lighting systems. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).
- **Tailgate Ajar Switch** - A tailgate ajar switch is integral to the latch mechanism of the tailgate.

OPERATION

The interior lighting systems can be divided into two general classifications based upon the circuit that controls their operation: The courtesy lamp circuit, or the panel lamps dimmer circuit.The hard wired circuits and components of the interior lighting systems may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, and the PCI data bus network inputs and outputs related to the various interior lighting systems requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

COURTESY LAMP CIRCUIT Depending upon the selected vehicle options the courtesy lamp circuit may include the courtesy lamps located below the instrument panel, the dome or map/reading lamps located in the headliner near the windshield, the cargo lamp located in the headliner near the rear roof header, and the vanity lamps located in the sun visors. The lamps in the courtesy lamp circuit are provided with battery voltage at all times from a fuse in the Junction Block (JB).The Body Control Module (BCM) controls the ground path for these lamps using an internal driver through the courtesy lamp driver circuit based upon hard wired inputs from the door ajar switches, the flip-up glass ajar switch, and the tailgate ajar switch. After all of the ajar switch inputs to the BCM transition to open, the BCM will keep the lamps illuminated for about 27 seconds, then fade the lamps to off (theater dimming) over about three seconds.

The BCM also provides courtesy lamp operation based upon a resistor multiplexed input from the interior lighting control ring on the left control stalk of the multi-function switch through the headlamp switch circuit, and in response to certain inputs from the optional Remote Keyless Entry (RKE) system. A resistor multiplexed courtesy lamp defeat input from the control ring on the left control stalk of the multi-function switch will cause the BCM to override normal courtesy lamp operation based upon inputs from all of the ajar switches. A hard wired input from the courtesy lamp defeat switch in the optional cargo lamp through a rear courtesy lamp control circuit will cause the BCM to override normal courtesy lamp operation based upon inputs from only the flip-up glass and tailgate ajar switches.

For those lamps on the courtesy lamp circuit with independent switching, such as the optional reading lamps and vanity lamps, the BCM provides a ground path to the switches using another internal driver through the courtesy lamp load shed circuit. The BCM provides a battery saver (load shedding) feature for all courtesy lamps, which will automatically turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position.

PANEL LAMPS DIMMER CIRCUIT The panel lamps dimmer circuit includes the ElectroMechanical Instrument Cluster (EMIC), heater-air conditioner control, hazard switch and, depending upon the selected vehicle options, ash receiver, and automatic transmission range indicator illumination lamps. All lamps in the panel lamps dimmer circuit are provided a path to ground at all times through a hard wired ground circuit. These lamps illuminate based upon inputs to the Body Control Module (BCM) from the exterior lighting control knob and the interior

LAMPS/LIGHTING - INTERIOR (Continued)

lighting control ring on the left control stalk of the multi-function switch. The control knob on the left control stalk of the multi-function switch selects the exterior lights, while the control ring selects the panel lamps intensity (dimming) level.

When the exterior lighting is turned On, the BCM energizes the park lamp relay and provides an electronic dimming level message to the ElectroMechanical Instrument Cluster (EMIC), the radio, and the Compass Mini-Trip Computer (CMTC) over the Programmable Communications Interface (PCI) data bus. The energized park lamp relay provides a hard wired battery voltage signal input to the EMIC on the park lamp relay output circuit. The EMIC responds to these inputs by supplying a 12-volt Pulse Width Modulated (PWM) output to all of the incandescent lamps in the panel lamps dimmer circuit over the fused panel lamps dimmer switch signal circuit. This shared PWM output synchronizes the selected illumination intensity level of all of the incandescent lamps in the panel lamps dimmer circuit.

The EMIC and the radio each use the electronic dimming level message from the BCM to control and synchronize the illumination intensity of their own Vacuum Fluorescent Display (VFD), while the CMTC uses the dimming level message to control the illumination intensity of both its VFD and its incandescent lighting. In addition, when the control ring on the left control stalk of the multi-function switch is moved to the Parade Mode detent position, all of the VFDs are illuminated at their full intensity levels for increased visibility when the vehicle is driven during daylight hours with the exterior lights turned On.

DIAGNOSIS AND TESTING - LAMPS/LIGHTING - INTERIOR

The hard wired circuits and components of the interior lighting system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, and the PCI data bus network inputs and outputs related to the various interior lighting systems requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

When diagnosing the interior lighting circuits, remember that high generator output can burn out bulbs rapidly and repeatedly; and, that dim or flickering bulbs can be caused by low generator output or poor battery condition. If one of these symptoms is a problem on the vehicle being diagnosed, be certain to diagnose and repair the battery and charging system as required. Also, that a good ground is necessary for proper lighting operation. If a lighting problem is being diagnosed that involves multiple symptoms, systems, or components the problem can often be traced to a loose, corroded, or open ground. For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

LAMPS/LIGHTING - INTERIOR (Continued)

COURTESY LAMP CIRCUIT

CONDITION	POSSIBLE CAUSES	CORRECTION
A SINGLE LAMP IN THE COURTESY LAMP CIRCUIT DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace the courtesy lamp bulb as required.
	2. Faulty lamp switch.	2. Test and replace a faulty map/reading lamp switch, cargo lamp switch, or sunvisor (vanity lamp switch) as required.
	3. Faulty ground circuit.	3. Test and repair the open courtesy lamp driver circuit as required.
	4. Faulty ground circuit (independently switched lamps only).	4. Test and repair the open courtesy lamp load shed circuit as required.
	5. Faulty supply circuit.	5. Test and repair the open fused B(+) circuit as required.
ALL LAMPS IN THE COURTESY LAMP CIRCUIT DO NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace the fused B(+) fuse (IOD) in the Junction Block (JB) as required.
	2. Faulty ground circuit.	2. Test and repair the open courtesy lamp driver circuit as required.
	3. Faulty supply circuit.	3. Test and repair the open fused B(+) circuit as required.
	4. Faulty cargo lamp (courtesy defeat) switch.	4. Test and replace the cargo lamp switch as required.
	5. Faulty rear courtesy lamp control circuit.	5. Test and repair the shorted courtesy lamp control circuit as required.
	6. Faulty multi-function switch.	6. Test and replace the multi-function switch as required.
	7. Faulty Body Control Module (BCM), BCM input, or BCM output.	7. Use a DRBIII® scan tool to test the BCM, its inputs, and its outputs. Refer to the appropriate diagnostic information.
A SINGLE LAMP IN THE COURTESY LAMP CIRCUIT DOES NOT EXTINGUISH	1. Faulty lamp switch.	1. Test and replace a faulty map/reading lamp switch, cargo lamp switch, or sunvisor (vanity lamp switch) as required.
	2. Faulty ground circuit.	2. Test and repair the shorted courtesy lamp driver circuit as required.
ALL LAMPS IN THE COURTESY LAMP CIRCUIT DO NOT EXTINGUISH	1. Faulty ajar switch.	1. Test and replace a faulty door, tailgate, or liftglass ajar switch as required.
	2. Faulty ajar switch sense circuit.	2. Test and repair the shorted ajar switch sense circuit as required.
	3. Faulty ground circuit.	3. Test and repair the shorted courtesy lamp driver circuit as required.
	4. Faulty Body Control Module (BCM), BCM input, or BCM output.	4. Use a DRBIII® scan tool to test the BCM, its inputs, and its outputs. Refer to the appropriate diagnostic information.

LAMPS/LIGHTING - INTERIOR (Continued)

PANEL LAMPS DIMMER CIRCUIT

CONDITION	POSSIBLE CAUSES	CORRECTION
A SINGLE LAMP DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace lamp bulb as required.
	2. Faulty ground circuit.	2. Test and repair lamp ground circuit as required.
	3. Faulty supply circuit.	3. Test and repair open fused panel lamps dimmer switch signal circuit as required.
A SINGLE LAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted fused panel lamps dimmer switch signal circuit as required.
ALL LAMPS DO NOT ILLUMINATE	1. Faulty fused park lamp relay output circuit.	1. Test and repair open fused park lamp relay output circuit as required.
	2. Faulty or missing park lamp relay.	2. Test and replace park lamp relay as required.
	3. Faulty fused panel lamps dimmer switch signal circuit.	3. Test and repair open fused panel lamps dimmer switch signal circuit as required.
	4. Faulty Body Control Module (BCM), BCM input, or BCM output.	4. Use a DRBIII® scan tool to test the BCM, its inputs, and its outputs. Refer to the appropriate diagnostic information.
	5. Faulty ElectroMechanical Instrument Cluster (EMIC), EMIC input, or EMIC output.	5. Use a DRBIII® scan tool to test the EMIC, its inputs, and its outputs. Refer to the appropriate diagnostic information.
	6. Faulty multi-function switch.	6. Test and replace the multi-function switch as required.
ALL LAMPS EXCEPT CLUSTER ILLUMINATION DO NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted fused panel lamps dimmer switch signal circuit as required.

SPECIFICATIONS - LAMPS/LIGHTING - INTERIOR

BULB SPECIFICATIONS

LAMP	BULB
Ash Receiver	161
Cargo	214-2
Cluster Illumination	103
Compass Mini-Trip Illumination	MOPAR 4437661
Courtesy	906
Heater-A/C Control Illumination	74
Map/Reading	192
Transmission Range Indicator Illumination	S14V
Vanity Mirror	MOPAR 6501966

ASH RECEIVER LAMP BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

ASH RECEIVER LAMP BULB (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the ash receiver lamp from the top of the ash receiver housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/ASH RECEIVER LAMP UNIT - REMOVAL).

(3) Carefully disengage the ash receiver lamp hood from the integral snap features on each side of the lamp socket and remove the hood (Fig. 2).

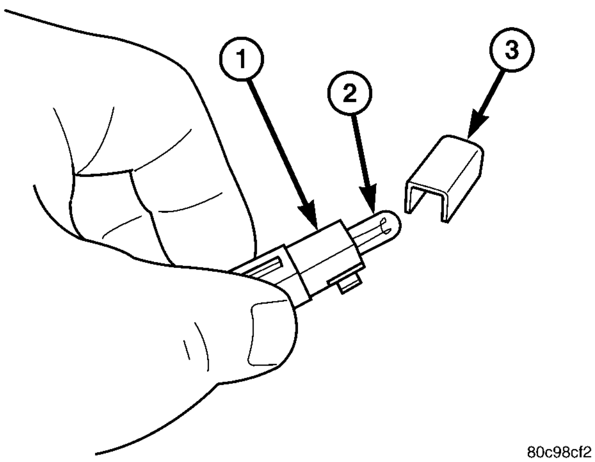

Fig. 2 Ash Receiver Lamp Bulb Remove/Install

1 - SOCKET
2 - BULB
3 - HOOD

(4) Pull the ash receiver lamp bulb straight out of the lamp socket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the ash receiver lamp bulb with the lamp socket.

(2) Push the ash receiver lamp bulb straight into the lamp socket until it is firmly seated (Fig. 2).

(3) Carefully slide the ash receiver lamp hood onto the lamp socket until it is fully engaged with the integral snap features on each side of the socket.

(4) Reinstall the ash receiver lamp onto the top of the ash receiver housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/ASH RECEIVER LAMP UNIT - INSTALLATION).

(5) Reconnect the battery negative cable.

ASH RECEIVER LAMP UNIT

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(3) While pulling the ash receiver lamp away from the top of the ash receiver housing, carefully release the four integral latches that secure the lamp to the mounting hole in the top of the housing.

(4) Remove the ash receiver lamp from the top of the ash receiver housing (Fig. 3).

ASH RECEIVER LAMP UNIT (Continued)

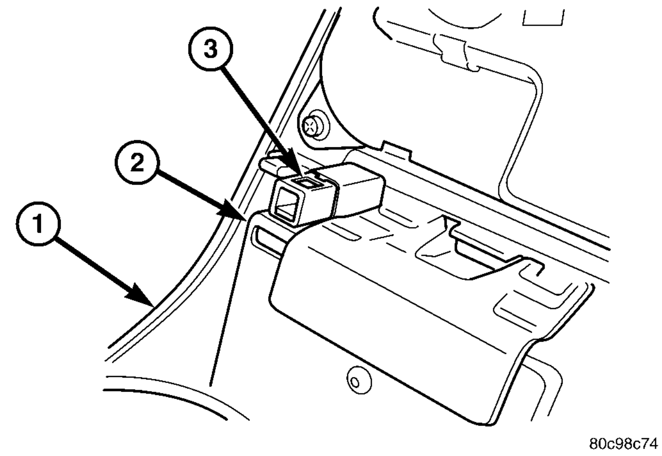

Fig. 3 Ash Receiver Lamp Unit Remove/Install

1 - CENTER BEZEL
2 - ASH RECEIVER HOUSING
3 - ASH RECEIVER LAMP UNIT

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the four integral latches of the ash receiver lamp to the mounting hole on the top of the ash receiver housing (Fig. 3).

(2) Press firmly and evenly on the ash receiver lamp until the four integral latches snap into place in the ash receiver housing mounting hole.

(3) Reinstall the center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

(4) Reconnect the battery negative cable.

CARGO LAMP BULB

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Using a small thin-bladed screwdriver, gently pry outward on either side near the top of the cargo lamp lens until the lens pivot unsnaps from the pivot pin within the lamp unit housing (Fig. 4).

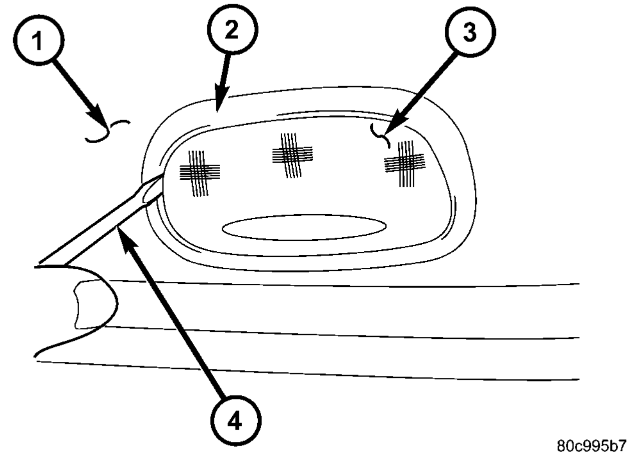

Fig. 4 Cargo Lamp Lens Remove

1 - HEADLINER
2 - CARGO LAMP
3 - LENS
4 - SCREWDRIVER

(3) Move the cargo lamp lens upward far enough to disengage the switch tab at the bottom of the lens from between the switch plunger and the lamp housing.

(4) Remove the cargo lamp lens from the lamp housing.

(5) Grasp the cargo lamp bulb and pull each end outward until it is disengaged from the lamp housing (Fig. 5).

(6) Remove the cargo lamp bulb from the lamp housing.

INSTALLATION

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the ends of the cargo lamp bulb with each of the bulb holders within the lamp housing (Fig. 5).

(2) Press firmly and evenly on both ends of the cargo lamp bulb until they snap into their respective bulb holders.

CARGO LAMP BULB (Continued)

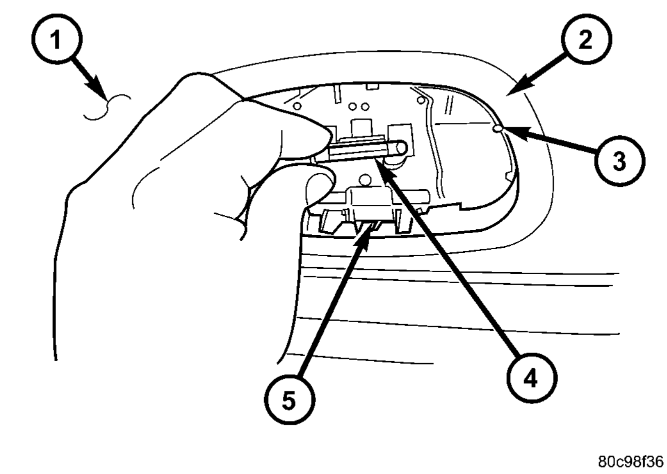

Fig. 5 Cargo Lamp Bulb Remove/Install

1 - HEADLINER
2 - CARGO LAMP
3 - LENS PIVOT PIN
4 - BULB
5 - SWITCH

(3) Position the cargo lamp lens to the lamp housing.

(4) Insert the switch tab at the bottom of the cargo lamp lens between the switch plunger and the lamp housing.

(5) Align the pivots on each side near the top of the cargo lamp lens with the pivot pins within the lamp housing.

(6) Press firmly and evenly on the cargo lamp lens over both pivots until they snap into place over the pivot pins within the lamp housing.

(7) Reconnect the battery negative cable.

CARGO LAMP SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cargo lamp unit from the headliner near the rear roof header. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/CARGO LAMP UNIT - REMOVAL).

(3) From the back of the cargo lamp housing, grasp the switch body (Fig. 6).

(4) Pull the cargo lamp switch toward the outside of the lamp housing until it unsnaps from the housing.

(5) Continue sliding the cargo lamp switch away from the terminal pins and out of the lamp housing.

INSTALLATION

(1) Align the terminal in the cargo lamp switch with the terminal pins of the lamp housing (Fig. 6).

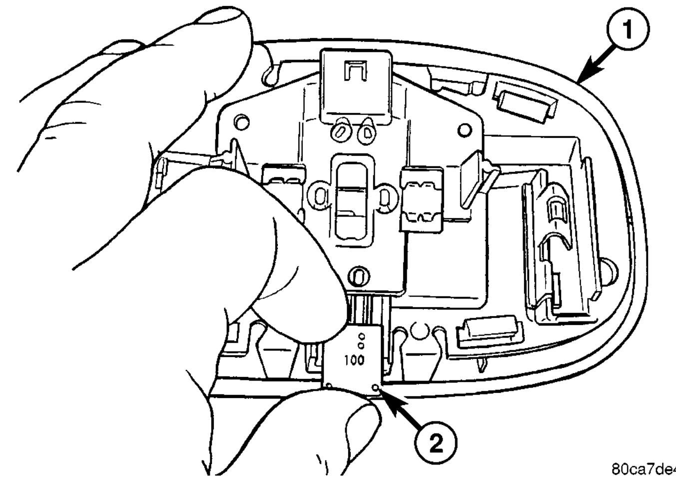

Fig. 6 Cargo Lamp Switch Remove/Install

1 - CARGO LAMP UNIT HOUSING
2 - SWITCH

(2) Push the cargo lamp switch toward the terminals of the lamp housing until it snaps into the housing.

(3) Reinstall the cargo lamp onto the headliner near the rear roof header. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/CARGO LAMP UNIT - INSTALLATION).

(4) Reconnect the battery negative cable.

CARGO LAMP UNIT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry between the flange around the edge of the cargo lamp housing and the headliner to release the metal snap clip on each side of the housing from the rear roof header (Fig. 7).

(3) Pull the cargo lamp away from the headliner far enough to access and disconnect the rear body wire harness connector.

(4) Remove the cargo lamp from the mounting hole in the headliner.

INSTALLATION

(1) Position the cargo lamp to the mounting hole in the headliner.

(2) Reconnect the rear body wire harness connector.

(3) With the finger depression in the cargo lamp lens oriented towards the rear of the vehicle, position the cargo lamp housing into the headliner mounting hole and align the metal snap clip on each side of the housing with the rear roof header (Fig. 7).

CARGO LAMP UNIT (Continued)

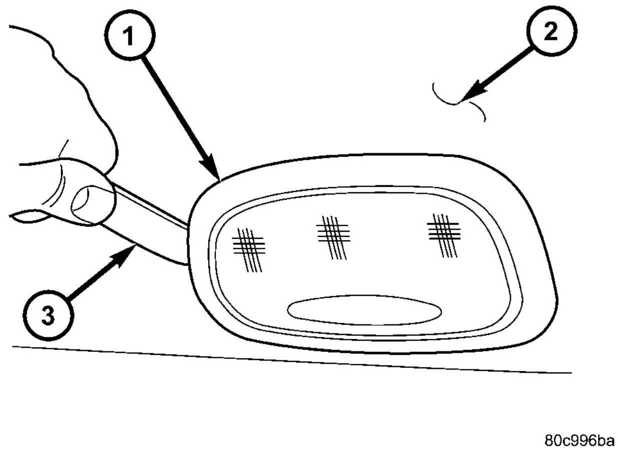

Fig. 7 Cargo Lamp Unit Remove/Install

1 - CARGO LAMP UNIT
2 - HEADLINER
3 - TRIM STICK

(4) Press upward firmly and evenly on both ends of the cargo lamp until both snap clips are fully engaged.

(5) Reconnect the battery negative cable.

COMPASS MINI-TRIP ILLUMINATION BULB

REMOVAL

The Compass Mini-Trip Computer (CMTC) in the overhead console includes either two or three incandescent illumination bulb and bulb holder units. Three bulbs are used only on models that also feature the optional Universal Garage Door Opener (UGDO).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the overhead console from the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(3) From the back of the unit, use a small thin-bladed screwdriver to rotate the compass mini-trip illumination bulb holder counterclockwise about 30 degrees on the circuit board (Fig. 8).

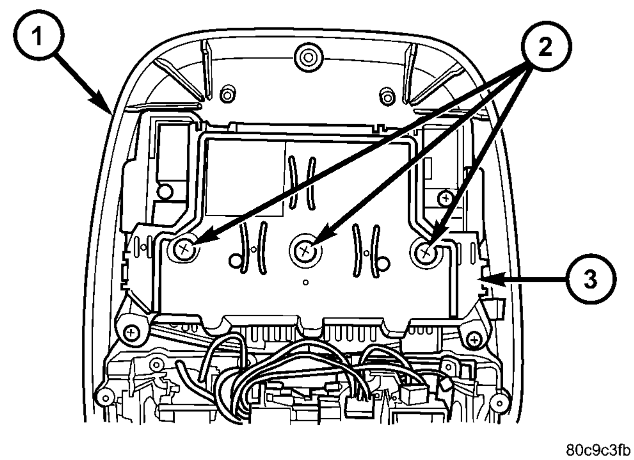

Fig. 8 Compass Mini-Trip Illumination Bulb Remove/Install

1 - OVERHEAD CONSOLE
2 - BULB & HOLDER (3)
3 - COMPASS MINI-TRIP COMPUTER

(4) Pull the compass mini-trip illumination bulb holder and bulb straight out of the circuit board bulb mounting hole.

INSTALLATION

The Compass Mini-Trip Computer (CMTC) in the overhead console includes either two or three incandescent illumination bulb and bulb holder units. Three bulbs are used only on models that also feature the optional Universal Garage Door Opener (UGDO).

COMPASS MINI-TRIP ILLUMINATION BULB (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the compass mini-trip illumination bulb holder and bulb with the circuit board bulb mounting hole.

(2) Insert the compass mini-trip illumination bulb holder and bulb straight into the circuit board bulb mounting hole until it is firmly seated (Fig. 8).

(3) Using a small thin-bladed screwdriver, rotate the compass mini-trip illumination bulb holder clockwise about 30 degrees on the circuit board.

(4) Reinstall the overhead console onto the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).

(5) Reconnect the battery negative cable.

COURTESY LAMP BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Support the courtesy lamp housing with one hand while grasping the flange on the outer circumference of the lens with the other hand, then pull the lens straight down to unsnap it from the housing (Fig. 9).

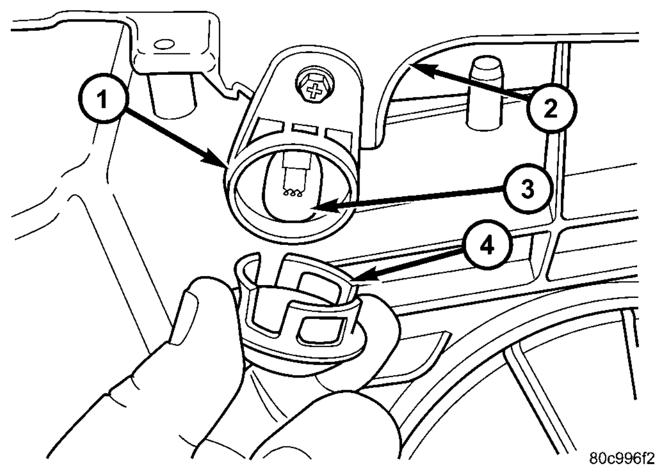

Fig. 9 Courtesy Lamp Lens Remove/Install

1 - COURTESY LAMP
2 - LOWER INSTRUMENT PANEL
3 - BULB
4 - LENS

(3) Pull the courtesy lamp bulb straight out of the lamp socket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

COURTESY LAMP BULB (Continued)

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the courtesy lamp bulb with the lamp socket.

(2) Push the courtesy lamp bulb straight into the lamp socket until it is firmly seated (Fig. 9).

(3) Align the courtesy lamp lens with the lamp housing.

(4) Support the courtesy lamp housing with one hand while firmly and evenly pushing the lens into the housing with the other hand, until the lens snaps into place.

(5) Reconnect the battery negative cable.

COURTESY LAMP UNIT

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the screw that secures the integral mounting tab of the courtesy lamp to the lower instrument panel (Fig. 10).

(3) Pull the courtesy lamp down from the lower instrument panel far enough to disconnect the instrument panel wire harness connector for the courtesy lamp.

(4) Remove the courtesy lamp from under the instrument panel.

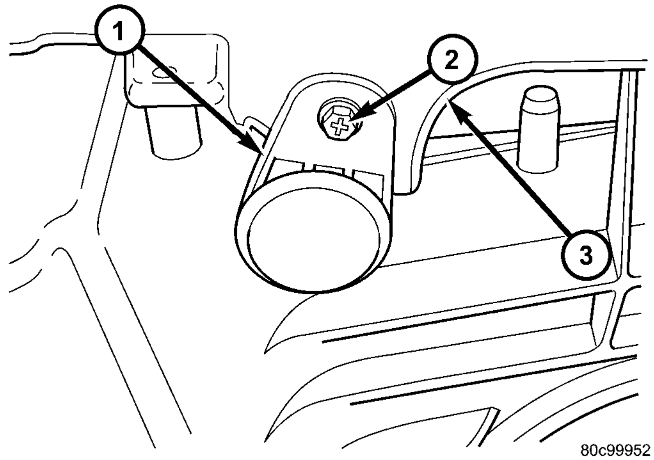

Fig. 10 Courtesy Lamp Unit Remove/Install

1 - COURTESY LAMP UNIT
2 - SCREW (1)
3 - LOWER INSTRUMENT PANEL

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the courtesy lamp under the instrument panel.

(2) Reconnect the instrument panel wire harness connector.

(3) Position the courtesy lamp to the lower instrument panel (Fig. 10).

(4) Install and tighten the screw that secures the integral mounting tab of the courtesy lamp.

(5) Reconnect the battery negative cable.

DOOR AJAR SWITCH

DESCRIPTION

This vehicle has four door ajar switches, one for each door. Each switch is concealed within and integral to its respective door latch unit. The switches are momentary leaf contact-type units that are actuated by the door latch mechanisms. A short pigtail wire and connector on each door latch connects the door ajar switch to the vehicle electrical system through its respective door wire harness. The door ajar switches cannot be adjusted or repaired and, if faulty or damaged, the door latch unit must be replaced. (Refer to 23 - BODY/DOOR - FRONT/LATCH - REMOVAL) or (Refer to 23 - BODY/DOOR - REAR/LATCH - REMOVAL).

OPERATION

The door ajar switches are actuated by the door latch mechanisms. When a door is closed and properly latched, its door ajar switch is an open circuit. When a door is open or only partially latched, the door ajar switch is a closed circuit. The door ajar switches are hard wired between a body ground and the Body Control Module (BCM). The driver side front door ajar switch is connected to the BCM through a driver door ajar switch sense circuit, while the remaining three door ajar switches are connected to the BCM through a passenger door ajar switch sense circuit in a parallel-series arrangement. The BCM reads the door ajar switch status through an internal pull-up, then uses these inputs to control many electronic functions and features of the vehicle. The door ajar switches can be diagnosed using conventional diagnostic tools and methods; however, for proper diagnosis of the BCM, and both the hard wired and electronic BCM outputs affected by the door ajar switch inputs, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

FLIP-UP GLASS AJAR SWITCH

DESCRIPTION

A flip-up glass ajar switch is standard equipment in this vehicle. This switch is concealed within and integral to the flip-up glass latch. The switch is a momentary leaf contact-type unit that is actuated by the flip-up glass latch mechanism. A dedicated connector on the flip-up glass latch connects the flip-up glass ajar switch to the vehicle electrical system through the tailgate wire harness. The flip-up glass ajar switch cannot be adjusted or repaired and, if faulty or damaged, must be replaced. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS LATCH - REMOVAL).

OPERATION

The flip-up glass ajar switch is actuated by the flip-up glass latch mechanism. When the flip-up glass is closed and properly latched, the flip-up glass ajar switch is an open circuit. When the flip-up glass is open or only partially latched, the flip-up glass ajar switch is a closed circuit. The flip-up glass ajar switch is hard wired between a body ground, the Body Control Module (BCM), and the rear wiper motor. The output of the switch is connected to the BCM and rear wiper motor through a flip-up glass ajar switch sense circuit. The BCM reads the flip-up glass ajar switch status through an internal pull-up, then uses this input to control many electronic functions and features of the vehicle. The rear wiper motor uses this input to restrict rear wiper operation when the flip-up glass is ajar. The flip-up glass ajar switch can be diagnosed using conventional diagnostic tools and methods; however, for proper diagnosis of the BCM, and both the hard wired and electronic BCM outputs affected by the flip-up glass ajar switch input, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

HEATER-A/C CONTROL ILLUMINATION BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

HEATER-A/C CONTROL ILLUMINATION BULB (Continued)

(3) From the back of the center bezel, use a small thin-bladed screwdriver to rotate the heater-A/C control illumination bulb holder counterclockwise about 30 degrees on the circuit board (Fig. 11).

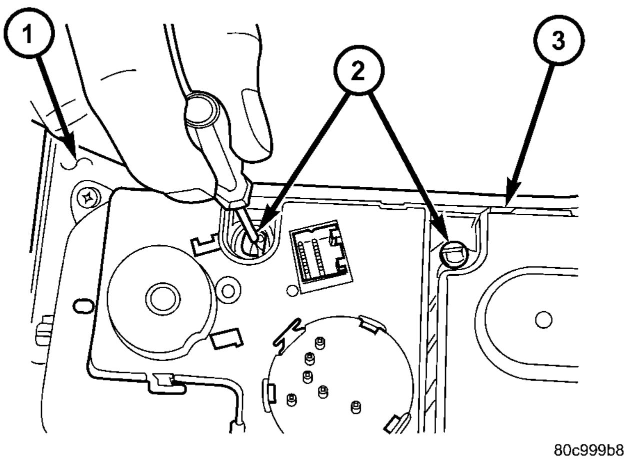

Fig. 11 Heater-A/C Control Illumination Bulb Remove/Install

1 - CENTER BEZEL
2 - BULB HOLDER & BULB (2)
3 - HEATER-A/C CONTROL

(4) Pull the heater-A/C illumination bulb holder and bulb straight out of the circuit board bulb mounting hole.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the heater-A/C control illumination bulb holder and bulb with the circuit board bulb mounting hole.

(2) Insert the heater-A/C control illumination bulb holder and bulb straight into the circuit board bulb mounting hole until it is firmly seated (Fig. 11).

(3) Using a small thin-bladed screwdriver, rotate the heater-A/C control illumination bulb holder clockwise about 30 degrees on the circuit board.

(4) Reinstall the center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

(5) Reconnect the battery negative cable.

READING LAMP BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) If the vehicle is not equipped with the optional Compass Mini-Trip Computer (CMTC), remove the reading lamp from the headliner mounting hole. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/READING LAMP UNIT - REMOVAL). If the vehicle is equipped with the optional CMTC, remove the overhead console from the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(3) From the back of the assembly, while pulling the reading lamp socket away from the outside of the bulb housing, use a small thin-bladed screwdriver to release the integral latch tabs of the socket from the inside of the bulb housing (Fig. 12).

(4) Pull the reading lamp socket and bulb straight out from the bulb housing.

READING LAMP BULB (Continued)

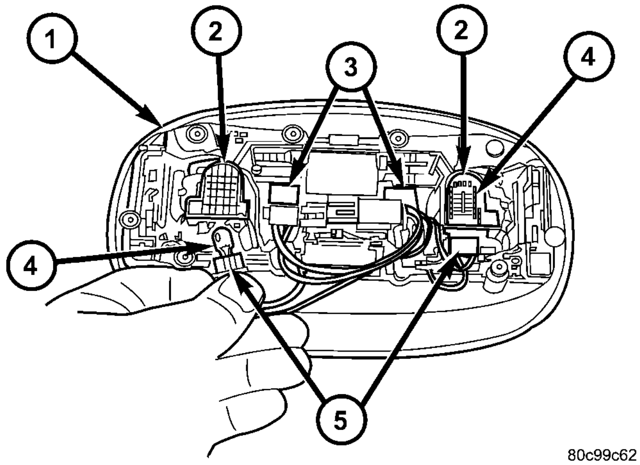

Fig. 12 Reading Lamp Bulb Remove/Install

1 - BEZEL
2 - BULB HOUSING
3 - SWITCH (2)
4 - BULB (2)
5 - SOCKET (2)

(5) Pull the reading lamp bulb straight out of the lamp socket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the reading lamp bulb with the lamp socket.

(2) Push the reading lamp bulb straight into the lamp socket until it is firmly seated.

(3) Align the reading lamp socket and bulb with the mounting hole in the bulb housing (Fig. 12).

(4) Push the reading lamp socket and bulb straight into the bulb housing until it is firmly seated and the integral socket latches are engaged within the bulb housing.

(5) If the vehicle is not equipped with the optional Compass Mini-Trip Computer (CMTC), reinstall the reading lamp into the headliner mounting hole. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/READING LAMP - INSTALLATION). If the vehicle is equipped with the optional CMTC, reinstall the overhead console onto the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).

(6) Reconnect the battery negative cable.

READING LAMP SWITCH

REMOVAL

The reading lamp switches are serviced as an assembly with the reading lamp sockets, wire harness, and connector.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove both reading lamp sockets and their bulbs from the lamp housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/READING LAMP BULB - REMOVAL).

(3) From the back of the reading lamp housing, carefully depress the blocking tab that engages the terminal end of the reading lamp wire harness connector, then slide the connector over the tab and off of the mount near the center of the lamp housing.

READING LAMP SWITCH (Continued)

(4) From the back of the reading lamp housing, firmly press each switch body toward the large end of the keyed hole into which it is secured until it unsnaps from the housing (Fig. 13).

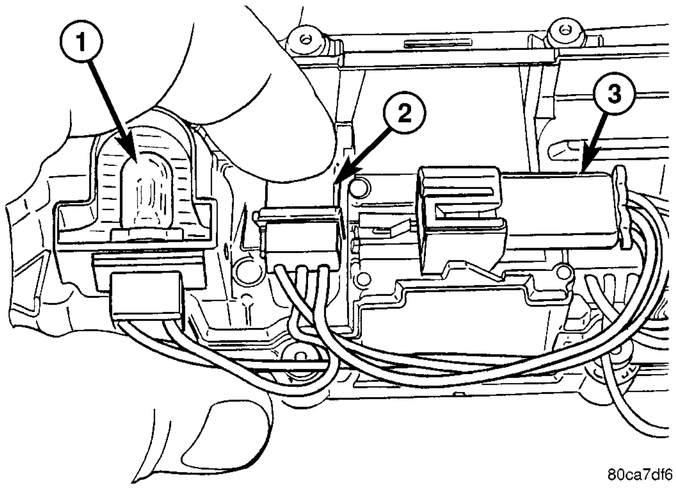

Fig. 13 Reading Lamp Switch Remove/Install

1 - READING LAMP BULB
2 - SWITCH
3 - WIRE HARNESS CONNECTOR

(5) Remove the connector, wire harness, both sockets, and both switches from the back of the reading lamp housing.

INSTALLATION

The reading lamp switches are serviced as an assembly with the reading lamp sockets, wire harness, and connector.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the connector, wire harness, both sockets, and both switches onto the back of the reading lamp housing.

(2) Insert the plunger of each switch into the large end of the keyed hole in the reading lamp housing.

(3) Firmly press each switch body toward the small end of the keyed hole into which it is secured until it snaps into the housing (Fig. 13).

(4) Engage the wire end of the reading lamp wire harness connector onto the connector mount near the center of the lamp housing, then slide the connector over the mount until the blocking tab snaps up into place.

(5) Reinstall both reading lamp bulbs and their sockets into the lamp housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/READING LAMP BULB - INSTALLATION).

(6) Reconnect the battery negative cable.

READING LAMP UNIT

REMOVAL

If the vehicle is equipped with an optional Compass Mini-Trip Computer (CMTC), the reading lamps are housed in the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry between the flange around the edge of the reading lamp housing and the headliner to release the metal snap clip on each side of the housing from the mounting bracket above the headliner (Fig. 14).

(3) Pull the reading lamp away from the headliner far enough to disconnect the body wire harness connector.

(4) If the vehicle is equipped with an optional power sunroof, disconnect the body wire harness connector for the sunroof switch.

READING LAMP UNIT (Continued)

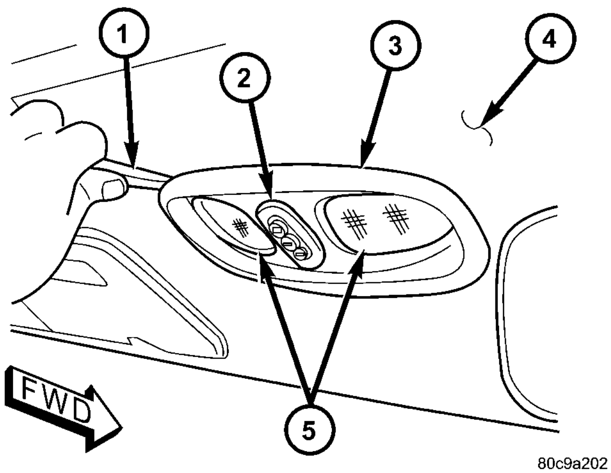

Fig. 14 Reading Lamp Unit Remove/Install

1 - TRIM STICK
2 - SUNROOF SWITCH
3 - READING LAMP UNIT
4 - HEADLINER
5 - LENS (2)

(5) Remove the reading lamp from the mounting hole in the headliner.

INSTALLATION

If the vehicle is equipped with an optional Compass Mini-Trip Computer (CMTC), the reading lamps are housed in the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the reading lamp to the mounting hole in the headliner.

(2) If the vehicle is equipped with an optional power sunroof, reconnect the body wire harness connector.

(3) Reconnect the body wire harness connector for the reading lamp.

(4) With the curved corners of the reading lamp lenses oriented towards the rear of the vehicle, position the reading lamp housing into the headliner mounting hole (Fig. 14).

(5) Press upward firmly and evenly on both ends of the reading lamp until both snap clips are fully engaged.

(6) Reconnect the battery negative cable.

TAILGATE AJAR SWITCH

DESCRIPTION

A tailgate ajar switch is standard equipment in this vehicle. This switch is concealed within the tailgate latch. The switch is a momentary leaf contact-type that is actuated by the tailgate latch mechanism. A pigtail wire harness and connector on the tailgate latch connects the tailgate ajar switch to the vehicle electrical system. The tailgate ajar switch cannot be adjusted or repaired and, if faulty or damaged, must be replaced. (Refer to 23 - BODY/SWING GATE/LATCH - REMOVAL).

OPERATION

The tailgate switch is actuated by the tailgate latch mechanism. When the tailgate is closed the tailgate ajar switch is an open circuit. When the tailgate is open or only partially latched, the tailgate ajar switch is a closed circuit. The tailgate ajar switch is hard wired between a body ground and the Body Control Module (BCM). The output of the switch is connected to the BCM through a tailgate ajar switch sense circuit. The BCM reads the tailgate ajar switch status through an internal pull-up, then uses this input to control many electronic functions and features of the vehicle. The tailgate ajar switch can be diagnosed using conventional diagnostic tools and methods; however, for proper diagnosis of the BCM, and both the hard wired and electronic BCM outputs affected by the tailgate ajar switch input, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TRANSMISSION RANGE INDICATOR ILLUMINATION BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center console from the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(3) From the left side of the vehicle, reach between transmission range indicator and the floor panel transmission tunnel to access the lamp socket (Fig. 15).

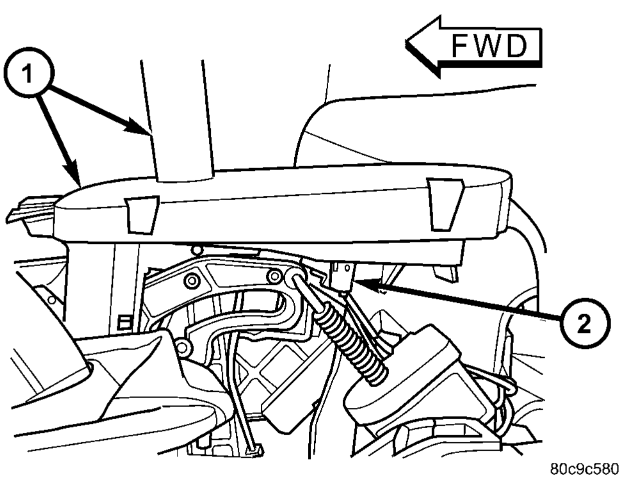

Fig. 15 Transmission Range Indicator Illumination Bulb Remove/Install

1 - AUTOMATIC TRANSMISSION SHIFT MECHANISM
2 - ILLUMINATION LAMP SOCKET

(4) Rotate the transmission range indicator lamp socket counterclockwise about 30 degrees on the bottom of the range indicator.

(5) Pull the transmission range indicator lamp socket and bulb straight out of the bulb mounting hole.

(6) Pull the transmission range indicator lamp bulb straight out of the socket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Align the base of the transmission range indicator lamp bulb with the lamp socket.

(2) Push the transmission range indicator lamp bulb straight into the lamp socket until it is firmly seated.

(3) Align the transmission range indicator lamp socket and bulb with the mounting hole on the bottom of the indicator (Fig. 15).

(4) Push the transmission range indicator lamp socket and bulb straight into the bottom of the indicator until it is firmly seated.

(5) Rotate the transmission range indicator lamp socket clockwise about 30 degrees on the bottom of the indicator.

(6) Reinstall the center console onto the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(7) Reconnect the battery negative cable.

VANITY LAMP BULB

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Using a small thin-bladed tool, pry outward on either side near the top or bottom of the vanity lamp lens until the lens unsnaps from the lamp housing (Fig. 16).

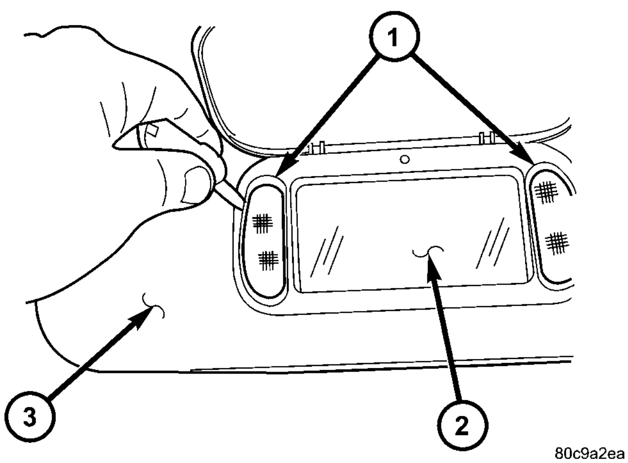

Fig. 16 Vanity Lamp Lens Remove

1 - LENS (2)
2 - MIRROR
3 - SUN VISOR

(3) Using small needle-nose pliers, pull the vanity lamp bulb straight out from the lamp socket (Fig. 17).

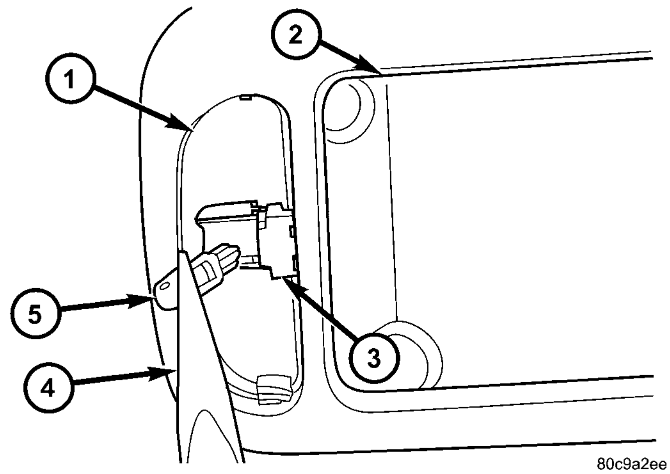

Fig. 17 Vanity Lamp Bulb Remove/Install

1 - HOUSING
2 - MIRROR
3 - SOCKET
4 - NEEDLE-NOSE PLIERS
5 - BULB

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

(1) Using small needle-nose pliers, grasp the vanity lamp bulb and align the base of the bulb with the lamp socket (Fig. 17).

(2) Push the vanity lamp bulb base straight into the lamp socket until it is fully seated.

(3) Insert one tab on the top or the bottom of the vanity lamp lens into the proper slot in the lamp housing.

(4) Flex the vanity lamp lens far enough to engage the loose tab into its slot in the lamp housing.

(5) Reconnect the battery negative cable.

MESSAGE SYSTEMS

TABLE OF CONTENTS

OVERHEAD CONSOLE

DESCRIPTION

An overhead console is standard factory-installed equipment on this model. The available overhead consoles can include the Compass Mini-Trip Computer with universal transmitter (Fig. 2), without the universal transmitter (Fig. 1), or base console with only two reading and courtesy lamps (Fig. 3). All overhead consoles are equipped with two reading and courtesy lamps. On vehicles equipped with a power sunroof, the sunroof switch is located between the two reading and courtesy lamps. The overhead console is mounted with one screw and two snap clips to a molded plastic retainer bracket located above the headliner.

OPERATION

Refer to the vehicle Owner's Manual for specific operation of each overhead console and its systems.

STANDARD PROCEDURE

STANDARD PROCEDURE - MODULE LENS REPLACEMENT

(1) Remove the overhead console.
(2) Remove the electronics module from the overhead console.
(3) Unsnap the lens from the module and replace lens as necessary.

OVERHEAD CONSOLE (Continued)

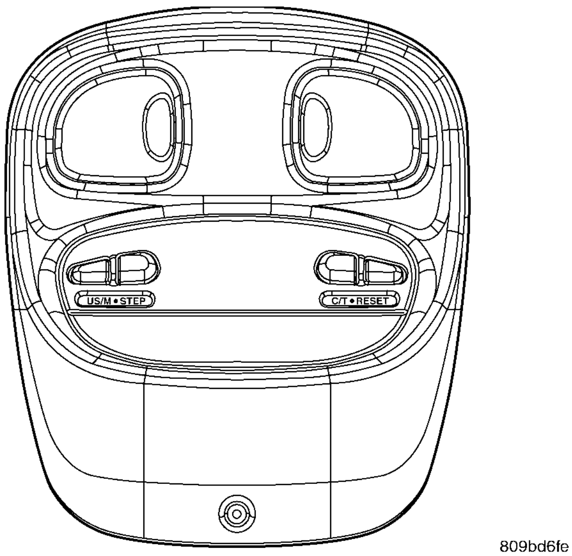

Fig. 1 Overhead Console Without Universal Transmitter

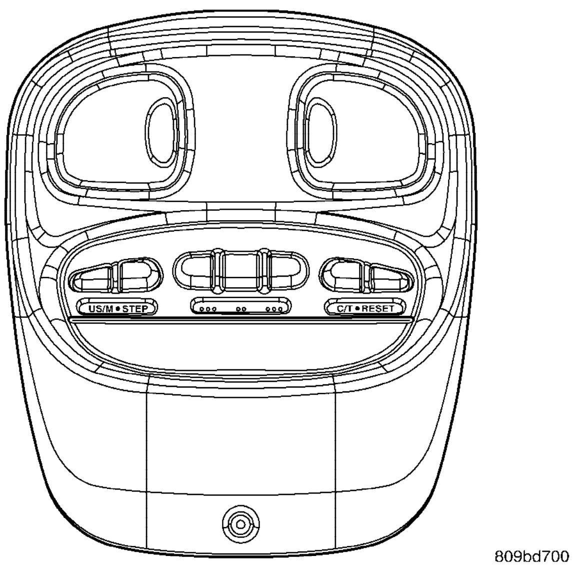

Fig. 2 Overhead Console With Universal Transmitter

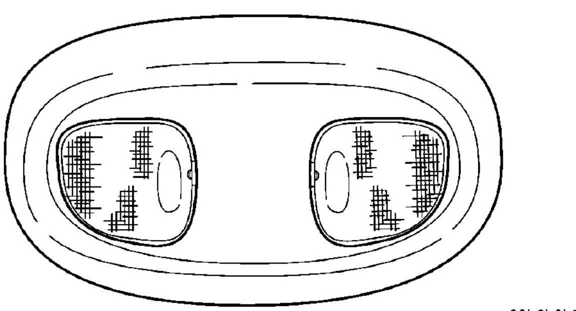

Fig. 3 Base Console

STANDARD PROCEDURE - MODULE LAMP REPLACEMENT

(1) Remove the overhead console.

(2) Using a flat blade screwdriver twist out socket/lamp (Fig. 4).

(3) Replace lamp(s) as necessary.

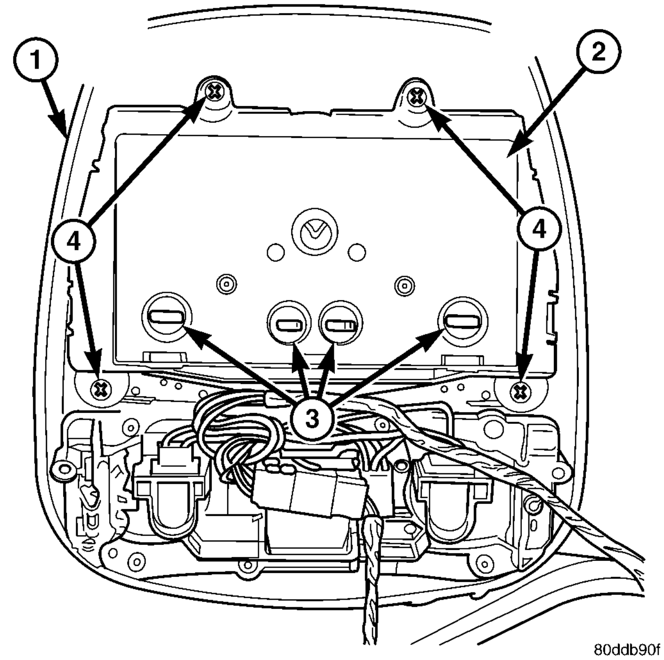

Fig. 4 Electronic Vehicle Information Center Remove/Install

1 - OVERHEAD CONSOLE HOUSING
2 - EVIC/CMTC MODULE
3 - ILLUMINATION LAMPS
4 - MODULE RETAINING SCREWS

STANDARD PROCEDURE - COURTESY LAMP REPLACEMENT

(1) Open hood, disconnect and isolate the negative battery cable.

(2) Remove the overhead console from the headliner.

(3) Remove the lamp and socket assembly from the overhead console.

(4) Remove the lamp bulb by pulling it straight out of its socket.

STANDARD PROCEDURE - COMPASS CALIBRATION

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not use magnetic tools when servicing the overhead console.

OVERHEAD CONSOLE (Continued)

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or out of calibration, perform the following calibration procedure. Also, new service replacement Compass Mini-Trip Computer (CMTC) modules must have their compass calibrated using this procedure. Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

NOTE: Whenever the compass is calibrated manually, the variance number must also be reset. Refer to Compass Variation Adjustment in this group.

Calibrate the compass manually as follows:

(1) Turn the ignition switch to the On position. If the compass/thermometer data is not currently being displayed, momentarily depress and release the C/T push button to reach the compass/thermometer display.

(2) Depress the Reset push button and hold the button down until "CAL" appears in the display. This takes about ten seconds, and appears about five seconds after "VARIANCE = XX" is displayed.

(3) Release the Reset push button.

(4) Drive the vehicle on a level surface, away from large metal objects and power lines, through three or more complete circles at between five and eight kilometers-per-hour (three and five miles-per-hour) in not less than 48 seconds. The "CAL" message will disappear from the display to indicate that the compass is now calibrated.

NOTE: If the "CAL" message remains in the display, either there is excessive magnetism near the compass, or the unit is faulty. Repeat the calibration procedure one more time.

NOTE: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

STANDARD PROCEDURE - COMPASS DEMAGNETIZING

A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the overhead console forward mounting screw and the roof panel above the overhead console. Equivalent units must be rated as continuous duty for 110/115 volts and 60 Hz. They must also have a field strength of over 350 gauss at 7 millimeters (0.25 inch) beyond the tip of the probe.

To demagnetize the roof panel and the overhead console forward mounting screw, proceed as follows:

(1) Be certain that the ignition switch is in the Off position, before you begin the demagnetizing procedure.

(2) Connect the degaussing tool (Fig. 5) to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.

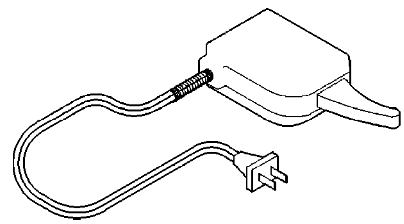

Fig. 5 Degaussing Tool 6029

(3) Slowly approach the head of the overhead console forward mounting screw with the degaussing tool connected.

(4) Contact the head of the screw with the plastic coated tip of the degaussing tool for about two seconds.

(5) With the degaussing tool still energized, slowly back it away from the screw. When the tip of the tool is at least 61 centimeters (2 feet) from the screw head, disconnect the tool.

(6) Place a piece of paper approximately 22 by 28 centimeters (8.5 by 11 inches), oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header (Fig. 6). The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.

(7) Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.

(8) Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool connected.

(9) Contact the roof panel with the plastic coated tip of the degaussing tool. Be sure that the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 13 millimeters (0.50 inch) between passes, move the tool at least 11 centimeters (4 inches) to each side of the roof center line, and 28 centimeters (11 inches) back from the windshield header.

(10) With the degaussing tool still energized, slowly back it away from the roof panel. When the tip of the tool is at least 61 centimeters (2 feet) from the roof panel, disconnect the tool.

(11) Calibrate the compass and adjust the compass variance.

OVERHEAD CONSOLE (Continued)

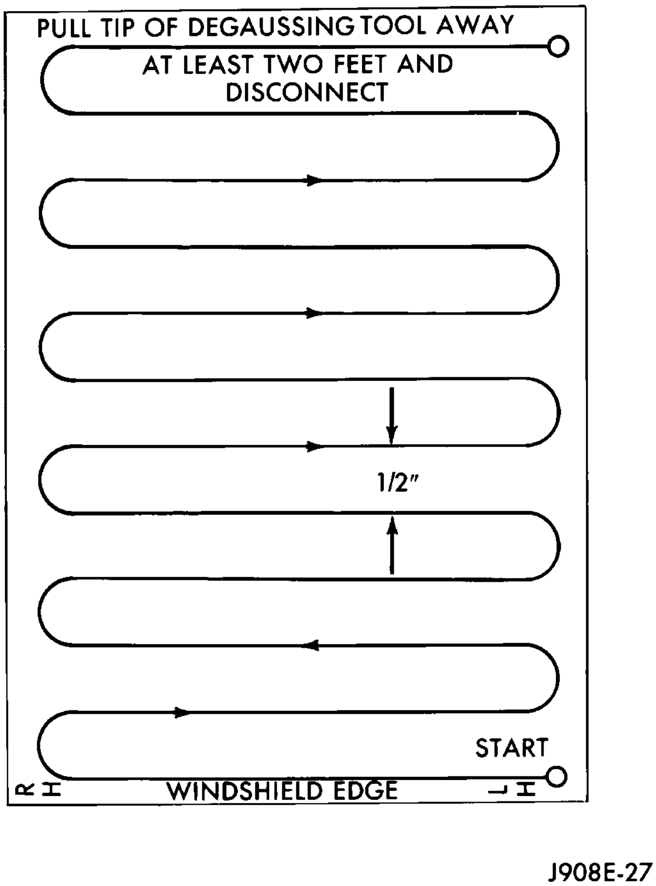

Fig. 6 Roof Demagnetizing Pattern

STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT

Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and true geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance setting may need to be changed.

To set the compass variance:

(1) Using the Variance Settings map, find your geographic location and note the zone number (Fig. 7).

(2) Turn the ignition switch to the On position. If the compass/thermometer data is not currently being displayed, momentarily depress and release the C/T push button to reach the compass/thermometer display.

(3) Depress the Reset push button and hold the button down until “VARIANCE = XX” appears in the display. This takes about five seconds.

(4) Release the Reset push button. “VARIANCE =XX ” will remain in the display. “XX” equals the current variance zone setting.

(5) Momentarily depress and release the Step push button to step through the zone numbers, until the zone number for your geographic location appears in the display.

(6) Momentarily depress and release the Reset push button to enter the displayed zone number into the CMTC module memory.

(7) Confirm that the correct directions are now indicated by the compass.

STANDARD PROCEDURE - ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING

EVIC PROGRAMMING MODE

The Electronic Vehicle Information Center (EVIC) provides the vehicle operator with a user interface, which allows the selection of several optional customer programmable electronic features to suit individual preferences. The EVIC must be placed into its programming mode in order to view or change the programmable features. To enter the EVIC programming mode and to view or change the selected programmable features options, proceed as follows:

(1) Turn the ignition switch to the On position.

(2) Depress and release the Menu push button. The first item in the programmable features menu list will appear in the EVIC display.

(3) Momentarily depress and release the Menu push button to step through the programmable features list. Each programmable feature and its currently selected option will appear on the EVIC display in the sequence shown in the Programmable Features list that follows.

(4) Momentarily depress and release the Step push button to step through the available options for the programmable feature being displayed.

(5) The option that last appears in the display with a programmable feature before exiting the programming mode, becomes the newly selected programmable feature option.

(6) The EVIC exits the programming mode and returns to its normal operating mode when the C/T push button is depressed or when the end of the programmable features menu list is reached, whichever occurs first.

PROGRAMMABLE FEATURES

• **LANGUAGE? -** The options include English, Francaise, Deutsch, Italiana, or Espanol. The default is English. All EVIC display nomenclature, including the trip computer functions, warning messages and the programmable features appear in the selected language.

OVERHEAD CONSOLE (Continued)

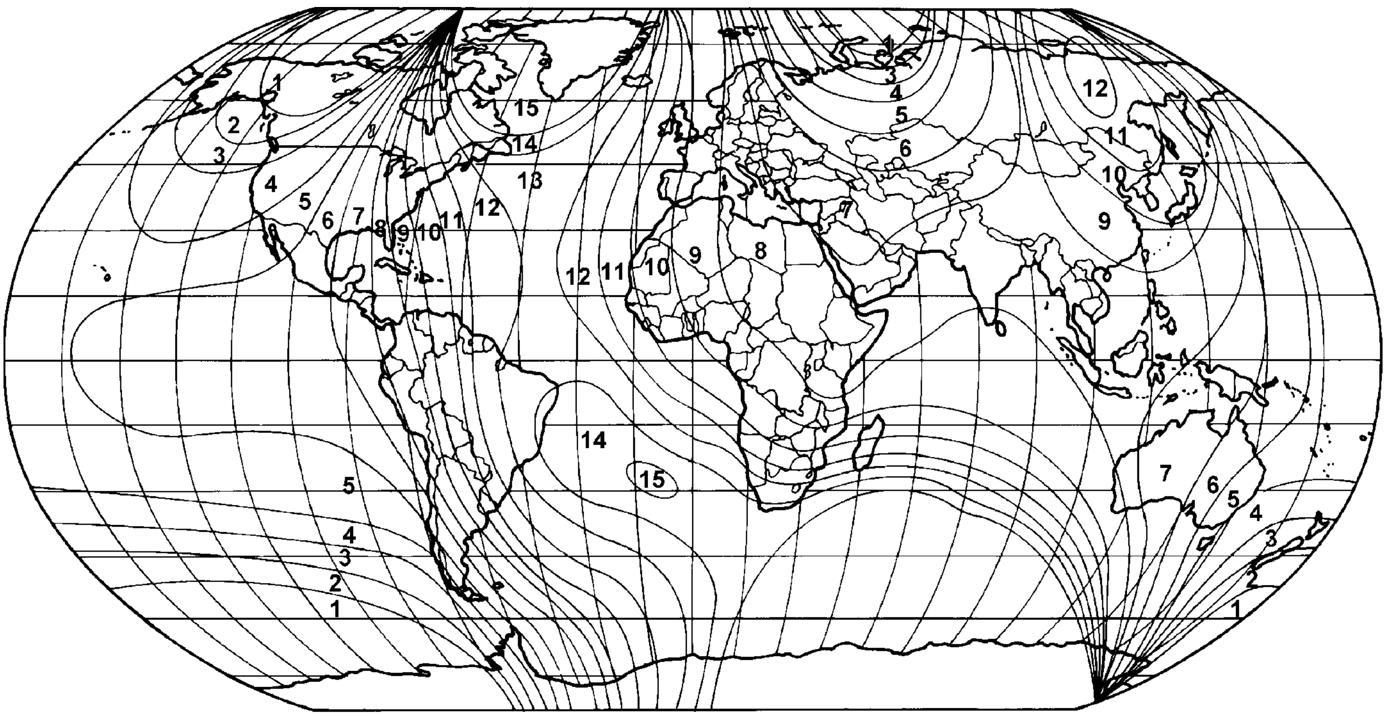

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Fig. 7 Variance Settings

- **DISPLAY U.S. OR METRIC? -** The options include U.S. and M. The default is U.S. This feature toggles the trip computer temperature, fuel economy and odometer display readings between U.S. and metric units of measure. It also changes the odometer display in the instrument cluster.
- **AUTO DOOR LOCKS? -** The options include Yes and No. The default is Yes. When Yes is selected, all doors lock automatically when vehicle speed reaches 25 kilometers-per-hour (15 miles-per-hour). If YES is selected, a second programmable feature appears, **AUTO UNLOCK ON EXIT? -** The options again include Yes and No. The default is No. When Yes is selected, following each Auto Door Lock event all doors will automatically unlock when the driver door is opened, if the vehicle is stopped and the transmission gear selector is in Park or Neutral. The Auto Door Unlock event will only occur once following each Auto Door Lock event.
- **REMOTE UNLOCK -** The options include Driver Door 1st and All Doors. The default is Driver Door 1st. When Diver Door 1st is selected, only the driver door unlocks when the Unlock button of the Remote Keyless Entry (RKE) transmitter is depressed once. The Unlock button of the RKE transmitter must be depressed twice to unlock all doors. When All Doors is selected, all doors unlock when the Unlock button of the RKE transmitter is depressed once.
- **SOUND HORN ON LOCK? -** The options include Yes and No. The default is No. When Yes is selected, a short horn chirp will provide an audible confirmation when the RKE receiver recognizes a valid Lock signal from an RKE transmitter. When No is selected, no horn chirp will occur with the RKE Lock event. This feature may be selected independent of the **FLASH LIGHTS WITH LOCKS?** programmable feature.
- **FLASH LIGHTS WITH LOCKS? -** The options include Yes and No. The default is Yes. When Yes is selected, a single flash of the hazard warning lamps will provide an optical confirmation when the RKE receiver recognizes a valid Lock signal from an RKE transmitter, and two flashes of the same lamps will occur when the RKE receiver recognizes a valid Unlock signal from an RKE transmitter. When No is selected, no lamp flash will occur with the RKE Lock or Unlock event. This feature may be selected independent of the **SOUND HORN ON LOCK?** programmable feature.
- **HEADLAMP DELAY = -** The options include Off, 30 Sec, 60 Sec, and 90 Sec. The default is 90 Sec. When a time interval is selected, the headlamps will remain on for that length of time when the headlamps are turned off after the ignition is turned off, or if the Auto mode is selected on vehicles with the Auto Headlamps option. When Off is selected, the headlamp delay feature is disabled.

OVERHEAD CONSOLE (Continued)

• **SERVICE INTERVAL = -** The options include from 3200 to 9600 kilometers in 800 kilometer increments (2000 to 6000 miles in 500 mile increments). The default is 9600 kilometers (6000 miles). The selected distance becomes the interval at which the Perform Service warning message will be displayed by the EVIC. If a new distance is selected, a second programmable feature appears, **RESET SERVICE DISTANCE? -** The options include No and Yes. The default is Yes. When Yes is selected, the accumulated distance since the last previous Perform Service warning message will be reset to zero because the service interval has been changed. When No is selected, the distance until the next Perform Service warning message is reduced by the accumulated distance since the last previous message.

• **TRAIN REMOTE -** When this feature is selected the driver can choose to train up to four remote keyless entry transmitters. The options include Yes and No. The default is No. When Yes is selected and the MENU button is pressed the EVIC will display "PRESS REMOTE LOCK & UNLOCK THEN PRESS UNLOCK", followed by a chime to indicate the training sequence can commence. You have approximately 30 seconds to train up to four transmitters, after each transmitter is trained a chime will sound indicating that the training was successful. If remote link to memory is "YES" , the first transmitter trained will be associated with memory setting 1 and the second transmitter trained will be associated with memory setting 2. Additional transmitters will not be associated with a memory setting. When you have finished training the transmitters, press the menu button again and the EVIC will display "TRAIN DONE "X" TRAINED. If no transmitters are trained within approx. 30 seconds the EVIC will display "TRAIN TIMEOUT".

• **RETRAIN TIRE SENSORS -** This programmable feature only applies to vehicles equipped with the optional Tire Pressure Monitoring System. The options include Yes and No. The default is No. When Yes is selected, and the menu button is depressed, the EVIC will enter the training mode starting with the left front tire.

REMOVAL

OVERHEAD CONSOLE - REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the overhead console retaining screw, located in the front of console near the windshield.

(3) Using your fingertips, grasp the sides of the overhead console and pull straight down evenly to disengage the two snap clips at the rear of the unit.

(4) Lower the overhead console far enough to access the wire harness connectors.

(5) Disconnect the control module, courtesy lamps and power sunroof switch electrical connectors, if equipped.

(6) Remove the overhead console assembly from the vehicle.

INSTALLATION

(1) Position the overhead console in the vehicle and connect the wire harness connectors.

(2) Connect the control module, courtesy lamps and power sunroof switch electrical connectors, if equipped.

(3) Grasp the sides of the overhead console and push straight up evenly to engage the two snap clips at the rear of the unit.

(4) Install the overhead console retaining screw, located in the front of console near the windshield. Torque the screw to 1.2 N·m (10 in. lbs.).

(5) Connect the negative battery cable.

COMPASS MINI/TRIP COMPUTER

DESCRIPTION

The Compass Mini-Trip Computer (CMTC) is located in the overhead console on models equipped with this option. The Compass Mini-Trip Computer module features a large Vacuum Fluorescent Display (VFD) screen for displaying information, and four back-lit push button function switches labeled C/T (compass/thermometer), RESET, STEP, and US/M (United States/Metric Scale).

The Compass Mini-Trip Computer module contains a central processing unit and interfaces with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

The Compass Mini-Trip Computer module contains six informational displays which can be displayed using the four outer buttons on the overhead console. When the vehicle is first turned ON:

• CMTC blanks the display for a half second

• Displays whatever was being viewed when the ignition was last turned OFF

The CMTC may also be integrated with the Universal Transmitter. If so, your CMTC module will have three buttons centered together between the

COMPASS MINI/TRIP COMPUTER (Continued)

outer four buttons. Below the three buttons are corresponding dots to indicate which button you are using.

The Compass Mini-Trip Computer includes the following display options:

- **Compass and thermometer** - provides the outside temperature and one of eight compass readings to indicate the direction the vehicle is facing.
- **Average fuel economy** - shows the average fuel economy since the last trip computer reset.
- **Trip odometer** - shows the distance travelled since the last trip computer reset.
- **Blank screen** - the CMTC compass/thermometer/trip computer VFD is turned off.

If the vehicle is equipped with the optional Universal Transmitter transceiver, the CMTC will also display messages and an icon indicating when the Universal Transmitter is being trained, which of the three transmitter buttons is transmitting, and when the transceiver is cleared.

Data input for all CMTC functions, including VFD dimming level, is received through PCI data bus messages. The CMTC module uses its internal programming and all of its data inputs to calculate and display the requested data. If the data displayed is incorrect, perform the self-diagnostic tests as described in this group. If these tests prove inconclusive, the use of a DRBIII® scan tool and the proper Diagnostic Procedures manual are recommended for further testing of the CMTC module and the PCI data bus.

The CMTC module cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic module and display lens. If any of these components is faulty or damaged, the complete CMTC module must be replaced. The incandescent bulbs used for CMTC push button back-lighting are available for service replacement.

DESCRIPTION - COMPASS

While in the compass/thermometer mode, the compass will display the direction in which the vehicle is pointed using the eight major compass headings (Examples: north is N, northeast is NE). The self-calibrating compass unit requires no adjusting in normal use. The only calibration that may prove necessary is to drive the vehicle in three complete circles at 5 to 8 kilometers-per-hour (3 to 5 miles-per-hour), on level ground, in not less than forty-eight seconds. This will reorient the compass unit to its vehicle.

The compass unit also will compensate for magnetism the body of the vehicle may acquire during normal use. However, avoid placing anything magnetic directly on the roof of the vehicle. Magnetic mounts for an antenna, a repair order hat, or a funeral procession flag can exceed the compensating ability of the compass unit if placed on the roof panel. Magnetic bit drivers used on the fasteners that hold the overhead console assembly to the roof header can also affect compass operation. If the vehicle roof should become magnetized, the demagnetizing and calibration procedures found in this group may be required to restore proper compass operation.

DESCRIPTION - THERMOMETER

The thermometer displays the outside ambient temperature in whole degrees. The temperature display can be toggled from Fahrenheit to Celsius by using the U.S./Metric button. The displayed temperature is not an instant reading of conditions, but an average temperature. It may take the thermometer display several minutes to respond to a major temperature change, such as driving out of a heated garage into winter temperatures.

When the ignition switch is turned to the Off position, the last displayed temperature reading stays in the Body Control Module (BCM) unit memory. When the ignition switch is turned to the On position again, the CMTC will display the memory temperature for one minute; then update the display to the current average temperature reading within five minutes.

The thermometer function is supported by an ambient temperature sensor. The sensor is mounted outside the passenger compartment near the front and center of the vehicle, and is hard wired to the Body Control Module (BCM). The BCM sends temperature status messages to the CMTC module over the PCI data bus network. The ambient temperature sensor is available as a separate service item, refer to additional information later in this section.

OPERATION

The compass mini-trip computer operates when the ignition is in the ON position. The VFD will display the last display before ignition was turned OFF. The four outer buttons operate:

- STEP
- C/T - Compass/Temperature
- US/M - English/Metric
- RESET

1. STEP BUTTON

Pressing the STEP button selects one of the following 6 displays:

- Average fuel economy
- Distance to empty
- Trip odometer
- Elapsed time
- Blank Screen

2. C/T (COMPASS/TEMPERATURE) BUTTON

COMPASS MINI/TRIP COMPUTER (Continued)

Pressing the C/T button selects the Compass/Temperature display.

3. US/M (ENGLISH/METRIC MEASUREMENT) BUTTON

Pressing the US/M button switches the display units between English and Metric readings.

4. RESET BUTTON

Pressing the RESET button resets the function on the display, provided that function can be reset. The functions which can be reset are Average fuel economy, Trip odometer and Elapsed time.

Global Reset This feature allows all three displays (Average fuel economy, Trip odometer and Elapsed time) to be reset easily, by pressing the RESET button twice within three seconds with any of the screens in display. This eliminates the need to reset each display individually.

The RESET button is also used to set the variance and/or calibrate the compass. Refer to the Variance Procedure and Calibration Procedure in this section.

For more information on the features, control functions and setting procedures for the CMTC module, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - COMPASS MINI-TRIP COMPUTER

The following diagnostic procedure can be used if the compass mini-trip computer is not operational in any way. If the problem is specific to a individual CMTC display, go to the appropriate display title noted below and diagnose using the information provided on how these displays are generated.

(1) Remove the overhead console from the headliner.

(2) Using a ohmmeter, check the ground circuit cavity of the compass mini-trip computer electrical connector for proper continuity to ground. Continuity should be present, If OK go to Step 3, If not OK repair the open or shorted ground circuit as required.

NOTE: Connect the negative battery cable before proceeding.

(3) Using a voltmeter, check the fused (B+) circuit cavity of the compass mini-trip computer electrical connector for 12v. Voltage should be present, If OK go to Step 4, If not OK repair the open or shorted fused (B+) circuit as required.

(4) Using a voltmeter, check the fused ignition switch output circuit cavity of the compass mini-trip computer electrical connector for 12v with Key ON. Voltage should be present, If OK, replace the inoperative CMTC module, If not OK repair the open or shorted fused ignition switch output circuit as required.

TEMPERATURE

The compass mini-trip computer receives Programmable Communications Interface bus (PCI bus) messages from the Body Control Module (BCM) for all displayed information except the compass display. If a dash (-) is displayed, the compass mini-trip computer is not receiving a PCI bus message from the BCM. To check out the PCI bus line and the BCM, use the DRB lll® scan tool and proper Body Diagnostic Procedure Manual.

If the compass mini-trip computer displays a temperature more than 54° C (130° F), check for a short circuit between the temperature sensor and the BCM.

If the compass mini-trip computer displays a temperature less than -40° C (-67° F), check for an open circuit between the temperature sensor and the BCM.

TRIP ODOMETER

The compass mini-trip computer receives trip odometer information from the Cluster over the PCI bus line. If compass mini-trip computer displays dashes - - instead of the trip odometer value, it is not receiving a PCI bus message for the trip odometer from the cluster. To check out the PCI bus line and the Cluster, use the DRB lll® scan tool and proper Body Diagnostic Procedure Manual.

COMPASS DISPLAY

To display the vehicle direction, the compass mini-trip computer processes information from a sensor internal to the module. The compass mini-trip computer is self- calibrating and requires only variance adjustments dependent upon location. The compass mini-trip computer displays the label CAL whenever the compass is in the fast calibration mode.

If all three of the following conditions listed below occur, the vehicle must be demagnetized.

- Compass portion of the display is blank
- Temperature portion of the display is OK
- The label CAL is illuminated

If demagnetizing the vehicle is needed, refer to the demagnetizing procedure in this section. After demagnetizing, to calibrate the compass refer to Calibration Procedure and to set the variance refer to Variance Procedure, both within this section. If the compass portion of the display is still blank, replace the compass mini-trip computer.

COMPASS MINI-TRIP COMPUTER - SELF DIAGNOSTIC TEST

(1) With the ignition switch in the OFF position simultaneously press the C/T and STEP buttons and hold.

COMPASS MINI/TRIP COMPUTER (Continued)

(2) Turn the ignition switch ON, then release C/T and STEP buttons.

(3) The Compass mini-trip computer should light all segments on the VF Display Screen for 2-4 seconds. Check for segments that are not illuminated.

(4) If the compass mini-trip computer displays PASS, the module is OK.

(5) If the compass mini-trip computer displays FAIL, replace the module.

(6) If the compass mini-trip computer displays bUS, check for an open or a short on the PCI bus communication circuit.

(7) Press the C/T or the STEP button to exit the self-diagnostic test.

REMOVAL

(1) Remove overhead console, refer to Console Removal and Installation in this section.

(2) Remove mounting screws and release the map lamp wire connector from the compass mini-trip computer. (Fig. 8).

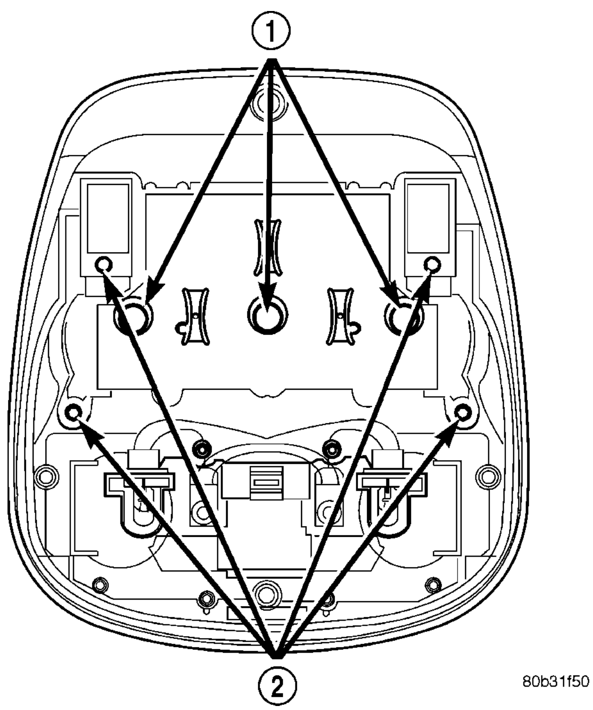

Fig. 8 Compass Mini-Trip Computer Retaining Screws

1 - LAMPS
2 - MOUNTING SCREWS

(3) Remove the compass mini-trip computer from the overhead console.

INSTALLATION

(1) Install the compass mini-trip computer in the overhead console. Align the compass mini-trip computer guides on the housing with the grooves of the console.

(2) Install the mounting screws and install the map lamp wire connector on the compass mini-trip computer. Make sure the LOOP of wire that was clipped into the compass mini-trip computer module housing is properly clipped into the new module before the console is placed back into the headliner.

(3) Install the overhead console, refer to Console Installation in this section.

ELECTRONIC VEHICLE INFO CENTER

DESCRIPTION - ELECTRONIC VEHICLE INFORMATION CENTER (EVIC)

The Electronic Vehicle Information Center (EVIC) is located in the overhead console on models equipped with this option. The EVIC module features a large Vacuum Fluorescent Display (VFD) screen for displaying information, and back-lit push button function switches labeled C/T (compass/temperature), RESET, STEP, and MENU.

The EVIC module contains a central processing unit and interfaces with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

The EVIC includes the following display options:

• **Compass and temperature -** provides the outside temperature and one of eight compass readings to indicate the direction the vehicle is facing.

• **Elapsed time -** shows the accumulated ignition-on time since the last trip computer reset.

• **Distance to service -** shows the distance remaining until the next scheduled service interval.

• **Blank screen -** the EVIC compass/temperature/trip computer VFD is turned off.

The EVIC “Menu” push button provides the vehicle operator with a user interface, which allows the selection of several optional customer programmable electronic features to suit individual preferences. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of this group for more information on the customer programmable feature options.

If the vehicle is equipped with the optional Universal Transmitter, the EVIC will also display messages and an icon indicating when the Universal Transmit-

ELECTRONIC VEHICLE INFO CENTER (Continued)

ter is being trained, which of the three transmitter buttons is transmitting, and when the transceiver is cleared.

Data input for all EVIC functions, including VFD dimming level, is received through PCI data bus messages. The EVIC module uses its internal programming and all of its data inputs to calculate and display the requested data. If the data displayed is incorrect, perform the self-diagnostic tests as described in this group. If these tests prove inconclusive, the use of a DRB III® scan tool and the proper Diagnostic Procedures manual are recommended for further testing of the EVIC module and the PCI data bus.

The EVIC module cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic module. If any of these components is faulty or damaged, the complete EVIC module must be replaced. The incandescent bulbs used for EVIC push button back-lighting and the lens are available for service replacement.

DESCRIPTION - COMPASS

While in the compass/temperature mode, the compass will display the direction in which the vehicle is pointed using the eight major compass headings (Examples: north is N, northeast is NE). The self-calibrating compass unit requires no adjusting in normal use. The only calibration that may prove necessary is to drive the vehicle in three complete circles at 5 to 8 kilometers-per-hour (3 to 5 miles-per-hour), on level ground, in not less than forty-eight seconds. This will reorient the compass unit to its vehicle.

The compass unit also will compensate for magnetism the body of the vehicle may acquire during normal use. However, avoid placing anything magnetic directly on the roof of the vehicle. Magnetic mounts for an antenna, a repair order hat, or a funeral procession flag can exceed the compensating ability of the compass unit if placed on the roof panel. Magnetic bit drivers used on the fasteners that hold the overhead console assembly to the roof header can also affect compass operation. If the vehicle roof should become magnetized, the demagnetizing and calibration procedures found in this group may be required to restore proper compass operation.

DESCRIPTION - TEMPERATURE

The temperature displays the outside ambient temperature in whole degrees. The temperature display can be toggled from Fahrenheit to Celsius by selecting the desired U.S./Metric option from the customer programmable features as described in **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of this group. The displayed temperature is not an instant reading of conditions, but an average temperature. It may take the thermometer display several minutes to respond to a major temperature change, such as driving out of a heated garage into winter temperatures.

When the ignition switch is turned to the Off position, the last displayed temperature reading stays in the Body Control Module (BCM) unit memory. When the ignition switch is turned to the On position again, the EVIC will display the memory temperature for one minute; then update the display to the current average temperature reading within five minutes.

The temperature function is supported by an ambient temperature sensor. The sensor is mounted outside the passenger compartment near the front and center of the vehicle, and is hard wired to the Body Control Module (BCM). The BCM sends temperature status messages to the EVIC module over the PCI data bus network. The ambient temperature sensor is available as a separate service item.

OPERATION

The EVIC has access to both non-switched and ignition switched sources of battery current so that some of its features remain operational at any time, while others may only operate with the ignition switch in the On position. When the ignition switch is turned to the On position, the EVIC module VFD will return to the last function being displayed before the ignition was turned to the Off position.

The compass/temperature display is the normal EVIC display. With the ignition switch in the On position, momentarily depressing and releasing the C/T (compass/temperature) push button switch will cause the EVIC to return to the compass/temperature/trip computer display mode from any other mode. While in the compass/temperature/trip computer display mode, momentarily depressing and releasing the Step push button will step through the available trip computer display options.

The EVIC trip computer features several functions that can be reset. The functions that can be reset are: average fuel economy, trip odometer and elapsed time. With the ignition switch in the On position and with one of the functions of the trip computer that can be reset currently displayed, depressing the Reset push button twice within three seconds will perform a global reset, and all of the trip computer information that can be reset will be reset to zero. With the ignition switch in the On position and the function that is to be reset currently displayed, momentarily depressing and releasing the Reset push button once will perform a local reset, and only the value of the displayed function will be reset to

ELECTRONIC VEHICLE INFO CENTER (Continued)

zero. A global or local reset will only occur if the function currently displayed is a function that can be reset. The distance to service function can also be reset using the local reset method, but it will reset back to the Service Interval distance that is set in the EVIC programmable features mode. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of this group for more information on setting the Service Interval.

For more information on the features, control functions and setting procedures for the EVIC module, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - ELECTRONIC VEHICLE INFORMATION CENTER

If the problem with the EVIC is an inaccurate or scrambled display, refer to **Self-Diagnostic Test** in the Diagnosis and Testing section of this group. If the problem with the EVIC is incorrect Vacuum Fluorescent Display (VFD) dimming levels, use a DRB scan tool and the proper Diagnostic Procedures manual to test for the correct dimming message inputs being received from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. If the problem is a no-display condition, use the following procedures. For complete circuit diagrams, refer to **Overhead Console** in Wiring Diagrams.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the fused B(+) fuse in the PDC as required.

(3) Check the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run/start) circuit to the ignition switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the overhead console. Check for continuity between the ground circuit cavity of the roof wire harness connector for the EVIC module and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the roof wire harness connector for the EVIC module. If OK, go to Step 7. If not OK, repair the open fused B(+) circuit to the fused B(+) fuse in the junction block as required.

(7) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the roof wire harness connector for the EVIC module. If OK, refer to **Self-Diagnostic Test** in the Diagnosis and Testing section of this group for further diagnosis of the EVIC module and the PCI data bus. If not OK, repair the open fused ignition switch output (run/start) circuit to the fuse in the junction block as required.

SELF-DIAGNOSTIC TEST

A self-diagnostic test is used to determine that the EVIC module is operating properly, and that all PCI data bus messages are being received for initial operation. Initiate the self-diagnostic test as follows:

(1) With the ignition switch in the Off position, simultaneously depress and hold the **C/T button** and the **Reset button**.

(2) Turn the ignition switch to the On position.

(3) Continue to hold both buttons depressed until the EVIC software version information is displayed, then release both buttons.

(4) Following completion of these tests, the EVIC module will display one of the following messages:

a. **PASS SELF TEST -** Momentarily depress and release the Reset button to return to the compass/temperature/trip computer display mode. The EVIC module is working properly.

b. **FAILED SELF TEST -** The EVIC module has an internal failure. The EVIC module is faulty and must be replaced.

c. **NOT RECEIVING J1850 MESSAGE -** The EVIC module is not receiving proper message input through the PCI data bus. This can result from one or more faulty electronic modules in the vehicle, or from a faulty PCI data bus. The use of a DRB scan tool and the proper Diagnostic Procedures manual are required for further diagnosis.

NOTE: If the compass functions, but accuracy is suspect, it may be necessary to perform a variation adjustment. This procedure allows the compass unit to accommodate variations in the earth's magnetic field strength, based on geographic location. Refer to Compass Variation Adjustment in the Service Procedures section of this group.

ELECTRONIC VEHICLE INFO CENTER (Continued)

NOTE: If the compass reading displays a blank, and only "CAL" appears in the display, demagnetizing may be necessary to remove excessive residual magnetic fields from the vehicle. Refer to Compass Demagnetizing in the Service Procedures section of this group.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the overhead console from the headliner.

(3) Remove the four screws that secure the Electronic Vehicle Information Center (EVIC) module to the overhead console housing (Fig. 9).

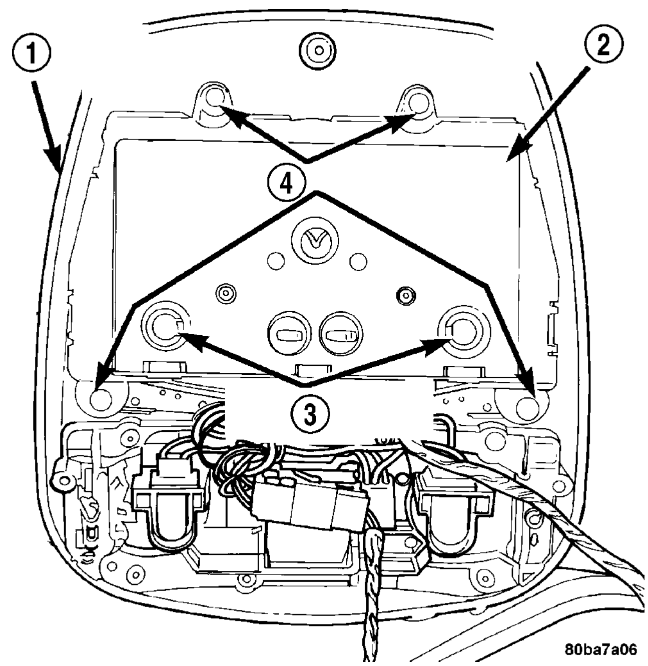

Fig. 9 Electronic Vehicle Information Center (EVIC) Module

1 - Overhead Console Housing
2 - EVIC Module
3 - Illumination Lamps
4 - Screws (4)

(4) Remove the EVIC module from the overhead console housing.

NOTE: IF THE EVIC MODULE IS BEING REPLACED, THE TIRE PRESSURE MONITORING SYSTEM MUST BE PROGRAMMED. REFER TO THE TIRES/WHEELS SECTION OF THIS MANUAL FOR DETAILED INSTRUCTIONS.

INSTALLATION

(1) Position the EVIC module onto the overhead console housing.

(2) Install and tighten the four screws that secure the EVIC module to the overhead console housing. Tighten the screws to 0.9 N·m (8 in. lbs.).

(3) Install the overhead console onto the headliner.

(4) Reconnect the battery negative cable.

NOTE: IF A NEW COMPASS MINI-TRIP COMPUTER HAS BEEN INSTALLED, THE COMPASS WILL HAVE TO BE CALIBRATED AND THE VARIANCE SET. REFER TO COMPASS VARIATION ADJUSTMENT AND COMPASS CALIBRATION IN THE SERVICE PROCEDURES SECTION OF THIS GROUP FOR THE PROCEDURES.

UNIVERSAL TRANSMITTER

DESCRIPTION

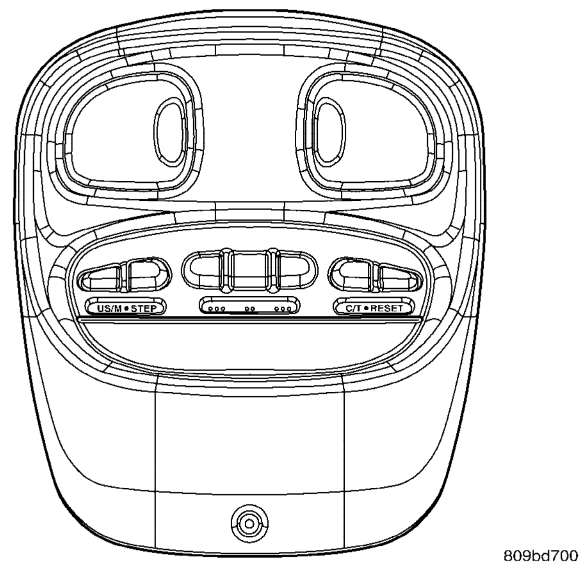

Fig. 10 Overhead Console With Universal Transmitter

On some KJ models a Universal Transmitter transceiver is standard factory-installed equipment. The universal transmitter transceiver is integral to the Compass Mini-Trip Computer (CMTC), which is located in the overhead console. The only visible component of the universal transmitter are the three transmitter push buttons (Fig. 10) centered between the four CMTC push buttons located just rearward of the CMTC display screen in the overhead console. The three universal transmitter push buttons are identified with one, two or three light indicators so that they be easily identified by sight or by feel.

Each of the three universal transmitter push buttons controls an independent radio transmitter channel. Each of these three channels can be trained to transmit a different radio frequency signal for the

UNIVERSAL TRANSMITTER (Continued)

remote operation of garage door openers, motorized gate openers, home or office lighting, security systems or just about any other device that can be equipped with a radio receiver in the 286 to 399 MegaHertz (MHz) frequency range for remote operation. The universal transmitter is capable of operating systems using either rolling code or non-rolling code technology.

The CMTC module displays messages and a small house-shaped icon with one, two or three dots corresponding to the three transmitter buttons to indicate the status of the Universal Transmitter.

The Universal Transmitter cannot be repaired, and is available for service only as a unit with the CMTC module. This unit includes the push button switches and the plastic module and display lens. If any of these components is faulty or damaged, the complete CMTC module must be replaced.

OPERATION

The universal transmitter operates on a non-switched source of battery current so the unit will remain functional, regardless of the ignition switch position. For more information on the features, programming procedures and operation of the universal transmitter, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - UNIVERSAL TRANSMITTER

If the Universal Transmitter is inoperative, but the Compass Mini-Trip Computer (CMTC) is operating normally, see the owner's manual in the vehicle glove box for instructions on training the universal transmitter. Retrain the universal transmitter with a known good transmitter as instructed in the owner's manual and test the universal transmitter operation again. If the unit is still inoperative, test the universal transmitter with Radio Frequency Detector special tool (Fig. 11) as described below:

(1) Turn the Radio Frequency (RF) Detector ON. A "chirp" will sound and the green power LED will light. If the green LED does not light, replace the battery.

(2) Hold the RF detector within one inch of the TRAINED universal transmitter and press any of the transmitters buttons.

(3) The red signal detection LEDs will light and the tool will beep if a radio signal is detected. Repeat this test three times.

If both the universal transmitter and the CMTC module are inoperative, refer to **Diagnosis and Testing the Compass Mini-Trip Computer** in this section for further diagnosis. For complete circuit diagrams, refer to **Wiring Diagrams**.

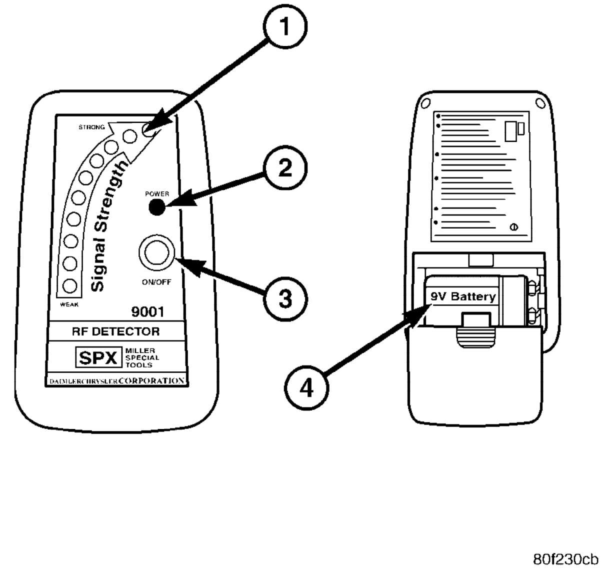

Fig. 11 RADIO FREQUENCY DETECTOR

1 - SIGNAL DETECTION LED'S
2 - POWER LED
3 - ON/OFF SWITCH
4 - 9V BATTERY

STANDARD PROCEDURE

STANDARD PROCEDURE - ERASING TRANSMITTER CODES

To erase the universal transmitter codes, simply hold down buttons 1 and 3 until the two green dots below the house symbol begin to flash.

NOTE: Individual channels cannot be erased. Erasing the transmitter codes will erase ALL programmed codes.

STANDARD PROCEDURE - SETTING TRANSMITTER CODES

(1) Turn off the engine.

(2) Erase the factory test codes by pressing buttons 1 and 3. Release the buttons when the two green lights begin to flash (about 20 seconds).

(3) Choose one of the three buttons to train. Place the hand-held transmitter within one inch of the universal transmitter and push the buttons on both transmitters. The green dot below the house symbol will begin to flash slowly.

(4) When the red light on the universal transmitter begins to flash rapidly (this may take as long as 60 seconds), release both buttons. Your universal transmitter is now "trained". To train the other buttons, repeat Step 3 and Step 4. Be sure to keep your

UNIVERSAL TRANSMITTER (Continued)

hand-held transmitter in case you need to retrain the universal transmitter.

AMBIENT TEMP SENSOR

DESCRIPTION

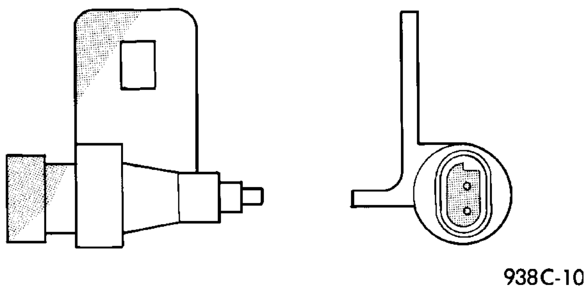

Fig. 12 Ambient Temperature Sensor

Ambient air temperature is monitored by the Compass Mini-Trip Computer (CMTC) through ambient temperature sensor messages received from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus network. The BCM receives a hard wired input from the ambient temperature sensor. The ambient temperature sensor (Fig. 12) is a variable resistor mounted in front the radiator, behind the grille, near the center of the vehicle.

Refer to **Body Control Module** in Electronic Control Modules. For complete circuit diagrams, refer to the appropriate wiring information. The ambient temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal sent to it by the BCM. The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the BCM. Based upon the resistance in the sensor, the BCM senses a specific voltage on the temperature sensor signal circuit, which it is programmed to correspond to a specific temperature. The BCM then sends the proper ambient temperature messages to the CMTC over the PCI data bus.

The thermometer function is supported by the ambient temperature sensor, a wiring circuit, the Body Control Module (BCM), the Programmable Communications Interface (PCI) data bus, and a portion of the Compass Mini-Trip Computer module.

The ambient temperature sensor circuit can also be diagnosed by referring to **Diagnosis and Testing - Ambient Temperature Sensor, and Diagnosis and Testing - Ambient Temperature Sensor Circuit**. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, refer to **Diagnosis and Testing - Compass Mini-Trip Computer** in this section. For complete circuit diagrams, refer to the appropriate wiring information.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AMBIENT TEMPERATURE SENSOR

(1) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor wire harness connector.

(2) Measure the resistance of the ambient temperature sensor. At –40° C (–40° F), the sensor resistance is 336.6 kilohms. At 60° C (140° F), the sensor resistance is 2.49 kilohms. The sensor resistance should read between these two values. If OK, refer to **Diagnosis and Testing - Ambient Temperature Sensor Circuit** in this group. If not OK, replace the faulty ambient temperature sensor.

DIAGNOSIS AND TESTING - AMBIENT TEMPERATURE SENSOR CIRCUIT

(1) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor wire harness connector and the Body Control Module wire harness connector.

(2) Connect a jumper wire between the two terminals in the body half of the ambient temperature sensor wire harness connector.

(3) Check for continuity between the sensor return circuit and the ambient temperature sensor signal circuit cavities of the BCM wire harness connector. There should be continuity. If OK, go to Step 4. If not OK, repair the open sensor return circuit or ambient temperature sensor signal circuit to the ambient temperature sensor as required.

(4) Remove the jumper wire from the body half of the ambient temperature sensor wire harness connector. Check for continuity between the sensor return circuit cavity of the BCM wire harness connector and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted sensor return circuit as required.

(5) Check for continuity between the ambient temperature sensor signal circuit cavity of the BCM wire harness connector and a good ground. There should be no continuity. If OK, refer to **Diagnosis and Testing - Compass Mini-Trip Computer** in this

group. If not OK, repair the shorted ambient temperature sensor signal circuit as required.

REMOVAL

(1) Open hood, disconnect and isolate the negative battery cable.

(2) Remove the grille from the vehicle.

(3) Disconnect the ambient temperature sensor electrical connector.

(4) Remove the ambient temperature sensor retaining screw and remove the sensor from the vehicle.

INSTALLATION

(1) Position the ambient temperature sensor and install the retaining screw.

(2) Connect the ambient temperature sensor electrical connector.

(3) Install the grille on the vehicle.

(4) Connect the negative battery cable.

POWER SYSTEMS

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POWER LOCKS

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POWER LOCKS

DESCRIPTION

POWER LOCKS

A power operated door and tailgate lock system is available factory-installed equipment on this model. The power lock system allows all of the doors and the tailgate to be locked or unlocked electrically by operating a switch on either front door trim panel. The power lock system receives non-switched battery current through a fuse in the Junction Block (JB), so that the power locks remain operational, regardless of the ignition switch position.

POWER LOCKS (Continued)

The Body Control Module (BCM) locks the doors and tailgate automatically when the vehicle is driven beyond the speed of 25.7 Km/h (15 mph), all doors are closed and the accelerator pedal is depressed. The rolling door lock feature can be disabled if desired.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences.

The power lock system for this vehicle can also be operated remotely using the available Remote Keyless Entry (RKE) system radio frequency transmitters, if equipped.

Certain functions and features of the power lock system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. For proper diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB III® scan tool and the appropriate diagnostic information are required.

REMOTE KEYLESS ENTRY

A Radio Frequency (RF) type Remote Keyless Entry (RKE) system is an available factory-installed option on this model. The RKE system allows the use of a remote battery-powered radio transmitter to signal the Body Control Module (BCM) to actuate the power lock system. The RKE receiver operates on non-switched battery current through a fuse in the Junction Block (JB), so that the system remains operational, regardless of the ignition switch position.

Certain RKE transmitters are also equipped with a Panic button. If the Panic button on the RKE transmitter is depressed, the horn will sound and the exterior lights will flash on the vehicle for about three minutes, or until the Panic button is depressed a second time. A vehicle speed of about 25.7 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

The RKE system can also perform other functions on this vehicle. If the vehicle is equipped with the optional Vehicle Theft Security System (VTSS), the RKE transmitter will arm the VTSS when the Lock button is depressed, and disarm the VTSS when the Unlock button is depressed.

The RKE system includes two transmitters when the vehicle is shipped from the factory, but the system can retain the vehicle access codes of up to four transmitters. The transmitter codes are retained in the RKE receiver memory, even if the battery is disconnected. If an RKE transmitter is faulty or lost, new transmitter vehicle access codes can be programmed into the system using a DRB III® scan tool.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. Customer programmable feature options affecting the RKE system include:

- **Remote Unlock Sequence** - Allows the option of having only the driver side front door unlock when the RKE transmitter Unlock button is depressed the first time. The remaining doors and the tailgate unlock when the button is depressed a second time within 5 seconds of the first unlock press. Another option is having all doors and the tailgate unlock upon the first depression of the RKE transmitter Unlock button.
- **Sound Horn on Lock** - Allows the option of having the horn sound a short chirp as an audible verification that the RKE system received a valid Lock request from the RKE transmitter, or having no audible verification. This feature is not available on export vehicles.
- **Flash Lights with Lock and Unlock** - Allows the option of having the lights flash as an optical verification that the RKE system received a valid Lock request or Unlock request from the RKE transmitter, or having no optical verification.
- **Flip-up Glass Release** - Allows the operation of a one half second press or a one second press of the rear release button to open flip-up glass.
- **Programming Additional Transmitters** - Allows up to four transmitter vehicle access codes to be stored in the receiver memory. This feature is not available on export vehicles.

Certain functions and features of the RKE system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRBIII® scan tool and the appropriate diagnostic information are required.

TAILGATE / FLIP-UP GLASS POWER RELEASE SYSTEM

A power operated tailgate / flip-up glass release system is standard factory installed equipment on this model. The entire system is controlled by the Body Control Module (BCM). The tailgate / flip-up glass power release system allows the flip-up glass latch to be released electrically by actuating a switch located integral to the outside tailgate handle. By pulling the handle to the first detent or turning the key cylinder to unlock, the flip-up glass will open.

POWER LOCKS (Continued)

Pulling the handle to the second detent will allow the tailgate to open.

The tailgate / flip-up glass release system operates on non-switched battery current supplied through a fuse in the junction block so that the system remains functional, regardless of the ignition switch position. However, the BCM prevents the flip-up glass latch from being actuated when the tailgate latch is locked.

The tailgate will lock and can not be unlocked if the rear wiper switch is activated. The tailgate will also lock if battery power is lost and then restored.

The tailgate/flip-up glass will not function with the battery discharged or disconnected.

COMBINATION FLASHER

This flasher can be energized by the BCM to flash all of the park/turn signal lamps as a optical alert for the RKE panic function and, if the Flash Lights with Lock/Unlock programmable feature is enabled, as an optical verification for the RKE lock/unlock event.

HORN RELAY

This relay can be energized by the BCM to sound the horns as an audible alert for the RKE panic function and, if the Sound Horn on Lock programmable feature is enabled, as an audible verification for the RKE lock event.

LOW BEAM HEADLAMP RELAY

This relay can be energized by the BCM to flash the headlamp low beams as an optical alert for the RKE panic function.

OPERATION

POWER LOCKS

The Body Control Module (BCM) locks or unlocks the doors when an actuation input signal from a door lock switch or Remote Keyless Entry Module (RKE) is received. The BCM turns on the output drivers and provides a voltage level to the door lock motor for a specified time. All passenger doors can be locked or unlocked using a mechanical button mounted on the door trim panel. The front passenger doors and tailgate can be locked or unlocked by using the key cylinder (tailgate cylinder does not lock/unlock vehicle. It only unlocks the tailgate). The tailgate will lock and can not be unlocked if the rear wiper switch is activated (this prevents the wiper from operating when the tailgate is ajar). The tailgate will also lock if battery power is lost and then restored.

AUTOMATIC DOOR LOCKS

When the automatic door locks are ENABLED the door locks will lock when the vehicle is moving at about 25.7 Km/h (15 mph), all doors are closed and the accelerator pedal is depressed. This feature can be switched ON or OFF as desired. When the system is DISABLED the door locks will operate normally, but will not lock automatically when the vehicle is rolling. Once the automatic door locks have been actuated, they will not try to lock the doors again until a door is opened.

DOOR LOCK INHIBIT

If the key is in the ignition, in any position, and either front door is ajar, the doors can not be locked, but the unlock function still operates. Pressing the RKE lock/unlock button under these conditions will result in a normal lock/unlock activation.

After the key is removed from the Ignition Switch, or the doors are closed, the power door locks will operate normally.

DOOR LOCK CIRCUIT PROTECTION

The BCM controls the door lock relays. If the door lock switch is actuated continuously for more than five seconds the BCM will turn the output driver OFF (the BCM would consider the switch stuck). Each lock motor is protected with a Positive Temperature Coefficient device that prevents motor burn out.

REMOTE KEYLESS ENTRY

- **LOCK**: Pressing the LOCK button locks all doors, sounds horn (chirp) if enabled, and arms the Vehicle Theft Security System, if enabled. The chirp verifies that the RKE receiver has sent a message to the BCM for door lock operation. If a door has not been closed before pressing the LOCK button, the vehicle may not be secured and the VTSS (if equipped) will not arm until the door is closed.
- **UNLOCK**: Pressing the UNLOCK button once will unlock the driver's door and activate the illuminated entry system and disarm Vehicle Theft Security System, if equipped. Pressing the UNLOCK button twice within five seconds will unlock all doors.
- **TAILGATE**: Pressing the TAILGATE BUTTON unlocks the tailgate remotely and opens the flip-up glass.
- **PANIC**: If equipped, pressing the PANIC button sounds the horns at half second intervals, flashes the exterior lamps, and turns ON the interior lamps. The panic alarm will remain on for three minutes, or until the PANIC button is actuated again or the ignition switch is turned to the RUN position.

POWER LOCKS (Continued)

The Remote Keyless Entry Module is capable of retaining the transmitter Vehicle Access Code(s) in its memory even after vehicle power has been interrupted.

DIAGNOSIS AND TESTING - POWER LOCKS

The Body Control Module (BCM) enters a reduced power mode after the key is turned OFF. All diagnosis and testing of the power lock system must be done with the key in the ON position unless otherwise stated.

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a DRBIII® scan tool and the proper Diagnostic Procedures manual. The DRBIII® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the power lock motors are being sent the proper hard wired outputs by the relays for them to perform their power lock system functions.

Following are tests that will help to diagnose the hard wired components and circuits of the power lock system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power lock system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the power lock system components must be checked.

The Body Control Module (BCM) will set Diagnostic Trouble Codes (DTC) for the power lock system.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the power lock system, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter. Then, proceed as follows:

- If the entire power lock system fails to function with either the power lock switches or the RKE transmitter, check the fused B(+) fuse in the junction Block (JB).
- If the power lock system functions with both power lock switches, but not with the RKE transmitter, proceed to diagnosis of the Remote Keyless Entry (RKE) system. (Refer to 8 - ELECTRICAL/POWER LOCKS/KEYLESS ENTRY TRANSMITTER - DIAGNOSIS AND TESTING) or (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY MODULE - DIAGNOSIS AND TESTING).
- If the power lock system functions with the RKE transmitter, but not with one or both power lock switches, proceed to diagnosis of the door lock switches. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - DIAGNOSIS AND TESTING).
- If the driver side power lock switch operates only the driver side front door power lock motor, but all other power lock motors operate with the passenger side power lock switch or the RKE transmitter, use a DRBIII® scan tool and the appropriate diagnostic information to diagnose the Programmable Communications Interface (PCI) data bus.
- If only one power lock motor fails to operate with both power lock switches and the RKE transmitter, proceed to diagnosis of the power lock motor. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK MOTOR - DIAGNOSIS AND TESTING).

DOOR LOCK / UNLOCK SWITCH

DIAGNOSIS AND TESTING - DOOR LOCK/UNLOCK SWITCH

(1) Remove the switch to be tested (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - REMOVAL).

(2) Using an ohmmeter, Test switch for resistance values (Fig. 1).

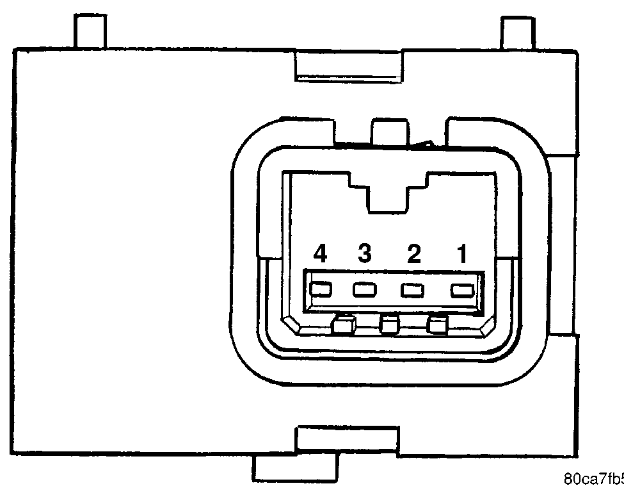

Fig. 1 DOOR LOCK/UNLOCK SWITCH

DOOR LOCK / UNLOCK SWITCH (Continued)

DOOR LOCK SWITCH TEST

SWITCH POSITION	PINS	RESISTANCE VALUE
UNACTUATED	1 AND 4	5.0K OHM ± 10 %
LOCK	1 AND 4	1.4K OHM ±10 %
UNLOCK	1 AND 4	426 OHM ± 10 %

(3) If test results are not obtained as shown in the test table, replace the switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the door trim panel (Fig. 2) (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

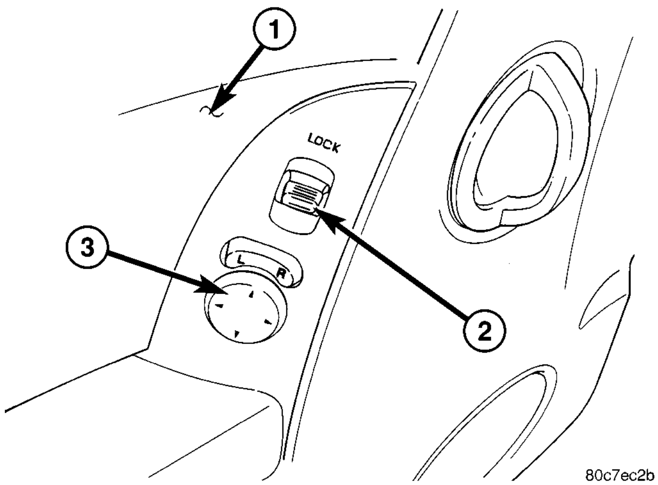

Fig. 2 DOOR LOCK SWITCH

1 - DOOR TRIM PANEL
2 - DOOR LOCK SWITCH
3 - POWER MIRROR SWITCH

(3) Disconnect electrical harness connector from switch.

(4) From behind the door trim panel, gently pry the switch from the door trim panel (Fig. 3).

INSTALLATION

(1) Press the switch into place.

(2) Connect the electrical harness connector to the switch.

(3) Install the door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

(4) Connect the battery negative cable.

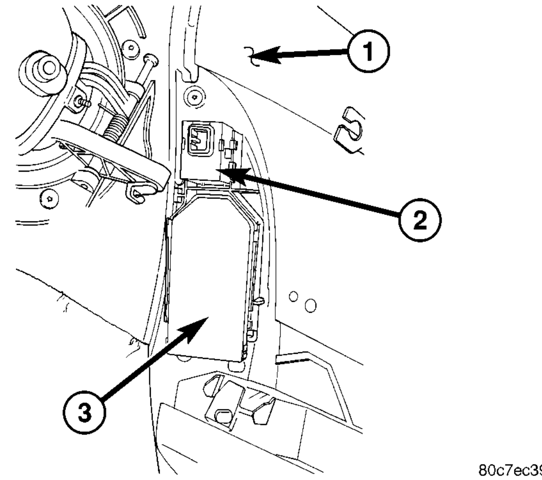

Fig. 3 DOOR LOCK/MIRROR SWITCH

1 - DOOR TRIM PANEL
2 - DOOR LOCK SWITCH
3 - POWER MIRROR SWITCH

DOOR LOCK MOTOR

DESCRIPTION

The lock mechanisms are actuated by a reversible electric motor mounted within each door and tailgate. The power lock motors are integral to the door latch units.

The power lock motors cannot be adjusted or repaired and, if faulty or damaged, the door latch unit must be replaced.

OPERATION

The door lock motors are controlled by relays. A positive and negative battery connection to the two motor terminals will cause the motor to move in one direction. Reversing the current will cause the motor to move in the opposite direction.

DIAGNOSIS AND TESTING - DOOR LOCK MOTOR

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a DRBIII® scan tool and the proper Diagnostic Procedures manual. The DRBIII® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the power lock motors are being sent the proper hard wired outputs by the door modules for them to perform their power lock system functions.

DOOR LOCK MOTOR (Continued)

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

FLIP-UP GLASS RELEASE SWITCH

DIAGNOSIS AND TESTING - FLIP-UP GLASS RELEASE SWITCH

(1) Disconnect and isolate the battery negative cable.

(2) Remove the tailgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(3) Disconnect the wire harness connector.

(4) Using an ohmmeter, check for continuity between the pins of the wire harness connector while pulling on the tailgate handle.

(5) If no continuity is found, replace the tailgate handle assembly (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/EXTERIOR HANDLE - REMOVAL).

DOOR LOCK RELAY

DESCRIPTION

The power door lock system uses the following relays for the front and rear passenger doors only:

- Driver door unlock relay
- Door lock relay
- Passenger Doors unlock relay

The tailgate uses outputs from the Body Control Module (BCM).

The relays are electromechanical devices that switch battery current to the door lock circuit when the Body Control Module (BCM) grounds the relay coil. These relays are located in the Junction Block (JB). For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

The relays are a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - DOOR LOCK RELAY

The power lock relays (Fig. 4) are located in the Junction Block (JB) under the instrument panel. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove suspected faulty relay from the (JB).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

DOOR LOCK RELAY (Continued)

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If not OK, replace the faulty relay.

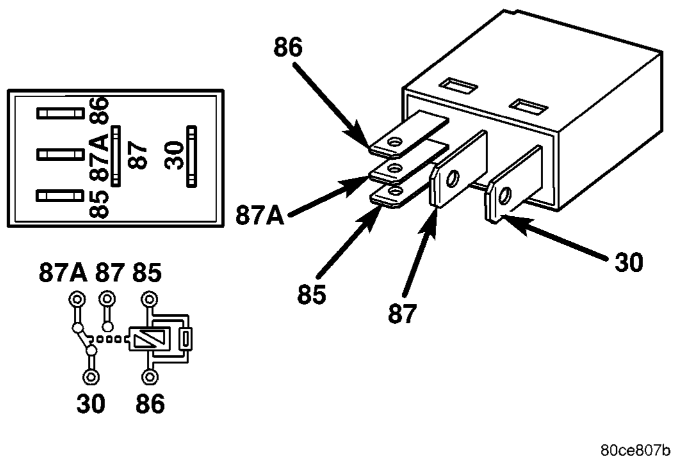

Fig. 4 Power Lock Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Reach up under instrument panel and remove the relay from Junction Block (JB).

INSTALLATION

(1) Position the horn relay in the proper receptacle in the Junction Block (JB).

(2) Push down firmly on the relay until the terminals are fully seated.

(3) Connect the battery negative cable.

REMOTE KEYLESS ENTRY MODULE

DESCRIPTION

When an RKE lock message is sent to the Body Control Module (BCM), the BCM actuates the doors and the tailgate lock, the interior lighting is turned off, the horn chirps (if this feature is enabled), the exterior lamps flash (if this feature is enabled) and, if the vehicle is so equipped, the Vehicle Theft Security System (VTSS) is armed. When an RKE unlock message is sent to the BCM, the BCM actuates the driver side front door (or all doors and the tailgate if this feature is enabled) unlock, the interior lighting is turned on and, if the vehicle is so equipped, the VTSS is disarmed. The exterior lamps flash if this feature is enabled

When an RKE panic message is sent to the BCM, the BCM actuates the driver side front door (or all doors and the tailgate if this feature is enabled) unlock, the interior lighting is turned on and, if the vehicle is so equipped, the VTSS is disarmed. The panic message will also cause the exterior lamps (including the headlights) to flash, and the horn to pulse for about three minutes, or until a second panic message is sent to the BCM. A vehicle speed of about 25.7 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

Refer to the owner's manual for more information on the features, use and operation of the RKE system.

OPERATION

Whenever the vehicle battery power is interrupted, the Remote Keyless Module (RKE) Module will retain all vehicle access codes in its memory. When replacing or adding a key fob transmitter (maximum of 4) a DRB III® scan tool is required to program the RKE Module to accept the new Vehicle Access Code if a customer owned transmitter is not available.

If a functioning transmitter is available, (Refer to 8 - ELECTRICAL/POWER LOCKS/KEYLESS ENTRY TRANSMITTER - STANDARD PROCEDURE)

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY MODULE

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds. Refer to the proper Body Diagnostic Procedures Manual for testing the Remote Keyless Entry system using a DRB III® scan tool.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the Junction Block (JB) (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - REMOVAL).

(3) Remove Remote Keyless Entry module from Body Control Module (Fig. 5).

INSTALLATION

(1) Install Remote Keyless Entry module to Body Control Module.

REMOTE KEYLESS ENTRY MODULE (Continued)

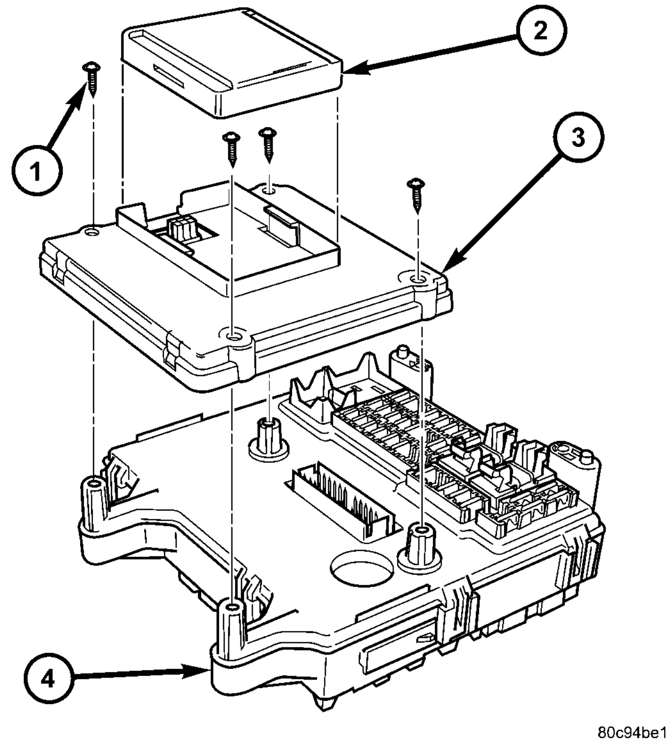

Fig. 5 RKE Module Remove/Install

1 - SCREW (4)
2 - RKE MODULE
3 - BODY CONTROL MODULE
4 - JUNCTION BLOCK

(2) Install Junction Block (JB) (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - INSTALLATION).

(3) Connect the battery negative cable.

REMOTE KEYLESS ENTRY TRANSMITTER

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY TRANSMITTER

Using special tool 9001, first test to ensure that the transmitter is functioning. Typical testing distance is 2.5 centimeters (1 inch) for Asian transmitters and 30.5 centimeters (12 inches) for all others. To test, position the transmitter as shown (Fig. 6). Press any transmitter button, then test each button individually. The tool will beep if a radio signal strength that lights five or more LED's is detected. Repeat this test three times. If transmitter fails any of the test refer to the Diagnostic Procedures manual.

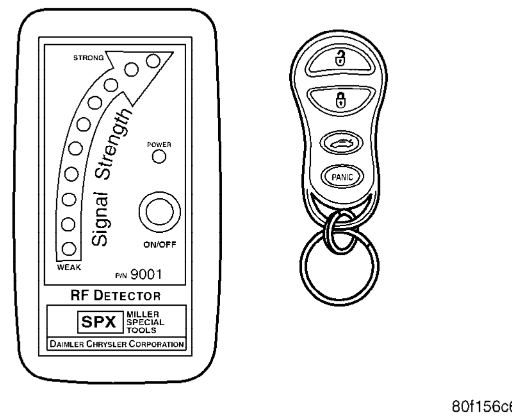

Fig. 6 TRANSMITTER DIAGNOSIS

STANDARD PROCEDURE

STANDARD PROCEDURE - RKE TRANSMITTER CUSTOMER PREFERENCES

AUTOMATIC (ROLLING) LOCKS

The rolling locks feature can be toggled ON/OFF by using the DRB III® only.

HORN CHIRP DISABLING / ENABLING

The horn chirp can be toggled using a DRB III® or by using the Remote Keyless Entry (RKE) transmitter.

To DISABLE (cancel) the horn chirp feature, press and hold the transmitter LOCK button for four to ten seconds. While pressing the LOCK button in, press the UNLOCK button. Release both buttons.

To ENABLE the horn chirp feature, repeat the above procedure.

OPTICAL CHIRP (FLASH) DISABLING / ENABLING

The optical chirp can be toggled using a DRB III® or by using the Remote Keyless Entry (RKE) transmitter.

To DISABLE (cancel) the optical chirp feature, press and hold the transmitter LOCK button for four to ten seconds. While pressing the LOCK button in, press the TAILGATE RELEASE button. Release both buttons.

To ENABLE the optical chirp feature, repeat the above procedure.

TAIL GATE RELEASE DELAY

Press the UNLOCK button for four to ten seconds. While pressing the UNLOCK button, press the TAIL GATE RELEASE button. Release both buttons.

This will toggle between PRESS AND HOLD and PRESS (no delay).

REMOTE KEYLESS ENTRY TRANSMITTER (Continued)

UNLOCK SEQUENCE

The unlock sequence can be toggled using a DRB III® or by using the Remote Keyless Entry (RKE) transmitter.

Press and hold the transmitter UNLOCK button for four to ten seconds. While pressing the UNLOCK button in, press the LOCK button. Release both buttons.

This will toggle between Driver door first and Unlock all doors function.

STANDARD PROCEDURE - RKE TRANSMITTER PROGRAMING

New Remote Keyless Entry (RKE) transmitters can be programed using the DRBIII® scan tool and the proper Diagnostic Procedures manual, if no functioning transmitter is available. The DRBIII® scan tool can provide confirmation that the PCI data bus is functional, and that all of the electronic modules are sending and receiving the proper messages on the PCI data bus.

The following procedure can be used as long as one functioning transmitter is available:

(1) Turn ignition to the RUN position (allow ignition chimes to stop).

(2) Using any original (working) transmitter, press the UNLOCK button for 4 to 10 seconds.

(3) Within the specified 4 to 10 seconds, continue pressing the UNLOCK button and press the PANIC button for 1 second, and release both buttons (a chime will sound to indicate that the transmitter programming mode has been entered - allow 3 seconds for chime to sound).

(4) Press LOCK and UNLOCK buttons simultaneously for 1 second and release.

(5) Press and release any button on the same transmitter and a chime will sound after successfully programming the transmitter.

(6) Repeat steps 4 to 6 to program additional transmitters.

(7) Turn ignition to the OFF position. Transmitter programming mode will discontinue after 60 seconds. All transmitter programming must be completed within time specified.

STANDARD PROCEDURE - RKE TRANSMITTER BATTERIES

The Remote Keyless Entry (RKE) transmitter case snaps open and shut for battery access. To replace the RKE transmitter batteries:

(1) Using a thin coin, gently pry at the notch in the center seam of the RKE transmitter case halves near the key ring until the two halves unsnap.

(2) Lift the back half of the transmitter case off of the RKE transmitter.

(3) Remove the two batteries from the RKE transmitter.

(4) Replace the two batteries with new Panasonic 2016 (if equipped with one battery, use 2032), or equivalent. Be certain that the batteries are installed with their polarity correctly oriented.

(5) Align the two RKE transmitter case halves with each other, and squeeze them firmly and evenly together until they snap back into place.

SPECIFICATIONS - REMOTE KEYLESS ENTRY TRANSMITTER

RANGE

Normal operation range is up to a distance of 3 to 7 meters (10 to 23 ft.) of the vehicle. Range may be better or worse depending on the environment around the vehicle.

TAILGATE CYLINDER LOCK SWITCH

DESCRIPTION

The tailgate cylinder lock switch is integral to the key lock cylinder inside the tailgate. The tailgate cylinder lock switch is a normally-open momentary switch that is hard wired directly to the Body Control Module (BCM), and closes a path to ground through an internal resistor when the lock cylinder is rotated to the unlock or lock position.

The tailgate cylinder lock switch cannot be adjusted or repaired.

OPERATION

The tailgate cylinder lock switch is actuated when the key is inserted in the lock cylinder and turned to the unlock or lock position. The tailgate cylinder lock switch closes a path to ground through an internal resistor for the Body Control Module (BCM) when the tailgate key lock cylinder is in the lock or unlock position, and opens the ground path when the lock cylinder is in the neutral position. The BCM reads the switch status, then sends the proper switch status messages to other electronic modules over the Programmable Communications Interface (PCI) data bus network. The tailgate cylinder lock switch unlock status message is used by the BCM as an input for Vehicle Theft Security System (VTSS) operation and to tell the BCM to lock or unlock the tailgate. There is no mechanical linkage between the tailgate key cylinder and the latches.

TAILGATE CYLINDER LOCK SWITCH (Continued)

DIAGNOSIS AND TESTING - TAILGATE CYLINDER LOCK SWITCH

(1) Disconnect and isolate the battery negative cable.

(2) Remove tailgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(3) Disconnect tailgate cylinder lock switch harness connector.

(4) Using a ohmmeter, test for resistances as shown in the Tailgate Cylinder Lock Switch Table.

TAILGATE CYLINDER LOCK SWITCH TABLE

SWITCH POSITION	RESISTANCE
NEUTRAL	0 OHMS
LOCK (CLOCKWISE)	2 K OHMS ± 10 %
UNLOCK (COUNTER-CLOCKWISE)	470 OHMS ± 10 %

(5) If switch resistance is not correct, replace switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the tailgate trim panel.(Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(3) Remove the retainer clip from the pin on the back of the door lock cylinder (Fig. 7).

(4) Remove the washer from the pin on the back of the door lock cylinder.

(5) Remove the door cylinder lock switch from the back of the lock cylinder.

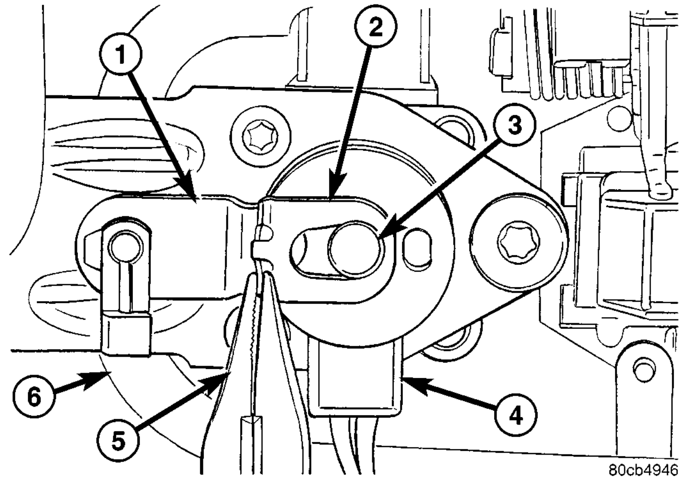

Fig. 7 Lock Cylinder Switch Remove/Install -Typical

1 - LEVER
2 - RETAINER
3 - LOCK CYLINDER
4 - SWITCH
5 - PLIERS
6 - OUTSIDE DOOR HANDLE

INSTALLATION

(1) Position the tailgate cylinder lock switch onto the back of the lock cylinder with the wire harness oriented toward the bottom.

(2) Position the washer over the switch.

(3) Install the retainer clip onto the pin on the back of the tailgate lock cylinder. Be certain that the center tab of the retainer is engaged in the retention hole on the lock lever.

(4) Install the trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

(5) Connect the battery negative cable.

POWER MIRRORS

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POWER MIRRORS

DESCRIPTION

The available power operated sideview mirrors allow the driver to adjust both outside mirrors electrically from the drivers seat by operating a switch on the driver side front door trim panel (Fig. 1).

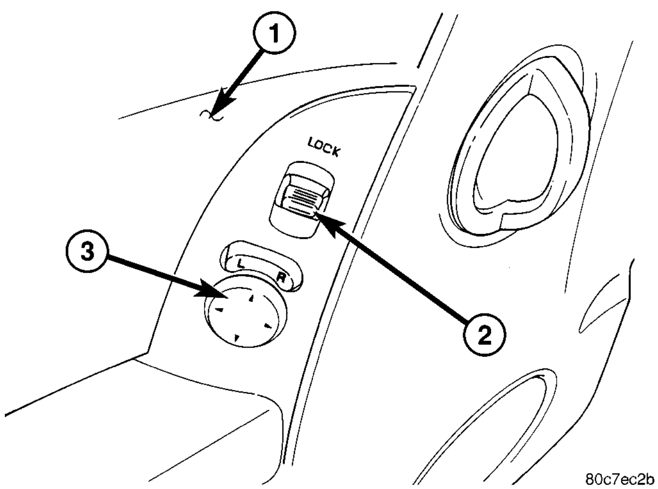

Fig. 1 POWER MIRROR SWITCH

1 - DOOR TRIM PANEL
2 - DOOR LOCK SWITCH
3 - POWER MIRROR SWITCH

OPERATION

The power mirrors receive ignition current through a fuse in the junction block, and will only operate when the ignition switch is in the Run position.

DIAGNOSIS AND TESTING - POWER MIRRORS

WIRING VOLTAGE TEST

The following wiring test determines whether or not voltage is continuous through the body harness to switch.

(1) Remove the power mirror switch (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).

(2) Disconnect wire connector from back of power mirror switch.

(3) Switch ignition to the RUN position.

(4) Connect the clip end of a 12 volt test light to Pin 5 in the harness connector at the mirror switch. Touch the test light probe to Pin 3.

If the test light illuminates, the wiring circuit between the battery and switch is OK.

If the lamp does not illuminate, first check fuse 25 in the Junction Block (JB). If fuse 25 is OK, then check for a broken wire.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

POWER MIRRORS (Continued)

POWER MIRROR MOTOR TEST

If the power mirror switch is receiving proper current and ground and mirrors do not operate, proceed with power mirror motor test. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove front door trim panel to gain access to power mirror wire connector (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(2) Disconnect wire harness connector to power mirror switch (Fig. 2).

(3) Using two jumper wires:

- Connect one to a 12 volt source
- Connect the other to a good body ground
- Refer to the Mirror Motor Test Chart for proper wire connections at the switch connector

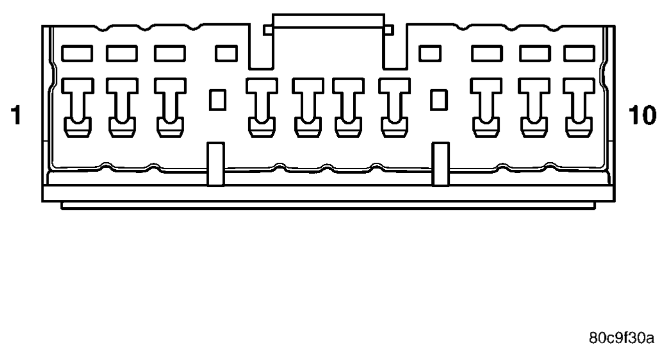

Fig. 2 POWER MIRROR SWITCH CONNECTOR

MIRROR MOTOR TEST CHART

12 VOLTS	GROUND	MIRROR REACTION	
SWITCH CONNECTOR		RIGHT	LEFT
PIN 2	PIN 6	-	UP
PIN 6	PIN 1	-	LEFT
PIN 6	PIN 2	-	DOWN
PIN 1	PIN 6	-	RIGHT
PIN 9	PIN 6	UP	-
PIN 6	PIN 10	LEFT	-
PIN 6	PIN 9	DOWN	-
PIN 10	PIN 6	RIGHT	-

(4) If results shown in table are not obtained, check for open or shorted circuit. Replace mirror assembly as necessary.

AUTOMATIC DAY / NIGHT MIRROR

DESCRIPTION

DESCRIPTION - REAR VIEW MIRROR

An automatic day/night mirror system is an available factory-installed option on this model. The automatic dimming inside day/night rear view mirror system is a completely self-contained unit that replaces the standard equipment inside rear view mirror. This system will automatically change the reflectance of the inside rear view mirror to protect the driver from the unwanted headlight glare of trailing vehicles while driving at night. The automatic day/night inside mirror receives ignition switched battery current through a fuse in the junction block, and will only operate when the ignition switch is in the On position.

Vehicles equipped with the automatic day/night mirror system are also available with an optional factory-installed automatic dimming outside rear view mirror for the driver side of the vehicle.

The automatic day/night mirror sensitivity cannot be repaired or adjusted. If any component of this unit is faulty or damaged, the entire automatic day/night inside rear view mirror unit must be replaced.

DESCRIPTION - OUTSIDE REAR VIEW MIRROR

An automatic dimming outside rear view mirror is an available factory-installed option for the driver side of the vehicle, if the vehicle is also equipped with the automatic day/night inside rear view mirror. The automatic dimming outside mirror is completely controlled by the circuitry of the automatic day/night inside rear view mirror. The automatic dimming outside mirror will automatically change the reflectance of the driver side outside rear view mirror to protect the driver from the unwanted headlight glare of trailing vehicles while driving at night. The automatic dimming outside mirror will only operate when the ignition switch is in the On position.

The automatic dimming outside mirror sensitivity cannot be repaired or adjusted. If any component of this unit is faulty or damaged, the entire automatic dimming outside mirror unit must be replaced.

AUTOMATIC DAY / NIGHT MIRROR (Continued)

OPERATION

OPERATION - REAR VIEW MIRROR

The automatic day/night mirror switch allows the driver a manual control of whether the automatic dimming feature is operational. This switch is a momentary rocker-type switch located on the lower rear-facing surface of the mirror housing. When Auto is selected, a Light-Emitting Diode (LED) on the mirror housing just to the right of the switch illuminates to indicate that automatic day/night mirror is turned on. When Off is selected, the LED is turned off. The mirror also senses the backup lamp circuit, and will automatically disable its self-dimming feature whenever the transmission gear selector is in the Reverse position.

A thin layer of electrochromatic material between two pieces of conductive glass make up the face of the mirror. Two photocell sensors are used to monitor light levels and adjust the reflectance of the mirror. The ambient photocell sensor faces forward, to detect the outside light levels. The headlamp sensor is located on the mirror housing just to the left of the switch and facing rearward, to detect the light level received at the rear window side of the mirror. When the difference between the two light levels becomes too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror), the mirror begins to darken.

On models with an optional driver side automatic dimming outside mirror, the signal to control the dimming of that mirror is generated by the automatic day/night inside rear view mirror circuitry. That signal is then delivered to the driver side outside rear view mirror on a hard wired circuit.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the automatic day/night mirror system.

OPERATION - OUTSIDE REAR VIEW MIRROR

The automatic dimming outside mirror is operated by the same controls and circuitry as the automatic day/night mirror. When the automatic day/night mirror is turned on or off, the automatic dimming outside mirror is likewise turned on or off. Like in the automatic day/night mirror, a thin layer of electrochromatic material between two pieces of conductive glass make up the face of the automatic dimming outside mirror. However, the signal to control the dimming of the outside mirror is generated by the automatic day/night inside rear view mirror circuitry.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the automatic dimming outside mirror.

DIAGNOSIS AND TESTING - AUTOMATIC DAY / NIGHT MIRROR

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Check the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run/start) circuit to the ignition switch as required.

(3) Disconnect the overhead wire harness connector from the automatic day/night mirror connector receptacle. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the overhead wire harness connector for the automatic day/night mirror. If OK, go to Step 4. If not OK, repair the open fused ignition switch output (run/start) circuit to the fuse in the junction block as required.

(4) Turn the ignition switch to the Off position. Check for continuity between the ground circuit cavity of the overhead wire harness connector for the automatic day/night mirror and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Turn the ignition switch to the On position. Set the parking brake. Place the transmission gear selector lever in the Reverse position. Check for battery voltage at the backup lamp switch output circuit cavity of the overhead wire harness connector for the automatic day/night mirror. If OK, reconnect the overhead wire harness connector to the automatic day/night mirror connector receptacle and go to Step 6. If not OK, repair the open backup lamp switch output circuit as required.

(6) Place the transmission gear selector lever in the Neutral position. Place the automatic day/night mirror switch in the Auto (LED next to the switch is lighted) position (Fig. 3). Cover the forward facing ambient photocell sensor to keep out any ambient light.

AUTOMATIC DAY / NIGHT MIRROR (Continued)

NOTE: The ambient photocell sensor must be covered completely, so that no light reaches the sensor. Use a finger pressed tightly against the sensor, or cover the sensor completely with electrical tape.

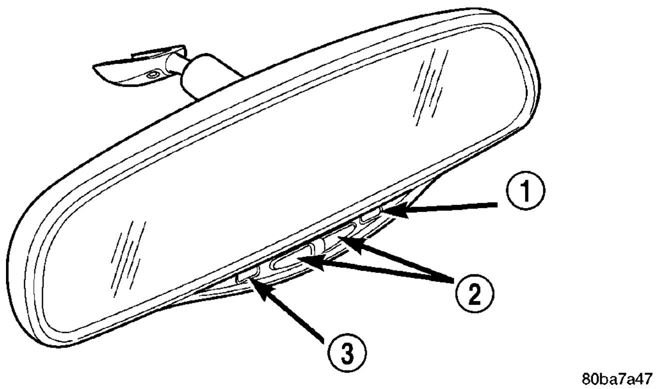

Fig. 3 Automatic Day/Night Mirror

1 - LED INDICATOR
2 - SWITCH
3 - HEADLAMP SENSOR

(7) Shine a light into the rearward facing headlamp photocell sensor. The automatic day/night mirror should darken. If OK, go to Step 8. If not OK, replace the faulty automatic day/night mirror unit.

(8) With the mirror darkened, place the transmission gear selector lever in the Reverse position. The automatic day/night mirror should return to its normal reflectance. If not OK, replace the faulty automatic day/night mirror unit.

POWER FOLDAWAY MIRROR SWITCH - EXPORT

DESCRIPTION

These vehicles may be equipped with Power Foldaway Mirrors. This feature allows both the driver and passenger side view mirrors to fold inward (retract) on demand. The vehicle has an additional switch located below the power mirror switch that controls the folding function of the mirror assembly (Fig. 4).

The fold-away side view mirror is attached to the vehicle's door in the same manner as mirrors without the fold-away option. The fold-away mirrors unique option is the internal motor which allows the mirrors to fold inward. The fold-away mirror motor is not serviceable separately and if a motor is found to be faulty, the entire side view mirror must be replaced.

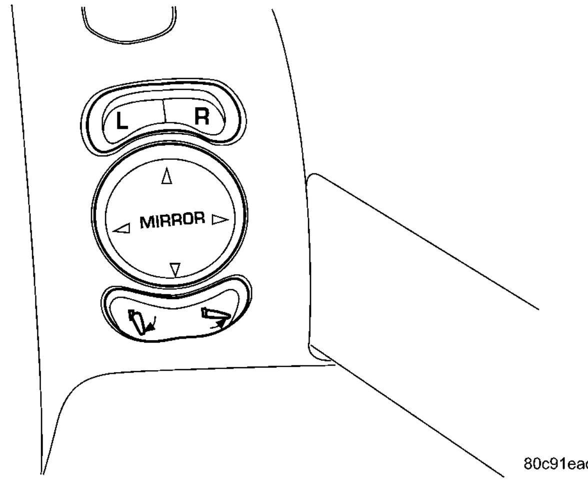

Fig. 4 POWER FOLDAWAY MIRROR SWITCH

OPERATION

When the mirror retract switch is depressed, both of the side view mirrors will fold inward, Thus making the overall width of the vehicle the smallest possible. This can be helpful were parking space is a absolute minimum.

The power fold away mirrors will operate only when the ignition is in the On position.

The power fold away mirror system consists of the following components: mirror switch, side view mirror, relay, wires and fuse. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - POWER FOLDAWAY MIRROR SWITCH - EXPORT

(1) Disconnect and isolate the battery negative cable.

(2) Remove power foldaway mirror switch (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).

(3) Disconnect wire harness connector.

(4) Using a ohmmeter, test for continuity between the terminals of the switch (Fig. 5).

(5) If results shown in the table are not obtained, replace the switch.

POWER FOLDAWAY MIRROR SWITCH - EXPORT (Continued)

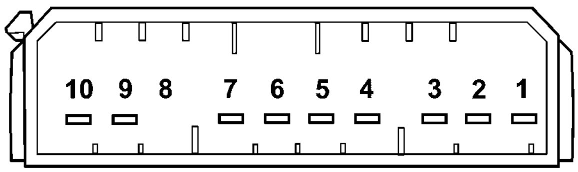

Fig. 5 POWER MIRROR SWITCH

POWER FOLDAWAY MIRROR SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN
RETRACT	5 AND 4
	3 AND 7
EXTEND	5 AND 7
	3 AND 4
MIRROR SELECT SWITCH IN ″LEFT″ POSITION	
UP	5 AND 2
	3 AND 6
DOWN	5 AND 6
	3 AND 2
LEFT	5 AND 6
	3 AND 1
RIGHT	5 AND 1
	3 AND 6
MIRROR SELECT SWITCH IN ″RIGHT″ POSITION	
UP	5 AND 9
	3 AND 6
DOWN	5 AND 6
	3 AND 9
LEFT	5 AND 6
	3 AND 10
RIGHT	5 AND 10
	3 AND 6

REMOVAL

For removal procedures (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).

POWER MIRROR SWITCH

DIAGNOSIS AND TESTING - POWER MIRROR SWITCH

(1) Remove power mirror switch (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).

(2) Disconnect wiring harness connector from switch.

(3) Using a ohmmeter, test for continuity between the terminals of the switch (Fig. 6).

(4) If results shown in the table are not obtained, replace the switch.

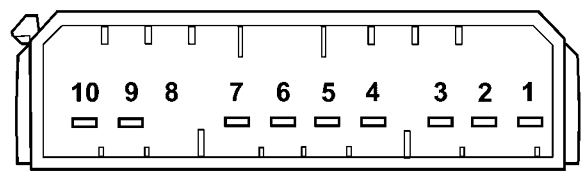

Fig. 6 POWER MIRROR SWITCH

POWER MIRROR SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN
MIRROR SELECT SWITCH IN ″LEFT″ POSITION	
UP	5 AND 2
	3 AND 6
DOWN	5 AND 6
	3 AND 2
LEFT	5 AND 6
	3 AND 1
RIGHT	5 AND 1
	3 AND 6
MIRROR SELECT SWITCH IN ″RIGHT″ POSITION	
UP	5 AND 9
	3 AND 6
DOWN	5 AND 6
	3 AND 9
LEFT	5 AND 6
	3 AND 10
RIGHT	5 AND 10
	3 AND 6

POWER MIRROR SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(3) Disconnect wire harness connector from switch (Fig. 7).

(4) Remove switch from door trim panel.

INSTALLATION

(1) Install switch to door trim panel.

(2) Connect wire harness connector to switch.

(3) Install door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

(4) Connect battery negative cable.

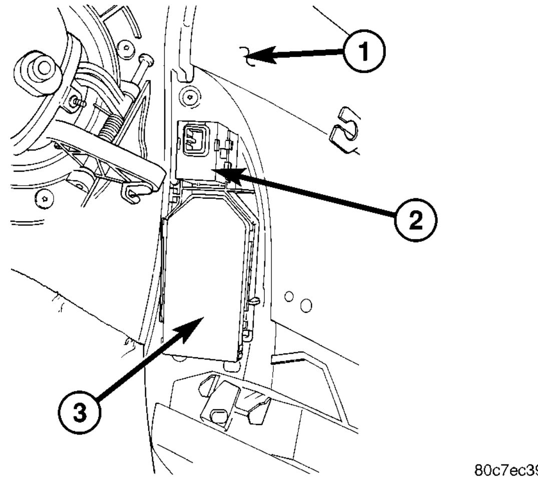

Fig. 7 DOOR LOCK/MIRROR SWITCH

1 - DOOR TRIM PANEL
2 - DOOR LOCK SWITCH
3 - POWER MIRROR SWITCH

SIDEVIEW MIRROR

REMOVAL

(1) For removal procedures, (Refer to 23 - BODY/EXTERIOR/SIDE VIEW MIRROR - REMOVAL).

POWER SEATS

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POWER SEATS

DESCRIPTION

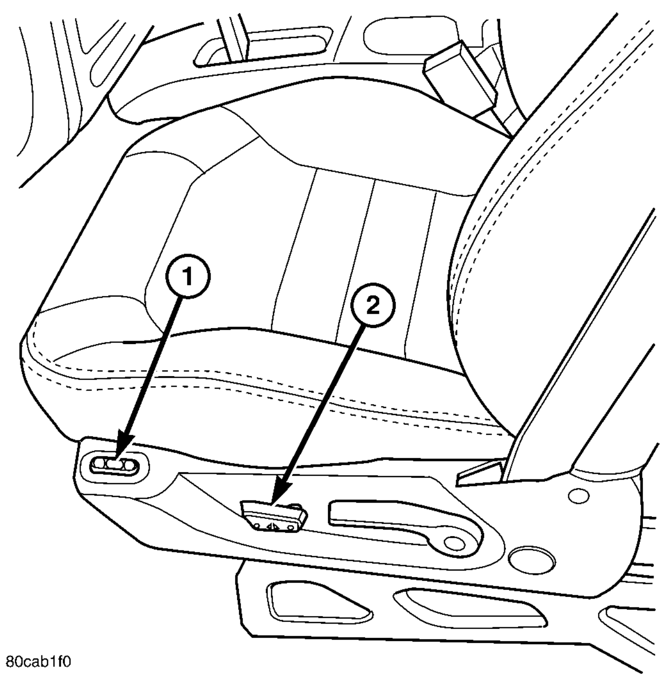

Fig. 1 KJ Heated/Power Seat

1 - HEATED SEAT SWITCH
2 - POWER SEAT SWITCH

Individually controlled, electrically powered front seats are available as factory-installed equipment on this model. Vehicles with this option can be visually identified by the two separate power seat switches, mounted on each of the front seat cushion side shields (Fig. 1). The power seat system option allows the front seating positions to be electrically adjusted for optimum vehicle control and comfort. The power seat cushion can be adjusted forward, rearward, front up, front down, rear up, or rear down. The power seat system for this vehicle includes the following major components, which are described in further detail later in this section:

- **Power Seat Switches** - Two power seat switches are used per vehicle, one for the driver and one for the front seat passenger. Refer to the left and right power seat switch information later in this section.
- **Power Seat Tracks** - Two power seat tracks are used per vehicle, one for the driver and one for the front seat passenger seats. Refer to the power seat track information later in this section.
- **Circuit Breaker** - An automatic resetting circuit breaker (# 1) is located in the Junction Block and is used to protect the power seat system from current overload.

POWER SEATS (Continued)

Hard wired circuitry connects the power seat system components to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the power seat system components through the use of a combination of soldered splices, splice block connectors and many different types of wire harness terminal connectors and insulators. Refer to the **Wiring** section of this manual for more information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The power seat system receives battery current through a fuse in the Power Distribution Center (PDC) and a circuit breaker in the Junction Block, regardless of the ignition switch position.

When a power seat switch control knob or knobs are actuated, a battery feed and a ground path are applied through the switch contacts to the appropriate power seat track adjuster motor. The selected adjuster motor operates to move the seat track through its drive unit in the selected direction until the switch is released, or until the travel limit of the seat track is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the power seat system.

DIAGNOSIS AND TESTING - POWER SEATS

Before any testing of the power seat system is attempted, the battery should be fully-charged and all wire harness connections and pins cleaned and tightened to ensure proper continuity and grounds. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and joint connector location views for the various wire harness connectors, splices and grounds.

(1) If all power seats are inoperative, check the automatic resetting circuit breaker in the Junction Block. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/CIRCUIT BREAKER - DIAGNOSIS AND TESTING).

(2) With the dome lamp on, apply the power seat switch in the direction of the failure.

(3) If the dome lamp dims, the seat or the power seat track may be jammed. Check under and behind the seat for binding or obstructions.

(4) If the dome lamp does not dim, proceed with testing of the individual power seat system components and circuits.

LEFT POWER SEAT SWITCH

DESCRIPTION

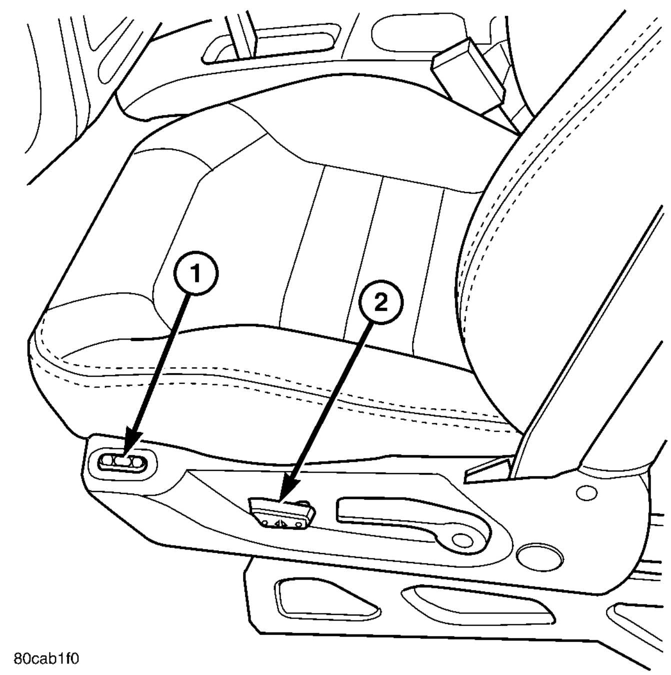

Fig. 2 KJ Heated/Power Seat

1 - HEATED SEAT SWITCH
2 - POWER SEAT SWITCH

Vehicles equipped with the power seat option utilize a six-way power seat switch. This six-way power seat switch features one seat cushion shaped knob, visible on the outboard seat cushion side shield (Fig. 2).

The switch is secured to the back of the seat cushion side shield with two screws. However, the control knob must be removed before the seat switch can be removed from the side shield.

The individual switches internal to the power seat switch cannot be repaired. If one switch is damaged or faulty, the entire power seat switch unit must be replaced.

LEFT POWER SEAT SWITCH (Continued)

OPERATION

The power seat tracks can be adjusted in six different ways using the power seat switches. See the owner's manual in the vehicle glove box for more information on the power seat switch functions and the seat adjusting procedures.

When a power seat switch control knob or knobs are actuated, a battery feed and a ground path are applied through the switch contacts to the power seat track adjuster motor. The selected adjuster motor operates to move the seat track through its drive unit in the selected direction until the switch is released, or until the travel limit of the seat track is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

No power seat switch should be held applied in any direction after the seat track has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

DIAGNOSIS AND TESTING - LEFT POWER SEAT SWITCH

For complete circuit diagrams, refer to **Power Seat** in Wiring Diagrams.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power seat switch from the outboard seat cushion side shield.

(3) Use an ohmmeter to test the continuity of the power seat switch in each switch position. See the Power Seat Switch Continuity chart (Fig. 3) and switch (Fig. 4) below. If OK, refer to **Diagnosis and Testing the Power Seat Track** in this section. If not OK, replace the faulty power seat switch unit.

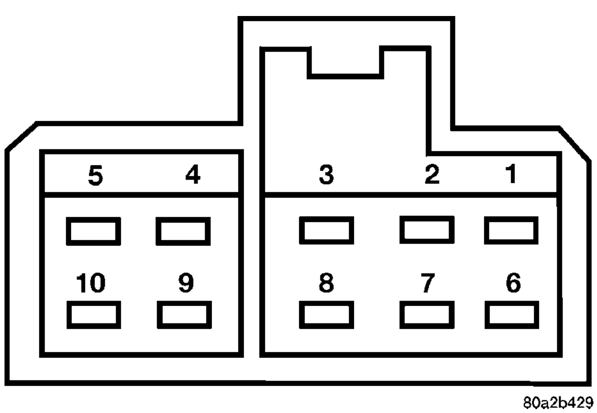

Fig. 3 Power Seat Switch Pin ID.

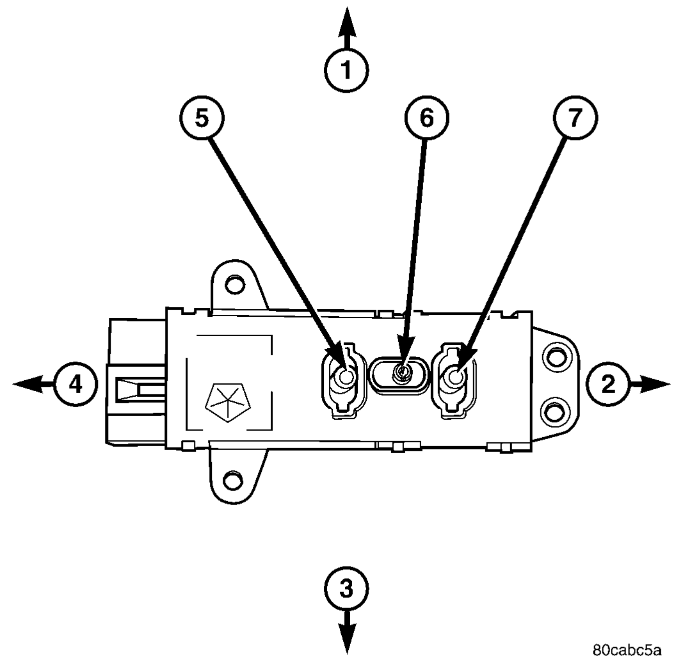

Fig. 4 Diagnosing Power Seat Switch

1 - UP
2 - REARWARD
3 - DOWN
4 - FORWARD
5 - FRONT RISER SWITCH
6 - CENTER SEAT SWITCH
7 - REAR RISER SWITCH

SWITCH POSITION	CONTINUITY BETWEEN PINS	
	DRIVER SEAT	PASSENGER SEAT
OFF	PIN 1 to 3 PIN 1 to 6 PIN 1 to 7 PIN 1 to 8 PIN 1 to 9 PIN 1 to 10	PIN 1 to 3 PIN 1 to 6 PIN 1 to 7 PIN 1 to 8 PIN 1 to 9 PIN 1 to 10
FRONT RISER UP	PIN 1 to 8 PIN 5 to 9	PIN 1 to 8 PIN 5 to 9
FRONT RISER DOWN	PIN 1 to 9 PIN 5 to 8	PIN 1 to 9 PIN 5 to 8
CENTER SWITCH FORWARD	PIN 1 to 6 PIN 5 to 3	PIN 1 to 6 PIN 5 to 3
CENTER SWITCH REARWARD	PIN 1 to 3 PIN 5 to 6	PIN 1 to 3 PIN 5 to 6
REAR RISER UP	PIN 1 to 7 PIN 5 to 10	PIN 1 to 7 PIN 5 to 10
REAR RISER DOWN	PIN 1 to 10 PIN 5 to 7	PIN 1 to 10 PIN 5 to 7

LEFT POWER SEAT SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Using a push pin remover or another suitable wide flat-bladed tool, gently pry the power seat switch knob off of the switch control levers (Fig. 5).

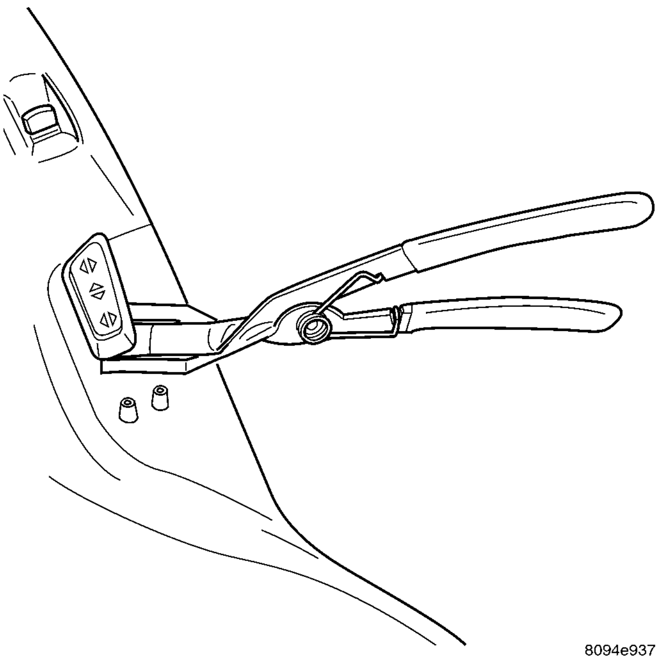

Fig. 5 Removing Power Seat Switch Control Knobs - Typical

(3) Remove the two forward-most screws that secure the outboard seat cushion side shield to the seat cushion frame.

(4) Remove the recliner handle retaining screw and remove the recliner handle.

(5) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power seat switch wire harness tie-strap and connector. Cut the tie-strap, if equipped.

(6) Disconnect the power seat wire harness connector from the power seat switch connector receptacle. Depress the connector retaining tab and pull straight apart.

(7) Using a very short phillips-headed screwdriver, remove the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield.

(8) Remove the power seat switch from the outboard seat cushion side shield.

INSTALLATION

(1) Reconnect the power seat wire harness connector to the power seat switch connector receptacle.

(2) Position the power seat switch onto the outboard seat cushion side shield. Make certain the alignment dowel is inserted into the corresponding hole in the power seat switch.

(3) Install and tighten the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the two screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) Install the recliner handle and retaining screw. Tighten the screws to 1.5 N·m (14 in. lbs.).

(7) Position the power seat switch knob onto the switch control levers and push firmly and evenly until it snaps into place.

(8) Reconnect the battery negative cable.

RIGHT POWER SEAT SWITCH

DESCRIPTION

Vehicles equipped with the power seat option utilize a six-way power seat switch. This six-way power seat switch features one seat cushion shaped knob, visible on the outboard seat cushion side shield.

The switch is secured to the back of the seat cushion side shield with two screws. However, the control knob must be removed before the seat switch can be removed from the side shield.

The individual switches internal to the power seat switch cannot be repaired. If one switch is damaged or faulty, the entire power seat switch unit must be replaced.

OPERATION

The power seat tracks can be adjusted in six different ways using the power seat switches. See the owner's manual in the vehicle glove box for more information on the power seat switch functions and the seat adjusting procedures.

RIGHT POWER SEAT SWITCH (Continued)

When a power seat switch control knob or knobs are actuated, a battery feed and a ground path are applied through the switch contacts to the power seat track adjuster motor. The selected adjuster motor operates to move the seat track through its drive unit in the selected direction until the switch is released, or until the travel limit of the seat track is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

No power seat switch should be held applied in any direction after the seat track has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

DIAGNOSIS AND TESTING - RIGHT POWER SEAT SWITCH

For complete circuit diagrams, refer to **Power Seat** in Wiring Diagrams.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power seat switch from the outboard seat cushion side shield.

(3) Use an ohmmeter to test the continuity of the power seat switch in each switch position. See the Power Seat Switch Continuity chart (Fig. 6) and switch (Fig. 7) below. If OK, refer to **Diagnosis and Testing the Power Seat Track** in this section. If not OK, replace the faulty power seat switch unit.

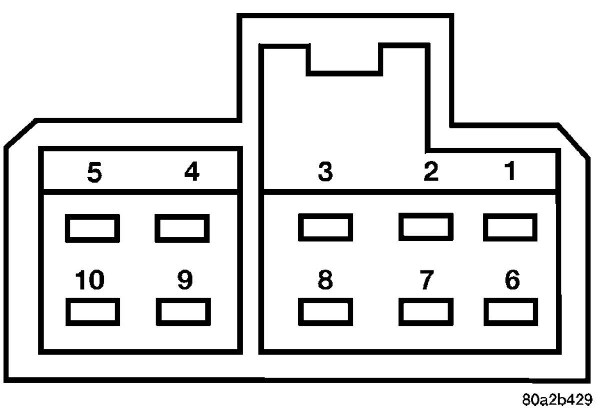

Fig. 6 Power Seat Switch Pin ID.

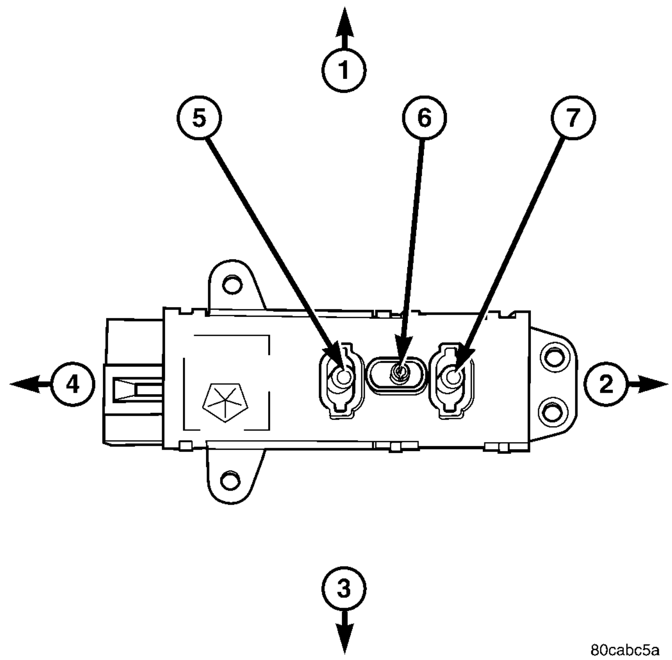

Fig. 7 Diagnosing Power Seat Switch

1 - UP
2 - REARWARD
3 - DOWN
4 - FORWARD
5 - FRONT RISER SWITCH
6 - CENTER SEAT SWITCH
7 - REAR RISER SWITCH

SWITCH POSITION	CONTINUITY BETWEEN PINS	
	DRIVER SEAT	PASSENGER SEAT
OFF	PIN 1 to 3 PIN 1 to 6 PIN 1 to 7 PIN 1 to 8 PIN 1 to 9 PIN 1 to 10	PIN 1 to 3 PIN 1 to 6 PIN 1 to 7 PIN 1 to 8 PIN 1 to 9 PIN 1 to 10
FRONT RISER UP	PIN 1 to 8 PIN 5 to 9	PIN 1 to 8 PIN 5 to 9
FRONT RISER DOWN	PIN 1 to 9 PIN 5 to 8	PIN 1 to 9 PIN 5 to 8
CENTER SWITCH FORWARD	PIN 1 to 6 PIN 5 to 3	PIN 1 to 6 PIN 5 to 3
CENTER SWITCH REARWARD	PIN 1 to 3 PIN 5 to 6	PIN 1 to 3 PIN 5 to 6
REAR RISER UP	PIN 1 to 7 PIN 5 to 10	PIN 1 to 7 PIN 5 to 10
REAR RISER DOWN	PIN 1 to 10 PIN 5 to 7	PIN 1 to 10 PIN 5 to 7

RIGHT POWER SEAT SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Using a push pin remover or another suitable wide flat-bladed tool, gently pry the power seat switch knob off of the switch control levers (Fig. 8).

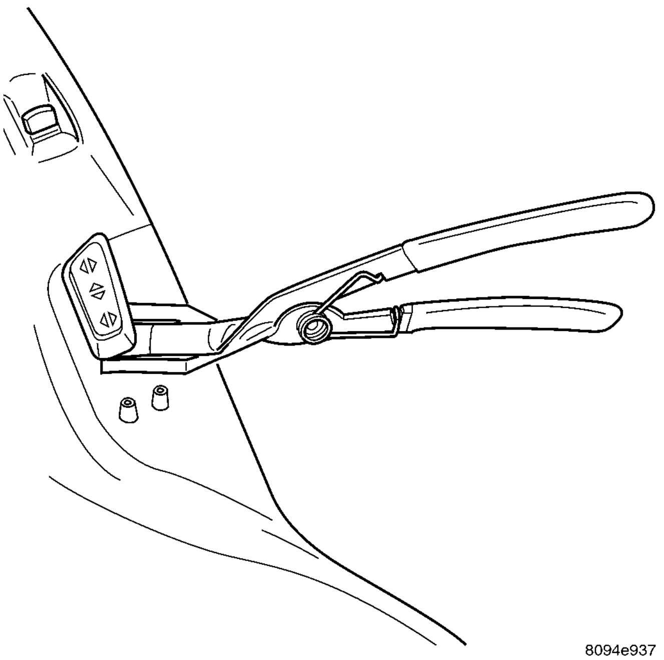

Fig. 8 Removing Power Seat Switch Control Knobs - Typical

(3) Remove the two forward-most screws that secure the outboard seat cushion side shield to the seat cushion frame.

(4) Remove the recliner handle retaining screw and remove the recliner handle.

(5) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power seat switch wire harness tie-strap and connector. Cut the tie-strap, if equipped.

(6) Disconnect the power seat wire harness connector from the power seat switch connector receptacle. Depress the connector retaining tab and pull straight apart.

(7) Using a very short phillips-headed screwdriver, remove the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield.

(8) Remove the power seat switch from the outboard seat cushion side shield.

INSTALLATION

(1) Reconnect the power seat wire harness connector to the power seat switch connector receptacle.

(2) Position the power seat switch onto the outboard seat cushion side shield. Make certain the alignment dowel is inserted into the corresponding hole in the power seat switch.

(3) Install and tighten the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the two screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) Install the recliner handle and retaining screw. Tighten the screws to 1.5 N·m (14 in. lbs.).

(7) Position the power seat switch knob onto the switch control levers and push firmly and evenly until it snaps into place.

(8) Reconnect the battery negative cable.

POWER SEAT TRACK

DESCRIPTION

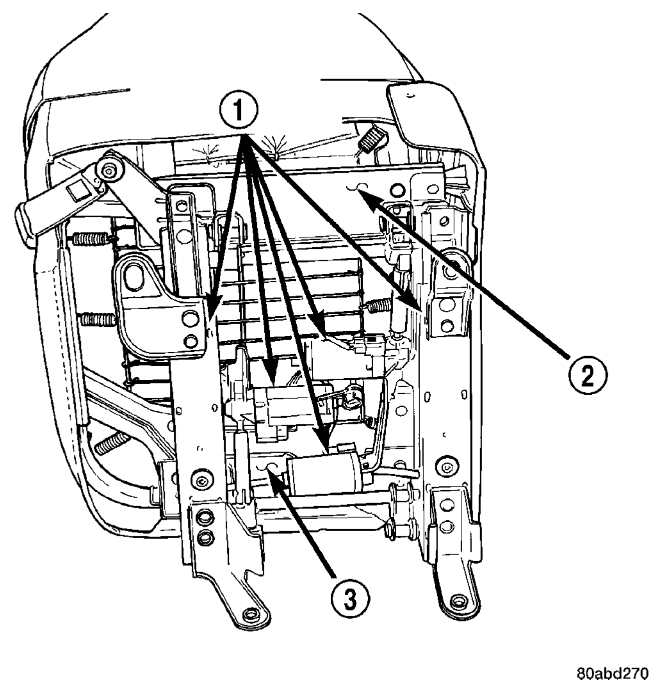

Fig. 9 Power Seat Track - Typical

1 - POWER SEAT ADJUSTER AND MOTORS
2 - SEAT CUSHION FRAME
3 - POWER SEAT TRACK ASSEMBLY

The six-way power seat option includes a power seat track assembly located under each front seat (Fig. 9). The power seat track assembly replaces the standard manually operated seat tracks. The lower half of the power seat track is secured at the front with two bolts to the floor panel seat cross member, and at the rear with one bolt and one nut to the floor

POWER SEAT TRACK (Continued)

panel. Four bolts secure the bottom of the seat cushion frame to the upper half of the power seat track unit.

The power seat track assembly cannot be repaired, and is serviced only as a complete assembly. If any component in this assembly is faulty or damaged, the entire power seat track must be replaced.

OPERATION

The power seat track unit includes three reversible electric motors that are secured to the upper half of the track unit. Each motor moves the seat adjuster through a combination of worm-drive gearboxes and screw-type drive units. Each of the three driver side power seat track motors also has a position potentiometer integral to the motor assembly, which electronically monitors the motor position.

The front and rear of the seat are operated by two separate vertical adjustment motors. These motors can be operated independently of each other, tilting the entire seat assembly forward or rearward; or, they can be operated in unison by selecting the proper power seat switch functions, which will raise or lower the entire seat assembly. The third motor is the horizontal adjustment motor, which moves the seat track in the forward and rearward directions.

DIAGNOSIS AND TESTING - POWER SEAT TRACK

(1) Remove the power seat switch from the seat (Refer to 8 - ELECTRICAL/POWER SEATS/DRIVER SEAT SWITCH - REMOVAL).

(2) Checking the body harness side of the power seat switch electrical connector (Fig. 10), check Pin 1 for ground and Pin 5 for battery voltage. If either of these two are not present repair the body harness as required.

(3) To test the seat motors and verify proper seat responses, refer to the Seat Motor Test table below. Using two jumper wires, connect one to a battery supply and the second to a ground. Connect the other ends to the seat wire harness connector as described in the Seat Motor Test table.

SEAT TRACK MOTOR TEST

SEAT SWITCH CONNECTOR			
CONNECT JUMPER		SEAT ACTION	
B(+)	B(–)	LEFT SIDE	RIGHT SIDE
PIN 9	PIN 8	FRONT RISER UP	FRONT RISER DOWN
PIN 8	PIN 9	FRONT RISER DOWN	FRONT RISER UP
PIN 3	PIN 6	FORWARD	FORWARD
PIN 6	PIN 3	REARWARD	REARWARD
PIN 10	PIN 7	REAR RISER UP	REAR RISER DOWN
PIN 7	PIN 10	REAR RISER DOWN	REAR RISER UP

REMOVAL

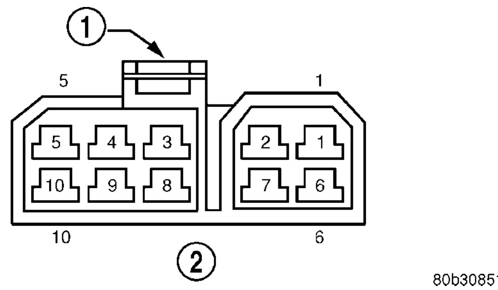

Fig. 10 Power Seat Switch Connector Pin ID.

1 - CONNECTOR RETAINING TAB
2 - VIEWED FROM BODY HARNESS END

(1) Remove the appropriate seat from the vehicle. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).

(2) Remove the seat cushion side shield from the seat (Refer to 23 - BODY/SEATS/SEAT CUSHION SIDE COVERS - REMOVAL).

(3) Remove four seat track mounting bolts from cushion pan.

(4) Disconnect the power seat electrical and remove the seat track from the seat cushion.

INSTALLATION

(1) Position the seat track and install the retaining bolts in the seat cushion pan. Torque the bolts to 45-60 N·m.

(2) Route and connect the power seat electrical on the seat track and cushion pan.

(3) Install the seat cushion side shield on the seat. Refer to the Body section for the procedure.

(4) Install the seat in the vehicle (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

(5) Connect the negative battery cable.

POWER WINDOWS

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POWER WINDOWS

DESCRIPTION

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on the center console. A master switch on the front of the center console allows the driver to raise or lower each of the passenger door windows and to lock out the individual switches on the rear of the center console from operation. The power window system receives battery feed through fuse 13 in the Power Distribution Center (PDC), only when the ignition switch is in the RUN or ACCESSORY position.

OPERATION

WINDOW SWITCH

The power window switches control the battery and ground feeds to the power window motors. Both of the rear door power window switches receive their battery and ground feeds through the circuitry of the front window switch. When the power window lock-out switch is in the Lock position, the battery feed for the rear door window switches is interrupted.

WINDOW MOTOR

Front door window lift motors use permanent type magnets. The B+ and ground applied at the motor terminal pins will cause the motor to rotate in one direction. Reversing current through the motor terminals will cause the motor to rotate in the opposite direction.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - POWER WINDOWS

WIRING VOLTAGE TEST

The following wiring test determines whether or not voltage is continuous through the body harness to the front switch.

(1) Remove the power window switch and bezel (Refer to 8 - ELECTRICAL/POWER WINDOWS/ POWER WINDOW SWITCH - REMOVAL).

(2) Disconnect wire connector from back of power window switch.

(3) Switch ignition to the ON position.

(4) Connect the clip end of a 12 volt test light to Pin 14 of the window switch harness connector. Touch the test light probe to Pin 10.

- If the test light illuminates, the wiring circuit between the battery and switch is OK.
- If the lamp does not illuminate, first check fuse 13 in the Power Distribution Center (PDC). If fuse 13 is OK, then check for a broken wire.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

POWER WINDOW MOTOR TEST

If the power window motor is receiving proper current and ground and does not operate, proceed with motor test. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove front door trim panel as necessary to gain access to power window motor wire connector

POWER WINDOWS (Continued)

(Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(2) Disconnect power window motor wire connector from door harness.

(3) Using two jumper wires, connect one to a battery (+) source and the other to a good ground (-).

(4) Connect the Negative (-) jumper probe to one of the motor connector terminals.

(5) Momentarily touch the Positive (+) jumper probe to the other motor connector terminal.

When positive probe is connected the motor should rotate in one direction to either move window up or down. If window is all the way up or down the motor will grunt and the inner door panel will flex when actuated in that one direction.

(6) Reverse jumper probes at the motor connector terminals and window should now move in opposite direction. If window does not move or grunt, replace the motor.

If window moved completely up or down, reverse the jumper probes and cycle window to the opposite position to verify full operation.

If motor grunts and does not move, verify that regulator is not binding.

WINDOW MOTOR

REMOVAL

The window motor is incorporated into the window regulator assembly. If the window motor requires replacement, the window regulator must be replaced. (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - REMOVAL).

WINDOW SWITCH

DIAGNOSIS AND TESTING - WINDOW SWITCH

(1) Remove the switch to be tested (Refer to 8 - ELECTRICAL/POWER WINDOWS/POWER WINDOW SWITCH - REMOVAL).

(2) Using an ohmmeter, Test front switch for continuity (Fig. 1).

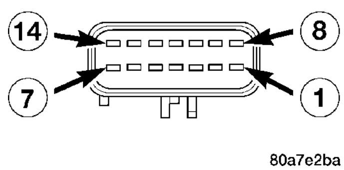

Fig. 1 FRONT WINDOW SWITCH

POWER WINDOW FRONT SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN
OFF	14 AND 4
	14 AND 5
	14 AND 6
	14 AND 7
	14 AND 9
	14 AND 11
	14 AND 12
	14 AND 13
LEFT FRONT UP	10 AND 11
LEFT FRONT DOWN	10 AND 9
RIGHT FRONT UP	10 AND 12
RIGHT FRONT DOWN	10 AND 13
LEFT REAR UP	10 AND 5
LEFT REAR DOWN	10 AND 4
RIGHT REAR UP	10 AND 7
RIGHT REAR DOWN	10 AND 6
LOCKOUT (LOCKED)	NO CONTINUITY BETWEEN 10 AND 2
LOCKOUT (UNLOCKED)	10 AND 2

(3) If the proper results are not obtained, replace the front window switch.

(4) Test rear switch for continuity (Fig. 2).

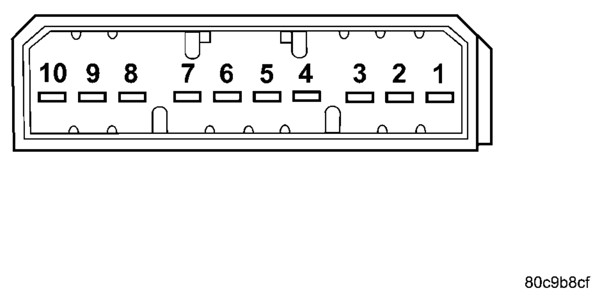

Fig. 2 REAR WINDOW SWITCH

POWER WINDOW REAR SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN
OFF	1 AND 3
	4 AND 2
	7 AND 10
	8 AND 9

WINDOW SWITCH (Continued)

SWITCH POSITION	CONTINUITY BETWEEN
LEFT UP	10 AND 6
LEFT DOWN	6 AND 8
RIGHT UP	5 AND 2
RIGHT DOWN	5 AND 3

(5) If the proper results are not obtained, replace the rear window switch.

The power window master switch has a Auto-Down feature on both front windows. The switch is equipped with two detent positions when actuating the power window OPEN. The first detent position allows the window to roll down and stop when the switch is released. The second detent position actuates an integral express roll down relay that rolls the window down after the switch is released. When the express down circuit senses stall current (window has reached end of down travel), the switch will turn current off to the motor. The AUTO feature can be cancelled by actuating the switch UP or DOWN while window is in motion. If the electronic circuit in the switch fails to detect a stall current, the auto down circuit will time out within 9 to 14 seconds.

REMOVAL

FRONT

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick, gently pry the switch from the console (Fig. 3).

(3) Disconnect electrical harness connector.

REAR

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick, gently pry the switch from the console (Fig. 4).

(3) Disconnect electrical harness connector.

INSTALLATION

FRONT

(1) Connect electrical harness connector to switch. Slide connector lock into position.

(2) Install switch into opening in console and press into place.

(3) Connect battery negative cable.

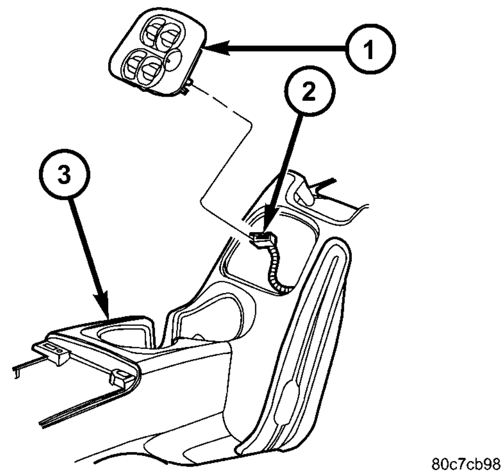

Fig. 3 FRONT WINDOW SWITCH

1 - FRONT WINDOW SWITCH
2 - ELECTRICAL CONNECTOR
3 - CENTER CONSOLE

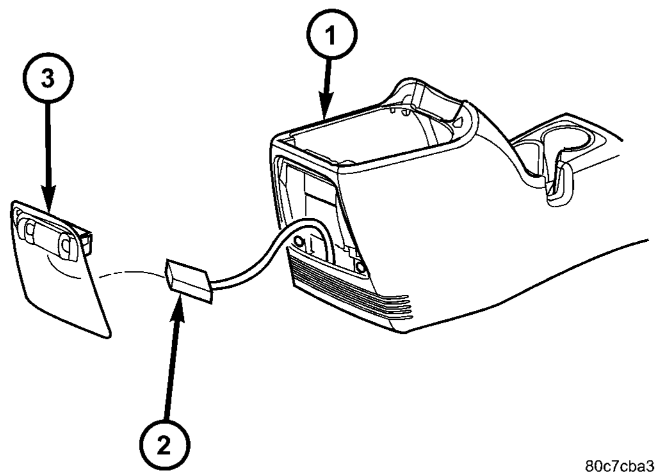

Fig. 4 REAR WINDOW SWITCH

1 - CENTER CONSOLE
2 - ELECTRICAL CONNECTOR
3 - REAR WINDOW SWITCH

REAR

(1) Connect electrical harness connector to switch.

(2) Install switch into opening in console and press into place.

(3) Connect battery negative cable.

(Continued)

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RESTRAINTS

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RESTRAINTS

DESCRIPTION

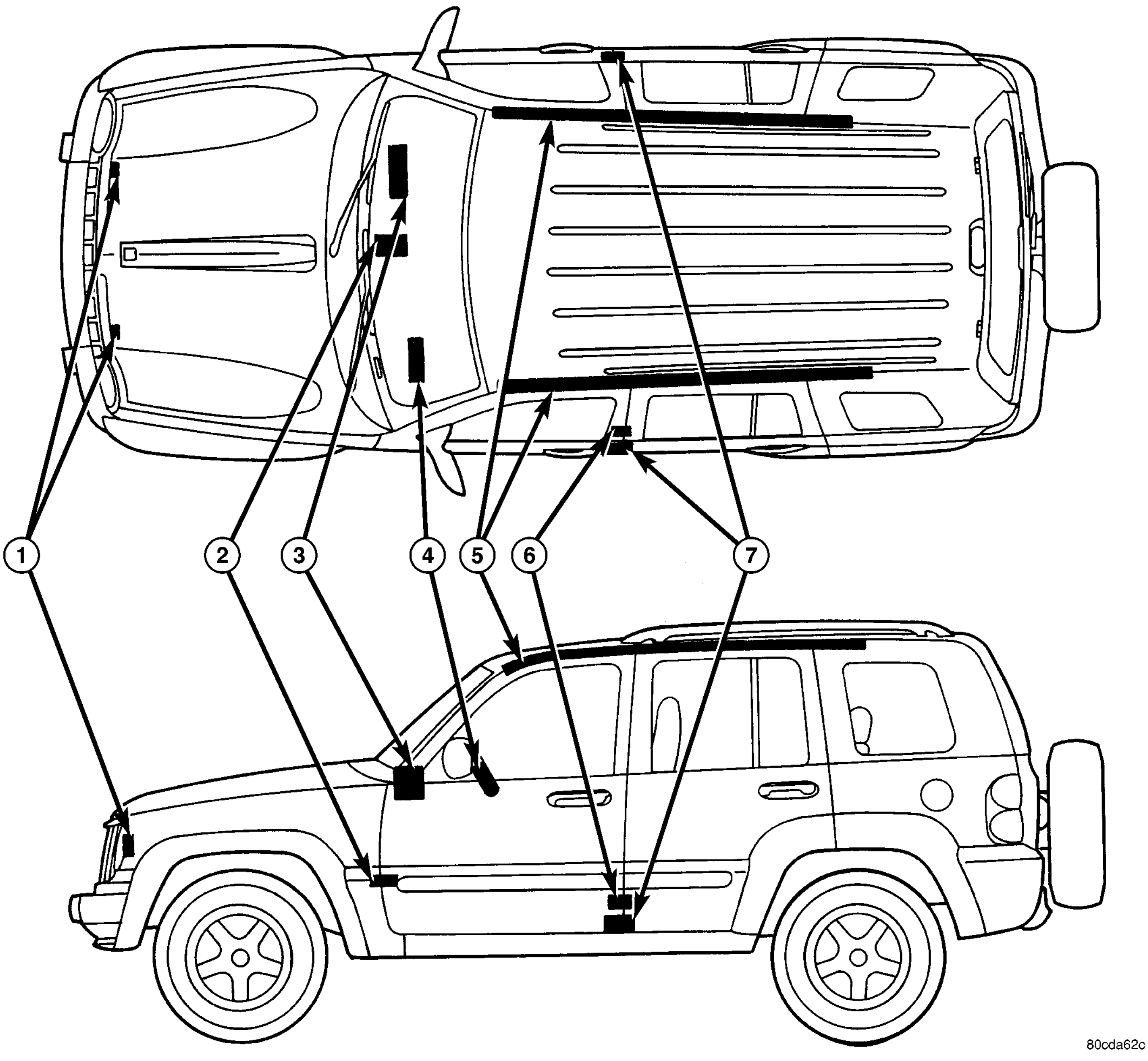

Fig. 1 Supplemental Restraint System

1 - FRONT IMPACT SENSOR (2)
2 - AIRBAG CONTROL MODULE
3 - PASSENGER AIRBAG
4 - DRIVER AIRBAG
5 - SIDE CURTAIN AIRBAG (2)
6 - DRIVER SEAT BELT TENSIONER
7 - SIDE IMPACT AIRBAG CONTROL MODULE (2)

An occupant restraint system is standard factory-installed safety equipment on this model. Available occupant restraints for this model include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed (Fig. 1).

RESTRAINTS (Continued)

ACTIVE RESTRAINTS

The active restraints for this model include:

• **Front Seat Belts** - Both front seating positions are equipped with three-point seat belt systems employing a lower B-pillar mounted inertia latch-type retractor, height-adjustable upper B-pillar mounted turning loops, a traveling lower seat belt anchor secured to the outboard side of the seat frame, and a traveling end-release seat belt buckle secured to the inboard side of the seat frame. The driver side front seat belt buckle includes an integral Hall-effect seat belt switch that detects whether the driver side front seat belt has been fastened.

• **Rear Seat Belts** - All three rear seating positions are equipped with three-point seat belt systems. The outboard seating position belts employ a lower C-pillar mounted inertia latch-type retractor, a fixed position upper C-pillar mounted turning loop, and a fixed lower seat belt anchor secured to the floor panel. The rear seat center seating position belt has an inertia latch-type retractor that is integral to the rear seat back panel, and a cable from the seat back latch locks the center belt retractor spool unless the seat back is fully latched. The rear seat center seating position belt lower anchor is secured to the floor panel. All three rear seat belts have fixed end-release seat belt buckles secured to the floor panel, a single buckle unit on the right side and a double buckle unit on the left side.

• **Child Restraint Anchors** - All vehicles are equipped with three, fixed-position, child seat upper tether anchors. Two anchors are integral to the back of the right rear seat back panel, and one is integral to the left rear seat back panel. Two lower anchors are also provided for each rear outboard seating position on all models. These lower anchors are accessed from the front of the rear seat where the seat back meets the seat cushion. Two lower anchors are integral to the right rear seat back panel, and two are integral to the left rear seat back panel.

PASSIVE RESTRAINTS

The passive restraints available for this model include the following:

• **Dual Front Airbags** - Multistage driver and front passenger airbags are available for this model. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by the “SRS - AIRBAG” logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag door on the instrument panel above the glove box (Fig. 2). Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the instrument cluster for about seven seconds as a bulb test each time the ignition switch is turned to the On position. A pyrotechnic-type seat belt tensioner is integral to the driver side front seat belt retractor mounted on the lower B-pillar of all models equipped with dual front airbags.

• **Side Curtain Airbags** - Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located on the headliner above each B-pillar (Fig. 2).

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Fig. 2 SRS Logo

The supplemental restraint system includes the following major components, which are described in further detail elsewhere in this service information:

• **Airbag Control Module** - The Airbag Control Module (ACM) is also sometimes referred to as the Occupant Restraint Controller (ORC). The ACM is located on a mount on the floor panel transmission tunnel, below the center of the instrument panel.

• **Airbag Indicator** - The airbag indicator is integral to the ElectroMechanical Instrument Cluster (EMIC), which is located on the instrument panel in front of the driver.

• **Clockspring** - The clockspring is located near the top of the steering column, directly beneath the steering wheel.

• **Driver Airbag** - The driver airbag is located in the center of the steering wheel, beneath the driver airbag trim cover.

• **Driver Knee Blocker** - The driver knee blocker is a structural unit secured to the back side of and integral to the instrument panel steering column opening cover.

• **Front Impact Sensor** - Two front impact sensors are used on vehicles equipped with dual front airbags, one left side and one right side. One sensor

RESTRAINTS (Continued)

is located on the back side of each vertical member of the radiator support.

- **Passenger Airbag** - The passenger airbag is located on the instrument panel, beneath the passenger airbag door on the instrument panel above the glove box on the passenger side of the vehicle.
- **Passenger Knee Blocker** - The passenger knee blocker is a structural reinforcement that is integral to and concealed within the glove box door.
- **Seat Belt Tensioner** - The seat belt tensioner is integral to the driver side front seat belt retractor unit on vehicles equipped with dual front airbags.
- **Side Impact Airbag Control Module** - Two Side Impact Airbag Control Modules (SIACM) are used on vehicles equipped with the optional side curtain airbags, one left side and one right side. One SIACM is located behind the B-pillar trim near the base of each B-pillar.
- **Side Curtain Airbag** - In vehicles equipped with this option, a side curtain airbag is located on each inside roof side rail above the headliner, and extends from the A-pillar to just beyond the C-pillar.

The ACM, both SIACMs, and the EMIC each contain a central processing unit and programming that allow them to communicate with each other using the Programmable Communications Interface (PCI) data bus network. This method of communication is used by the ACM for control of the airbag indicator on all models equipped with dual front airbags. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION).

Hard wired circuitry connects the supplemental restraint system components to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system, and to the supplemental restraint system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

ACTIVE RESTRAINTS

The primary passenger restraints in this or any other vehicle are the standard equipment factory-installed seat belts and child restraint anchors. Seat belts and child restraint anchors are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them. See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed active restraints.

PASSIVE RESTRAINTS

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle **only** when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the factory-installed supplemental restraint system.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Airbag Control Module (ACM) and, on vehicles equipped with the side curtain airbags, both Side Impact Airbag Control Modules (SIACM). An airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the airbag indicator is turned on or off by the ACM to indicate the status of the supplemental restraint system. If the airbag indicator comes on at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the supplemental restraints depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of deceleration as measured by the forces of gravity (G force) upon the impact sensors. When an impact is severe enough, the microprocessor in the ACM or the SIACM signals the inflator of the appropriate airbag units to deploy their airbag cushions. The driver side front seat belt tensioner is provided with a deployment signal by the ACM in conjunction with the driver airbag. During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the front seat passenger to the structure of the instrument panel.

RESTRAINTS (Continued)

The seat belt tensioner removes the slack from the driver side front seat belt to provide further assurance that the driver is properly positioned and restrained for an airbag deployment.

Typically, the vehicle occupants recall more about the events preceding and following a collision than they do of an airbag deployment itself. This is because the airbag deployment and deflation occur so rapidly. In a typical 48 kilometer-per-hour (30 mile-per-hour) barrier impact, from the moment of impact until the airbags are fully inflated takes about 40 milliseconds. Within one to two seconds from the moment of impact, the airbags are almost entirely deflated. The times cited for these events are approximations, which apply only to a barrier impact at the given speed. Actual times will vary somewhat, depending upon the vehicle speed, impact angle, severity of the impact, and the type of collision.

When the ACM monitors a problem in any of the dual front airbag system circuits or components, including the seat belt tensioner, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit and sends an electronic message to the EMIC to turn on the airbag indicator. When the SIACM monitors a problem in any of the side curtain airbag system circuits or components, it stores a fault code or DTC in its memory circuit and sends an electronic message to the ACM, and the ACM sends an electronic message to the EMIC to turn on the airbag indicator. Proper testing of the supplemental restraint system components, the Programmable Communications Interface (PCI) data bus, the electronic message inputs to and outputs from the EMIC, the SIACM, or the ACM, as well as the retrieval or erasure of a DTC from the ACM, SIACM, or EMIC requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed passive restraints.

WARNING

WARNINGS - RESTRAINT SYSTEM

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: AN AIRBAG INFLATOR UNIT MAY CONTAIN SODIUM AZIDE AND POTASSIUM NITRATE. THESE MATERIALS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES (SODIUM HYDROXIDE IS FORMED IN THE PRESENCE OF MOISTURE) OR COMBUSTIBLE COMPOUNDS. AN AIRBAG INFLATOR UNIT MAY ALSO CONTAIN A GAS CANISTER PRESSURIZED TO OVER 2500 PSI. DO NOT ATTEMPT TO DISMANTLE AN AIRBAG UNIT OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93° C (200° F).

WARNING: WHEN HANDLING A SEAT BELT TENSIONER RETRACTOR, PROPER CARE SHOULD BE EXERCISED TO KEEP FINGERS OUT FROM UNDER THE RETRACTOR COVER AND AWAY FROM THE SEAT BELT WEBBING WHERE IT EXITS FROM THE RETRACTOR COVER.

RESTRAINTS (Continued)

WARNING: REPLACE ALL RESTRAINT SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.

WARNING: THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE RESTRAINT SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE RESTRAINT SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

WARNING: WHEN A STEERING COLUMN HAS AN AIRBAG UNIT ATTACHED, NEVER PLACE THE COLUMN ON THE FLOOR OR ANY OTHER SURFACE WITH THE STEERING WHEEL OR AIRBAG UNIT FACE DOWN.

DIAGNOSIS AND TESTING - SUPPLEMENTAL RESTRAINT SYSTEM

Proper diagnosis and testing of the supplemental restraint system components, the Programmable Communications Interface (PCI) data bus, the data bus electronic message inputs to and outputs from the ElectroMechanical Instrument Cluster (EMIC), the Airbag Control Module (ACM), or the Side Impact Airbag Control Module (SIACM) as well as the retrieval or erasure of a Diagnostic Trouble Code (DTC) from the ACM or SIACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

STANDARD PROCEDURE

STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS

At no time should any source of electricity be permitted near the inflator on the back of a non-deployed airbag or seat belt tensioner. When carrying a non-deployed airbag, the trim cover or airbag cushion side of the unit should be pointed away from the body to minimize injury in the event of an accidental deployment. If the airbag unit is placed on a bench or any other surface, the trim cover or airbag cushion side of the unit should be face up to minimize movement in the event of an accidental deployment. When handling a non-deployed seat belt tensioner, take proper care to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover. In addition, the supplemental restraint system should be disarmed whenever any steering wheel, steering column, seat belt tensioner, driver airbag, passenger airbag, front impact sensor, side curtain airbag, or instrument panel components require diagnosis or service. Failure to observe this warning could result in accidental airbag deployment and possible personal injury.

All damaged, faulty or non-deployed airbags and seat belt tensioners which are replaced on vehicles are to be handled and disposed of properly. If an airbag or seat belt tensioner unit is faulty or damaged and non-deployed, refer to the Hazardous Substance Control System for proper disposal. Dispose of all non-deployed and deployed airbags and seat belt tensioners in a manner consistent with state, provincial, local and federal regulations.

SUPPLEMENTAL RESTRAINT STORAGE

Airbags and seat belt tensioners must be stored in their original, special container until they are used for service. Also, they must be stored in a clean, dry environment; away from sources of extreme heat, sparks, and high electrical energy. Always place or store any airbag on a surface with its trim cover or airbag cushion side facing up, to minimize movement in case of an accidental deployment.

RESTRAINTS (Continued)

STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT

Any vehicle which is to be returned to use following a supplemental restraint deployment, must have the deployed restraints replaced. In addition, if the driver airbag has been deployed, the clockspring must be replaced. If the passenger airbag is deployed, the passenger airbag door and both passenger airbag mounting brackets must be replaced. If a side curtain airbag has been deployed, the complete airbag unit, the headliner, as well as the upper A, B, C and D-pillar trim must be replaced. These components are not intended for reuse and will be damaged or weakened as a result of a supplemental restraint deployment, which may or may not be obvious during a visual inspection.

On vehicles with an optional sunroof, the sunroof drain tubes and hoses must be closely inspected following a side curtain airbag deployment. It is also critical that the mounting surfaces and/or mounting brackets for the Airbag Control Module (ACM), Side Impact Airbag Control Module (SIACM), and front impact sensors be closely inspected and restored to their original conditions following any vehicle impact damage. Because the ACM, SIACM, and each front impact sensor are used by the supplemental restraint system to monitor or confirm the direction and severity of a vehicle impact, improper orientation or insecure fastening of these components may cause airbags not to deploy when required, or to deploy when not required.

All other vehicle components should be closely inspected following any other supplemental restraint deployment, but are to be replaced only as required by the extent of the visible damage incurred.

AIRBAG SQUIB STATUS

Multistage airbags with multiple initiators (squibs) must be checked to determine that all squibs were used during the deployment event. The driver and passenger airbags in this model are deployed by electrical signals generated by the Airbag Control Module (ACM) through the driver or passenger squib 1 and squib 2 circuits to the two initiators in the airbag inflators. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used due to an airbag system fault; therefore, it is always necessary to confirm that both initiators have been used in order to avoid the improper handling or disposal of potentially live pyrotechnic or hazardous materials. The following procedure should be performed using a DRBIII® scan tool to verify the status of both airbag squibs before either deployed airbag is removed from the vehicle for disposal.

CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to the Hazardous Substance Control System for proper disposal procedures. Dispose of all non-deployed and deployed airbags and seat belt tensioners in a manner consistent with state, provincial, local, and federal regulations.

(1) Be certain that the DRBIII® scan tool contains the latest version of the proper DRBIII® software. Connect the DRBIII® to the 16-way Data Link Connector (DLC). The DLC is located on the driver side lower edge of the instrument panel, outboard of the steering column.

(2) Turn the ignition switch to the On position.

(3) Using the DRBIII®, read and record the active (current) Diagnostic Trouble Code (DTC) data.

Using the active DTC information, refer to the **Airbag Squib Status** table to determine the status of both driver and/or passenger airbag squibs.

<table>
<tr><th colspan="3">AIRBAG SQUIB STATUS</th></tr>
<tr><th>IF the Active DTC is:</th><th>Conditions</th><th>Squib Status</th></tr>
<tr><td>Driver or Passenger Squib 1 open</td><td rowspan="2">AND the stored DTC minutes for both Driver or Passenger squibs are within 15 minutes of each other</td><td rowspan="2">Both Squib 1 and 2 were used.</td></tr>
<tr><td>Driver or Passenger Squib 2 open</td></tr>
<tr><td>Driver or Passenger Squib 1 open</td><td rowspan="2">AND the stored DTC minutes for Driver or Passenger Squib 2 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 1 by 15 minutes or more</td><td rowspan="2">Squib 1 was used; Squib 2 is live.</td></tr>
<tr><td>Driver or Passenger Squib 2 open</td></tr>
</table>

RESTRAINTS (Continued)

AIRBAG SQUIB STATUS		
IF the Active DTC is:	**Conditions**	**Squib Status**
Driver or Passenger Squib 1 open	**AND** the stored DTC minutes for Driver or Passenger Squib 1 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 2 by 15 minutes or more	Squib 1 is live; Squib 2 was used.
Driver or Passenger Squib 2 open		
Driver or Passenger Squib 1 open	**AND** Driver or Passenger Squib 2 open is NOT an active code	Squib 1 was used; Squib 2 is live.
Driver or Passenger Squib 2 open	**AND** Driver or Passenger Squib 1 open is NOT an active code	Squib 1 is live; Squib 2 was used.

If none of the Driver or Passenger Squib 1 or 2 open are active codes, the status of the airbag squibs is unknown. In this case the airbag should be handled and disposed of as if the squibs were both live.

CLEANUP PROCEDURE

Following a supplemental restraint deployment, the vehicle interior will contain a powdery residue. This residue consists primarily of harmless particulate by-products of the small pyrotechnic charge that initiates the propellant used to deploy a supplemental restraint. However, this residue may also contain traces of sodium hydroxide powder, a chemical by-product of the propellant material that is used to generate the inert gas that inflates the airbag. Since sodium hydroxide powder can irritate the skin, eyes, nose, or throat, be sure to wear safety glasses, rubber gloves, and a long-sleeved shirt during cleanup (Fig. 3).

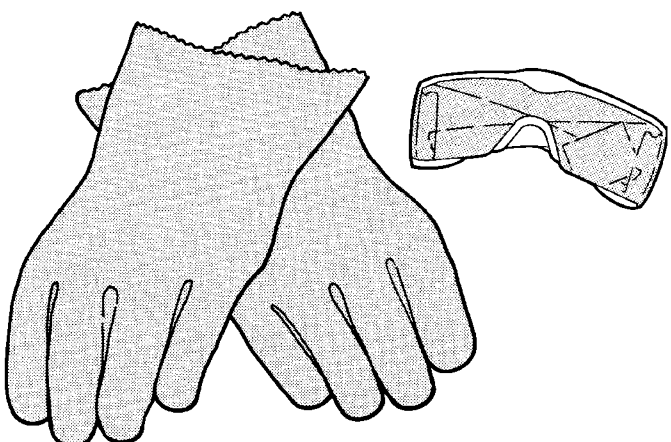

Fig. 3 Wear Safety Glasses and Rubber Gloves - Typical

WARNING: IF YOU EXPERIENCE SKIN IRRITATION DURING CLEANUP, RUN COOL WATER OVER THE AFFECTED AREA. ALSO, IF YOU EXPERIENCE IRRITATION OF THE NOSE OR THROAT, EXIT THE VEHICLE FOR FRESH AIR UNTIL THE IRRITATION CEASES. IF IRRITATION CONTINUES, SEE A PHYSICIAN.

(1) Begin the cleanup by using a vacuum cleaner to remove any residual powder from the vehicle interior. Clean from outside the vehicle and work your way inside, so that you avoid kneeling or sitting on a non-cleaned area.

(2) Be certain to vacuum the heater and air conditioning outlets as well (Fig. 4). Run the heater and air conditioner blower on the lowest speed setting and vacuum any powder expelled from the outlets.

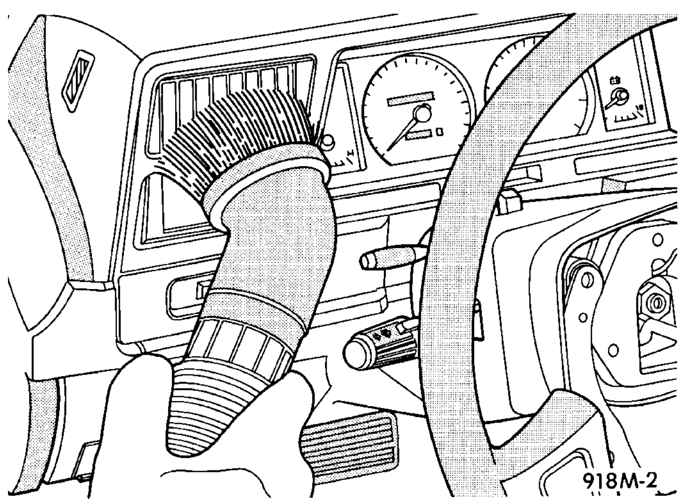

Fig. 4 Vacuum Heater and A/C Outlets - Typical

RESTRAINTS (Continued)

CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to AIRBAG SQUIB STATUS . All damaged, faulty, or non-deployed supplemental restraints which are replaced on vehicles are to be handled and disposed of properly. If an airbag or seat belt tensioner unit is faulty or damaged and non-deployed, refer to the Hazardous Substance Control System for proper disposal. Be certain to dispose of all non-deployed and deployed supplemental restraints in a manner consistent with state, provincial, local and federal regulations.

(3) Next, remove the deployed supplemental restraints from the vehicle. Refer to the appropriate service removal procedures.

(4) You may need to vacuum the interior of the vehicle a second time to recover all of the powder.

STANDARD PROCEDURE - VERIFICATION TEST

The following procedure should be performed using a DRBIII® scan tool to verify proper supplemental restraint system operation following the service or replacement of any supplemental restraint system component.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) During the following test, the battery negative cable remains disconnected and isolated, as it was during the supplemental restraint system component removal and installation procedures.

(2) Be certain that the DRBIII® scan tool contains the latest version of the proper DRBIII® software. Connect the DRBIII® to the 16-way Data Link Connector (DLC). The DLC is located on the driver side lower edge of the instrument panel, outboard of the steering column (Fig. 5).

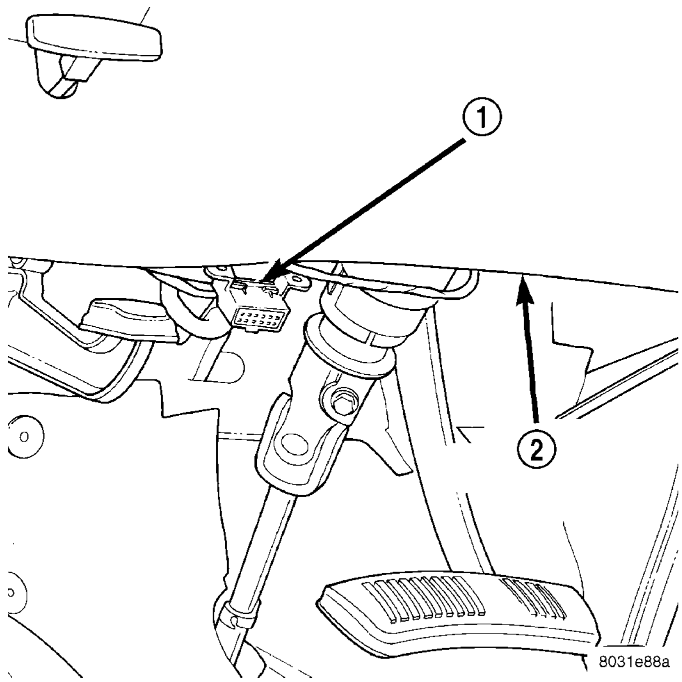

Fig. 5 16-Way Data Link Connector - Typical

1 - 16–WAY DATA LINK CONNECTOR
2 - BOTTOM OF INSTRUMENT PANEL

(3) Turn the ignition switch to the On position and exit the vehicle with the DRBIII® scan tool.

(4) Check to be certain that nobody is in the vehicle, then reconnect the battery negative cable.

(5) Using the DRBIII®, read and record the active (current) Diagnostic Trouble Code (DTC) data.

NOTE: All service replacement Airbag Control Modules (ACM) are shipped configured for the optional side curtain airbag feature. If a service replacement ACM is installed in a vehicle that is not equipped with the optional side curtain airbags, the airbag indicator will illuminate and "No Right SIACM" and "No Left SIACM" DTCs will be registered. The ACM must be configured to electronically disable the side curtain airbag feature using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

(6) Next, use the DRBIII® to read and record any stored (historical) DTC data.

(7) If any DTC is found in Step 5 or Step 6, refer to the appropriate diagnostic information.

(8) Use the DRBIII® to erase the stored DTC data. If any problems remain, the stored DTC data will not erase. Refer to the appropriate diagnostic information to diagnose any stored DTC that will not erase. If the stored DTC information is successfully erased, go to Step 9.

RESTRAINTS (Continued)

(9) Turn the ignition switch to the Off position for about fifteen seconds, and then back to the On position. Observe the airbag indicator in the instrument cluster. It should illuminate for six to eight seconds, and then go out. This indicates that the supplemental restraint system is functioning normally and that the repairs are complete. If the airbag indicator fails to light, or lights and stays on, there is still an active supplemental restraint system fault or malfunction. Refer to the appropriate diagnostic information to diagnose the problem.

AIRBAG CONTROL MODULE

DESCRIPTION

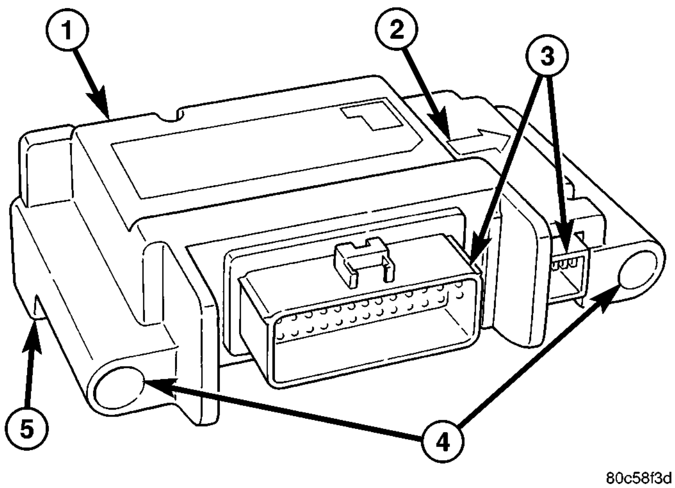

Fig. 6 Airbag Control Module

1 - AIRBAG CONTROL MODULE
2 - ORIENTATION ARROW
3 - CONNECTOR RECEPTACLE (2)
4 - MOUNTING HOLE (2)
5 - GROUND LUG

The Airbag Control Module (ACM) is also sometimes referred to as the Occupant Restraint Controller (ORC) (Fig. 6). The ACM is secured with two long screws within a tray-like stamped steel mounting bracket welded onto the top of the floor panel transmission tunnel forward of the instrument panel center support bracket and below the instrument panel center stack in the passenger compartment of the vehicle. Concealed within a hollow in the center of the die cast aluminum ACM housing is the electronic circuitry of the ACM which includes a microprocessor, an electronic impact sensor, an electromechanical safing sensor, and an energy storage capacitor. A stamped metal cover plate is secured to the bottom of the ACM housing with four screws to enclose and protect the internal electronic circuitry and components.

The ACM housing also has an integral ground lug with a tapped hole that protrudes from the lower left rear corner of the unit. This lug provides a case ground to the ACM when a ground screw is installed through the left side of the mounting bracket. An arrow cast into the top of the ACM housing near the front provides a visual verification of the proper orientation of the unit, and should always be pointed toward the front of the vehicle. Two molded plastic electrical connector receptacles exit the right side of the ACM housing. The smaller of the two receptacles contains twelve terminal pins, while the larger one contains twenty-three. These terminal pins connect the ACM to the vehicle electrical system through two dedicated take outs and connectors of the instrument panel wire harness.

A molded rubber protective cover is installed loosely over the ACM to protect the unit from condensation or coolant leaking from a damaged or faulty heater-air conditioner unit housing. An integral flange on the left side of the cover is secured to the floor panel transmission tunnel with a short piece of double-faced tape as an assembly aid during the manufacturing process, but this tape does not require replacement following service removal.

The impact sensor and safing sensor internal to the ACM are calibrated for the specific vehicle, and are only serviced as a unit with the ACM. All service replacement ACMs are shipped configured for the optional side curtain airbag feature. If a service replacement ACM is installed in a vehicle that is not equipped with the optional side curtain airbags, the ACM must be configured to electronically disable the side curtain airbag feature using a DRBIII® scan tool. Refer to the appropriate diagnostic information. The ACM cannot be repaired or adjusted and, if damaged or faulty, it must be replaced. The ACM cover is available for individual service replacement.

OPERATION

The microprocessor in the Airbag Control Module (ACM) contains the front supplemental restraint system logic circuits and controls all of the front supplemental restraint system components. The ACM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the DRBIII® scan tool using the Programmable Communications Interface (PCI) data bus network. This method of communication is used for control of the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and for supplemental restraint system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/AIRBAG INDICATOR - OPERATION).

AIRBAG CONTROL MODULE (Continued)

The ACM microprocessor continuously monitors all of the front supplemental restraint system electrical circuits to determine the system readiness. If the ACM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the EMIC over the PCI data bus to turn on the airbag indicator. An active fault only remains for the duration of the fault, or in some cases, the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ACM. For some DTCs, if a fault does not recur for a number of ignition cycles, the ACM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The ACM also monitors a Hall effect-type seat belt switch located in the buckle of the driver side front seat belt to determine whether that seat belt is buckled, and provides an input to the EMIC over the PCI data bus to control the seatbelt indicator operation based upon the status of the driver side front seat belt switch. On models equipped with optional side curtain airbags, the ACM communicates with both the left and right Side Impact Airbag Control Modules (SIACM) over the PCI data bus. The SIACM notifies the ACM when it has detected a monitored system fault and stored a DTC in memory for its respective side curtain airbag system, and the ACM sets a DTC and controls the airbag indicator operation accordingly.

The ACM receives battery current through two circuits; a fused ignition switch output (run) circuit through a fuse in the Junction Block (JB), and a fused ignition switch output (run-start) circuit through a second fuse in the JB. The ACM has a case ground through a lug on the bottom of the ACM housing that is secured with a ground screw to the left side of the ACM mounting bracket. The ACM also receives a power ground through a ground circuit and take out of the instrument panel wire harness. This take out has a single eyelet terminal connector that is secured by a second ground screw to the left side of the ACM mounting bracket. These connections allow the ACM to be operational whenever the ignition switch is in the Start or On positions.

The ACM also contains an energy-storage capacitor. When the ignition switch is in the Start or On positions, this capacitor is continually being charged with enough electrical energy to deploy the front supplemental restraint components for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup supplemental restraint system protection in case there is a loss of battery current supply to the ACM during an impact.

Two sensors are contained within the ACM, an electronic impact sensor and a safing sensor. The ACM also monitors inputs from two remote front impact sensors located on the back of the right and left vertical members of the radiator support near the front of the vehicle. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact.

The safing sensor is an electromechanical sensor within the ACM that provides an additional logic input to the ACM microprocessor. The safing sensor is used to verify the need for a front supplemental restraint deployment by detecting impact energy of a lesser magnitude than that of the electronic impact sensors, and must be closed in order for the front airbags or the seat belt tensioner to deploy.

A pre-programmed decision algorithm in the ACM microprocessor determines when the deceleration rate as signaled by the impact sensors and the safing sensor indicate an impact that is severe enough to require front supplemental restraint system protection and, based upon the status of the driver side front seat belt switch input and the severity of the monitored impact, determines what combination of driver seat belt tensioner and front airbag deployment is required for each front seating position. When the programmed conditions are met, the ACM sends the proper electrical signals to deploy the driver seat belt tensioner and the dual multistage front airbags at the programmed force levels.

The hard wired inputs and outputs for the ACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ACM, the PCI data bus network, or the electronic message inputs to and outputs from the ACM. The most reliable, efficient, and accurate means to diagnose the ACM, the PCI data bus network, and the electronic message inputs to and outputs from the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

AIRBAG CONTROL MODULE (Continued)

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the center console from the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(3) From the left side of the floor panel transmission tunnel, remove the Airbag Control Module (ACM) cover from the ACM (Fig. 7). The cover flange is secured to the silencer pad on the floor panel transmission tunnel with double-faced tape.

(4) Remove the ground screw that secures the ground lug on the left rear corner of the ACM housing to the ACM bracket on the floor panel transmission tunnel.

(5) Remove the two screws that secure the ACM to the ACM bracket that is welded onto the top of the floor panel transmission tunnel (Fig. 8).

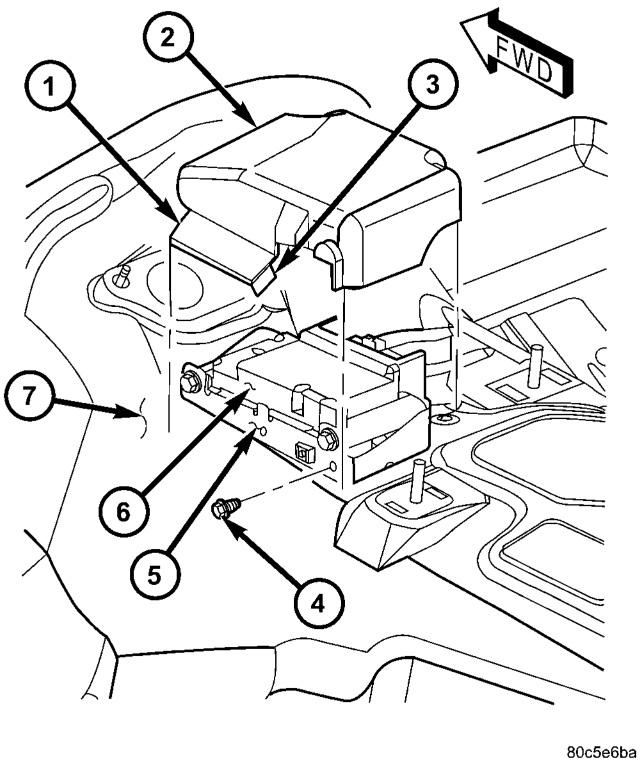

Fig. 7 ACM Cover Remove/Install

1 - FLANGE
2 - COVER
3 - TAPE
4 - SCREW
5 - BRACKET
6 - AIRBAG CONTROL MODULE
7 - FLOOR PANEL TRANSMISSION TUNNEL

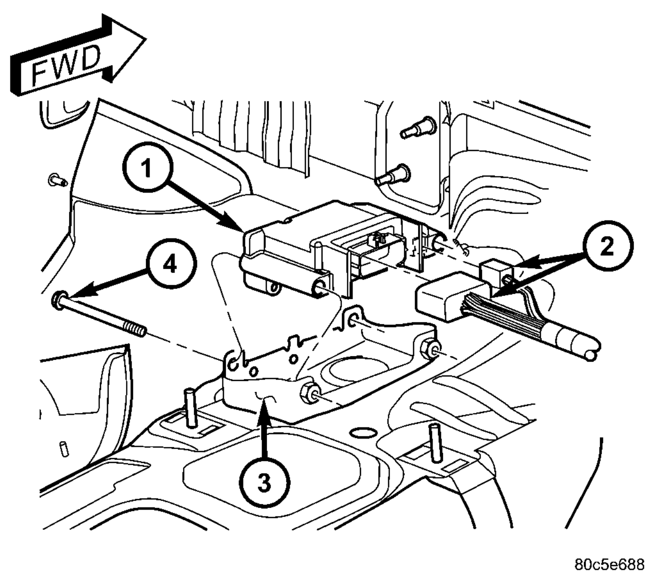

Fig. 8 Airbag Control Module Remove/Install

1 - AIRBAG CONTROL MODULE
2 - WIRE HARNESS CONNECTOR (2)
3 - BRACKET
4 - SCREW (2)

AIRBAG CONTROL MODULE (Continued)

(6) Lift the ACM from the ACM bracket on the top of the floor panel transmission tunnel and move the unit to the left far enough to access the ACM wire harness connectors.

(7) Disconnect the two instrument panel wire harness connectors for the ACM from the ACM connector receptacles located on the right side of the module. To disconnect the large instrument panel wire harness connector from the ACM:

(a) Slide the red Connector Position Assurance (CPA) lock on the top of the connector toward the side of the connector.

(b) Depress the connector latch tab and pull the connector straight away from the ACM connector receptacle.

(8) Remove the ACM from the left side of the floor panel transmission tunnel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the Airbag Control Module (ACM) to the left side of the floor panel transmission tunnel near the ACM bracket (Fig. 8).

(2) Reconnect the instrument panel wire harness connectors for the ACM to the ACM connector receptacles located on the right side of the module. Be certain that the latches on both connectors and the red Connector Position Assurance (CPA) lock on the large connector are each fully engaged.

(3) Carefully position the ACM into the ACM bracket on the top of the floor panel transmission tunnel. When the ACM is correctly positioned, the arrow on the ACM housing will be pointed forward in the vehicle.

(4) Install and tighten the two screws that secure the ACM to the ACM bracket that is welded onto the floor panel transmission tunnel. Tighten the screws to 36 N·m (26 ft. lbs.).

(5) Install and tighten the ground screw that secures the ground lug on the left rear corner of the ACM housing to the ACM bracket on the floor panel transmission tunnel (Fig. 7). Tighten the screw to 12 N·m (105 in. lbs.).

(6) From the left side of the floor panel transmission tunnel, carefully position the ACM cover back over the top of the ACM.

NOTE: The integral flange on the left side of the ACM cover is secured to the floor panel transmission tunnel with a short piece of double-faced tape as an assembly aid during the manufacturing process, but this tape does not require replacement following service removal.

(7) Reinstall the center console onto the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(8) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

CHILD RESTRAINT ANCHOR

DESCRIPTION

This model is equipped with a Lower Anchors and Tether for CHildren, or LATCH child restraint anchorage system (Fig. 9). The LATCH system provides for the installation of suitable child restraints in certain seating positions without using the standard equipment seat belt provided for that seating position. The rear seats in this model are equipped with a fixed-position child restraint upper tether anchor for both the center and the two outboard seating positions, and child restraint lower anchors for the two outboard seating positions only.

CHILD RESTRAINT ANCHOR (Continued)

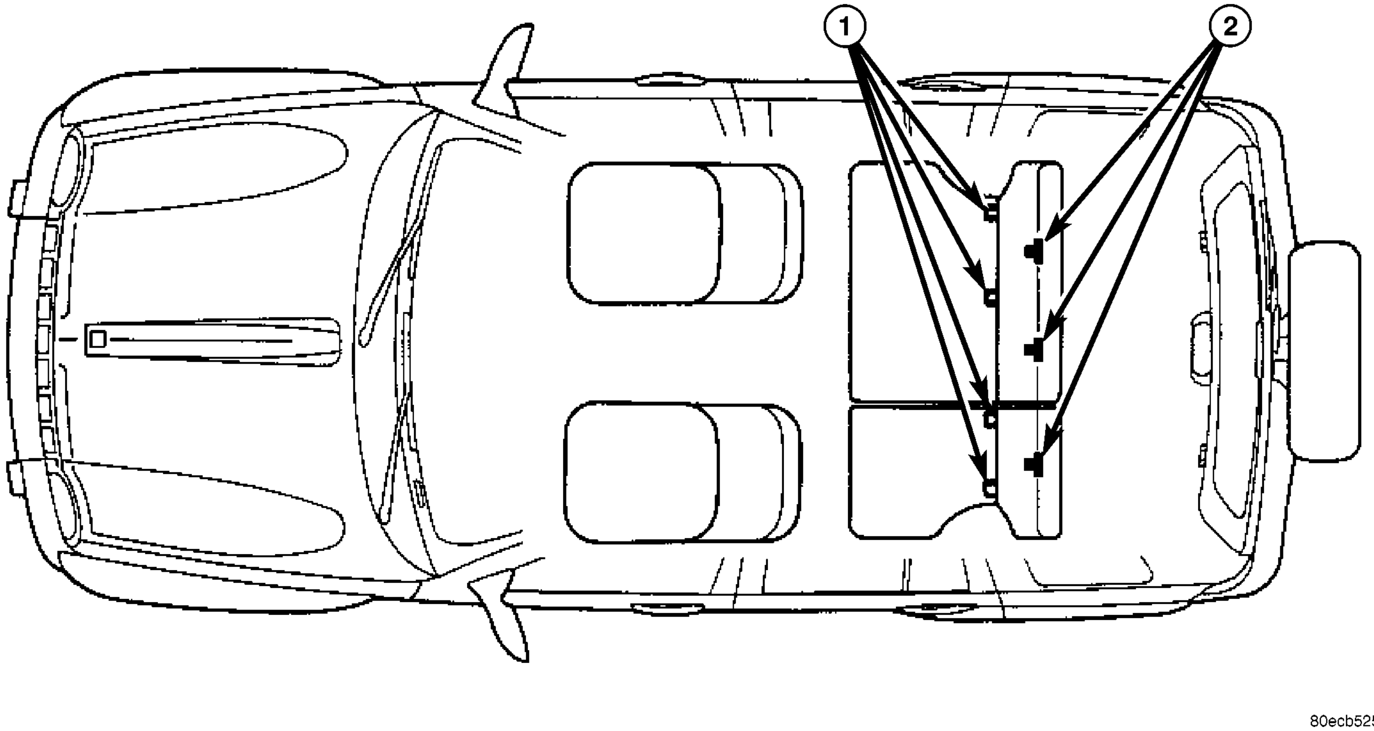

Fig. 9 Child Restraint Anchor Locations

1 - LOWER ANCHOR (PROVIDED FOR REAR OUTBOARD SEATING POSITIONS ONLY)
2 - TETHER ANCHOR (PROVIDED FOR REAR CENTER AND OUTBOARD SEATING POSITIONS)

The three upper tether anchors are integral to the rear seat back panels (Fig. 10). Two anchors are integral to the back of the right rear seat back panel, and one is integral to the left rear seat back panel. These anchors are each constructed from a short piece of round steel bar stock that is securely welded into a stamped cup integral to the seat back panel. There is a separate molded plastic trim bezel located around each of the three anchors. The child restraint upper tether anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with their respective rear seat back panels.

The lower anchors for this model are also integral to their respective rear seat back panel (Fig. 11). These anchors are constructed from round steel bar stock that is formed into a U-shape, then securely welded to the lower edge of the seat back panel. They are each accessed from the front of their respective seats, at each side where the seat back meets the seat cushion. These lower anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with the seat back panel.

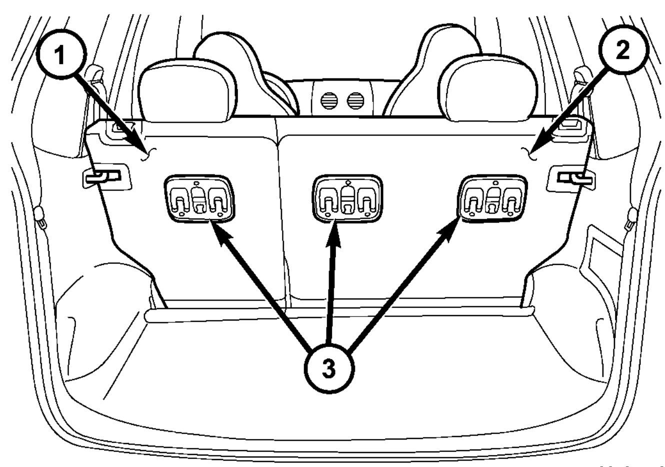

Fig. 10 Child Tether Anchors

1 - REAR SEAT BACK (LEFT)
2 - REAR SEAT BACK (RIGHT)
3 - CHILD TETHER ANCHOR BEZEL (3)

CHILD RESTRAINT ANCHOR (Continued)

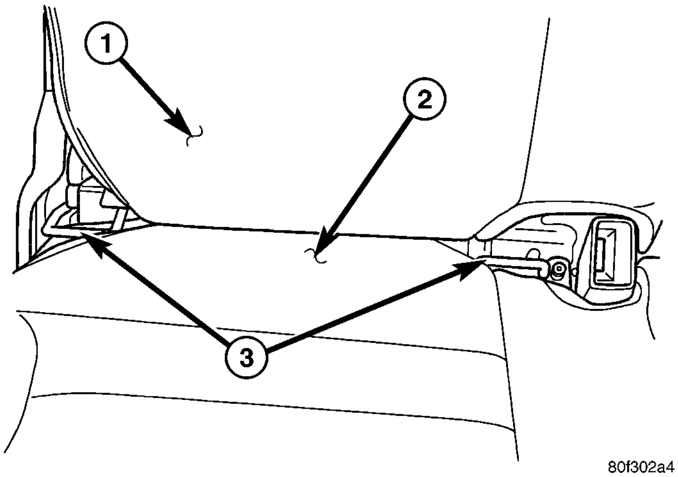

Fig. 11 Child Restraint Lower Anchors

1 - REAR SEAT BACK
2 - REAR SEAT CUSHION
3 - LOWER ANCHOR

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of all of the factory-installed child restraint anchors.

CLOCKSPRING

DESCRIPTION

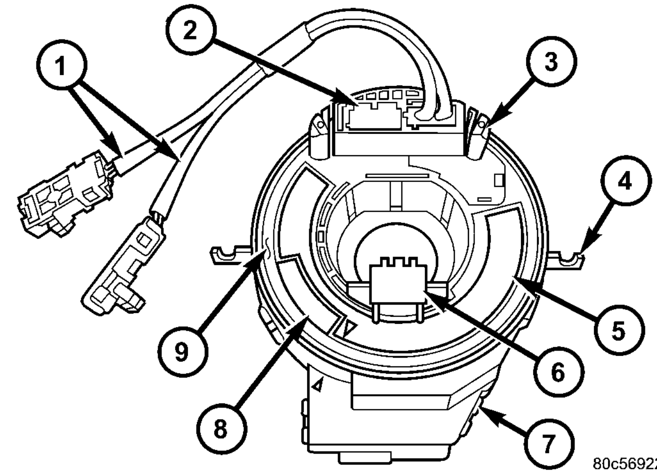

Fig. 12 Clockspring

1 - PIGTAIL WIRE (2)
2 - UPPER CONNECTOR RECEPTACLE
3 - BUMPER (2)
4 - BRACKET (2)
5 - LABEL
6 - SHIELD
7 - CASE
8 - WINDOW
9 - ROTOR

The clockspring assembly is secured with two integral plastic latches onto the upper steering column housing near the top of the steering column behind the steering wheel (Fig. 12). The clockspring consists of a flat, round molded plastic case with a stubby tail that hangs below the steering column (Fig. 13). The tail contains two connector receptacles that face toward the instrument panel. Within the plastic case is a spool-like molded plastic rotor with a large exposed hub and several plastic rollers. The upper surface of the rotor hub has a large center hole, a release button, a clear plastic inspection window, two short pigtail wires with connectors, and a connector receptacle that faces toward the steering wheel. Two versions of the clockspring are used on this model, one is a seven circuit unit for vehicles not equipped with optional remote radio switches on the steering wheel and can be visually identified by the use of yellow heat-shrink tubing on the pigtail wires, while the other is a nine circuit unit for vehicles with remote radio switches and can be visually identified by the use of black heat-shrink tubing on the pigtail wires.

CLOCKSPRING (Continued)

A rubber bumper block is located on each side of the tower formation that contains the connector receptacle and pigtail wires on the upper surface of the rotor hub. The lower surface of the rotor hub has a molded plastic turn signal cancel cam with a single lobe that is integral to the rotor. Within the plastic case and wound around the rotor spool is a long ribbon-like tape that consists of several thin copper wire leads sandwiched between two thin plastic membranes. The outer end of the tape terminates at the connector receptacles that face the instrument panel, while the inner end of the tape terminates at the pigtail wires and connector receptacle on the hub of the clockspring rotor that face the steering wheel.

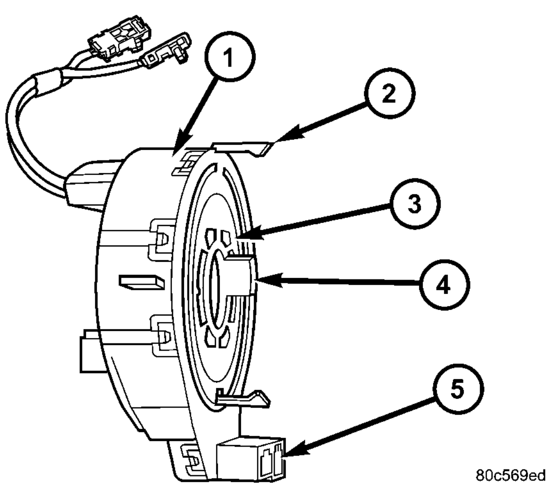

Fig. 13 Clockspring Latches

1 - CASE
2 - LATCH (2)
3 - ROTOR
4 - CANCEL CAM
5 - LOWER CONNECTOR RECEPTACLE (2)

Service replacement clocksprings are shipped pre-centered and with a molded plastic shield that snaps onto the rotor over the release button. The release button secures the centered clockspring rotor to the clockspring case and the shield prevents the release button from being inadvertently depressed during shipment and handling, but the shield must be removed from the clockspring after it is installed on the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring cannot be repaired. If the clockspring is faulty, damaged, or if the driver airbag has been deployed, the clockspring must be replaced.

OPERATION

The clockspring is a mechanical electrical circuit component that is used to provide continuous electrical continuity between the fixed instrument panel wire harness and the electrical components mounted on or in the rotating steering wheel. On this model the rotating electrical components include the driver airbag, the horn switch, the speed control switches, and the remote radio switches, if the vehicle is so equipped. The clockspring case is positioned and secured to the upper steering column housing near the top of the steering column. The connector receptacles on the tail of the fixed clockspring case connect the clockspring to the vehicle electrical system through two take outs with connectors from the instrument panel wire harness.

The clockspring rotor is movable and is keyed by the tower formation that is molded onto the upper surface of the rotor hub to an opening that is cast into the steering wheel armature. Rubber bumper blocks on either side of the clockspring tower formation eliminate contact noise between the clockspring tower and the steering wheel. The lobe of the turn signal cancel cam on the lower surface of the clockspring rotor hub contacts a turn signal cancel actuator of the multi-function switch to provide automatic turn signal cancellation. The yellow or black-sleeved pigtail wires on the upper surface of the clockspring rotor connect the clockspring to the driver airbag, while a steering wheel wire harness connects the connector receptacle on the upper surface of the clockspring rotor to the horn switch and, if the vehicle is so equipped, to the optional speed control switches and remote radio switches on the steering wheel.

Like the clockspring in a timepiece, the clockspring tape has travel limits and can be damaged by being wound too tightly during full stop-to-stop steering wheel rotation. To prevent this from occurring, the clockspring is centered when it is installed on the steering column. Centering the clockspring indexes the clockspring tape to the movable steering components so that the tape can operate within its designed travel limits. However, if the clockspring is removed from the steering column or if the steering shaft is disconnected from the steering gear, the clockspring spool can change position relative to the movable steering components and must be re-centered following completion of the service or the tape may be damaged.

Service replacement clocksprings are shipped pre-centered and with a plastic shield installed over the clockspring release button. This shield should not be removed and the release button should not be depressed until the clockspring has been installed on the steering column. If the release button is depressed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

CLOCKSPRING (Continued)

STANDARD PROCEDURE - CLOCKSPRING CENTERING

The clockspring is designed to wind and unwind when the steering wheel is rotated, but is only designed to rotate the same number of turns (about five complete rotations) as the steering wheel can be turned from stop to stop. Centering the clockspring indexes the clockspring tape to other steering components so that it can operate within its designed travel limits. The rotor of a centered clockspring can be rotated two and one-half turns in either direction from the centered position, without damaging the clockspring tape.

However, if the clockspring is removed for service or if the steering column is disconnected from the steering gear, the clockspring tape can change position relative to the other steering components. The clockspring must then be re-centered following completion of such service or the clockspring tape may be damaged. Service replacement clocksprings are shipped pre-centered, with the release button engaged (raised) and a molded plastic shield installed over the release button. This release button should not be disengaged and the shield should not be removed until the clockspring has been installed on the steering column. If the release button is disengaged before the clockspring is installed on a steering column, the clockspring centering procedure must be performed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Place the front wheels in the straight-ahead position.

(2) Remove the clockspring from the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

(3) Depress the release button (Fig. 14).

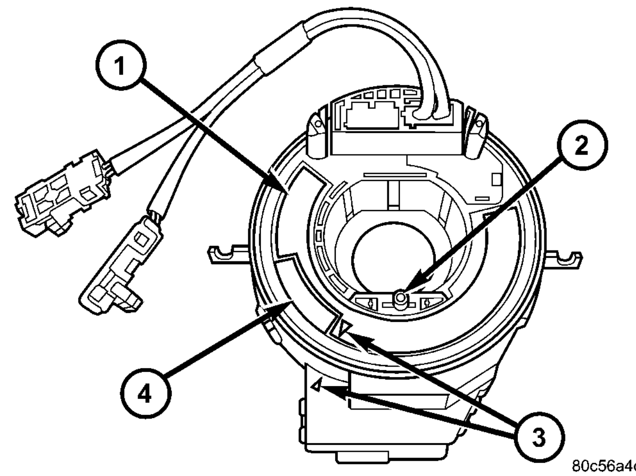

Fig. 14 Clockspring Centering

1 - ROTOR LABEL
2 - RELEASE BUTTON
3 - ALIGNMENT ARROWS
4 - INSPECTION WINDOW

(4) Keeping the release button depressed, rotate the clockspring rotor clockwise to the end of its travel. **Do not apply excessive torque.**

(5) From the end of the clockwise travel, rotate the rotor about two and one-half turns counterclockwise, then release the release button. The clockspring tower formation with the pigtail wires for the driver airbag and the connector receptacle for the steering wheel wire harness should end up at the top, the blue roller should be visible through the inspection window, and the printed arrow on the label of the clockspring rotor should be aligned with the arrow molded into the clockspring case. The clockspring is now centered.

(6) The front wheels should still be in the straight-ahead position. Reinstall the clockspring onto the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

REMOVAL

The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

CLOCKSPRING (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Place the front wheels in the straight ahead position.

(2) Remove the driver airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(3) Disconnect the steering wheel wire harness connector from the upper clockspring connector receptacle.

(4) Remove the steering wheel from the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).

(5) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column to the fully lowered position and leave the tilt release lever in the released (down) position.

(6) From below the steering column, remove the two screws that secure the lower shroud to the upper shroud (Fig. 15).

(7) Using hand pressure, push gently inward on both sides of the upper shroud near the parting line between the upper and lower shrouds to release the snap features that secure the two halves to each other.

(8) Remove both the upper and lower shrouds from the steering column.

(9) Disconnect the two instrument panel wire harness connectors for the clockspring from the two connector receptacles below the steering column on the back of the clockspring housing.

(10) Using a small thin-bladed screwdriver, release the two integral plastic latches that secure the back of the clockspring housing to the steering column lock housing.

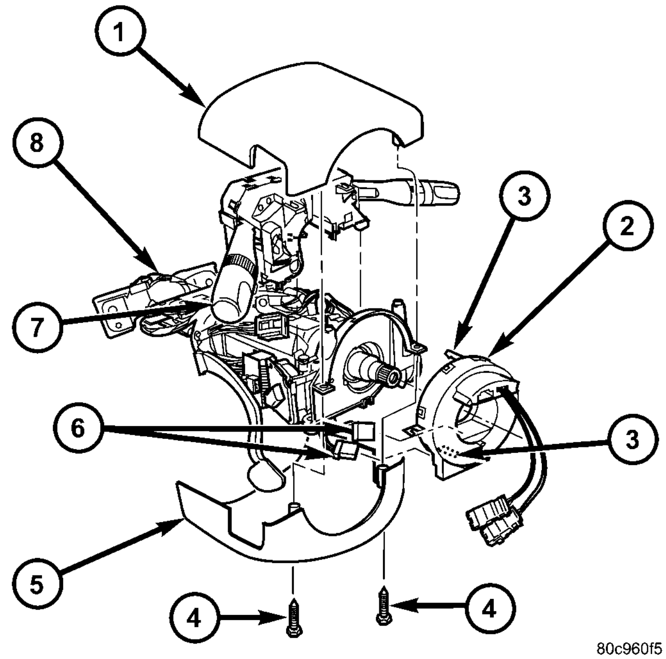

Fig. 15 Clockspring Remove/Install

1 - UPPER SHROUD
2 - CLOCKSPRING
3 - LATCH (2)
4 - SCREW (2)
5 - LOWER SHROUD
6 - WIRE HARNESS CONNECTOR (2)
7 - MULTI-FUNCTION SWITCH
8 - STEERING COLUMN

(11) Remove the clockspring from the steering column lock housing. The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

(12) If the removed clockspring is to be reused, be certain that the release button on the clockspring rotor is raised and latched to secure the rotor to the clockspring case to maintain clockspring centering until it is reinstalled on the steering column. If clockspring centering is not maintained, the clockspring must be centered again before it is reinstalled. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

INSTALLATION

The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

If the clockspring is not properly centered in relation to the steering wheel, steering shaft and steering gear, it may be damaged. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING). Service replacement clocksprings are shipped pre-centered, with the release button

CLOCKSPRING (Continued)

engaged (raised) and a molded plastic shield installed over the release button. This release button should not be disengaged and the shield should not be removed until the clockspring has been installed on the steering column. If the release button is disengaged before the clockspring is installed on a steering column, the clockspring centering procedure must be performed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain that the front wheels are in the straight-ahead position.

(1) Carefully slide the centered clockspring down over the steering column upper shaft until the two integral plastic latches on the back of the clockspring housing are fully engaged through their openings in the steering column lock housing (Fig. 15).

(2) Reconnect the two instrument panel wire harness connectors for the clockspring to the two connector receptacles below the steering column on the back of the clockspring housing.

(3) Position the upper and lower shrouds onto the steering column.

(4) Align the snap features on the lower shroud with the receptacles on the upper shroud and apply hand pressure to snap them together.

(5) From below the steering column, install and tighten the two screws that secure the lower shroud to the upper shroud. Tighten the screws to 2 N·m (18 in. lbs.).

(6) If the vehicle is equipped with the optional tilt steering column, move the tilt steering column back to the fully raised position and move the tilt release lever back to the locked (up) position.

(7) If a new clockspring has been installed, remove the plastic shield covering the release button that secures the clockspring rotor to the clockspring case to maintain clockspring centering.

(8) Reinstall the steering wheel onto the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).

NOTE: Be certain that the steering wheel mounting screw is tightened to the proper torque specification to ensure proper clockspring operation.

(9) Reconnect the steering wheel wire harness connector to the upper clockspring connector receptacle.

(10) Reinstall the driver airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

DRIVER AIRBAG

DESCRIPTION

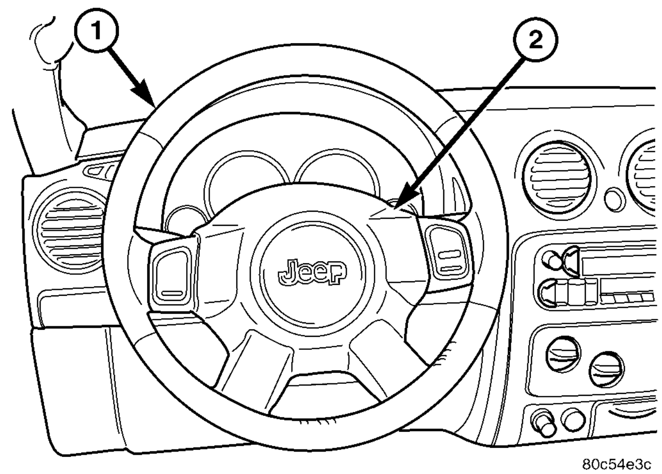

Fig. 16 Driver Airbag Trim Cover

1 - STEERING WHEEL
2 - TRIM COVER

The black, injection molded, thermoplastic driver airbag protective trim cover is the most visible part of the driver airbag (Fig. 16). The driver airbag is located in the center of the steering wheel, where it is secured with two screws to the two horizontal spokes of the four-spoke steering wheel armature. Base models have a Jeep® logo embossed in the center of the trim cover, while premium models feature a stamped, satin polished emblem with the Jeep® logo applied to the center of the trim cover. Concealed beneath the driver airbag trim cover are the horn switch, the folded airbag cushion, the airbag cushion retainer, the airbag housing, the airbag inflator, and the retainers that secure the inflator to the airbag housing. The airbag cushion, housing, and inflator are secured within an integral receptacle molded into the back of the trim cover.

DRIVER AIRBAG (Continued)

The resistive membrane-type horn switch is secured with heat stakes to the inside surface of the driver airbag trim cover, between the trim cover and the folded airbag cushion. The horn switch ground pigtail wire has a female spade terminal connector that receives a path to ground through a male spade terminal that is integral to the driver airbag housing stamping and is located near the upper right corner on the back of the housing (Fig. 17). The horn switch feed pigtail wire has a white, molded plastic insulator that is secured by an integral retainer to a mounting hole located near the lower left corner on the back of the housing, and is connected to the vehicle electrical system through a take out and connector of the steering wheel wire harness.

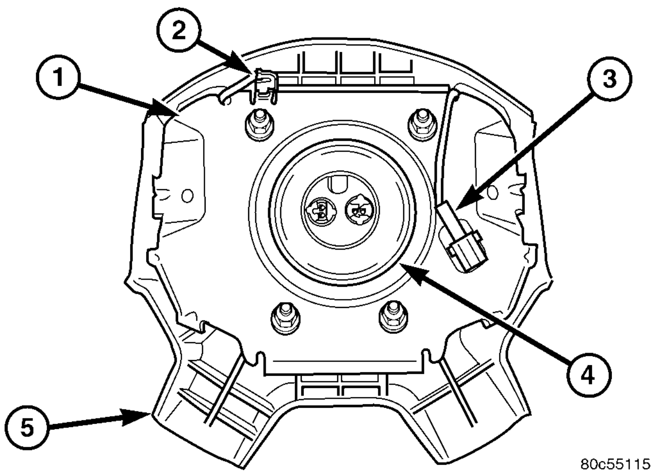

Fig. 17 Driver Airbag Housing

1 - HOUSING
2 - HORN SWITCH GROUND WIRE
3 - HORN SWITCH FEED WIRE
4 - INFLATOR
5 - TRIM COVER

The airbag used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. A 71 centimeter (28.0 inch) diameter, radial deploying fabric cushion with internal tethers is used. The airbag inflator is a dual-initiator, non-azide, pyrotechnic-type unit with four mounting studs and is secured to the stamped metal airbag housing using four hex nuts with washers. Two keyed and color-coded connector receptacles on the driver airbag inflator connect the two inflator initiators to the vehicle electrical system through two yellow or black-jacketed, two-wire pigtail harnesses of the clockspring. The driver airbag, trim cover, and horn switch unit cannot be repaired, and must be replaced if deployed or in any way damaged.

OPERATION

The multistage driver airbag is deployed by electrical signals generated by the Airbag Control Module (ACM) through the driver airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ACM to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ACM sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch unit. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas towards the instrument panel through vent holes within the fabric used to construct the back (steering wheel side) panel of the airbag cushion.

Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic or hazardous materials. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

DRIVER AIRBAG (Continued)

REMOVAL

The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG CUSHION AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) From the underside of the steering wheel, remove the two screws that secure the driver airbag to the steering wheel armature (Fig. 18).

(3) Pull the driver airbag away from the steering wheel far enough to access the three electrical connections on the back of the airbag housing.

(4) Disconnect the steering wheel wire harness connector for the horn switch from the horn switch feed pigtail wire connector, which is located on the back of the driver airbag housing.

CAUTION: Do not pull on the clockspring pigtail wires or pry on the connector insulator to disengage the connector from the driver airbag inflator connector receptacle. Improper removal of these pigtail wires and their connector insulators can result in damage to the airbag circuits or connector insulators.

(5) The clockspring driver airbag pigtail wire connectors are secured by integral latches to the airbag inflator connector receptacles, which are located on the back of the driver airbag housing. Depress the latches on each side of each connector insulator and pull the insulators straight out from the airbag inflator to disconnect them from the connector receptacles.

(6) Remove the driver airbag from the steering wheel.

(7) If the driver airbag has been deployed, the clockspring must be replaced. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

INSTALLATION

The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

DRIVER AIRBAG (Continued)

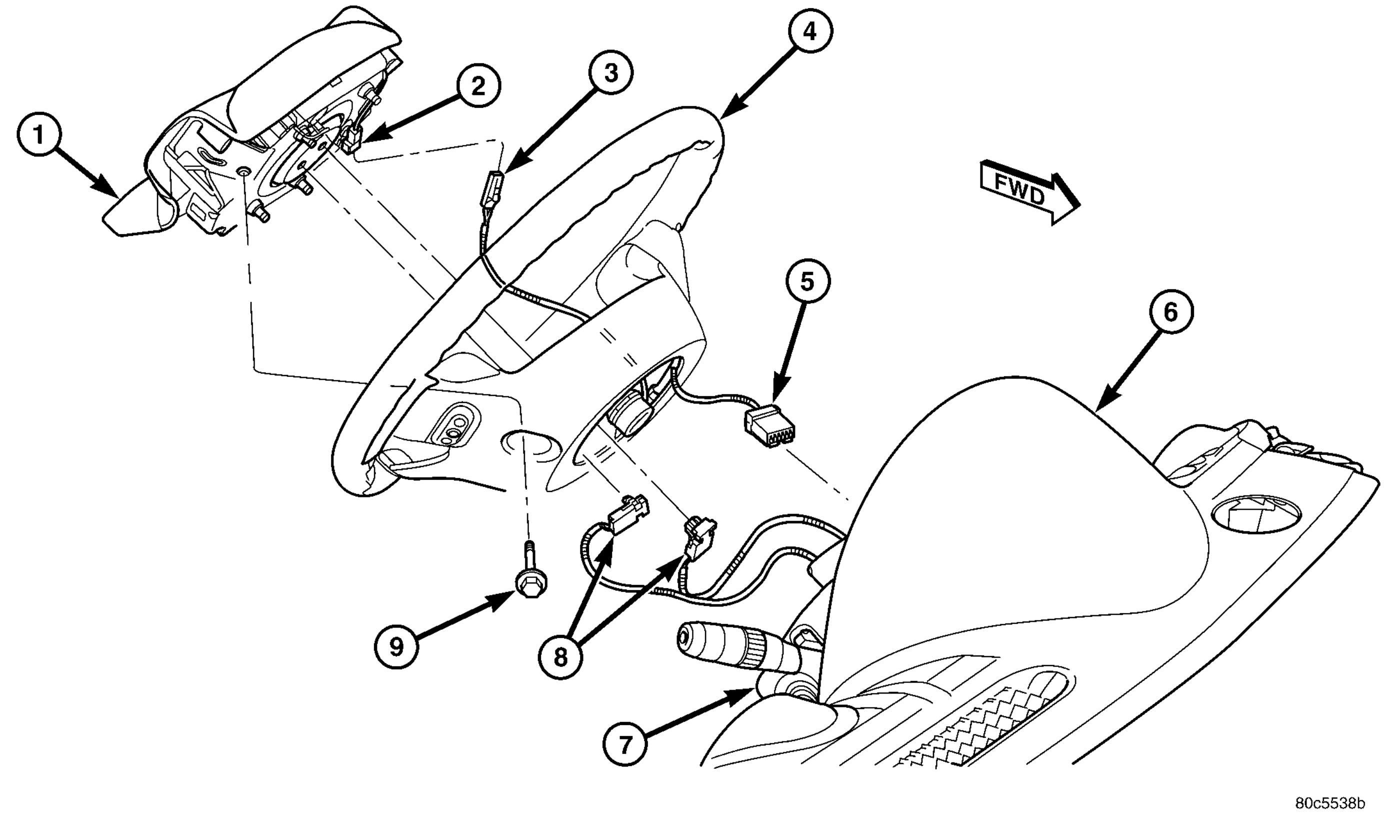

Fig. 18 Driver Airbag Remove/Install

1 - DRIVER AIRBAG
2 - HORN SWITCH FEED WIRE CONNECTOR
3 - WIRE HARNESS CONNECTOR
4 - STEERING WHEEL
5 - TO CLOCKSPRING
6 - INSTRUMENT PANEL
7 - STEERING COLUMN
8 - CLOCKSPRING PIGTAIL WIRE CONNECTOR (2)
9 - SCREW (2)

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE DRIVER AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE DRIVER AIRBAG CUSHION AND THE DRIVER AIRBAG TRIM COVER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

WARNING: THE DRIVER AIRBAG TRIM COVER MUST NEVER BE PAINTED. REPLACEMENT AIRBAGS ARE SERVICED WITH TRIM COVERS IN THE ORIGINAL COLORS. PAINT MAY CHANGE THE WAY IN WHICH THE MATERIAL OF THE TRIM COVER RESPONDS TO AN AIRBAG DEPLOYMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Position the driver airbag close enough to the steering wheel to reconnect the three electrical connections on the back of the airbag housing.

(2) When installing the driver airbag, reconnect the two clockspring driver airbag pigtail wire connectors to the airbag inflator connector receptacles by pressing straight in on the connectors (Fig. 18). Be certain to engage each keyed and color-coded connector to the matching connector receptacle. You can be certain that each connector is fully engaged in its receptacle by listening carefully for a distinct, audible click as the connector latches snap into place.

(3) Reconnect the steering wheel wire harness connector for the horn switch to the horn switch feed pigtail wire connector, which is located at the back of the driver airbag housing.

(4) Carefully position the driver airbag in the steering wheel. Be certain that the clockspring pigtail wires and steering wheel wire harness in the steering wheel hub area are not pinched between the driver airbag and the steering wheel armature.

(5) From the underside of the steering wheel, install and tighten the two screws that secure the

DRIVER AIRBAG (Continued)

driver airbag to the steering wheel armature. Tighten the screws to 10 N·m (90 in. lbs.).

(6) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT IMPACT SENSOR

DESCRIPTION

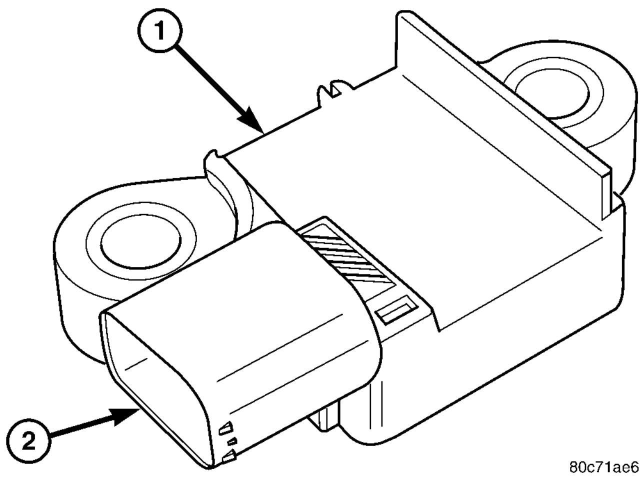

Fig. 19 Front Impact Sensor

1 - SENSOR
2 - CONNECTOR RECEPTACLE

Two front impact sensors are used on this model, one each for the left and right sides of the vehicle (Fig. 19). These sensors are mounted remotely from the impact sensor that is internal to the Airbag Control Module (ACM). Each front sensor is secured with two screws to the backs of the right and left vertical members of the radiator support within the engine compartment. The sensor housing has an integral connector receptacle and two integral mounting points each with a metal sleeve to provide crush protection.

The right and left front impact sensors are identical in construction and calibration with two exceptions. On models equipped with an optional 2.4L gasoline engine or an optional 2.5L diesel engine, the left front impact sensor includes a stamped metal mounting bracket that rotates the connector receptacle end of the sensor toward the outboard side of the vehicle for additional clearance that is required for those applications.

A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The front impact sensors are each connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness.

The impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced. On models equipped with an optional 2.4L gasoline engine or an optional 2.5L diesel engine, the mounting bracket for the left front impact sensor is serviced as a unit with that sensor.

OPERATION

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Airbag Control Module (ACM). The ACM microprocessor continuously monitors all of the front passive restraint system electrical circuits to determine the system readiness. If the ACM detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly.

The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ACM. The impact sensors and the ACM communicate by modulating the voltage in the sensor plus circuit. The hard wired circuits between the front impact sensors and the ACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ACM or the impact sensors. The most reliable, efficient, and accurate means to diagnose the impact sensors, the ACM, and the electronic message communication between the sensors and the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

FRONT IMPACT SENSOR (Continued)

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the two screws that secure the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) to the back of the right or left radiator support vertical member (Fig. 20).

(3) Disconnect the headlamp and dash wire harness connector for the front impact sensor from the sensor connector receptacle.

(4) Remove the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) from the engine compartment.

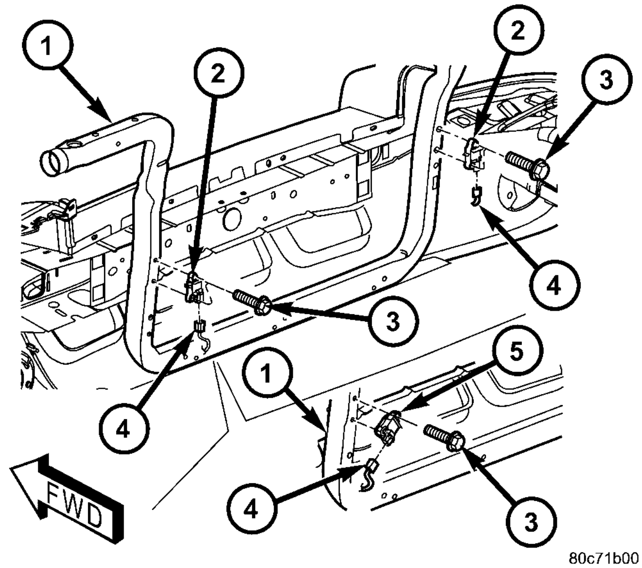

Fig. 20 Front Impact Sensor Remove/Install

1 - RADIATOR SUPPORT
2 - IMPACT SENSOR
3 - SCREW (4)
4 - WIRE HARNESS CONNECTOR
5 - LEFT IMPACT SENSOR & BRACKET (2.4L GASOLINE OR 2.5L DIESEL ENGINES ONLY)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

FRONT IMPACT SENSOR (Continued)

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) into the engine compartment (Fig. 20).

(2) Reconnect the headlamp and dash wire harness connector for the front impact sensor to the sensor connector receptacle.

(3) Position the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) onto the back of the right or left radiator support vertical member.

(4) Loosely install the upper screw that secures the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) to the back of the right or left radiator support vertical member.

(5) Install and tighten the lower screw that secures the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) to the back of the right or left radiator support vertical member. Tighten the screw to 7 N·m (65 in. lbs.).

(6) Tighten the upper screw that secures the right or left front impact sensor, or left impact sensor and bracket unit (2.4L gasoline or 2.5L diesel engine only) to the back of the right or left radiator support vertical member. Tighten the screw to 7 N·m (65 in. lbs.).

(7) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT SEAT BELT & RETRACTOR

REMOVAL

The following procedure is for replacement of a faulty or damaged seat belt and retractor unit. The driver side front retractor also includes a seat belt tensioner. If the driver side front seat belt or retractor is faulty or damaged, but the seat belt tensioner is not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the seat belt tensioner has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the unit from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

FRONT SEAT BELT & RETRACTOR (Continued)

(1) Adjust the front seat to its most forward position for easiest access to the front seat belt lower anchor and the B-pillar trim.

(2) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the plug that covers the front seat belt lower anchor screw to remove it from the rear of the outboard seat side shield (Fig. 21).

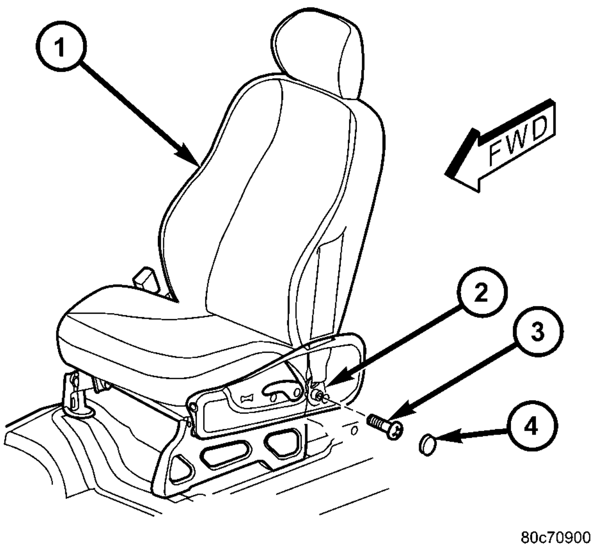

Fig. 21 Front Seat Belt Lower Anchor Remove/ Install

1 - FRONT SEAT
2 - LOWER ANCHOR
3 - SCREW
4 - PLUG

(4) Remove the screw that secures the lower anchor to the bracket on the outboard side of the front seat cushion frame.

(5) Unsnap and lift the trim cover to access the nut that secures the front seat belt turning loop to the height adjuster on the upper B-pillar (Fig. 22).

(6) Remove the nut that secures the seat belt turning loop to the height adjuster stud on the upper B-pillar.

(7) Remove the seat belt turning loop from the height adjuster stud.

(8) Remove the upper and lower trim from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL) and (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(9) On the driver side only, disconnect the seat belt tensioner pigtail wire connector from the body wire harness connector.

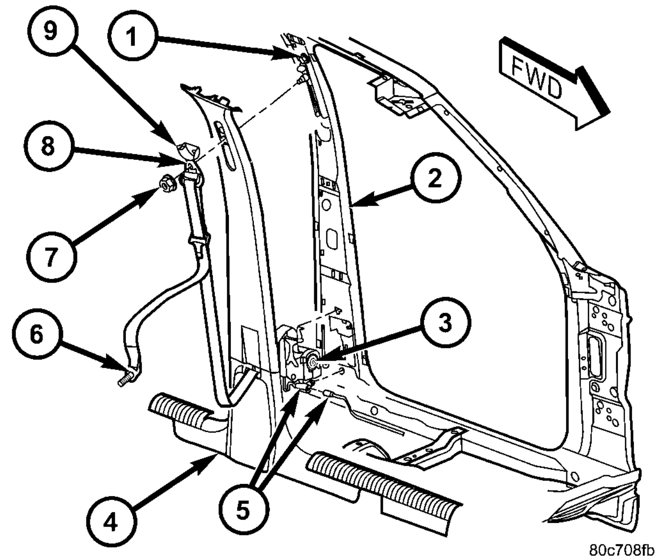

Fig. 22 Front Seat Belt Retractor Remove/Install

1 - ADJUSTER
2 - B-PILLAR
3 - RETRACTOR
4 - B-PILLAR TRIM
5 - CONNECTOR (DRIVER SIDE ONLY)
6 - LOWER ANCHOR
7 - NUT
8 - TURNING LOOP
9 - COVER

(10) Remove the screw that secures the lower retractor bracket to the lower B-pillar.

(11) Disengage the engagement tab on the upper retractor bracket/seat belt web guide from the engagement slot in the lower B-pillar.

(12) Remove the front seat belt and retractor from the B-pillar as a unit.

INSTALLATION

The following procedure is for replacement of a faulty or damaged seat belt and retractor unit. The driver side front retractor also includes a seat belt tensioner. If the driver side front seat belt or retractor is faulty or damaged, but the seat belt tensioner is not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the seat belt tensioner has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the unit from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

FRONT SEAT BELT & RETRACTOR (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Position the front seat belt and retractor to the B-pillar as a unit (Fig. 22). Be certain to engage the engagement tab on the upper retractor bracket/seat belt web guide into the engagement slot in the lower B-pillar.

(2) Install and tighten the screw that secures the lower retractor bracket to the lower B-pillar. Tighten the screw to 43 N·m (32 ft. lbs.).

(3) On the driver side only, reconnect the seat belt tensioner pigtail wire connector to the body wire harness connector.

(4) Reinstall the upper and lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION) and (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(5) Position the seat belt turning loop onto the height adjuster stud on the upper B-pillar.

(6) Install and tighten the nut that secures the seat belt turning loop to the height adjuster stud. Tighten the nut to 34 N·m (25 ft. lbs.).

(7) Fold and snap the trim cover back into place to conceal the nut that secures the front seat belt turning loop to the height adjuster on the upper B-pillar.

(8) Position the front seat belt lower anchor to the bracket on the outboard side of the front seat cushion frame (Fig. 21).

(9) Install and tighten the screw that secures the lower anchor to the bracket on the outboard side of the front seat cushion frame. Tighten the screw to 43 N·m (32 ft. lbs.).

(10) Align the plug that covers the front seat belt lower anchor screw with the hole near the rear of the outboard seat side shield. Using hand pressure, press firmly and evenly on the plug until it snaps into place.

(11) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT SEAT BELT BUCKLE

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

FRONT SEAT BELT BUCKLE (Continued)

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) On the driver side only, disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) On the driver side only, remove the front seat and seat track from the floor panel as a unit. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).

(3) On the driver side only, disconnect the seat belt switch pigtail wire connector from the seat wire harness connector on the seat cushion frame bracket located under the rear edge of the seat cushion near the inboard side of the seat (Fig. 23).

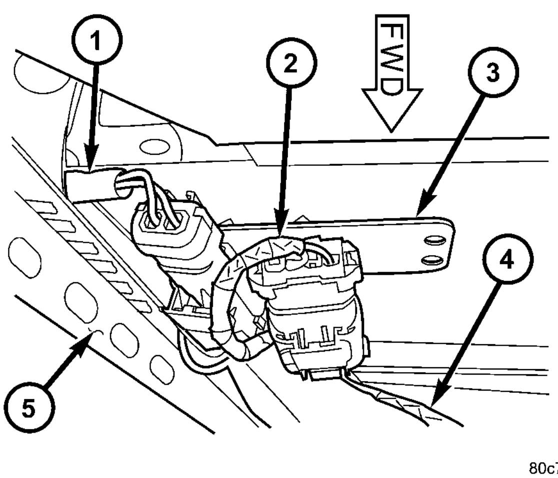

Fig. 23 Seat Belt Switch Connector

1 - PIGTAIL WIRE
2 - SEAT WIRE HARNESS
3 - SEAT CUSHION FRAME BRACKET
4 - BODY WIRE HARNESS
5 - INBOARD SEAT TRACK

(4) Remove the screw that secures the front seat belt buckle anchor to the bracket near the rear of the inboard seat track (Fig. 24).

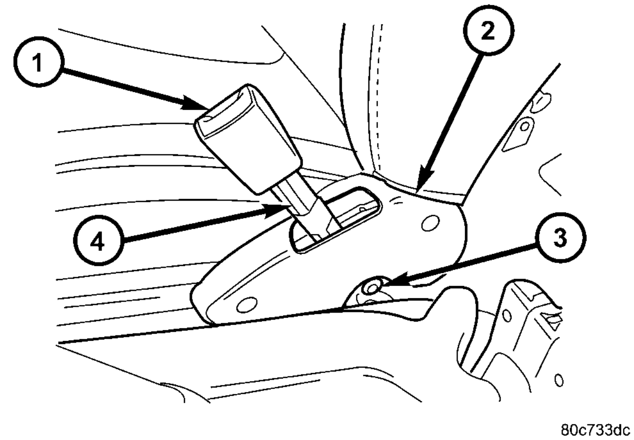

Fig. 24 Front Seat Belt Buckle Remove/Install

1 - FRONT SEAT BELT BUCKLE
2 - INBOARD SIDE SHIELD
3 - SCREW
4 - PIGTAIL WIRE

(5) On the driver side only, remove the two screws that secure the inboard seat cushion side shield to the seat cushion frame.

(6) On the driver side only, remove the two screws that secure the inboard seat track to the rear inboard corner of the seat cushion frame.

(7) On the driver side only, disconnect the seat belt switch pigtail wire routing clip from the locating hole in the seat cushion frame.

(8) On the driver side only, remove the seat belt switch pigtail wire from between the seat cushion frame and the seat track by gently prying the inboard seat track away from the inboard rear corner of the seat cushion frame far enough to slide the pigtail wire from between them.

(9) Remove the front seat belt buckle from the inboard seat cushion side shield.

FRONT SEAT BELT BUCKLE (Continued)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Position the front seat belt buckle to the inboard seat cushion side shield (Fig. 24).

(2) On the driver side only, position the seat belt switch pigtail wire between the seat cushion frame and the seat track by gently prying the inboard seat track away from the inboard rear corner of the seat cushion frame far enough to slide the pigtail wire into position between them.

(3) On the driver side only, engage the seat belt switch pigtail wire routing clip into the locating hole in the seat cushion frame.

(4) On the driver side only, install and tighten the two screws that secure the inboard seat track to the rear inboard corner of the seat cushion frame. Tighten the screws to 28 N·m (21 ft. lbs.).

(5) On the driver side only, position the inboard seat cushion side shield to the seat cushion frame.

(6) On the driver side only, install and tighten the two screws that secure the inboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1 N·m (9 in. lbs.).

(7) Position the front seat belt buckle anchor to the bracket on the inboard side of the seat track.

(8) Install and tighten the screw that secures the front seat belt buckle anchor to the bracket on the inboard side of the seat track. Tighten the screw to 43 N·m (32 ft. lbs.).

(9) On the driver side only, reconnect the seat belt switch pigtail wire connector to the seat wire harness connector on the seat cushion frame bracket located under the rear edge of the seat cushion near the inboard side of the seat (Fig. 23).

(10) On the driver side only, reinstall the front seat and seat track to the floor panel as a unit. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION).

(11) On the driver side only, do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

PASSENGER AIRBAG

DESCRIPTION

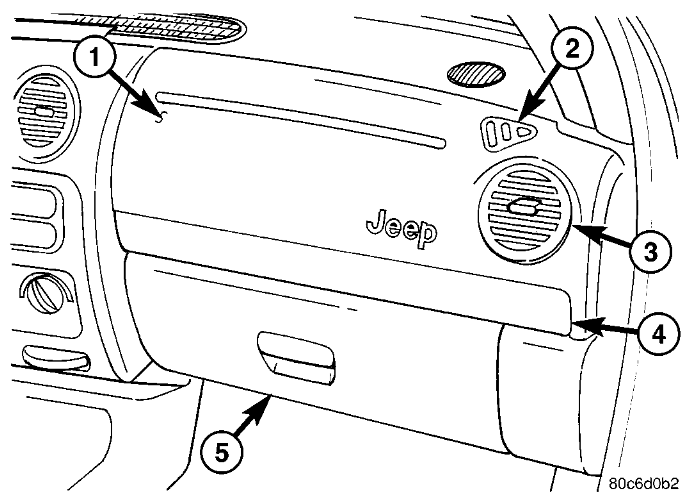

Fig. 25 Passenger Airbag Door

1 - PASSENGER AIRBAG DOOR
2 - DEMISTER OUTLET
3 - PANEL OUTLET
4 - BEZEL
5 - GLOVE BOX

PASSENGER AIRBAG (Continued)

The rearward facing surface of the injection molded, thermoplastic passenger airbag door is the most visible part of the passenger airbag (Fig. 25). The passenger airbag door is located above the glove box opening on the instrument panel in front of the front seat passenger seating position. The integral upper mounting flange of the airbag door is secured with five screws and the lower mounting flange with six screws to the instrument panel structural support. The passenger airbag door includes an integral air conditioning panel outlet housing and an integral side window demister outlet. An integral stamped metal bracket that reinforces the upper airbag door mounting flange is secured to the back of the door unit with heat stakes. The upper airbag door fasteners and mounting flange are concealed beneath the instrument panel top cover, while the lower fasteners and mounting flange are concealed beneath a bezel on the instrument panel above the glove box opening.

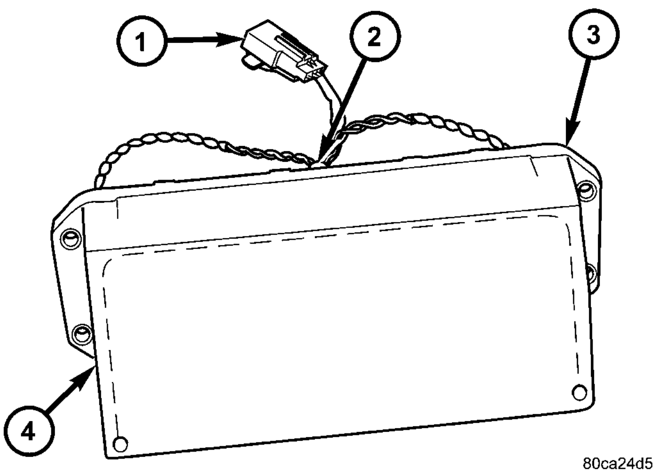

Fig. 26 Passenger Airbag Unit

1 - PIGTAIL WIRE CONNECTOR
2 - RETAINER
3 - HOUSING
4 - INNER COVER

Located behind the passenger airbag door within the instrument panel is the passenger airbag unit (Fig. 26). The passenger airbag unit is secured by two screws on each side to two stamped metal mounting brackets that are fastened with screws to the instrument panel structural support. A short four-wire pigtail harness with a keyed, yellow connector insulator connects the two inflator initiators to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness.

The passenger airbag unit used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. The passenger airbag unit consists of a molded, glass-filled nylon plastic housing, a molded plastic inner airbag cushion cover, the airbag cushion, and the airbag inflator. The airbag housing contains the airbag inflator, while the inner cover contains the folded airbag cushion. The inner cover completely encloses the airbag cushion and is permanently retained to the housing. The airbag cushion is constructed of a coated nylon fabric. The airbag inflator is a dual-initiator, hybrid-type unit that is secured to and sealed within the airbag housing.

The passenger airbag cannot be repaired, and must be replaced if deployed, faulty, or in any way damaged. If the passenger airbag is deployed, the passenger airbag door and both passenger airbag mounting brackets must also be replaced. The passenger airbag door and the passenger airbag mounting brackets are available for individual service replacement.

OPERATION

The multistage passenger airbag is deployed by electrical signals generated by the Airbag Control Module (ACM) through the passenger airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ACM to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

The hybrid-type inflator assembly includes a small canister of highly compressed gas. When the ACM sends the proper electrical signal to the airbag initiator, the initiator converts the electrical energy into chemical energy. This chemical energy opens up a burst disk in the airbag inflator to allow the compressed inert gas to flow into the airbag cushion. The inflator is sealed to the airbag cushion so that all of the released inert gas is directed into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the passenger airbag door will split at predetermined tear seam lines on the inside surface of the door and the door will pivot downwards out of the way. Following a passenger airbag deployment, the airbag cushion quickly deflates by venting the inert gas through vent holes within the fabric used to construct the sides of the airbag cushion.

Typically, both initiators are used during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic materials. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

PASSENGER AIRBAG (Continued)

REMOVAL

The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the passenger airbag door from the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG DOOR - REMOVAL).

(3) Remove the two screws on each side of the passenger airbag housing that secure the passenger airbag to the metal brackets on the instrument panel support structure (Fig. 27).

(4) Disengage the passenger airbag wire harness connector from the retainer securing the connector to the metal bracket on the instrument panel support structure above the airbag by sliding both halves of the connector to the left.

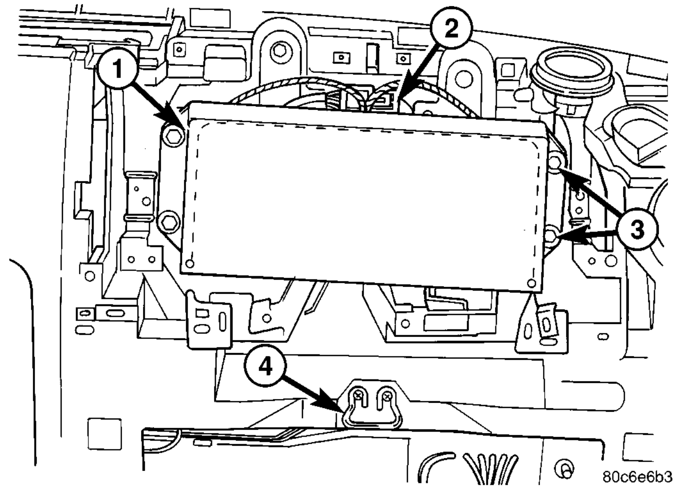

Fig. 27 Passenger Airbag Remove/Install

1 - PASSENGER AIRBAG
2 - WIRE HARNESS CONNECTOR
3 - SCREW (4)
4 - GLOVE BOX LATCH STRIKER

(5) Disconnect the passenger airbag pigtail wire connector from the instrument panel wire harness connector for the airbag. To disconnect the connector:

(a) Slide the red Connector Position Assurance (CPA) lock on the top of the connector toward the side of the connector.

(b) Depress the connector latch tab and pull the two halves of the connector straight away from each other.

(6) Remove the passenger airbag from the instrument panel as a unit.

(7) If the passenger airbag has been deployed, both passenger airbag mounting brackets on the instrument panel must be replaced. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG MOUNTING BRACKET - REMOVAL).

INSTALLATION

The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

PASSENGER AIRBAG (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE PASSENGER AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE PASSENGER AIRBAG CUSHION AND THE PASSENGER AIRBAG DOOR. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Position the passenger airbag unit into the instrument panel (Fig. 27).

(2) Reconnect the passenger airbag pigtail wire connector to the instrument panel wire harness connector for the airbag. Be certain that the latch on the connector and the red Connector Position Assurance (CPA) lock are each fully engaged.

(3) Engage the passenger airbag wire harness connector onto the retainer that secures the connector to the metal bracket on the instrument panel support structure above the airbag by aligning the right end of the connector slot with the left end of the retainer and sliding both halves of the connector to the right.

(4) Carefully position the passenger airbag unit onto the two metal brackets on the instrument panel support structure, being certain that the alignment pin features on each side of the airbag are engaged in the alignment holes in the metal brackets.

(5) Install and tighten the two screws on each side of the passenger airbag housing that secure the passenger airbag to the metal brackets on the instrument panel support structure. Tighten the screws to 6 N·m (55 in. lbs.).

(6) Reinstall the passenger airbag door onto the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG DOOR - INSTALLATION).

(7) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

PASSENGER AIRBAG DOOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the top cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(3) Remove the passenger side bezel from the upper glove box opening of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP PASSENGER SIDE BEZEL - REMOVAL).

PASSENGER AIRBAG DOOR (Continued)

(4) Remove the three small screws that secure the passenger airbag door to the glove box opening upper reinforcement (Fig. 28).

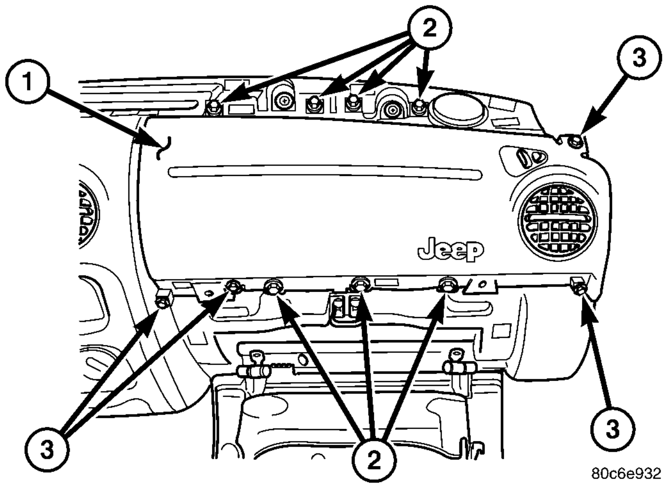

Fig. 28 Passenger Airbag Door Remove/Install

1 - PASSENGER AIRBAG DOOR
2 - LARGE SCREW (7)
3 - SMALL SCREW (4)

(5) Remove the three large screws that secure the passenger airbag door to the glove box opening upper reinforcement.

(6) Remove the one small screw that secures the passenger airbag door to the top of the instrument panel.

(7) Remove the four large screws that secure the passenger airbag door to the top of the instrument panel.

(8) Remove the passenger airbag door from the instrument panel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE PASSENGER AIRBAG DOOR MUST NEVER BE PAINTED. REPLACEMENT PASSENGER AIRBAG DOORS ARE SERVICED IN THE ORIGINAL COLORS. PAINT MAY CHANGE THE WAY IN WHICH THE MATERIAL OF THE AIRBAG DOOR RESPONDS TO AN AIRBAG DEPLOYMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Position the passenger airbag door onto the instrument panel (Fig. 28).

(2) Install and tighten the four large screws that secure the passenger airbag door to the top of the instrument panel. Tighten the screws to 4 N·m (35 in. lbs.).

(3) Install and tighten the one small screw that secures the passenger airbag door to the top of the instrument panel. Tighten the screw to 2 N·m (20 in. lbs.).

(4) Install and tighten the three large screws that secure the passenger airbag door to the glove box opening upper reinforcement. Tighten the screws to 4 N·m (35 in. lbs.).

(5) Install and tighten the three small screws that secure the passenger airbag door to the glove box opening upper reinforcement. Tighten the screws to 2 N·m (20 in. lbs.).

(6) Reinstall the passenger side bezel onto the upper glove box opening of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP PASSENGER SIDE BEZEL - INSTALLATION).

(7) Reinstall the top cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(8) Reconnect the battery negative cable.

PASSENGER AIRBAG MOUNTING BRACKET

REMOVAL

The passenger airbag mounting brackets cannot be repaired. They must be replaced if faulty or damaged, or if the passenger airbag has been deployed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the passenger airbag from the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL).

(2) Remove the two screws that secure the inboard and/or outboard passenger airbag mounting bracket(s) to the instrument panel support structure (Fig. 29).

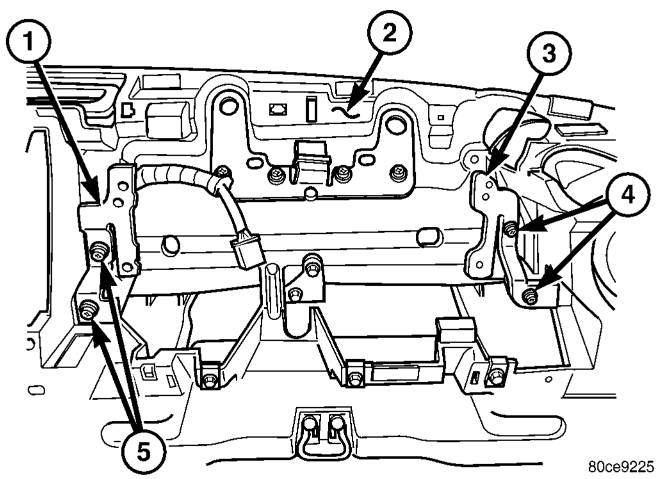

Fig. 29 Passenger Airbag Mounting Brackets Remove/Install

1 - INBOARD BRACKET
2 - I/P SUPPORT STRUCTURE
3 - OUTBOARD BRACKET
4 - SCREW (2)
5 - SCREW (2)

(3) Remove the inboard and/or outboard passenger airbag mounting bracket(s) from the instrument panel support structure.

INSTALLATION

The passenger airbag mounting brackets cannot be repaired. They must be replaced if faulty or damaged, or if the passenger airbag has been deployed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the inboard and/or outboard passenger airbag mounting bracket(s) to the instrument panel support structure (Fig. 29).

(2) Install and tighten the two screws that secure the inboard and/or outboard passenger airbag mounting bracket(s) to the instrument panel support structure. Tighten the screws to 2 N·m (20 in. lbs.).

(3) Reinstall the passenger airbag to the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION).

REAR CENTER SEAT BELT & RETRACTOR

REMOVAL

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Remove the right center seat belt buckle unit from the floor panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR SEAT BELT BUCKLE - REMOVAL).

(2) Unlatch and fold the right rear seat back forward and separate the cargo area carpet from the base of the seat back panel.

(3) Reach between the base of the right rear seat back and the forward edge of the rear cargo floor to access and remove the screw that secures the rear center seat belt lower anchor to the floor panel (Fig. 30).

(4) Lift the rear center seat belt lower anchor off of the stud on the rear floor panel.

(5) Remove the two screws that secure the belt web guide to the top of the right rear seat back panel.

(6) Remove the right rear seat back panel from the vehicle. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - REMOVAL).

(7) Remove the two screws that secure the belt web guide to the top of the right rear seat back panel.

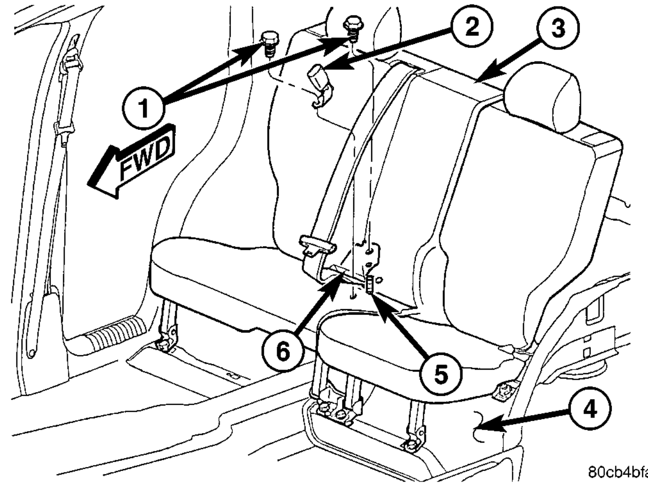

Fig. 30 Rear Center Seat Belt Anchor Plate Remove/Install

1 - SCREW (2)
2 - BUCKLE UNIT
3 - REAR SEAT BACK
4 - REAR FLOOR PANEL
5 - STUD (1)
6 - ANCHOR PLATE

(8) Remove the trim from the right rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - REMOVAL).

(9) Route the rear seat belt lower anchor and belt web guide through the top of the seat back panel.

(10) Disengage the seat back latch cable fitting from the cable support on the retractor, which is a light snap fit (Fig. 31).

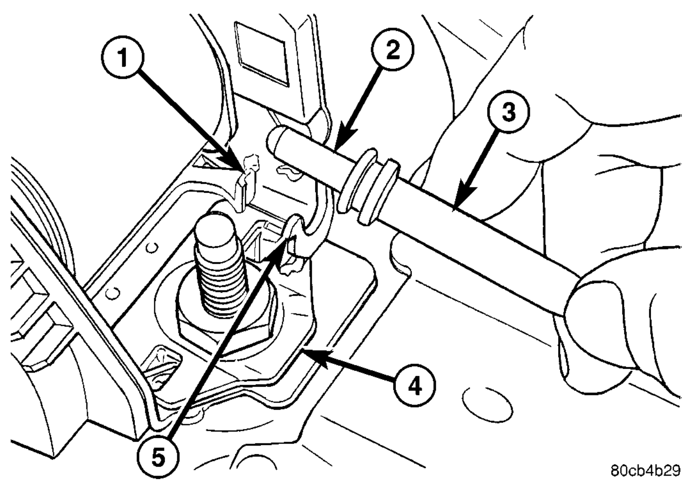

Fig. 31 Seat Back Latch Cable Disengage/Engage

1 - LEVER
2 - PLUNGER
3 - LATCH CABLE FITTING
4 - REAR CENTER RETRACTOR
5 - SUPPORT

REAR CENTER SEAT BELT & RETRACTOR (Continued)

(11) Remove the screw that secures the retractor to the rear seat back panel (Fig. 32).

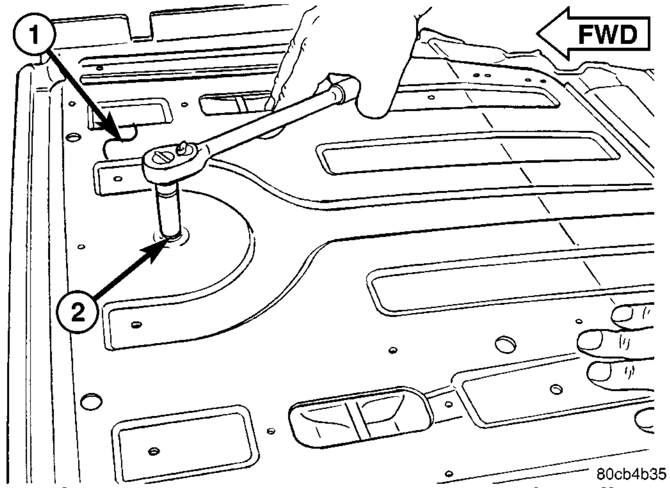

Fig. 32 Rear Center Retractor Remove/Install

1 - REAR SEAT BACK PANEL
2 - SCREW (1)

(12) Remove the rear center seat belt and retractor unit from the seat back panel.

INSTALLATION

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Position the rear center seat belt and retractor unit onto the seat back panel.

(2) Install and tighten the screw that secures the retractor to the rear seat back panel (Fig. 32). Tighten the screw to 27 N·m (20 ft. lbs.).

(3) Position the seat back latch cable plunger against the retractor latch lever, then engage the cable fitting into the cable support on the retractor, which is a light snap fit (Fig. 31).

(4) Route the rear seat belt lower anchor and belt web guide through the top of the seat back panel.

(5) Reinstall the trim onto the right rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - INSTALLATION).

(6) Install and tighten the two screws that secure the belt web guide to the top of the right rear seat back panel. Tighten the screws to 2 N·m (20 in. lbs.).

(7) Reinstall the right rear seat back panel into the vehicle. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - INSTALLATION).

(8) Position the rear center seat belt lower anchor onto the stud on the rear floor panel (Fig. 30).

(9) Reach between the base of the right rear seat back and the forward edge of the rear cargo floor to install and tighten the screw that secures the rear center seat belt lower anchor to the floor panel. Tighten the screw to 43 N·m (32 ft. lbs.).

(10) Restore the cargo area carpet to the base of the seat back panel and unfold the right rear seat back to its upright position.

(11) Reinstall the right center seat belt buckle unit onto the floor panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - INSTALLATION).

REAR OUTBOARD SEAT BELT & RETRACTOR

REMOVAL

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REAR OUTBOARD SEAT BELT & RETRACTOR (Continued)

(1) Unsnap and lift the trim cover to access the screw that secures the rear outboard seat belt turning loop to the upper C-pillar (Fig. 33).

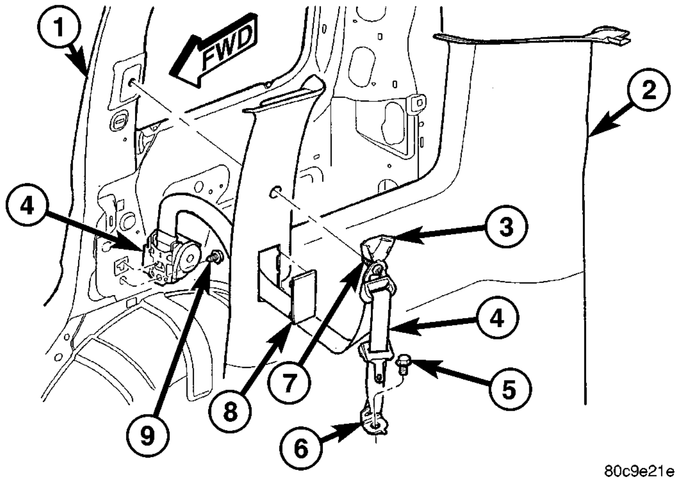

Fig. 33 Rear Outboard Seat Belt & Retractor Remove/Install

1 - C-PILLAR
2 - QUARTER TRIM PANEL
3 - COVER
4 - SEAT BELT & RETRACTOR
5 - SCREW (1)
6 - LOWER ANCHOR
7 - SCREW (1)
8 - ACCESS COVER
9 - SCREW (1)

(2) Remove the screw that secures the seat belt turning loop to the upper C-pillar.

(3) Remove the screw that secures the lower seat belt anchor to the bracket on the outboard side of the rear seat cushion frame.

(4) Remove the quarter trim panel from the C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).

(5) Route the seat belt lower anchor and turning loop through the access hole in the quarter trim panel.

(6) Remove the screw that secures the retractor bracket to the lower C-pillar.

(7) Lift the retractor upward far enough to disengage the retractor tab from the engagement hole in the lower C-pillar.

(8) Remove the rear outboard seat belt and retractor from the C-pillar as a unit.

INSTALLATION

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(1) Position the rear outboard seat belt and retractor to the C-pillar as a unit (Fig. 33).

(2) Engage the retractor tab into the engagement hole in the lower C-pillar.

(3) Install and tighten the screw that secures the retractor bracket to the lower C-pillar. Tighten the screw to 43 N·m (32 ft. lbs.).

(4) Route the seat belt lower anchor and turning loop through the access hole in the quarter trim panel.

(5) Reinstall the quarter trim panel onto the C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).

(6) Position the lower seat belt anchor to the bracket on the outboard side of the rear seat cushion frame. Be certain that the anti-rotation tab on the anchor is engaged in the slot in the seat bracket.

(7) Install and tighten the screw that secures the lower seat belt anchor to the bracket on the outboard side of the rear seat cushion frame. Tighten the screw to 43 N·m (32 ft. lbs.).

(8) Position the seat belt turning loop to the upper C-pillar.

(9) Install and tighten the screw that secures the seat belt turning loop to the upper C-pillar. Tighten the screw to 43 N·m (32 ft. lbs.).

(10) Fold and snap the trim cover back into place to conceal the screw that secures the rear outboard seat belt turning loop to the upper C-pillar.

REAR SEAT BELT BUCKLE

REMOVAL

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(1) Unlatch the rear seat back and fold it forward far enough to access the screw that secures the rear seat belt buckle anchor to the rear floor panel between the rear seat back and the rear seat cushion.

(2) Remove the screw that secures the rear seat belt buckle anchor to the rear floor panel (Fig. 34).

(3) Lift the rear seat belt buckle anchor off of the stud on the rear floor panel.

(4) Remove the rear seat belt buckle and anchor from between the rear seat back and the rear seat cushion as a unit.

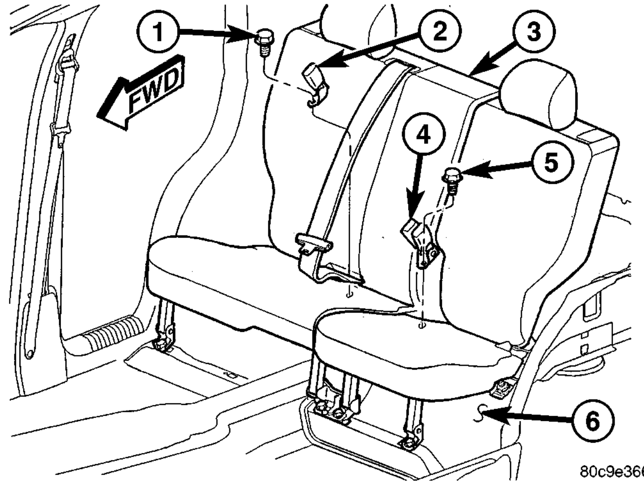

Fig. 34 Rear Seat Belt Buckle Remove/Install

1 - SCREW (1)
2 - BUCKLE (SINGLE)
3 - REAR SEAT
4 - BUCKLE (DOUBLE)
5 - SCREW (1)
6- REAR FLOOR PANEL

INSTALLATION

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Unlatch the rear seat back and fold it forward far enough to access the mounting location for the rear seat belt buckle anchor to the rear floor panel between the rear seat back and the rear seat cushion.

(2) Position the rear seat belt buckle and anchor between the rear seat back and the rear seat cushion as a unit (Fig. 34).

(3) Lower the rear seat belt buckle anchor over the stud on the rear floor panel.

(4) Install and tighten the screw that secures the rear seat belt buckle anchor to the rear floor panel. Tighten the screw to 43 N·m (32 ft. lbs.).

SEAT BELT SWITCH

DESCRIPTION

The seat belt switch for this model is actually a Hall Effect-type sensor. This sensor consists of a fixed-position, Hall Effect Integrated Circuit (IC) chip and a small permanent magnet that are integral to the driver side front seat belt buckle. The driver side front seat belt buckle is located on a stamped steel stanchion and secured with a screw to the inboard

SEAT BELT SWITCH (Continued)

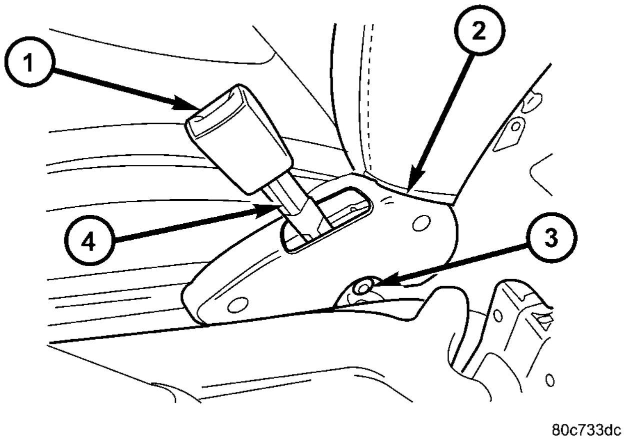

Fig. 35 Front Seat Belt Buckle

1 - FRONT SEAT BELT BUCKLE
2 - INBOARD SIDE SHIELD
3 - SCREW
4 - PIGTAIL WIRE

side of the driver side front seat cushion frame between the seat and the floor panel transmission tunnel (Fig. 35). The seat belt switch is connected to the vehicle electrical system through a two-lead pigtail wire and connector on the driver side front seat belt buckle-half, which is connected to a wire harness connector and take out of the seat wire harness beneath the rear edge of the driver side front seat cushion frame. A radio noise suppression capacitor is connected in parallel with the IC where the two pigtail wire leads connect to the IC pins.

The seat belt switch cannot be adjusted or repaired and, if faulty or damaged, the entire driver side front seat belt buckle-half unit must be replaced.

OPERATION

The seat belt switch is designed to provide a status signal to the seat belt switch sense input of the Airbag Control Module (ACM) indicating whether the driver side front seat belt is fastened. The ACM uses the seat belt switch input as a factor in determining what level of force with which it should deploy the multistage driver airbag. In addition, the ACM sends electronic messages to the ElectroMechanical Instrument Cluster (EMIC) to control the seat belt indicator based upon the status of the driver side front seat belt switch.

A spring-loaded plastic slide with a small, enclosed permanent magnet is integral to the buckle latch mechanism. When a seat belt tip-half is inserted and latched into the seat belt buckle, the slide is pushed downward and into close proximity of the Hall Effect Integrated Circuit (IC) chip within the buckle. The field of the permanent magnet induces a current within the chip. The chip provides this induced current as an output to the ACM, which monitors the current to determine the status of the driver side front seat belt. When the seat belt is unbuckled, the spring-loaded slide and permanent magnet move upward and away from the IC, causing the output current from the seat belt switch to be reduced.

The seat belt switch receives a supply current from the ACM, and the ACM senses the status of the driver side front seat belt through its pigtail wire connection to the seat wire harness. The ACM also monitors the condition of the seat belt switch circuit and will illuminate the airbag indicator in the EMIC then store a Diagnostic Trouble Code (DTC) for any fault that is detected in the seat belt switch circuit. For proper diagnosis of the seat belt switch, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SEAT BELT TENSIONER

DESCRIPTION

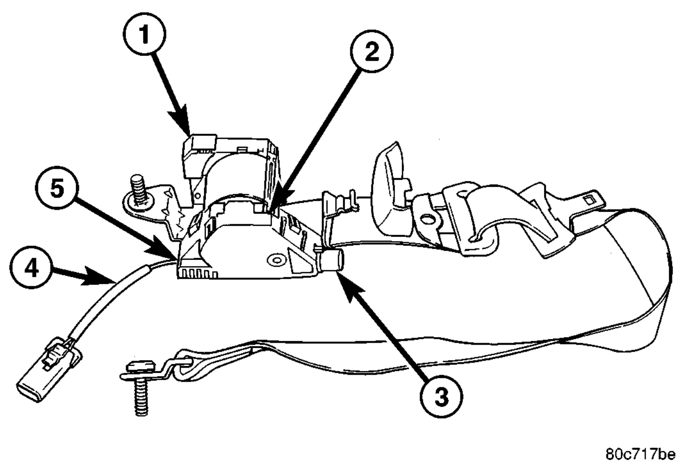

Fig. 36 Seat Belt Tensioner

1 - RETRACTOR
2 - TENSIONER HOUSING
3 - PISTON HOUSING
4 - PIGTAIL WIRE
5 - GAS GENERATOR

A driver side seat belt tensioner supplements the driver airbag system for all versions of this model (Fig. 36). The seat belt tensioner is integral to the driver side front seat belt and retractor unit, which is secured to the B-pillar on the left side of the vehicle. The retractor is concealed beneath the molded plastic B-pillar trim. The seat belt tensioner consists primarily of a molded plastic tensioner housing, a tubular metal piston housing, a piston, a short rack gear, a set of pinion gears, a pyrotechnically activated gas generator, and a short pigtail wire. All of these components are located on one side of the retractor spool

SEAT BELT TENSIONER (Continued)

on the outside of the retractor housing. The seat belt tensioner is controlled by the Airbag Control Module (ACM) and is connected to the vehicle electrical system through a dedicated take out of the body wire harness by a keyed and latching molded plastic connector insulator to ensure a secure connection.

The seat belt tensioner cannot be repaired and, if faulty or damaged, the entire driver side front seat belt and retractor unit must be replaced. The seat belt tensioner is not intended for reuse and must be replaced following a deployment. A locked retractor that will not allow the seat belt webbing to be retracted or extracted is a sure indication that the seat belt tensioner has been deployed and requires replacement. (Refer to 8 - ELECTRICAL/RESTRAINTS/FRONT SEAT BELT & RETRACTOR - REMOVAL).

OPERATION

The seat belt tensioner is deployed by a signal generated by the Airbag Control Module (ACM) through the driver seat belt tensioner line 1 and line 2 (or squib) circuits. When the ACM sends the proper electrical signal to the tensioner, the electrical energy generates enough heat to initiate a small pyrotechnic gas generator. The gas generator is installed in one end of the tubular metal piston housing, which contains a piston and a small rack gear. As the gas expands, it pushes the piston and the rack gear through the tube. The rack gear engages a pinion gear that drives a gear set in the tensioner housing, which drives the seat belt retractor spool causing the slack to be removed from the driver side front seat belt. Removing excess slack from the driver side front seat belt not only keeps the occupant properly positioned for an airbag deployment following a frontal impact of the vehicle, but also helps to reduce injuries that the occupant of the driver side front seat might experience in these situations as a result of a harmful contact with the steering wheel and/or steering column. Also, the seat belt tensioner has a torsion bar mechanism that is designed to deform in order to control the loading being applied to the occupant of the driver side front seat by the seat belt during a frontal impact, further reducing the potential for occupant injuries.

The ACM monitors the condition of the seat belt tensioner through circuit resistance, and will illuminate the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and store a Diagnostic Trouble Code (DTC) for any fault that is detected. For proper diagnosis of the seat belt tensioner, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SEAT BELT TURNING LOOP ADJUSTER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Unsnap and lift the trim cover to access the nut that secures the front seat belt turning loop to the height adjuster on the upper B-pillar.

(3) Remove the nut that secures the seat belt turning loop to the height adjuster stud on the upper B-pillar.

SEAT BELT TURNING LOOP ADJUSTER (Continued)

(4) Remove the seat belt turning loop from the height adjuster stud.

(5) Remove the upper trim from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).

(6) Remove the screw that secures the seat belt turning loop adjuster to the upper B-pillar (Fig. 37).

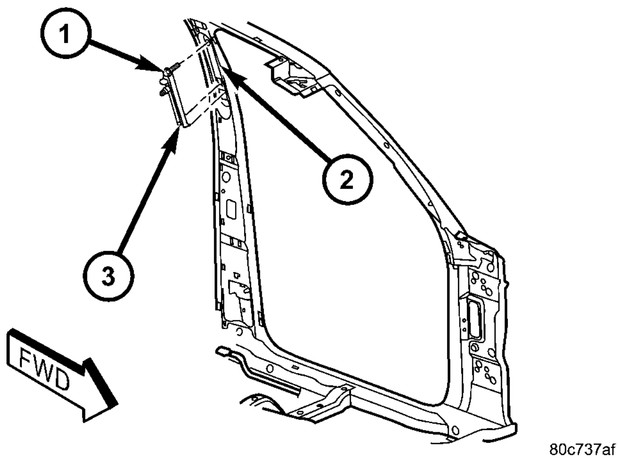

Fig. 37 Seat Belt Turning Loop Adjuster Remove/ Install

1 - SCREW
2 - B-PILLAR
3 - ADJUSTER

(7) Pull the upper end of the turning loop adjuster away from the B-pillar far enough to disengage the hooks on the lower end of the adjuster from the slots in the B-pillar.

(8) Remove the seat belt turning loop adjuster from the B-pillar.

INSTALLATION

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(1) Position the seat belt turning loop adjuster to the B-pillar (Fig. 37).

(2) Engage the hooks on the lower end of the adjuster into the slots in the B-pillar.

(3) Tilt the upper end of the turning loop adjuster up into position against the B-pillar.

(4) Install and tighten the screw that secures the seat belt turning loop adjuster to the upper B-pillar. Tighten the screw to 34 N·m (25 ft. lbs.).

(5) Reinstall the upper trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).

(6) Position the seat belt turning loop onto the height adjuster stud on the upper B-pillar.

(7) Install and tighten the nut that secures the seat belt turning loop to the height adjuster stud. Tighten the nut to 34 N·m (25 ft. lbs.).

(8) Fold and snap the trim cover back into place to conceal the nut that secures the front seat belt turning loop to the height adjuster on the upper B-pillar.

(9) Reconnect the battery negative cable.

SIDE CURTAIN AIRBAG

DESCRIPTION

8098029e

Fig. 38 SRS Logo

Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. These airbags are passive, inflatable, Supplemental Restraint System (SRS) components, and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located on the headliner above each B-pillar (Fig. 38). This system is designed to reduce injuries to the vehicle occupants in the event of a side impact collision.

Vehicles equipped with side curtain airbags have two individually controlled curtain airbag units. These airbag units are concealed and mounted above the headliner where they are each secured to one of the roof side rails (Fig. 39). Each folded airbag cushion is contained within a long extruded plastic channel that extends along the roof rail from the A-pillar at the front of the vehicle to just behind the C-pillar at the rear of the vehicle. The channel is secured with plastic push-in fasteners to the roof rail. A tether extends down the A-pillar from the front of the airbag cushion, where it is retained to the pillar with plastic push-in routing clips and it is secured to the base of the A-pillar near the belt line with a screw.

The hybrid-type inflator for each airbag is secured to the roof rail at the rear of the airbag unit between the C-pillar and the D-pillar, and is connected to the airbag cushion by a long tubular manifold. The bracket holding the inflator and three other brackets holding the manifold are secured to the roof rail with screws. A two-wire pigtail harness is routed forward from the airbag inflator through a trough along the top of the plastic airbag channel on the roof rail and down the B-pillar, where it is retained by three routing clips. The pigtail harness is connected to a take out and connector of the body wire harness on the B-pillar, which connects the airbag unit to its respective right or left Side Impact Airbag Control Module (SIACM) on the sill panel at the base of the B-pillar.

The side curtain airbag unit cannot be adjusted or repaired and must be replaced if deployed, faulty, or in any way damaged. Once a side curtain airbag has been deployed, the complete airbag unit, the headliner, the upper A, B, and C-pillar trim, and all other visibly damaged components must be replaced.

OPERATION

Each side curtain airbag is deployed individually by an electrical signal generated by the left or right Side Impact Airbag Control Module (SIACM) to which it is connected through left or right curtain airbag line 1 and line 2 (or squib) circuits. The hybrid-type inflator assembly for each airbag contains a small canister of highly compressed inert gas. When the SIACM sends the proper electrical signal to the airbag inflator, the electrical energy creates enough heat to ignite chemical pellets within the inflator. Once ignited, these chemicals burn rapidly and produce the pressure necessary to rupture a containment disk in the inert gas canister. The inflator and inert gas canister are sealed and connected to a tubular manifold so that all of the released gas is directed into the folded curtain airbag cushion, causing the cushion to inflate.

As the airbag cushion inflates it will drop down from the roof rail between the edge of the headliner and the side glass/body pillars to form a curtain-like cushion to protect the vehicle occupants during a side impact collision. The front tether keeps the front portion of the bag taut, thus ensuring that the bag will deploy in the proper position. Following the airbag deployment, the airbag cushion quickly deflates by venting the inert gas through the loose weave of the cushion fabric, and the deflated cushion hangs down loosely from the roof rail.

REMOVAL

The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

SIDE CURTAIN AIRBAG (Continued)

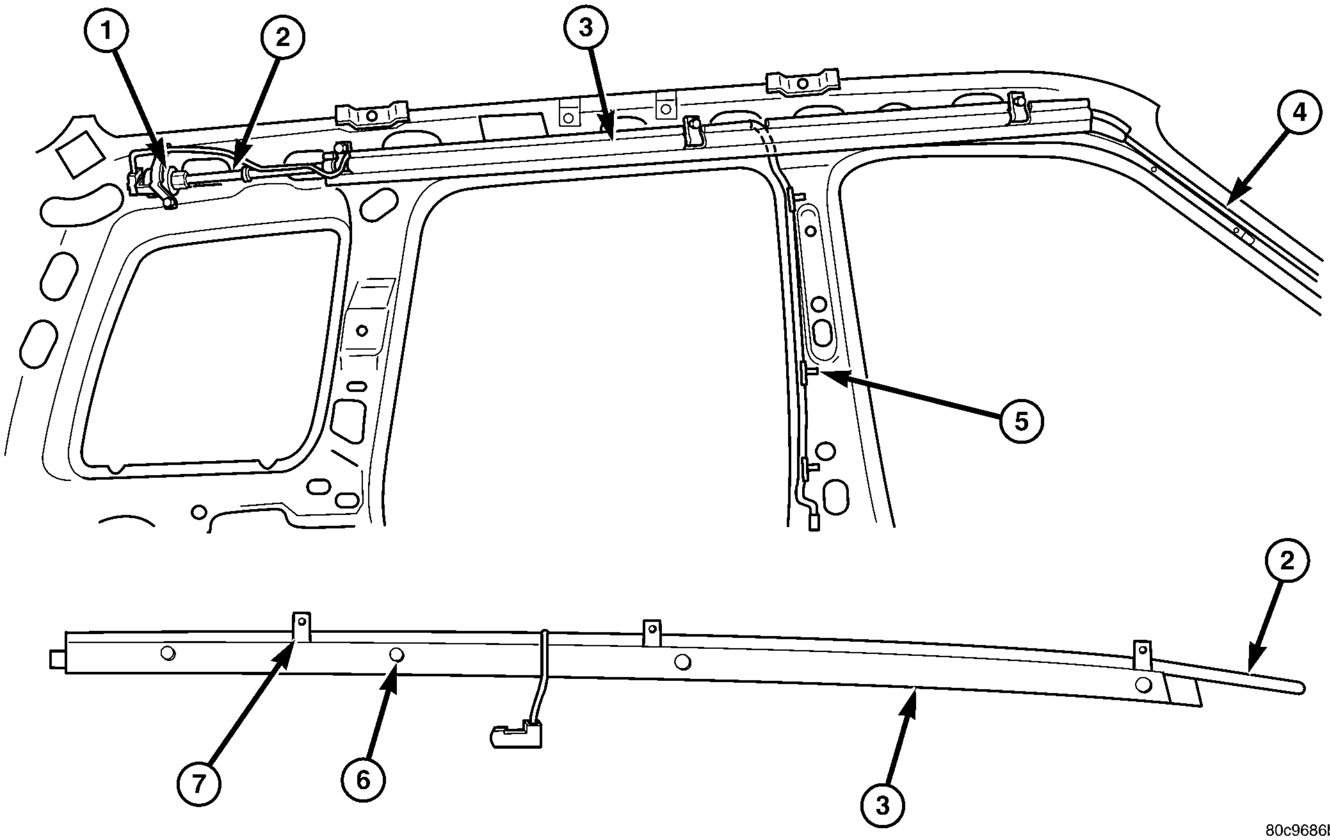

Fig. 39 Side Curtain Airbag

1 - INFLATOR
2 - MANIFOLD
3 - CHANNEL
4 - TETHER
5 - PIGTAIL WIRE RETAINER (3)
6 - PUSH-IN FASTENER (4)
7 - BRACKET (3)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE SIDE CURTAIN AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE SIDE CURTAIN AIRBAG CUSHION AND THE HEADLINER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

SIDE CURTAIN AIRBAG (Continued)

(2) Remove the lower trim from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(3) Remove the headliner from the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).

(4) Remove the screw that secures the side curtain airbag tether retainer to the base of the A-pillar near the belt line (Fig. 40).

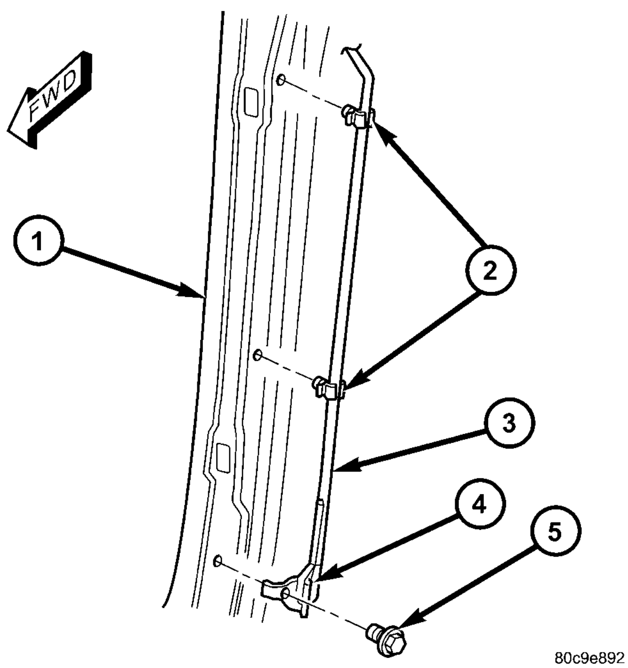

Fig. 40 Side Curtain Airbag Tether Remove/Install

1 - A-PILLAR
2 - CLIP (2)
3 - TETHER
4 - RETAINER (1)
5 - SCREW (1)

(5) Disengage the two side curtain airbag tether plastic retainer clips from the A-pillar.

(6) Disconnect the side curtain airbag pigtail wire connector from the body wire harness connector near the base of the B-pillar (Fig. 41).

(7) Disengage the three side curtain airbag pigtail wire retainer clips from the B-pillar.

(8) Remove the three screws that secure the side curtain airbag manifold tube brackets to the U-nuts in the roof rail (Fig. 42) and (Fig. 43).

(9) Remove the two screws that secure the side curtain airbag inflator bracket to the U-nuts in the roof rail (Fig. 44).

(10) Grasp the extruded plastic side curtain airbag channel firmly and pull it straight away from the roof rail far enough to disengage all four plastic push-in fasteners that secure it.

(11) Remove the side curtain airbag from the vehicle as a unit.

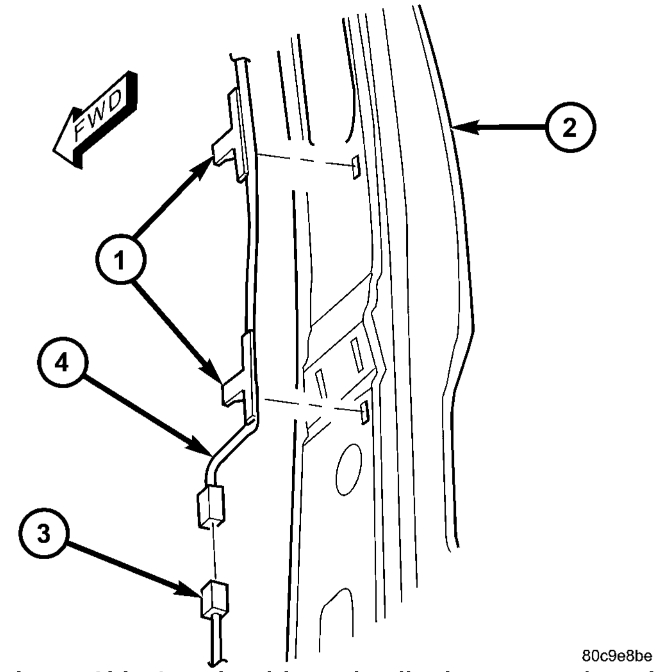

Fig. 41 Side Curtain Airbag Pigtail Wire Remove/Install

1 - RETAINER (3)
2 - B-PILLAR
3 - WIRE HARNESS CONNECTOR
4 - PIGTAIL WIRE

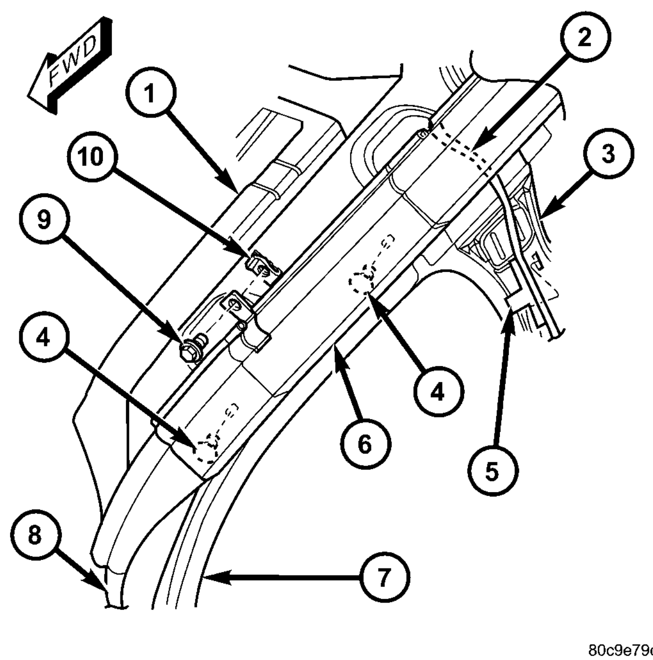

Fig. 42 Side Curtain Airbag (Front) Remove/Install

1 - ROOF PANEL
2 - PIGTAIL WIRE
3 - B-PILLAR
4 - PUSH-IN FASTENER (4)
5 - RETAINER
6 - CHANNEL
7 - A-PILLAR
8 - TETHER
9 - SCREW (3)
10 - U-NUT (5)

SIDE CURTAIN AIRBAG (Continued)

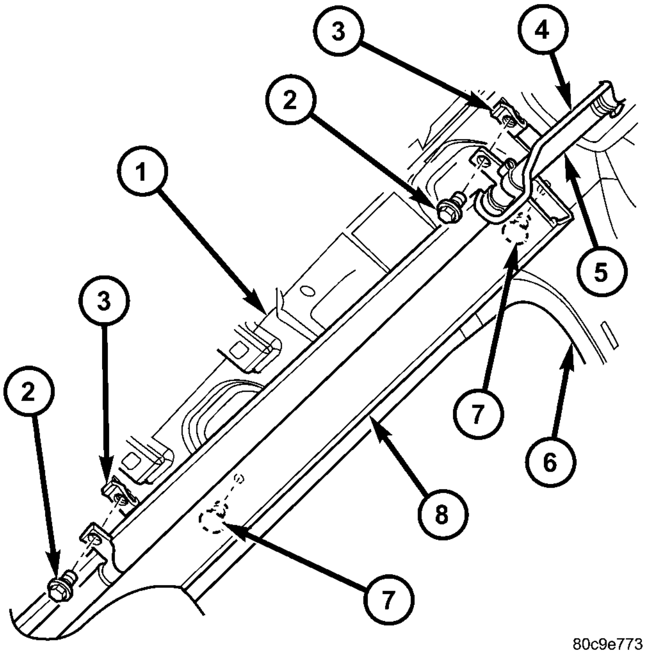

Fig. 43 Side Curtain Airbag (Rear) Remove/Install

1 - ROOF PANEL
2 - SCREW (3)
3 - U-NUT (5)
4 - PIGTAIL WIRE
5 - MANIFOLD
6 - C-PILLAR
7 - PUSH-IN FASTENER (4)
8 - CHANNEL

INSTALLATION

The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

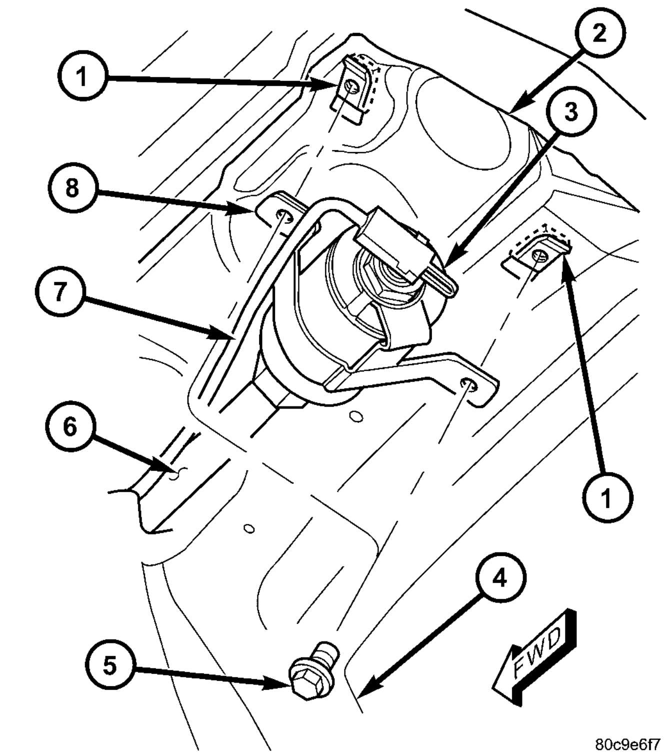

Fig. 44 Side Curtain Airbag Inflator Remove/Install

1 - U-NUT (5)
2 - ROOF PANEL
3 - INFLATOR
4 - C-PILLAR
5 - SCREW (2)
6 - MANIFOLD
7 - PIGTAIL WIRE
8 - BRACKET

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE SIDE CURTAIN AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE SIDE CURTAIN AIRBAG CUSHION AND THE HEADLINER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

SIDE CURTAIN AIRBAG (Continued)

(1) Position the side curtain airbag into the vehicle as a unit.

(2) Align all four plastic push-in fasteners that secure the extruded plastic side curtain airbag channel with their holes in the roof side rail and push them straight into the roof rail until they are fully seated (Fig. 42) and (Fig. 43).

(3) Install and tighten the upper screw that secures the side curtain airbag inflator bracket to the U-nut in the roof rail, followed by the lower screw (Fig. 44). Tighten the screws to 12 N·m (105 in. lbs.).

(4) Working from the rear of the vehicle to the front, install and tighten each of the three screws that secure the side curtain airbag manifold tube brackets to the U-nuts in the roof rail. Tighten the screws to 12 N·m (105 in. lbs.).

(5) Route the side curtain airbag pigtail wire through the trough along the top of the extruded plastic airbag channel on the roof side rail, then between the channel and the body down the B-pillar.

NOTE: Be certain that the side curtain airbag pigtail wire is routed behind the airbag channel, between the channel and the body above the B-pillar.

(6) Engage the three side curtain airbag pigtail wire retainer clips into the B-pillar (Fig. 41).

(7) Reconnect the side curtain airbag pigtail wire connector to the body wire harness connector near the base of the B-pillar.

(8) Engage the two side curtain airbag tether plastic retainer clips into the A-pillar (Fig. 40).

(9) Install and tighten the screw that secures the side curtain airbag tether retainer to the base of the A-pillar near the belt line. Tighten the screw to 14 N·m (120 in. lbs.).

(10) Reinstall the headliner into the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).

(11) Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(12) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SIDE IMPACT AIRBAG CONTROL MODULE

DESCRIPTION

On vehicles equipped with the optional side curtain airbags, a Side Impact Airbag Control Module

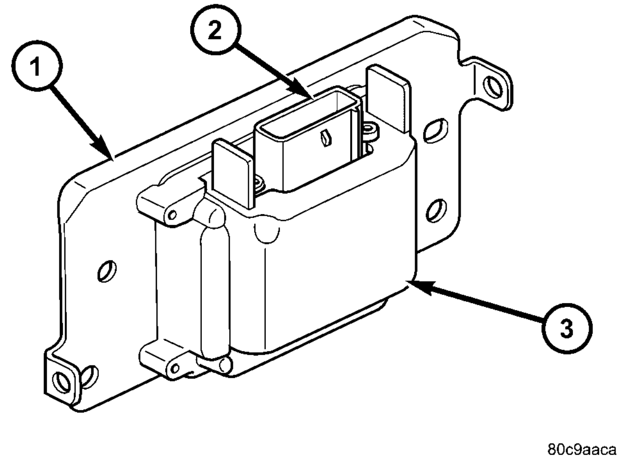

Fig. 45 Side Impact Airbag Control Module

1 - BRACKET (RIGHT SHOWN)
2 - CONNECTOR RECEPTACLE
3 - SIACM

(SIACM) and its mounting bracket are secured with four screws to the sill panel at the base of each B-pillar behind the lower B-pillar trim (Fig. 45). Concealed within a hollow in the center of the die cast aluminum SIACM housing is the electronic circuitry of the SIACM which includes a microprocessor and an electronic impact sensor.

The SIACM housing is secured to a stamped steel mounting bracket, which is unique for the right or left side application of this component. The SIACM should never be removed from its mounting bracket. The housing also receives a case ground through this mounting bracket when it is secured to the vehicle. A molded plastic electrical connector receptacle that exits the top of the SIACM housing connects the unit to the vehicle electrical system through a dedicated take out and connector of the body wire harness. Both the SIACM housing and its electrical connection are sealed to protect the internal electronic circuitry and components against moisture intrusion.

The impact sensor internal to the SIACM is calibrated for the specific vehicle, and is only serviced as a unit with the SIACM. The SIACM cannot be repaired or adjusted and, if damaged or faulty, it must be replaced.

OPERATION

The microprocessor in the Side Impact Airbag Control Module (SIACM) contains the side curtain airbag system logic circuits and controls all of the features of only the side curtain airbag mounted on the same side of the vehicle as the SIACM. The SIACM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the DRBIII® scan tool using the Programmable Communications Interface (PCI) data bus net-

SIDE IMPACT AIRBAG CONTROL MODULE (Continued)

work. This method of communication is used by the SIACM to communicate with the Airbag Control Module (ACM) and for supplemental restraints system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel. The ACM communicates with both the left and right SIACM over the PCI data bus.

The SIACM microprocessor continuously monitors all of the side curtain airbag electrical circuits to determine the system readiness. If the SIACM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the ACM over the PCI data bus. The ACM will respond by sending an electronic message to the EMIC to turn on the airbag indicator, and by storing a DTC that will indicate whether the left or the right SIACM has stored the DTC that initiated the airbag indicator illumination. An active fault only remains for the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the SIACM. For some DTCs, if a fault does not recur for a number of ignition cycles, the SIACM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The SIACM receives battery current on a fused ignition switch output (run-start) circuit through a fuse in the Junction Block (JB). The SIACM has a case ground through its mounting bracket and also receives a power ground through a ground circuit and take out of the body wire harness. This take out has a single eyelet terminal connector that is secured by a ground screw to the front seat front crossmember beneath the respective right or left front seat. These connections allow the SIACM to be operational whenever the ignition switch is in the Start or On positions. An electronic impact sensor is contained within the SIACM. The electronic impact sensor is an accelerometer that senses the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. A pre-programmed decision algorithm in the SIACM microprocessor determines when the deceleration rate as signaled by the impact sensor indicates a side impact that is severe enough to require side curtain airbag protection. When the programmed conditions are met, the SIACM sends the proper electrical signals to deploy the side curtain airbag.

The hard wired inputs and outputs for the SIACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SIACM, the PCI data bus network, or the electronic message inputs to and outputs from the SIACM. The most reliable, efficient, and accurate means to diagnose the SIACM, the PCI data bus network, and the electronic message inputs to and outputs from the SIACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE SIDE IMPACT AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SIDE CURTAIN AIRBAGS. NEVER STRIKE OR DROP THE SIDE IMPACT AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF A SIDE IMPACT AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SIDE CURTAIN AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Adjust the front seat to its most forward position for easiest access to the lower B-pillar trim.

(2) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(3) Remove the lower trim from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(4) Disconnect the body wire harness connector for the Side Impact Airbag Control Module (SIACM) from the module connector receptacle (Fig. 46).

(5) Disengage the body wire harness retainer from the tab on the SIACM mounting bracket.

SIDE IMPACT AIRBAG CONTROL MODULE (Continued)

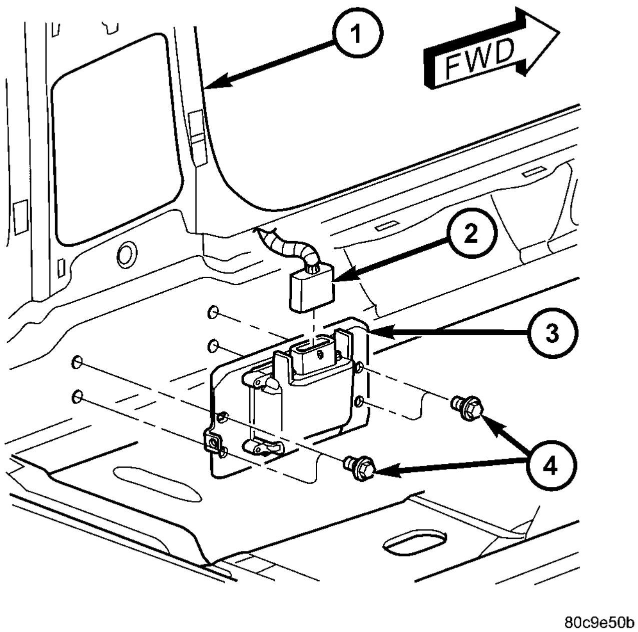

Fig. 46 Side Impact Airbag Control Module Remove/Install

1 - B-PILLAR
2 - WIRE HARNESS CONNECTOR
3 - SIACM
4 - SCREW (4)

(6) Remove the four screws that secure the SIACM mounting bracket to the sill panel at the base of the B-pillar.

(7) Remove the SIACM and its mounting bracket from the sill panel as a unit.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE SIDE IMPACT AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SIDE CURTAIN AIRBAGS. NEVER STRIKE OR DROP THE SIDE IMPACT AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF A SIDE IMPACT AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SIDE CURTAIN AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the Side Impact Airbag Control Module (SIACM) and its mounting bracket to the sill panel as a unit (Fig. 46).

(2) Loosely install the four screws that secure the SIACM mounting bracket to the sill panel at the base of the B-pillar.

(3) Tighten the four screws that secure the SIACM mounting bracket to the sill panel in the following sequence: upper front, upper rear, lower front, lower rear. Tighten the screws to 12 N·m (105 in. lbs.).

(4) Engage the body wire harness retainer to the tab on the SIACM mounting bracket.

(5) Reconnect the body wire harness connector for the SIACM to the module connector receptacle.

(6) Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(7) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SPEED CONTROL

TABLE OF CONTENTS

SPEED CONTROL

DESCRIPTION

The speed control system is electronically controlled and vacuum operated. Electronic control of the speed control system is integrated into the Powertrain Control Module (PCM). The controls consist of two steering wheel mounted switches. The switches are labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 30 mph (50 km/h).

WARNING: THE USE OF SPEED CONTROL IS NOT RECOMMENDED WHEN DRIVING CONDITIONS DO NOT PERMIT MAINTAINING A CONSTANT SPEED, SUCH AS IN HEAVY TRAFFIC OR ON ROADS THAT ARE WINDING, ICY, SNOW COVERED, OR SLIPPERY.

OPERATION

When speed control is selected by depressing the ON switch, the PCM allows a set speed to be stored in PCM RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:
- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.
- Depressing the clutch pedal (if equipped).

NOTE: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.

For added safety, the speed control system is programmed to disengage for any of the following conditions:
- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph per second (indicates that the coefficient of friction between the road surface and tires is extremely low)
- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RES/ACCEL switch (when speed is greater than 30 mph) restores the vehicle to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the RES/ACCEL switch. The new target speed is stored in the PCM when the RES/ACCEL is released. The PCM also has a "tap-up" feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

SPEED CONTROL (Continued)

A "tap down" feature is used to decelerate without disengaging the speed control system. To decelerate from an existing recorded target speed, momentarily depress the COAST switch. For each switch activation, speed will be lowered approximately 1 mph.

OVERSHOOT/UNDERSHOOT

If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as a "lift foot set"), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h). It may also decelerate to less than the desired set speed, before finally achieving the desired set speed.

The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. When the speed control is set with the vehicle operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly. If the "lift foot sets" are continually used, a speed control overshoot/undershoot condition will develop.

To "unlearn" the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating), and then turning the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. This procedure must be performed approximately 10–15 times to completely unlearn the overshoot/undershoot condition.

DIAGNOSIS AND TESTING - ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Group 8J, Instrument Cluster for speedometer diagnosis.

If a road test verifies a system problem and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose, damaged or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Leaking vacuum reservoir.
- Loose or leaking vacuum hoses or connections.
- Defective one-way vacuum check valve.
- Secure attachment of both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Failed speed control servo. Do the servo vacuum test.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

SPECIFICATIONS

TORQUE - SPEED CONTROL

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Servo Mounting Bracket-to-Servo Nuts	9	-	75
Servo Mounting Bracket-to-Body Bolts	12	-	105
Speed Control Switch Mounting Screws	1.5	-	14
Vacuum Reservoir Mounting Screws	3	-	20

CABLE

DESCRIPTION

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage.

OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

REMOVAL - 3.7L

(1) Disconnect negative battery cable at battery.

(2) Remove air filter resonator at throttle body.

The accelerator cable must be partially removed to gain access to speed control cable.

(3) Hold throttle in wide open position. While held in this position, slide throttle cable pin (Fig. 1) from throttle body bellcrank.

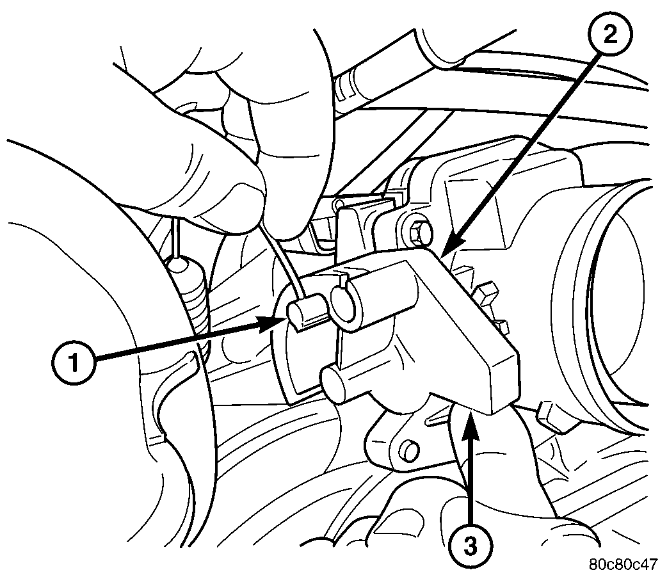

Fig. 1 THROTTLE CABLE PIN

1 - THROTTLE CABLE PIN
2 - THROTTLE BODY BELLCRANK
3 - PUSH UP HERE

(4) Using a pick or small screwdriver, press release tab (Fig. 2) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (Fig. 2) towards right side of vehicle to remove throttle cable from throttle body bracket.

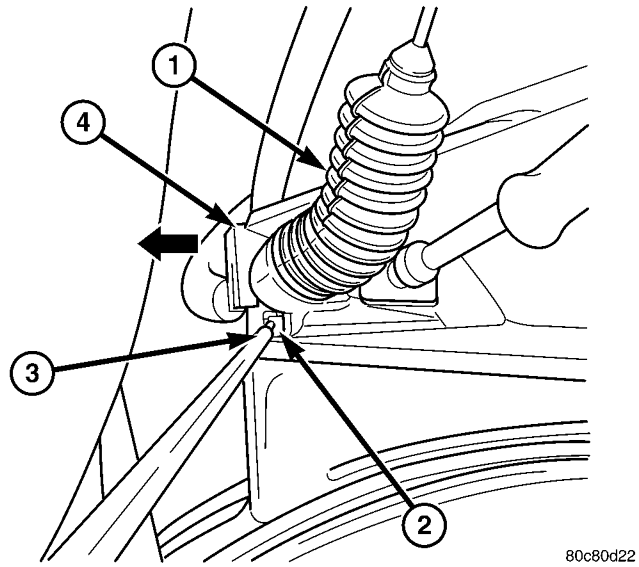

Fig. 2 THROTTLE CABLE RELEASE TAB

1 - THROTTLE CABLE
2 - RELEASE TAB
3 - PICK OR SCREWDRIVER
4 - PLASTIC CABLE MOUNT

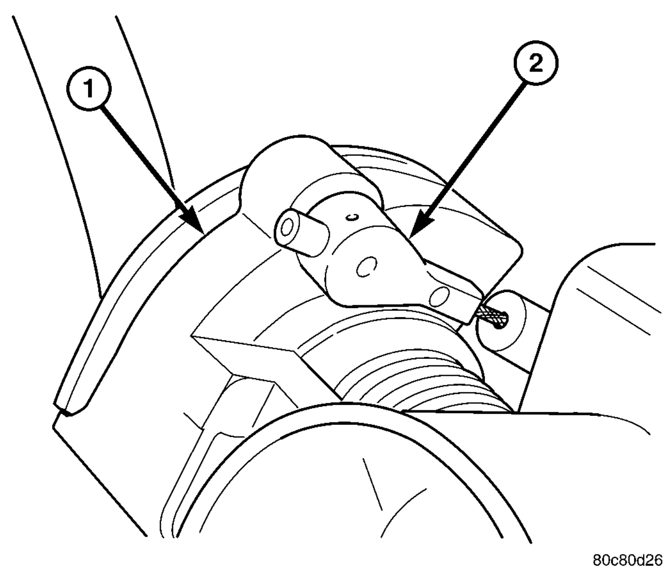

Fig. 3 SPEED CONTROL CABLE AT BELLCRANK

1 - THROTTLE BODY BELLCRANK
2 - SPEED CONTROL CABLE CONNECTOR

(5) Using finger pressure only, disconnect servo cable connector (Fig. 3) at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle. **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

CABLE (Continued)

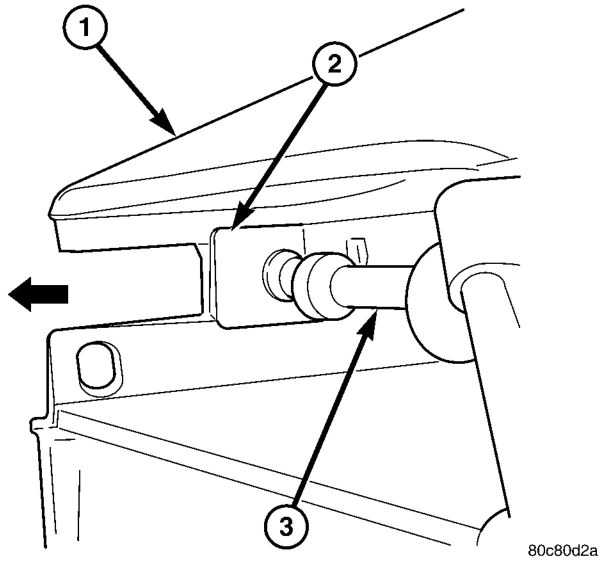

Fig. 4 SPEED CONTROL CABLE AT BRACKET

1 - THROTTLE CABLE BRACKET
2 - PLASTIC CABLE MOUNT
3 - SPEED CONTROL CABLE

(6) Slide speed control cable plastic mount towards right of vehicle to remove cable from throttle body bracket (Fig. 4).

(7) Remove servo cable from servo. Refer to Servo Removal/Installation.

INSTALLATION - 3.7L

(1) Install end of cable to speed control servo. Refer to Servo Removal/Installation.

(2) Slide speed control cable plastic mount into throttle body bracket.

(3) Install speed control cable connector onto throttle body bellcrank pin (push rearward to snap into location).

(4) Slide throttle (accelerator) cable plastic mount into throttle body bracket. Continue sliding until cable release tab is aligned to hole in throttle body mounting bracket.

(5) While holding throttle to wide open position, place throttle cable pin into throttle body bellcrank.

(6) Install air filter resonator box to throttle body.

(7) Connect negative battery cable at battery.

(8) Before starting engine, operate accelerator pedal to check for any binding.

SERVO

DESCRIPTION

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.

OPERATION

The Powertrain Control Module (PCM) controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo's by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

The vacuum and vent solenoids must be grounded at the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM duty cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids. When the brake is released, if vehicle speed exceeds 30 mph to resume, 35 mph to set, and the RES/ACCEL switch has been depressed, ground for the vent and vacuum circuits is restored.

SERVO (Continued)

REMOVAL

(1) Disconnect negative battery cable at battery.
(2) Disconnect vacuum line at servo (Fig. 5).
(3) Disconnect electrical connector at servo (Fig. 5).
(4) Remove coolant bottle nuts/bolts. Position bottle forward a few inches.
(5) Disconnect servo cable at throttle body. Refer to servo Cable Removal/Installation.
(6) Remove servo bracket mounting nuts (Fig. 5).
(7) Remove 2 mounting nuts holding servo cable sleeve to bracket (Fig. 6).
(8) Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (Fig. 6) and remove clip. Note: The servo mounting bracket displayed in (Fig. 6) is a typical bracket and may/may not be applicable to this model vehicle.
(9) Remove servo from mounting bracket. While removing, note orientation of servo to bracket.

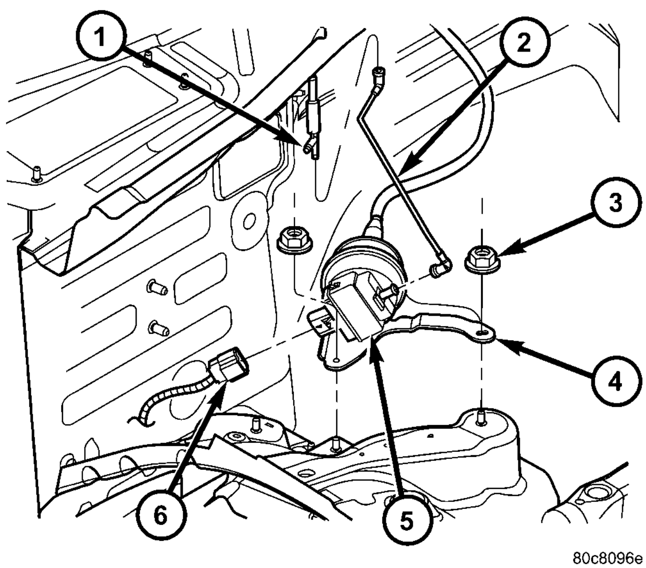

Fig. 5 SPEED CONTROL SERVO

1 - "T" FITTING
2 - VACUUM LINE
3 - SERVO BRACKET MOUNTING NUTS
4 - SERVO MOUNTING BRACKET
5 - SERVO
6 - SERVO ELECTRICAL CONNECTOR

INSTALLATION

(1) Position servo to mounting bracket.
(2) Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip.
(3) Insert servo mounting studs through holes in servo mounting bracket.
(4) Install servo-to-mounting bracket nuts and tighten. Refer to torque specifications.
(5) Install servo mounting bracket-to-body nuts and tighten. Refer to torque specifications.
(6) Connect vacuum line at servo.

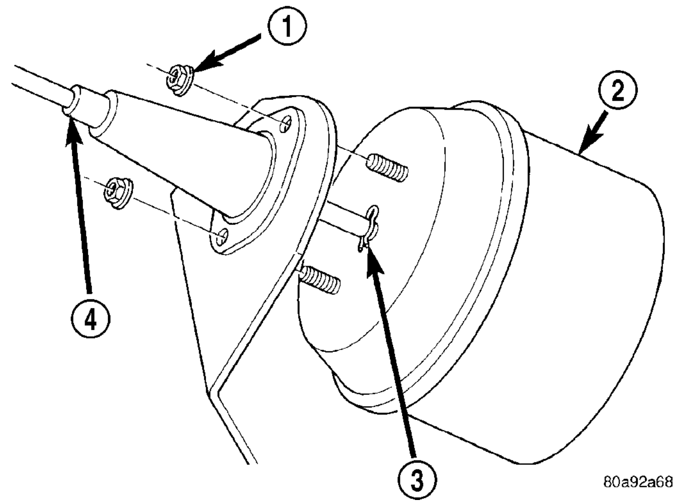

Fig. 6 SERVO CABLE CLIP REMOVE/INSTALL TYPICAL

1 - SERVO MOUNTING NUTS (2)
2 - SERVO
3 - CABLE RETAINING CLIP
4 - SERVO CABLE AND SLEEVE

(7) Connect electrical connector at servo.
(8) Connect servo cable to throttle body. Refer to servo Cable Removal/Installation.
(9) Install coolant bottle.
(10) Connect negative battery cable to battery.
(11) Before starting engine, operate accelerator pedal to check for any binding.

SWITCH

DESCRIPTION

There are two separate switch pods that operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME, ACCELERATE, SET, DECEL and CANCEL modes. Refer to the owner's manual for more information on speed control switch functions and setting procedures.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

OPERATION

When speed control is selected by depressing the ON, OFF switch, the PCM allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between approximately 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

SWITCH (Continued)

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- Depressing the clutch pedal.
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is not within 20 mph of the set speed

The previous disengagement conditions are programmed for added safety.

Once the speed control has been disengaged, depressing the ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM.

NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the PCM's RAM when the ACCEL switch is released. The PCM also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

Multiplexing

The PCM sends out 5 volts through a fixed resistor and monitors the voltage change between the fixed resistor and the switches. If none of the switches are depressed, the PCM will measure 5 volts at the sensor point (open circuit). If a switch with no resistor is closed, the PCM will measure 0 volts (grounded circuit). Now, if a resistor is added to a switch, then the PCM will measure some voltage proportional to the size of the resistor. By adding a different resistor to each switch, the PCM will see a different voltage depending on which switch is pushed.

Another resistor has been added to the 'at rest circuit' causing the PCM to never see 5 volts. This was done for diagnostic purposes. If the switch circuit should open (bad connection), then the PCM will see the 5 volts and know the circuit is bad. The PCM will then set an open circuit fault.

REMOVAL

WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE NEGATIVE (GROUND) BATTERY CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

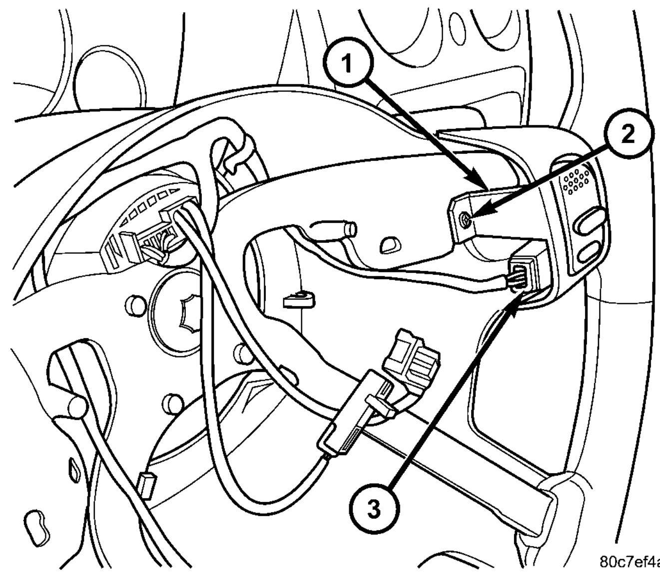

Fig. 7 SPEED CONTROL SWITCH

1 - SWITCH
2 - SCREW
3 - ELECTRICAL CONNECTOR

(1) Disconnect and isolate negative battery cable from battery.

(2) Remove airbag module. Refer to Restraint Systems.

(3) Unplug electrical connector (Fig. 7).

(4) Remove speed control switch mounting screw (Fig. 7) and remove switch from steering wheel.

INSTALLATION

(1) Position switch to steering wheel.

(2) Install switch mounting screw and tighten. Refer to torque specifications.

(3) Plug electrical connector into switch.

SWITCH (Continued)

(4) Install airbag module. Refer to Restraint Systems.

(5) Connect negative battery cable to battery.

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is a plastic storage tank connected to an engine vacuum source by vacuum lines.

OPERATION

The vacuum reservoir is used to supply the vacuum needed to maintain proper speed control operation when engine vacuum drops, such as in climbing a grade while driving. A one-way check valve is used in the vacuum line between the reservoir and the vacuum source. This check valve is used to trap engine vacuum in the reservoir. On certain vehicle applications, this reservoir is shared with the heating/air-conditioning system. The vacuum reservoir cannot be repaired and must be replaced if faulty.

DIAGNOSIS AND TESTING - VACUUM RESERVOIR

(1) Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.

(3) If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.

(4) If vacuum line to engine is not leaking, check for leak at vacuum reservoir. To locate and gain access to reservoir, refer to Vacuum Reservoir Removal/Installation in this group. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.

(5) Verify operation of one-way check valve and check it for leaks. **Certain models may be equipped with 2 check-valves.**

(a) Locate one-way check valve. The valve is located in vacuum line between vacuum reservoir and engine vacuum source. Disconnect vacuum hoses (lines) at each end of valve.

(b) Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.

(c) Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

REMOVAL

The vacuum reservoir is located behind, and at the outer end of the instrument panel (Fig. 8). To gain access for testing or removal, remove glovebox assembly. Also remove fuse box access cover panel at end of instrument panel. On vehicles equipped with LHD (Left Hand Drive), this fuse access panel is located at right end of instrument panel. On vehicles equipped with RHD (Right Hand Drive), this access panel is located at left end of instrument panel.

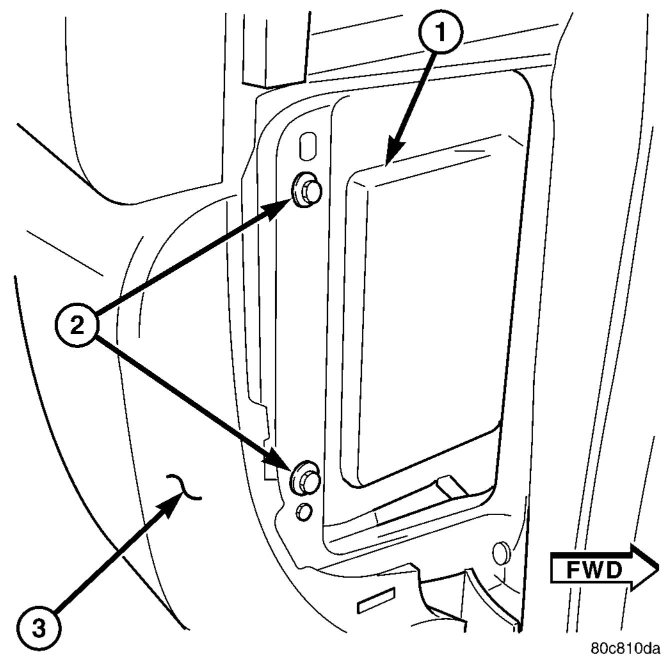

Fig. 8 VACUUM RESERVOIR LOCATION

1 - VACUUM RESERVOIR
2 - HORIZONTAL MOUNTING SCREWS
3 - OUTBOARD END OF I.P.

(1) Remove glovebox assembly. Access to reservoir vacuum line and fitting can now be made.

(2) Remove vacuum line at reservoir.

VACUUM RESERVOIR (Continued)

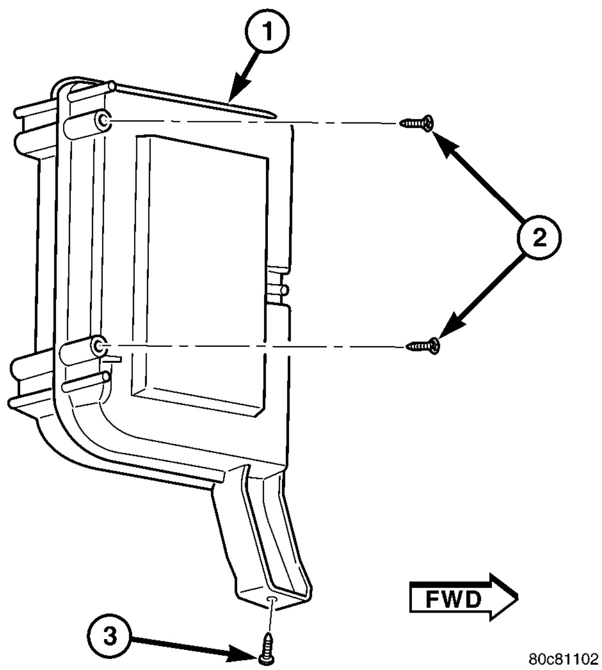

Fig. 9 VACUUM RESERVOIR REMOVE/INSTALL

1 - VACUUM RESERVOIR
2 - HORIZONTAL MOUNTING SCREWS (2)
3 - VERTICAL MOUNTING SCREW (1)

(3) Remove fuse access cover panel at end of instrument panel.

(4) Through fuse access opening, remove 2 horizontally mounted screws (Fig. 8).

(5) From bottom of instrument panel, remove 1 vertically mounted screw (Fig. 9).

(6) Remove reservoir from instrument panel.

INSTALLATION

The vacuum reservoir is located behind, and at the outer end of the instrument panel. To gain access for testing or removal, remove glovebox assembly. Also remove fuse box access cover panel at end of instrument panel. On vehicles equipped with LHD (Left Hand Drive), this fuse access panel is located at right end of instrument panel. On vehicles equipped with RHD (Right Hand Drive), this access panel is located at left end of instrument panel.

(1) Position reservoir to instrument panel.

(2) Install 3 mounting screws and tighten. Refer to torque specifications.

(3) Connect vacuum line to reservoir fitting.

(4) Install glovebox assembly.

(5) Install fuse box access cover panel.

VEHICLE THEFT SECURITY

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VEHICLE THEFT SECURITY

DESCRIPTION

The Vehicle Theft Security System (VTSS) is an available factory-installed option on this model (Fig. 1). The VTSS is comprised of two primary subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). The VTA is an active system that provides visual and audible responses as deterrents to and warnings of unauthorized vehicle tampering. The SKIS is a passive system that effectively immobilizes the vehicle against unauthorized operation. Following are paragraphs which describe the various components that are included in each of these subsystems of the VTSS.

Hard wired circuitry connects many of the VTSS components to each other through the electrical system of the vehicle. Refer to the appropriate wiring information.

VEHICLE THEFT ALARM The VTA is available in two different configurations for this vehicle: One configuration is designed for vehicles manufactured for sale in North America; while, the other configuration is designed for vehicles manufactured for sale in markets outside of North America, also referred to as Export. In addition, the VTA for Export is available in two versions: base and premium. All vehicles equipped with VTA are also equipped with the Remote Keyless Entry (RKE) system and the Sentry Key Immobilizer System (SKIS), regardless of their market destination. The North American and export base version of the VTA provides perimeter vehicle protection by monitoring the vehicle doors, the tailgate, the rear flip-up glass and, for vehicles built for certain markets where it is required equipment, the hood. If unauthorized vehicle use or tampering is detected, these systems respond by pulsing the horn and flashing certain exterior lamps. The Export premium version of the VTA is only available in vehicles manufactured for sale in certain markets where it is required equipment. The Export premium version of the VTA provides the same perimeter protection features as the base version, but adds interior vehicle intrusion protection. The Export premium VTA also replaces the pulsing horn feature of the base version with an alarm siren as the audible deterrent, while retaining the flashing exterior lamps visual deterrent.

The VTA includes the following major components, which are described in further detail elsewhere in this service information:

VEHICLE THEFT SECURITY (Continued)

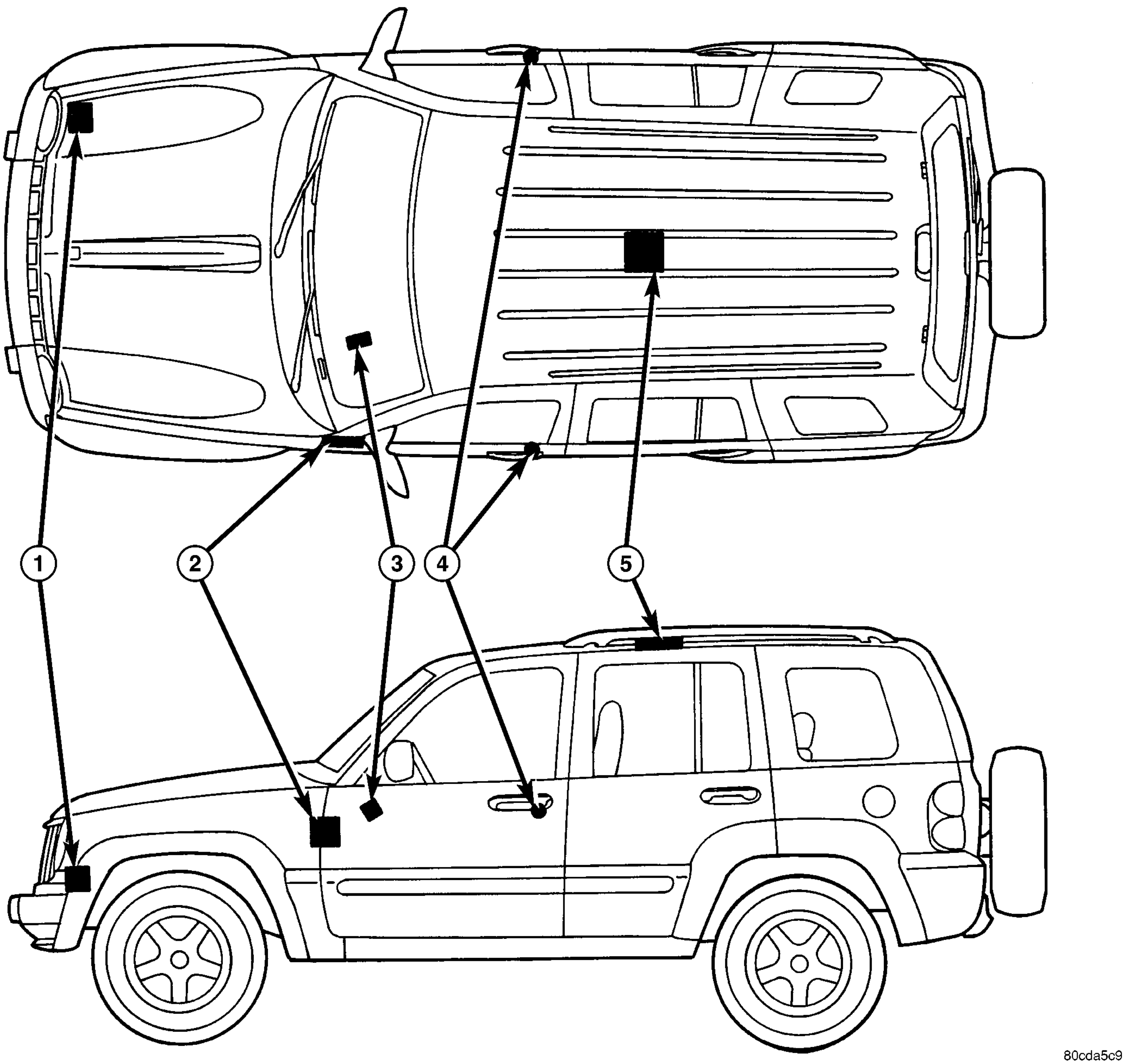

Fig. 1 Vehicle Theft Security System

1 - SIREN MODULE
2 - BODY CONTROL MODULE
3 - SENTRY KEY IMMOBILIZER MODULE
4 - DOOR CYLINDER LOCK SWITCH (2)
5 - INTRUSION TRANSCEIVER MODULE

- **Body Control Module** - The Body Control Module (BCM) is located on the Junction Block (JB) under the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL MODULE - DESCRIPTION).
- **Combination Flasher** - An electronic combination flasher is integral to the hazard switch located in the center of the instrument panel above the radio. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/COMBINATION FLASHER - DESCRIPTION).
- **Door Ajar Switch** - A door ajar switch is integral to the latch of each door in the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DESCRIPTION).
- **Door Cylinder Lock Switch** - For North American vehicles only, a door cylinder lock switch is located on the back of the driver door lock cylinder. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/DOOR CYLINDER LOCK SWITCH - DESCRIPTION).

VEHICLE THEFT SECURITY (Continued)

- **Flip-Up Glass Ajar Switch** - A flip-up glass ajar switch is integral to the rear flip-up glass latch, located on the top of the tailgate near the center. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/FLIP-UP GLASS AJAR SWITCH - DESCRIPTION).
- **Hood Ajar Switch** - A hood ajar switch is located on the right inner fender side shield of vehicles built for sale in markets where it is required equipment. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - DESCRIPTION).
- **Horn Relay** - A horn relay is located on the Junction Block (JB) under the instrument panel. (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DESCRIPTION).
- **Intrusion Transceiver Module** - An Intrusion Transceiver Module (ITM) is located near the center of the headliner in the passenger compartment of vehicles built for sale in markets where it is required equipment. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/UK SECURITY SYSTEM MODULE - DESCRIPTION).
- **Security Indicator** - A security indicator is located in the ElectroMechanical Instrument Cluster (EMIC) on the instrument panel in front of the driver side front seat. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/SECURITY INDICATOR - DESCRIPTION).
- **Siren** - An alarm siren is located on the front of the right front wheel house panel in the engine compartment of vehicles built for sale in markets where it is required equipment. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SIREN - DESCRIPTION).
- **Tailgate Ajar Switch** - A tailgate ajar switch is integral to the latch for the tailgate in the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/TAILGATE AJAR SWITCH - DESCRIPTION).

SENTRY KEY IMMOBILIZER SYSTEM The Sentry Key Immobilizer System (SKIS) is available as a factory-installed option on this model. Vehicles equipped with the Vehicle Theft Alarm (VTA) are also equipped with SKIS. The SKIS provides passive vehicle protection by preventing the engine from operating unless a valid electronically encoded key is detected in the ignition lock cylinder. The SKIS includes the following major components, which are described in further detail elsewhere in this service information:

- **Powertrain Control Module** - The Powertrain Control Module (PCM) is located on the left inner fender shield in the engine compartment. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION).
- **Sentry Key Immobilizer Module** - The Sentry Key Immobilizer Module (SKIM) is located beneath the steering column shrouds on the right side of the steering column.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/SENTRY KEY IMMOBILIZER MODULE - DESCRIPTION).
- **Sentry Key Transponder** - The Sentry Key transponder is molded into the head of the ignition key. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - DESCRIPTION).
- **SKIS Indicator** - The SKIS indicator is located in the ElectroMechanical Instrument Cluster (EMIC) on the instrument panel in front of the driver side front seat. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/SPEED CONTROL INDICATOR - DESCRIPTION).

OPERATION

The Vehicle Theft Security System (VTSS) is divided into two basic subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). Following are paragraphs that briefly describe the operation of each of these two subsystems.

VEHICLE THEFT ALARM The Body Control Module (BCM) is used to control many of the electronic functions and features included in the Vehicle Theft Alarm (VTA). The BCM receives hard wired inputs indicating the status of the door ajar switches, the door cylinder lock switches, the ignition switch, the tailgate ajar switch, the tailgate cylinder lock switch, the flip-up glass ajar switch, the power lock switches and, in vehicles built for certain markets where it is required, the hood ajar switch. The programming in the BCM allows it to process the information from all of these inputs and send control outputs to energize or de-energize the combination flasher, the horn relay (except vehicles with the Export premium version of the VTA), and the security indicator. In addition, in vehicles built for certain markets where the Export premium version of the VTA is required, the BCM also exchanges electronic messages with the Intrusion Transceiver Module (ITM) over the Programmable Communications Interface (PCI) data bus network to provide the features found in this version of the VTA.

VEHICLE THEFT SECURITY (Continued)

The hard wired circuits and components of the VTA may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), the Intrusion Transceiver Module (ITM), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, the ITM, and the PCI data bus network inputs and outputs related to the VTA requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Following are paragraphs that briefly describe the operation of each of the VTA features. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the VTA.

• **ENABLING** - The BCM must have the VTA function electronically enabled in order for the VTA to perform as designed. The logic in the BCM keeps its VTA function dormant until it is enabled using a DRBIII® scan tool. The VTA function of the BCM is enabled on vehicles equipped with the VTA option at the factory, but a service replacement BCM must be VTA-enabled by the dealer using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

• **PRE-ARMING** - The VTA has a pre-arming sequence. Pre-arming occurs when a door, the tailgate, or the flip-up glass is open when the vehicle is locked using a power lock switch, or when the "Lock" button on the Remote Keyless Entry (RKE) transmitter is depressed. The power lock switch will not initiate the pre-arming sequence if the key is in the ignition switch. When the VTA is pre-armed, the arming sequence is delayed until all of the doors, the tailgate, and the flip-up glass are closed.

• **ARMING** - Passive arming of the VTA occurs when the vehicle is exited with the key removed from the ignition switch and the doors are locked while they are open using the power lock switch (see Pre-Arming). Active arming of the VTA occurs when the "Lock" button on the Remote Keyless Entry (RKE) transmitter is depressed to lock the vehicle after all of the doors, the tailgate, and the flip-up glass are closed. The VTA will not arm if the doors are locked using the key in a lock cylinder or using a mechanical lock button. Once the VTA begins the passive or active arming sequence, the security indicator in the instrument cluster will flash rapidly for about sixteen seconds. This indicates that the VTA arming sequence is in progress. If the ignition switch is turned to the On position, if a door is unlocked with the power lock switch or the RKE transmitter, or if the tailgate is unlocked by any means during the sixteen second arming sequence, the security indicator will stop flashing and the VTA arming sequence will abort. On vehicles equipped with the hood ajar switch, the VTA arming sequence will occur regardless of whether the hood is open or closed, but the underhood area will not be protected unless the hood is closed when the VTA arming sequence begins. Also, if the status of the hood ajar switch changes from open to closed during the sixteen second arming sequence, the security indicator will stop flashing and the VTA arming sequence will abort. Once the sixteen second arming sequence is successfully completed, the security indicator will flash at a slower rate, indicating that the VTA is armed.

• **DISARMING** - For vehicles built for the North American market, disarming of the VTA occurs when the vehicle is unlocked using the key to unlock a door or the tailgate. Disarming of the VTA for any market also occurs when the vehicle is unlocked by depressing the "Unlock" button of the Remote Keyless Entry (RKE) transmitter, or by turning the ignition switch to the On position using a valid Sentry Key Immobilizer System (SKIS) key. Once the alarm has been activated, any of these disarming methods will also deactivate the alarm.

• **POWER-UP MODE** - When the armed VTA senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the alarm system returns to the mode that was last selected prior to the battery failure or disconnect. If the VTA was armed prior to the battery disconnect or failure, the technician or vehicle operator will have to actively or passively disarm the system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is then attempted. The VTA will remain armed until the technician or vehicle operator has actively or passively disarmed the system. If the VTA is in the disarmed mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

• **ALARM** - The VTA alarm output varies by the version of the VTA with which the vehicle is equipped. In all cases, the alarm provides both visual and audible outputs; however, the time intervals of these outputs vary by the requirements of the market for which the vehicle is manufactured. In all cases, the visual output will be a flashing on and off of the exterior lamps. For vehicles equipped with the North American or the Export base version of the VTA, the audible output will be a pulsing of the horn. For vehicles with the Export premium version of the VTA, the audible output will be a cycling of the alarm siren. See the owner's manual in the vehicle glove box for details of the alarm output requirements of the specific market for which the vehicle

VEHICLE THEFT SECURITY (Continued)

was manufactured. The inputs that will trigger the alarm include the door ajar switches, the tailgate ajar switch, the flip-up glass ajar switch, and in vehicles built for certain markets where they are required, the hood ajar switch and the Intrusion Transceiver Module (ITM).

- **TAMPER ALERT** - The VTA tamper alert feature will pulse the horn (or the alarm siren for the Export premium version of the VTA) three times upon VTA disarming, if the alarm was triggered and has since timed-out. This feature alerts the vehicle operator that the VTA alarm was activated while the vehicle was unattended.
- **INTRUSION ALARM** - The intrusion alarm is an exclusive feature of the Export premium version of the VTA, which is only available in certain markets where it is required. When the VTA is armed, a motion sensor in the Intrusion Transceiver Module (ITM) monitors the interior of the vehicle for movement. If motion is detected, the ITM sends an electronic message to the BCM over the PCI data bus to invoke the visual alarm feature, and sends an electronic message to the alarm siren in the engine compartment over a dedicated serial bus to invoke the audible alarm feature. The motion detect feature of the ITM can be disabled by depressing the “Lock” button on the RKE transmitter three times within fifteen seconds during VTA arming, while the security indicator is still flashing rapidly. The VTA provides a single short siren “chirp” as an audible confirmation that the motion detect disable request has been received. The ITM must be electronically enabled in order for the intrusion alarm to perform as designed. The logic in the ITM keeps its intrusion alarm function dormant until it is enabled using a DRBIII® scan tool. The intrusion alarm function of the ITM is enabled on vehicles equipped with this option at the factory, but a service replacement ITM must be configured and enabled by the dealer using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM The Sentry Key Immobilizer System (SKIS) is designed to provide passive protection against unauthorized vehicle use by disabling the engine after about two seconds of running, whenever any method other than a valid Sentry Key is used to start the vehicle. The SKIS is considered a passive protection system because it is always active when the ignition system is energized and does not require any customer intervention. The SKIS uses Radio Frequency (RF) communication to obtain confirmation that the key in the ignition switch is a valid key for operating the vehicle. The microprocessor-based SKIS hardware and software also use electronic messages to communicate with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

Pre-programmed Sentry Key transponders are provided with the vehicle from the factory. Each Sentry Key Immobilizer Module (SKIM) will recognize a maximum of eight Sentry Keys. If the customer would like additional keys other than those provided with the vehicle, they may be purchased from any authorized dealer. These additional keys must be programmed to the SKIM in the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer using a DRBIII® scan tool or, if Customer Learn programming is an available SKIS feature in the market where the vehicle was purchased, the customer can program the additional keys, as long as at least two valid Sentry Keys are already available. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of Diagnostic Trouble Codes (DTC’s) if a system malfunction is detected. The SKIS can be diagnosed, and any stored DTC’s can be retrieved using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft Security System (VTSS) is divided into two basic subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). Following are the recommended procedures for diagnosis and testing of each of these two subsystems.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, FRONT IMPACT SENSORS, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

VEHICLE THEFT SECURITY (Continued)

VEHICLE THEFT ALARM

Models equipped with the Export premium version of the Vehicle Theft Alarm (VTA) provide some preliminary diagnostic feedback by illuminating the security indicator located in the ElectroMechanical Instrument Cluster (EMIC). If the security indicator illuminates with the ignition switch in the On position, it indicates that there is a communication problem between the Intrusion Transceiver Module (ITM) and the Body Control Module (BCM), or between the ITM and the siren module. The BCM will also turn on the security indicator if it receives a message from the ITM indicating that the ITM has stored a Diagnostic Trouble Code (DTC) for a siren module fault.

The hard wired circuits and components of the VTA may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the ElectroMechanical Instrument Cluster (EMIC), the Intrusion Transceiver Module (ITM), or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient, and accurate means to diagnose the BCM, the EMIC, the ITM, and the PCI data bus network inputs and outputs related to the VTA requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic and wiring information.

SENTRY KEY IMMOBILIZER SYSTEM

SENTRY KEY IMMOBILIZER SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
SKIS INDICATOR FAILS TO LIGHT DURING BULB TEST	1. SKIS indicator faulty.	1. Test and replace the instrument cluster as required.
	2. Fuse faulty.	2. Test and replace the SKIM fused B(+) and fused ignition switch output (run-start) fuses in the Junction Block (JB) as required.
	3. Ground circuit faulty.	3. Test and repair the SKIM ground circuit as required.
	4. Fused B(+) circuit faulty.	4. Test and repair the SKIM fused B(+) circuit as required.
	5. Fused ignition switch output circuit faulty.	5. Test and repair the SKIM fused ignition switch output (run-start) circuit as required.
SKIS INDICATOR FLASHES WHEN IGNITION SWITCH IS TURNED TO ″ON″ POSITION	1. Invalid key in ignition switch lock cylinder.	1. Replace the key with a known valid key.
	2. Key-related fault.	2. Use a DRBIII® scan tool to diagnose the key-related fault. Refer to the appropriate diagnostic information.
SKIS INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	1. SKIS system malfunction/ fault detected.	1. Use a DRBIII® scan tool to diagnose the SKIS. Refer to the appropriate diagnostic information.
	2. SKIS system inoperative.	2. Use a DRBIII® scan tool to diagnose the SKIS. Refer to the appropriate diagnostic information.

SKIS INDICATOR FAILS TO LIGHT DURING BULB TEST

If the Sentry Key Immobilizer System (SKIS) indicator in the instrument cluster fails to illuminate for about three seconds after the ignition switch is turned to the On position (bulb test), perform the instrument cluster actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the SKIS indicator still fails to light during the bulb test, a wiring problem resulting in the loss of battery current or ground to the Sentry Key Immobilizer Module (SKIM) should be suspected, and the following procedure should be used for diagnosis. Refer to the appropriate wiring information.

VEHICLE THEFT SECURITY (Continued)

NOTE: The following tests may not prove conclusive in the diagnosis of this system. The most reliable, efficient, and accurate means to diagnose the Sentry Key Immobilizer System requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

(1) Check the fused B(+) fuse in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the JB. If OK, go to Step 3. If not OK, repair the open B(+) circuit between the JB and the battery.

(3) Check the fused ignition switch output (run-start) fuse in the JB. If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-start) fuse in the JB. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run-start) circuit between the JB and the ignition switch.

(5) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the Sentry Key Immobilizer Module (SKIM) from the SKIM connector receptacle. Check for continuity between each of the two ground circuits of the instrument panel wire harness connector for the SKIM and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit(s) to ground.

(6) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the SKIM. If OK, go to Step 7. If not OK, repair the open fused B(+) circuit between the SKIM and the JB.

(7) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-start) circuit of the instrument panel wire harness connector for the SKIM. If OK, use a DRBIII® scan tool to complete the diagnosis of the SKIS. Refer to the appropriate diagnostic information. If not OK, repair the open fused ignition switch output (run-start) circuit between the SKIM and the JB.

SKIS INDICATOR FLASHES UPON IGNITION "ON" OR LIGHTS SOLID FOLLOWING BULB TEST

A SKIS indicator that flashes following the ignition switch being turned to the On position indicates that an invalid key has been detected, or that a key-related fault has been set. A SKIS indicator that lights solid following a successful bulb test indicates that the SKIM has detected a system malfunction or that the SKIS is inoperative. In either case, fault information will be stored in the SKIM memory. For retrieval of this fault information and further diagnosis of the SKIS, the PCI data bus, the SKIM electronic message outputs to the instrument cluster that control the SKIS indicator and chime, or the electronic message inputs and outputs between the SKIM and the Powertrain Control Module (PCM) that control engine operation, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information. Following are preliminary troubleshooting guidelines to be followed during diagnosis using a DRBIII® scan tool:

(1) Using the DRBIII® scan tool, read and record the faults as they exist in the SKIM when you first begin your diagnosis of the vehicle. It is important to document these faults because the SKIM does not differentiate between history faults and active faults. If this problem turns out to be an intermittent condition, this information may become invaluable to your diagnosis.

(2) Using the DRBIII® scan tool, erase all of the faults from the SKIM.

(3) Cycle the ignition switch to the Off position, then back to the On position.

(4) Using the DRBIII® scan tool, read any faults that are now present in the SKIM. These are the active faults.

(5) Using this active fault information, refer to the proper procedure in the appropriate diagnostic information for the specific additional diagnostic steps.

STANDARD PROCEDURE

STANDARD PROCEDURE - SKIS INITIALIZATION

The Sentry Key Immobilizer System (SKIS) must be initialized following a Sentry Key Immobilizer Module (SKIM) replacement. SKIS initialization requires the use of a DRBIII® scan tool. Initialization will also require that you have access to the unique four-digit PIN code that was assigned to the original SKIM. The PIN code **must** be used to enter the Secured Access Mode in the SKIM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKIM PROGRAMMING).

VEHICLE THEFT SECURITY (Continued)

NOTE: If a Powertrain Control Module (PCM) is replaced on a vehicle equipped with the Sentry Key Immobilizer System (SKIS), the unique Secret Key data must be transferred from the Sentry Key Immobilizer Module (SKIM) to the new PCM using the PCM replacement procedure. This procedure also requires the use of a DRBIII® scan tool and the unique four-digit PIN code to enter the Secured Access Mode in the SKIM. Refer to the appropriate diagnostic information for the proper PCM replacement procedures.

STANDARD PROCEDURE - SENTRY KEY TRANSPONDER PROGRAMMING

All Sentry Keys included with the vehicle are pre-programmed to work with the Sentry Key Immobilizer System (SKIS) when it is shipped from the factory. The Sentry Key Immobilizer Module (SKIM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition switch lock cylinder in the vehicle for which it will be used. Once the additional or new key has been cut, the SKIM must be programmed to recognize it as a valid key. There are two possible methods to program the SKIM to recognize a new or additional valid key, the Secured Access Method and the Customer Learn Method. Following are the details of these two programming methods.

SECURED ACCESS METHOD

The Secured Access method applies to all vehicles. This method requires the use of a DRBIII® scan tool. This method will also require that you have access to the unique four-digit PIN code that was assigned to the original SKIM. The PIN code **must** be used to enter the Secured Access Mode in the SKIM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. Refer to the appropriate diagnostic information for the proper Secured Access method programming procedures.

CUSTOMER LEARN METHOD

The Customer Learn feature is only available on domestic vehicles, or those vehicles which have a U.S. country code designator. This programming method also requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, or if the vehicle does not have a U.S. country code designator, the Secured Access Method **must** be used to program new or additional valid keys to the SKIM. The Customer Learn programming method procedures are as follows:

(1) Obtain the blank Sentry Key(s) that are to be programmed as valid keys for the vehicle. Cut the blank key(s) to match the ignition switch lock cylinder mechanical key codes.

(2) Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the On position.

(3) After the ignition switch has been in the On position for longer than three seconds, but no more than fifteen seconds, cycle the ignition switch back to the Off position. Replace the first valid Sentry Key in the ignition switch lock cylinder with the second valid Sentry Key and turn the ignition switch back to the On position. The second valid Sentry Key must be inserted in the lock cylinder within fifteen seconds of removing the first valid key.

(4) About ten seconds after the completion of Step 3, the SKIS indicator in the instrument cluster will start to flash and a single audible chime will sound to indicate that the system has entered the Customer Learn programming mode.

(5) Within sixty seconds of entering the Customer Learn programming mode, turn the ignition switch to the Off position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the On position.

(6) About ten seconds after the completion of Step 5, a single audible chime will sound and the SKIS indicator will stop flashing, stay on solid for three seconds, then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKIS will immediately exit the Customer Learn programming mode and the vehicle may now be started using the newly programmed valid Sentry Key.

Each of these steps must be repeated and completed in their entirety for each additional Sentry Key that is to be programmed. If the above steps are not completed in the given sequence, or within the allotted time, the SKIS will exit the Customer Learn programming mode and the programming will be unsuccessful. The SKIS will also automatically exit the Customer Learn programming mode if it sees a non-blank Sentry Key transponder when it should see a blank, if it has already programmed eight (8) valid Sentry Keys, or if the ignition switch is turned to the Off position for more than about fifty seconds.

NOTE: If an attempt is made to start the vehicle while in the Customer Learn mode (SKIS indicator flashing), the SKIS will respond as though the vehicle were being started with an invalid key. In other words, the engine will stall after about two seconds of operation. No faults will be set.

VEHICLE THEFT SECURITY (Continued)

NOTE: Once a Sentry Key has been programmed as a valid key to a vehicle, it cannot be programmed as a valid key for use on any other vehicle.

DOOR CYLINDER LOCK SWITCH

DESCRIPTION

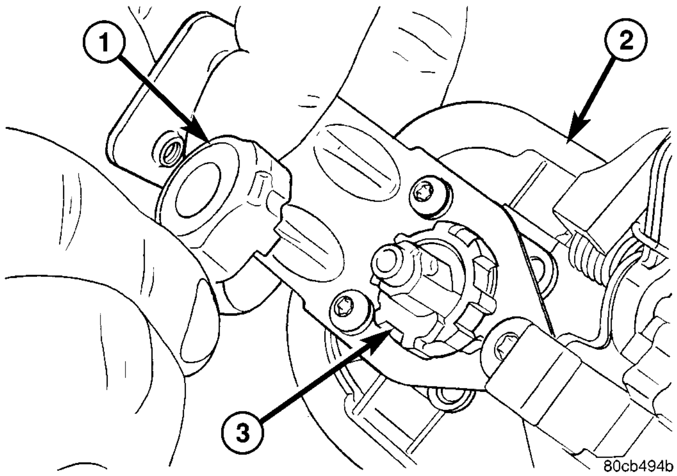

Fig. 2 Door Cylinder Lock Switch

1 - SWITCH
2 - OUTSIDE DOOR HANDLE
3 - DOOR LOCK CYLINDER

Vehicles manufactured for North American markets that are equipped with the optional Vehicle Theft Security System (VTSS) have a door cylinder lock switch secured to the back of the key lock cylinder inside each front door (Fig. 2). On models equipped with a key FOB, the redundant door key cylinder has been removed. The door cylinder lock switch is a resistor multiplexed momentary switch that is hard wired in series between the door lock switch ground and right or left cylinder lock switch circuits of the Body Control Module (BCM) through the front door wire harness. The door cylinder lock switches are driven by the key lock cylinders and contain two internal resistors. One resistor value is used for the Lock position, and one for the Unlock position.

The door cylinder lock switches cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The door cylinder lock switches are actuated by the key lock cylinder when the key is inserted in the lock cylinder and turned to the lock or unlock positions. The door cylinder lock switch close a circuit between the door lock switch ground circuit and the left or right cylinder lock switch circuits through one of two internal resistors for the Body Control Module (BCM) when either front door key lock cylinder is in the Lock, or Unlock positions. The BCM reads the switch status through an internal pull-up, then uses this information as an input for the Vehicle Theft Security System (VTSS) operation.

The door cylinder lock switches and circuits can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - DOOR CYLINDER LOCK SWITCH

Refer to the appropriate wiring information.

(1) Disconnect the door cylinder lock switch pigtail wire connector from the door wire harness connector.

(2) Using a ohmmeter, check the switch resistance checks between the two terminals in the door cylinder lock switch pigtail wire connector. Actuate the switch by rotating the key in the door lock cylinder to test for the proper resistance values in each of the two switch positions, as shown in the Door Cylinder Lock Switch Test table.

DOOR CYLINDER LOCK SWITCH TEST		
Switch Position		Resistance (±10%)
Left Side	Right Side	
Lock (Clockwise)	Unlock (Counterclockwise)	473 Ohms
Unlock (Counterclockwise)	Lock (Clockwise)	1.994 Kilohms

(3) If a door cylinder lock switch fails either of the resistance tests, replace the faulty switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the outside door handle unit from the outer door panel. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL).

DOOR CYLINDER LOCK SWITCH (Continued)

(3) Remove the retainer clip from the pin on the back of the door lock cylinder (Fig. 3).

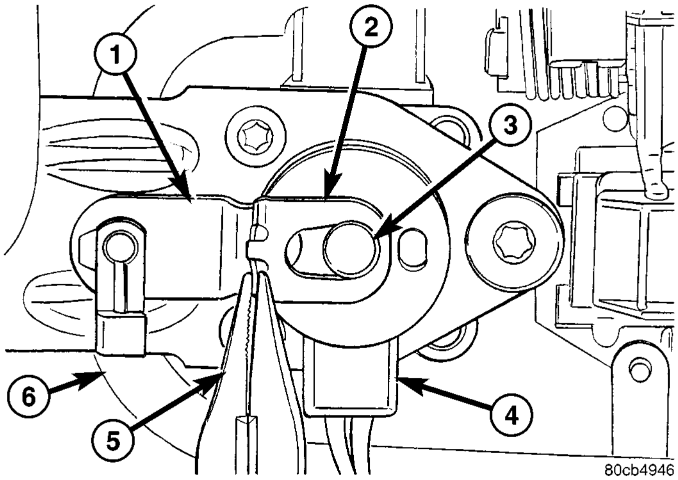

Fig. 3 Lock Cylinder Lever Retainer Remove/Install

1 - LEVER
2 - RETAINER
3 - LOCK CYLINDER
4 - SWITCH
5 - PLIERS
6 - OUTSIDE DOOR HANDLE

(4) Remove the lock lever from the pin on the back of the door lock cylinder.

(5) Remove the door cylinder lock switch from the back of the lock cylinder.

INSTALLATION

(1) Position the door cylinder lock switch onto the back of the lock cylinder with its pigtail wire harness oriented toward the bottom (Fig. 3).

(2) Position the lock lever onto the pin on the back of the door lock cylinder with the lever oriented toward the rear.

(3) Install the retainer clip onto the pin on the back of the door lock cylinder. Be certain that the center tab of the retainer is engaged in the retention hole on the lock lever.

(4) Reinstall the outside door handle unit onto the outer door panel. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION).

(5) Reconnect the battery negative cable.

HOOD AJAR SWITCH

DESCRIPTION

The hood ajar switch is a normally closed, single pole momentary switch that is used only on vehicles equipped with the Vehicle Theft Security System (VTSS) for sale in certain markets where it is required equipment (Fig. 4). The switch body has an integral molded connector on the lower end, while

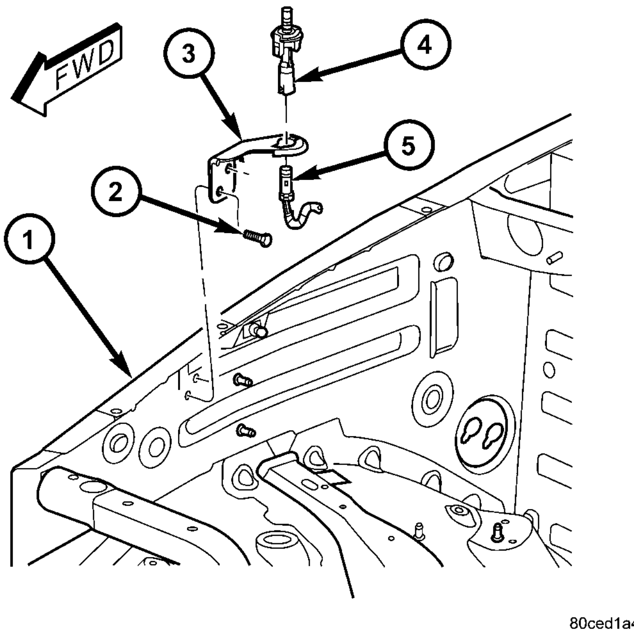

Fig. 4 Hood Ajar Switch

1 - INNER FENDER
2 - SCREW (2)
3 - BRACKET
4 - HOOD AJAR SWITCH
5 - WIRE HARNESS CONNECTOR

the spring-loaded switch plunger extends from the upper end. Two external latches integral to the mounting bezel lock the switch into a keyed mounting hole in the stamped steel switch mounting bracket. The mounting bracket is fastened with screws to the right inner fender shield near the fender ledge in the engine compartment. A molded plastic striker with an integral retainer and mounting tab is secured to the underside of the hood panel inner reinforcement to actuate the switch plunger as the hood panel is closed (Fig. 5). A single take out of the headlamp and dash wire harness connects the switch to the vehicle electrical system. The switch receives a path to ground at all times through a ground screw to the left inner fender shield in the engine compartment.

The hood ajar switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced. The hood ajar switch striker is not intended for reuse. If the striker is removed from the hood inner reinforcement for any reason, it must be replaced with a new unit.

OPERATION

The hood ajar switch is normally held open as the spring-loaded switch plunger is depressed by the striker on the hood panel when the hood panel is closed and latched. When the hood is opened, the

HOOD AJAR SWITCH (Continued)

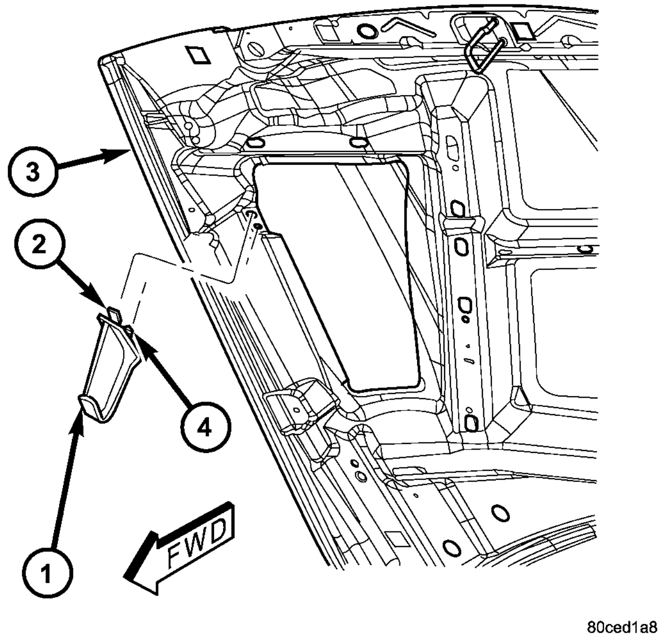

Fig. 5 Hood Ajar Switch Striker

1 - STRIKER
2 - TAB
3 - INNER HOOD REINFORCEMENT
4 - RETAINER

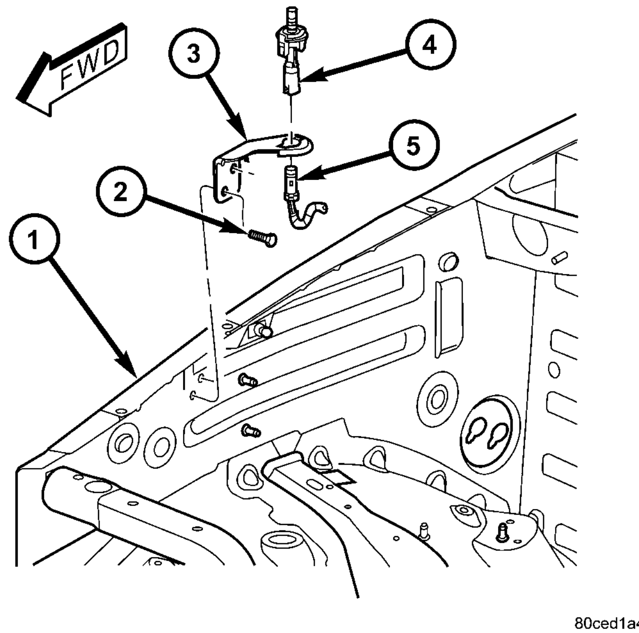

Fig. 6 Hood Ajar Switch Remove/Install

1 - INNER FENDER
2 - SCREW (2)
3 - BRACKET
4 - HOOD AJAR SWITCH
5 - WIRE HARNESS CONNECTOR

spring-loaded switch plunger extends from the switch body and the switch contacts are closed. The hood ajar switch is connected in series between ground and the hood ajar switch sense input of the Body Control Module (BCM). The BCM uses an internal resistor pull up to monitor the state of the hood ajar switch contacts. The hood ajar switch can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - HOOD AJAR SWITCH

Refer to the appropriate wiring information.

(1) Disconnect the harness connector for the hood ajar switch.

(2) Check for continuity between the two terminals in the connector of the hood ajar switch. There should be continuity with the switch plunger extended, and no continuity with the switch plunger depressed. If not OK, replace the faulty hood ajar switch.

REMOVAL

(1) Unlatch and open the hood.

(2) Disconnect and isolate the battery negative cable.

(3) From the top of the hood ajar switch mounting bracket, squeeze the two switch latch tabs together and pull the switch upward (Fig. 6).

(4) Pull the hood ajar switch up through the hole in the mounting bracket far enough to disconnect the harness connector.

(5) Remove the hood ajar switch from the mounting bracket.

INSTALLATION

(1) Position the hood ajar switch near the hole in the mounting bracket (Fig. 6).

(2) Reconnect the harness connector to the hood ajar switch.

(3) From the top of the hood ajar switch mounting bracket, press the switch downward into the mounting bracket until the latch tabs lock it into place.

(4) Reconnect the battery negative cable.

(5) Close and latch the hood.

HOOD AJAR SWITCH BRACKET

REMOVAL

(1) Remove the hood ajar switch from the mounting bracket. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - REMOVAL).

HOOD AJAR SWITCH BRACKET (Continued)

(2) If necessary, remove and set aside the engine air cleaner housing for access to the hood ajar switch mounting bracket screws.

(3) Remove the screws that secure the hood ajar switch bracket to the right fender inner shield (Fig. 7).

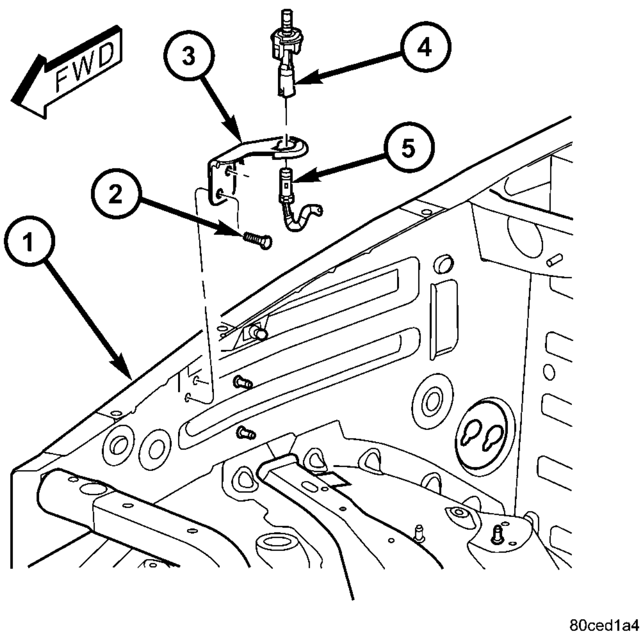

Fig. 7 Hood Ajar Switch Bracket Remove/Install

1 - INNER FENDER
2 - SCREW (2)
3 - BRACKET
4 - HOOD AJAR SWITCH
5 - WIRE HARNESS CONNECTOR

(4) Remove the hood ajar switch bracket from the right fender inner shield.

INSTALLATION

(1) Position the hood ajar switch bracket onto the right fender inner shield (Fig. 7).

(2) Install and tighten the two screws that secure the hood ajar switch bracket to the right fender inner shield. Tighten the screws to 7 N·m (60 in. lbs.).

(3) If removed, reinstall the engine air cleaner housing.

(4) Reinstall the hood ajar switch into the mounting bracket. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - INSTALLATION).

HOOD AJAR SWITCH STRIKER

REMOVAL

The hood ajar switch striker is not intended for reuse. If the striker is removed from the hood inner reinforcement for any reason, it must be replaced.

(1) Unlatch and open the hood.

(2) Using a trim stick or another suitable wide flat-bladed tool, pry the rearward end of the hood ajar switch striker away from the inner hood panel reinforcement far enough to disengage the integral retainer from its mounting hole (Fig. 8).

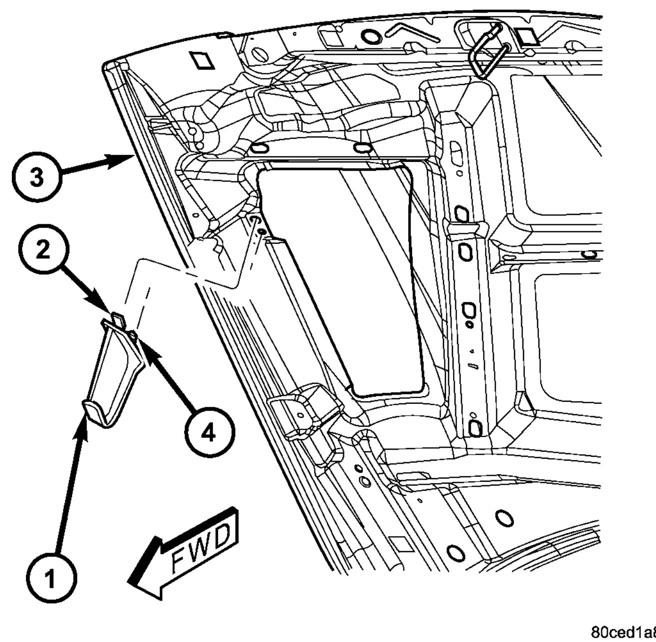

Fig. 8 Hood Ajar Switch Striker Remove/Install

1 - STRIKER
2 - TAB
3 - INNER HOOD REINFORCEMENT
4 - RETAINER

(3) Move the hood ajar switch striker slightly rearward to disengage the integral mounting tab from the forward mounting hole.

(4) Remove the hood ajar switch striker from the inner hood panel reinforcement and discard.

INSTALLATION

The hood ajar switch striker is not intended for reuse. If the striker is removed from the hood inner reinforcement for any reason, it must be replaced.

(1) Position the new hood ajar switch striker to the inner hood panel reinforcement (Fig. 8).

(2) Insert the mounting tab on the front of the hood ajar switch striker into the forward mounting hole.

HOOD AJAR SWITCH STRIKER (Continued)

(3) Align the retainer on the rear of the hood ajar switch striker with the rearward mounting hole.

(4) Firmly press the hood ajar switch striker rearward and upward against the inner hood panel reinforcement until the hood ajar switch striker retainer is fully engaged in the rearward mounting hole.

(5) Close and latch the hood.

INTRUSION TRANSCEIVER MODULE

DESCRIPTION

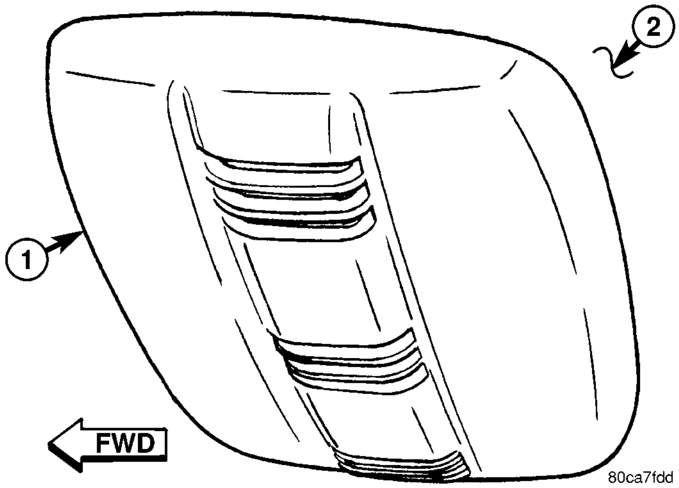

Fig. 9 Intrusion Transceiver Module

1 - ITM
2 - HEADLINER

An Intrusion Transceiver Module (ITM) is part of the Export premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS) (Fig. 9). The Export premium version of the VTA is only available in vehicles built for certain markets, where the additional features offered by this system are required. The ITM is located in the passenger compartment, on the lower surface of the headliner near the center of the vehicle. This component is designed to provide interior motion detection, and serve as an interface between the Body Control Module (BCM) and the alarm siren module.

The ITM is concealed beneath a molded plastic trim cover that approximates the size and shape of a typical dome lamp housing. Rather than a lens, the ITM features three sets of louvered openings. Each of the louvered openings is covered on the inside by a single molded black plastic sight shield that extends the length of the center rib for appearance. The module is secured to a molded plastic mounting bracket above the headliner. Besides the ITM, the trim cover also conceals two plastic pins integral to the mounting bracket that are used to secure the bracket to the headliner with two stamped nuts that are installed from below. An adhesive-backed foam pad is installed above the ITM bracket between the headliner and the roof panel to provide additional headliner stabilization and support for the ITM mounting. Two small notch-like service holes on the rear edge of the trim cover afford access to the two integral rear latches of the ITM for service removal (Fig. 10).

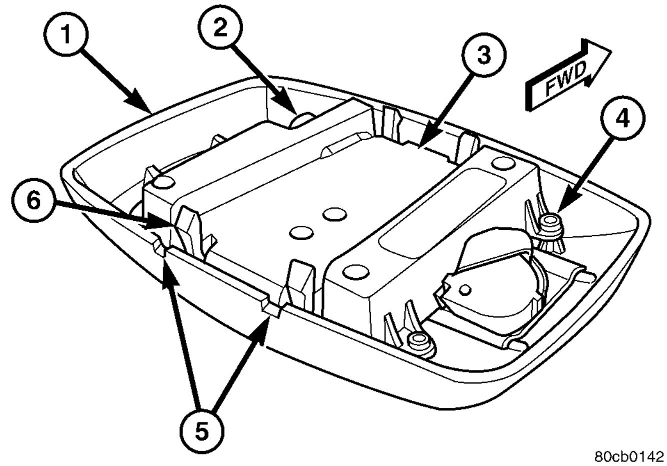

Fig. 10 Intrusion Transceiver Module

1 - TRIM COVER
2 - CONNECTOR RECEPTACLE
3 - HOUSING
4 - SCREW (4)
5 - SERVICE HOLE (2)
6 - LATCH FEATURE (4)

Concealed within the housing is the electronic circuitry of the ITM which includes a microprocessor, and an ultrasonic receive transducer. A molded plastic connector containing six terminal pins that is soldered to a small circuit board and extends through a clearance hole in the left front corner of the ITM housing, and an ultrasonic transmit transducer housing extends from the center of the right side of the ITM housing. Both the transmit transducer on the right side of the module and the receive transducer on the ITM circuit board are aimed through two small round holes in the sight shield of the trim cover. The ITM is connected to the vehicle electrical system by a wire harness that is integral to the headliner.

The ITM unit cannot be adjusted or repaired and, if faulty or damaged, must be replaced.

OPERATION

The microprocessor in the Intrusion Transceiver Module (ITM) contains the motion sensor logic circuits and controls all of the features of the premium version of the Vehicle Theft Alarm (VTA). The ITM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as

INTRUSION TRANSCEIVER MODULE (Continued)

well as with the DRBIII® scan tool using the Programmable Communications Interface (PCI) data bus network. This method of communication is used by the ITM to communicate with the Body Control Module (BCM) and for diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel. The ITM also communicates with the alarm siren over a dedicated serial bus circuit.

The ITM microprocessor continuously monitors inputs from its on-board motion sensor circuitry as well as inputs from the BCM and the alarm siren module. The on-board ITM motion sensor circuitry transmits ultrasonic signals into the vehicle cabin through a transmit transducer, then listens to the returning signals as the bounce off of objects in the vehicle interior. If an object is moving in the interior, a detection circuit in the ITM senses this movement through the modulation of the returning ultrasonic signals that occurs due to the Doppler effect. The motion detect function of the ITM can be disabled by depressing the “Lock” button on the Remote Keyless Entry (RKE) transmitter three times within fifteen seconds, while the security indicator is still flashing rapidly. The ITM will signal the alarm siren module to provide a single siren “chirp” as an audible confirmation that the motion sensor function has been disabled.

If movement is detected, the ITM sends an electronic message to the BCM over the PCI data bus to flash the exterior lighting and sends an electronic message to the alarm siren module over a dedicated serial bus line to sound the siren. When the BCM detects a breach in the perimeter protection through a door, tailgate, flip-up glass, or hood ajar switch input, it sends an electronic message to the ITM and the ITM sends an electronic message to the BCM over the PCI data bus to flash the exterior lighting and sends an electronic message to the alarm siren module over a dedicated serial bus line to sound the siren. The ITM also monitors inputs from the alarm siren module for siren battery or siren input/output circuit tamper alerts, and siren battery condition alerts, then sets active and stored Diagnostic Trouble Codes (DTC) for any monitored system faults it detects. An active fault only remains for the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ITM. If a fault does not recur for fifty ignition cycles, the ITM will automatically erase the stored DTC.

The ITM is connected to the vehicle electrical system through the overhead wire harness. The ITM receives battery voltage through a fuse in the Junction Block (JB), and receives ground through the body wire harness at the base of the left D-pillar behind the quarter trim panel. These connections allow the ITM to remain operational, regardless of the ignition switch position. The hard wired inputs and outputs for the ITM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ITM, the PCI data bus network, or the electronic message inputs to and outputs from the ITM. The most reliable, efficient, and accurate means to diagnose the ITM, the PCI data bus network, and the electronic message inputs to and outputs from the ITM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) While lightly pulling downward on either rear corner of the Intrusion Transceiver Module (ITM) trim cover, insert a small thin-bladed screwdriver through each of the service holes on the rear edge of the trim cover to depress and release the two integral rear latch features of the module from the mounting bracket above the headliner (Fig. 11).

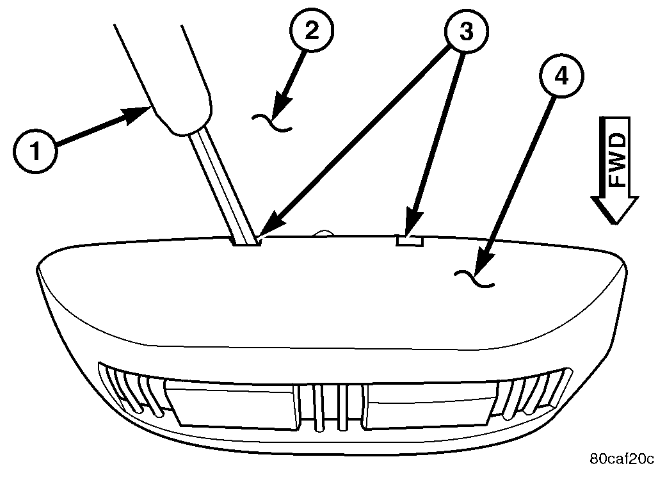

Fig. 11 Intrusion Transceiver Module Remove

1 - SMALL SCREWDRIVER
2 - HEADLINER
3 - SERVICE HOLES
4 - ITM

(3) Pull the ITM trim cover rearward far enough to disengage the two integral front latch features of the module from the mounting bracket above the headliner.

(4) Pull the ITM and trim cover down from the headliner far enough to access and disconnect the overhead wire harness connector for the ITM from the module connector.

(5) Remove the ITM from the headliner.

INTRUSION TRANSCEIVER MODULE (Continued)

INSTALLATION

(1) Position the Intrusion Transceiver Module (ITM) to the headliner.

(2) Reconnect the overhead wire harness connector for the ITM to the module connector.

(3) Align the two front latch features of the ITM with the mounting bracket above the headliner (Fig. 12).

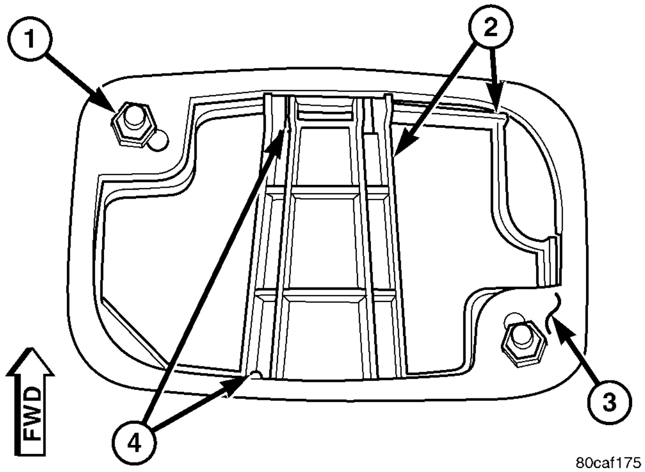

Fig. 12 Intrusion Transceiver Module Mounting Bracket

1 - STAMPED NUT (2)
2 - MOUNTING BRACKET
3 - HEADLINER
4 - LATCH RECEPTACLES (4)

(4) Push the ITM trim cover forward far enough to insert the two integral rear latch features of the module into the two rear latch receptacles of the mounting bracket above the headliner.

(5) Push upward and evenly on the rear edge of the ITM trim cover until the two rear latch features of the module are engaged in the mounting bracket above the headliner.

(6) Reconnect the battery negative cable.

NOTE: If the Intrusion Transceiver Module (ITM) has been replaced with a new unit, the new ITM MUST be initialized before the Vehicle Theft Security System can operate as designed. The use of a DRBIII® scan tool is required to initialize the ITM. Refer to the appropriate diagnostic information.

SIREN

DESCRIPTION

An alarm siren module is part of the Export premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS) (Fig. 13). The Export premium version of the VTA is only available in vehicles built for markets, where the additional features offered by this system are required. The alarm siren module is located in the engine compartment, on the front extension of the right front wheel house panel below and behind the right headlamp. This assembly is designed to provide the audible alert requirements for the Export premium VTA.

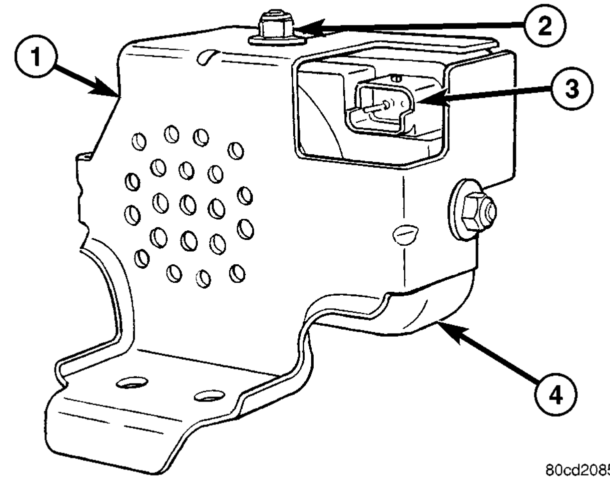

Fig. 13 Siren Module

1 - BRACKET
2 - NUT (3)
3 - CONNECTOR RECEPTACLE
4 - SIREN MODULE

The alarm siren module consists of microprocessor-based electronic control circuitry, the siren, and a nickel metal hydride backup battery. All of the alarm module components are protected and sealed within the plastic housing. A stamped steel mounting bracket is secured to the module with three stud plates and nuts that fit into slotted holes at the top and each side of the bracket. The front surface of the bracket features a tightly grouped series of small holes that serves as an outlet for the audible output of the alarm siren. Two mounting holes in the horizontal surface of the bracket are used to secure the alarm siren module to the wheel house extension with screws. A connector extends forward from the alarm siren housing, and connects electrical system to the headlamp and dash wire harness.

The alarm siren module cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The microprocessor within the alarm siren module performs the tasks required to provide the siren features and functions based upon internal programming and electronic arm and disarm message inputs received from the Intrusion Transceiver Module (ITM) over a dedicated serial bus communication cir-

SIREN (Continued)

cuit. The alarm siren module will self-detect problems with its internal and external power supply and communication circuits, then send electronic messages indicating the problem to the ITM upon receiving a request from the ITM. The ITM will store a Diagnostic Trouble Code (DTC) for a detected alarm siren module fault that can be retrieved with the DRBIII® scan tool over the Programmable Communications Interface (PCI) data bus network through the 16-way data link connector located on the driver side lower edge of the instrument panel.

When the Export premium version of the Vehicle Theft Alarm (VTA) is armed, the alarm siren module microprocessor continuously monitors inputs from the ITM for messages to sound its internal siren and enters its auto-detect mode. While in the auto-detect mode, if the alarm siren module detects that its power supply or communication circuits are being tampered with or have been sabotaged, it will sound an alarm and continue to operate through its on-board backup battery. If the arm siren module is in its disarmed mode when its power supply or communication circuits are interrupted, the siren will not sound. The alarm module will also notify the ITM when the backup battery requires charging, and the ITM will send a message that will allow the backup battery to be charged through the battery voltage and ground circuits to the alarm module only when the ignition switch is in the On position and the engine is running. This will prevent the charging of the alarm backup battery from depleting the charge in the main vehicle battery while the vehicle is not being operated.

The alarm siren module receives battery voltage through a fuse in the Power Distribution Center (PDC), and receives ground through the left inner fender shield in the engine compartment. These connections allow the alarm siren module to remain operational, regardless of the ignition switch position. The hard wired inputs and outputs for the alarm siren module may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the internal circuitry or the backup battery of the alarm siren module, the ITM, the serial bus communication line, or the electronic message inputs to and outputs from the alarm siren module. The most reliable, efficient, and accurate means to diagnose the alarm siren module, the ITM, the serial bus communication line, and the electronic message inputs to and outputs from the alarm siren module requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the wire harness connector for the alarm siren module (Fig. 14).

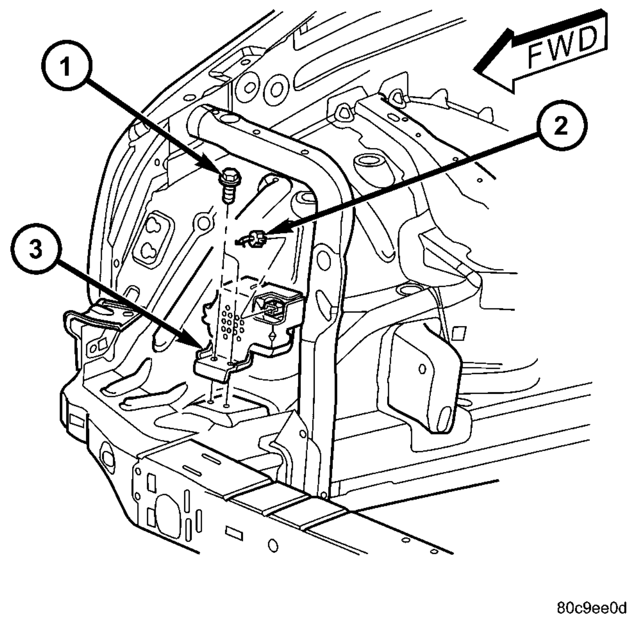

Fig. 14 Siren Remove/Install

1 - SCREW (2)
2 - WIRE HARNESS CONNECTOR
3 - SIREN

(3) Remove the screws that secure the alarm siren module to the front extension of the right front wheel house panel.

(4) Remove the alarm siren module from the front extension of the right front wheel house panel.

INSTALLATION

(1) Position the alarm siren module onto the front extension of the right front wheel house panel (Fig. 14).

(2) Install and tighten the screws that secure the alarm siren module to the front extension of the right front wheel house panel. Tighten the screws to 6 N·m (50 in. lbs.).

(3) Reconnect the wire harness connector for the alarm siren module.

(4) Reconnect the battery negative cable.

SIREN (Continued)

NOTE: If the alarm siren module has been replaced with a new unit, the new unit MUST be configured in the Intrusion Transceiver Module (ITM) before the Vehicle Theft Security System can operate as designed. The use of a DRBIII® scan tool is required to configure the alarm siren module settings in the ITM. Refer to the appropriate diagnostic information.

TRANSPONDER KEY

DESCRIPTION

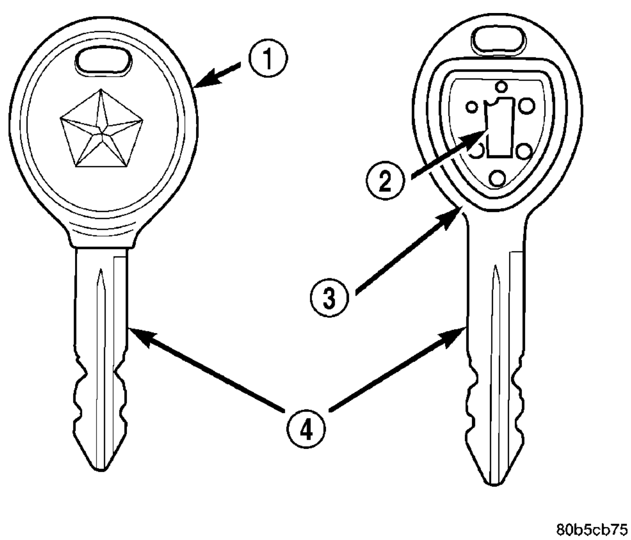

Fig. 15 Sentry Key Immobilizer Transponder

1 - MOLDED CAP
2 - TRANSPONDER CHIP
3 - MOLDED CAP REMOVED
4 - TRANSPONDER KEY

Each ignition key used in the Sentry Key Immobilizer System (SKIS) has an integral transponder chip (Fig. 15). Ignition keys with this feature can be readily identified by a gray rubber cap molded onto the head of the key, while conventional ignition keys have a black molded rubber cap. The transponder chip is concealed beneath the molded rubber cap, where it is molded within a plastic mount into the head of the metal key. In addition to being cut to match the mechanical coding of the ignition lock cylinder, each new Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. The Sentry Key transponder cannot be adjusted or repaired. If faulty or damaged, the entire key must be replaced.

OPERATION

When the ignition switch is turned to the On position, the Sentry Key Immobilizer Module (SKIM) communicates through its antenna with the Sentry Key transponder using a Radio Frequency (RF) signal. The SKIM then listens for a RF response from the transponder through the same antenna. The Sentry Key transponder chip is within the range of the SKIM transceiver antenna ring when it is inserted into the ignition lock cylinder. The SKIM determines whether a valid key is present in the ignition lock cylinder based upon the response from the transponder. If a valid key is detected, that fact is communicated by the SKIM to the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus, and the PCM allows the engine to continue running. If the PCM receives an invalid key message, or receives no message from the SKIM over the PCI data bus, the engine will be disabled after about two seconds of operation. The ElectroMechanical Instrument Cluster (EMIC) will also respond to the invalid key message on the PCI data bus by flashing the SKIS indicator on and off.

Each Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. Likewise, the SKIM has a unique Secret Key code programmed into it by the manufacturer. When a Sentry Key is programmed into the memory of the SKIM, the SKIM stores the transponder identification code from the Sentry Key, and the Sentry Key learns the Secret Key code from the SKIM. Once the Sentry Key learns the Secret Key code of the SKIM, it is permanently stored in the memory of the transponder. Therefore, once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store key-related fault information in the form of Diagnostic Trouble Codes (DTC's) in SKIM memory if a Sentry Key transponder problem is detected. The Sentry Key transponder chip can be diagnosed, and any stored DTC's can be retrieved using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

WIPERS/WASHERS

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FRONT WIPERS/WASHERS

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FRONT WIPERS/WASHERS

DESCRIPTION

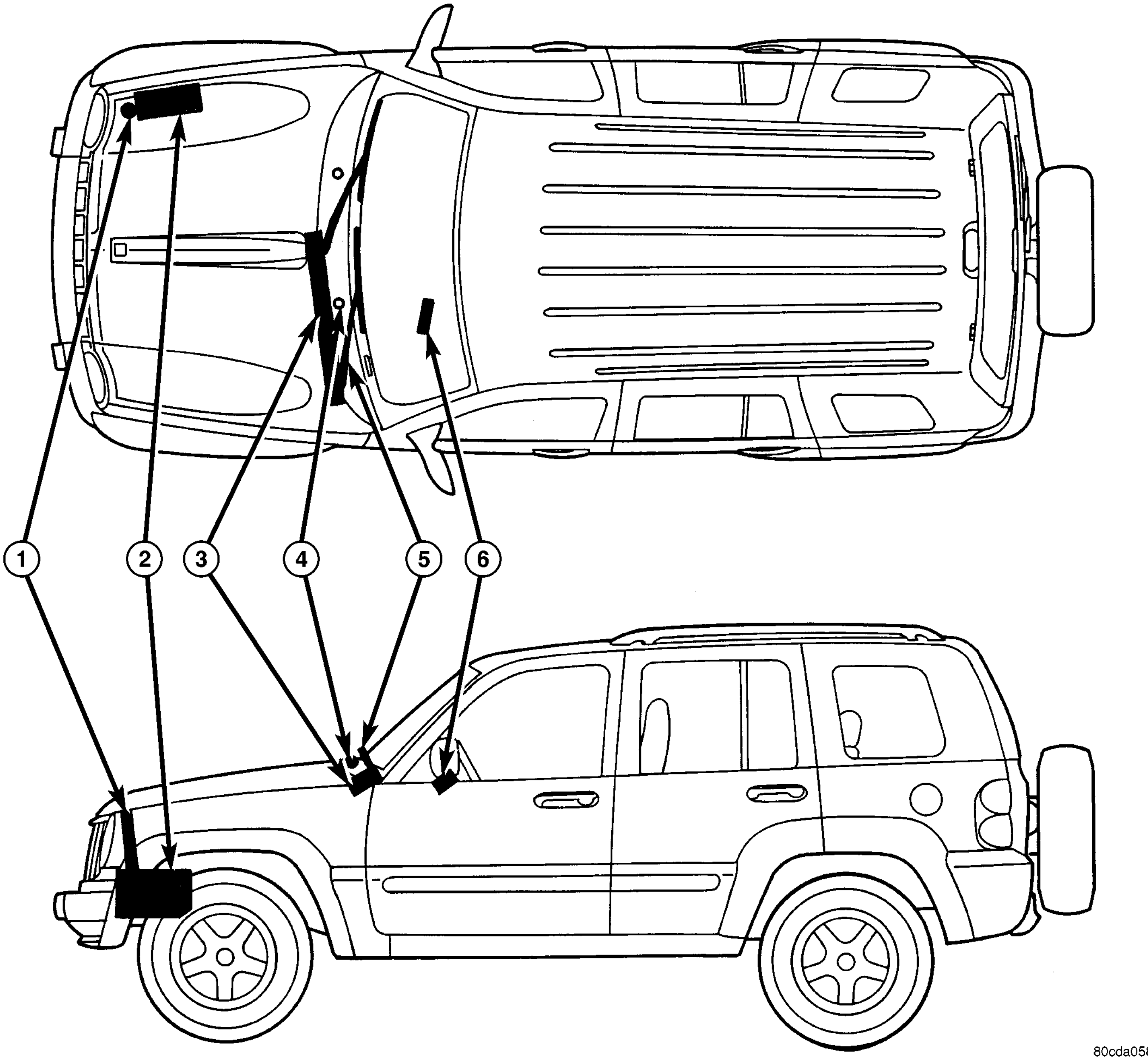


Fig. 1 Front Wiper & Washer System

1 - WASHER RESEVOIR FILLER TUBE
2 - WASHER RESERVOIR, PUMP/MOTOR, FLUID LEVEL SWITCH
3 - WIPER MODULE
4 - WASHER NOZZLE (2)
5 - WIPER ARM & BLADE (2)
6 - MULTI-FUNCTION SWITCH RIGHT (WIPER) CONTROL STALK

An electrically operated intermittent front wiper and washer system is standard factory-installed safety equipment on this model (Fig. 1). The front wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **Body Control Module** - The Body Control Module (BCM) is located on the Junction Block (JB) under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL MODULE - DESCRIPTION).

FRONT WIPERS/WASHERS (Continued)

- **Front Check Valve** - The front washer system check valve is integral to the wye fitting located in the washer plumbing between the cowl plenum washer hose and the front washer nozzles, and is concealed beneath the cowl plenum cover/grille panel at the base of the windshield.
- **Front Washer Nozzle** - Two fluidic front washer nozzles are secured with integral snap features to dedicated openings in the cowl plenum cover/grille panel located near the base of the windshield.
- **Front Washer Plumbing** - The plumbing for the front washer system consists of rubber hoses and molded plastic fittings. The plumbing is routed along the right side of the engine compartment from the washer reservoir, and through the dash panel into the cowl plenum beneath the cowl plenum cover/grille panel to the front washer nozzle fittings.
- **Front Wiper Arm** - The two front wiper arms are secured with nuts to the threaded studs on the ends of the two wiper pivot shafts, which extend through the cowl plenum cover/grille panel located near the base of the windshield.
- **Front Wiper Blade** - The two front wiper blades are secured to the two front wiper arms with an integral latch, and are parked on the glass near the bottom of the windshield when the front wiper system is not in operation.
- **Front Wiper Module** - The front wiper pivot shafts are the only visible components of the front wiper module. The remainder of the module is concealed within the cowl plenum area beneath the cowl plenum cover/grille panel. The front wiper module includes the wiper module bracket, four rubber-isolated wiper module mounts, the front wiper motor, the wiper motor crank arm, the two wiper drive links, and the two front wiper pivots.
- **Multi-Function Switch** - The multi-function switch is located on the top of the steering column, just below the steering wheel. The multi-function switch includes a left (lighting) control stalk and a right (wiper) control stalk. The right control stalk is dedicated to providing all of the driver controls for both the front and rear wiper systems. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ MULTI-FUNCTION SWITCH - DESCRIPTION).
- **Washer Fluid Level Switch** - The washer fluid level switch is located in a dedicated hole near the center of the rearward facing surface of the washer reservoir, behind the right front wheel house splash shield.
- **Washer Pump/Motor** - The reversible electric washer pump/motor unit is located in a dedicated hole on the lower outboard side of the washer reservoir, behind the right front wheel house splash shield. This single reversible washer pump/motor provides washer fluid to either the front or rear washer system plumbing, depending upon the direction of the pump motor rotation.
- **Washer Reservoir** - The washer reservoir is concealed behind the right front wheel house splash shield ahead of the right front wheel. The washer reservoir filler neck is the only visible portion of the reservoir, and it is accessed from the right front corner of the engine compartment.
- **Wiper High-Low Relay** - The wiper high-low relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.
- **Wiper On-Off Relay** - The wiper on-off relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.

Hard wired circuitry connects the front wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the front wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATING MODES

The components of the front wiper and washer system are designed to work in concert to provide the following operating modes:

- **Continuous Wipe Mode** - The control knob on the right (wiper) control stalk of the multi-function switch has two continuous wipe positions, Low and High. When selected, these switch positions will cause the two-speed front wiper motor to operate in a continuous low or high speed cycle.
- **Intermittent Wipe Mode** - The control knob on the right (wiper) control stalk of the multi-function switch has five minor detent intermittent wipe positions. When selected, these switch positions will cause the front wiper system to operate with one of five delay intervals between complete wipe cycles.
- **Mist Wipe Mode** - The right (wiper) control stalk of the multi-function switch has a momentary Mist position. When selected, this switch position will operate the front wipers in a low speed continuous cycle for as long as the switch is held closed,

FRONT WIPERS/WASHERS (Continued)

then will complete the current wipe cycle and park the front wiper blades near the base of the windshield when the switch is released.

- **Washer Mode** - When the momentary front wash position of the right (wiper) control stalk of the multi-function switch is selected with the front wiper system operating in a continuous wipe mode, washer fluid will be dispensed onto the windshield glass through the washer nozzles for as long as the washer switch is held closed. When the front washer switch is actuated with the front wiper system operating in an intermittent wipe mode, washer fluid is still dispensed until the switch is released; however, the front wipers will operate in a low speed continuous cycle from the time the washer switch is closed until several wipe cycles after the switch is released, before returning to the selected intermittent wipe mode.
- **Wipe-After-Wash Mode** - When the momentary front wash position of the right (wiper) control stalk of the multi-function switch is selected with the front wiper system turned Off, the internal circuitry of the BCM provides a wipe-after-wash feature. When selected, this feature will operate the washer pump/motor and the front wipers for as long as the front washer switch is held closed, then provide several additional wipe cycles after the switch is released before parking the front wiper blades near the base of the windshield.

OPERATION

The front wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the windshield glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blades to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outside windshield glass surface that might be encountered while driving the vehicle under numerous types of inclement operating conditions.

The vehicle operator initiates all front wiper and washer system functions with the right (wiper) control stalk of the multi-function switch that extends from the right side of the steering column, just below the steering wheel. Rotating the control knob on the end of the control stalk, selects the Off, Delay, Low, or High front wiper system operating modes. In the Delay mode, the control knob also allows the vehicle operator to select from one of five intermittent wipe Delay intervals. Pulling the right control stalk downwards actuates the momentary front wiper system Mist mode switch, while pulling the right control stalk towards the steering wheel actuates the momentary front washer system switch. The multi-function switch provides hard wired resistor multiplexed inputs to the Body Control Module (BCM) for all of the front wiper system functions, as well as a separate hard wired sense input to the BCM for the front washer system function.

The front wiper and washer system will only operate when the ignition switch is in the Accessory or On positions. Battery current is directed from a B(+) fuse in the Power Distribution Center (PDC) to the wiper and washer system circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit. The automatic resetting circuit breaker then provides battery current through a fused ignition switch output (run-acc) circuit to the wiper high/low relay, the wiper on/off relay, and the park switch within the front wiper motor. A separate fuse in the JB provides battery current through another fused ignition switch output (run-acc) circuit to the multi-function switch. The multi-function switch circuitry uses this battery feed and a ground circuit input to directly control the operation and direction of the reversible electric washer pump/motor unit. The BCM uses low side drivers to control front wiper system operation by energizing or de-energizing the wiper high/low and wiper on/off relays.

The hard wired circuits and components of the front wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), or the inputs to or outputs from the BCM that control the front wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the BCM, or the BCM inputs and outputs related to the various front wiper and washer system operating modes requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the front wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the Low position of the control knob on the right (wiper) control stalk of the multi-function switch is selected, the Body Control Module (BCM) energizes the wiper on/off relay. This directs battery

FRONT WIPERS/WASHERS (Continued)

current through the normally open contacts of the energized wiper on/off relay and the normally closed contacts of the de-energized wiper high/low relay to the low speed brush of the front wiper motor, causing the front wipers to cycle at low speed. When the High position of the control knob is selected, the BCM energizes both the wiper on/off relay and the wiper high/low relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally open contacts of the energized wiper high/low relay to the high speed brush of the front wiper motor, causing the front wipers to cycle at high speed.

When the Off position of the control knob is selected, the BCM de-energizes both the wiper on/off and wiper high/low relays, then one of two events will occur. The event that occurs depends upon the position of the wiper blades on the windshield at the moment that the control knob Off position is selected. If the wiper blades are in the down position on the windshield when the Off position is selected, the park switch that is integral to the front wiper motor is closed to ground and the wiper motor ceases to operate.

If the wiper blades are not in the down position on the windshield at the moment the Off position is selected, the park switch is closed to battery current from the fused ignition switch output (run-acc) circuit of the front wiper motor. The park switch directs this battery current to the low speed brush of the wiper motor through the wiper park switch sense circuit and the normally closed contacts of the de-energized wiper on/off and wiper high/low relays. This causes the wiper motor to continue running at low speed until the wiper blades are in the down position on the windshield and the park switch is again closed to ground.

INTERMITTENT WIPE MODE

When the control knob on the right (wiper) control stalk of the multi-function switch is moved to one of the Delay interval positions, the BCM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input. The BCM monitors the changing state of the wiper motor park switch through a hard wired front wiper park switch sense circuit input. This input allows the BCM to determine the proper intervals at which to energize and de-energize the wiper on/off relay to operate the front wiper motor intermittently for one low speed cycle at a time.

The BCM logic is also programmed to provide an immediate wipe cycle and begin a new delay interval timing cycle each time a shorter delay interval is selected, and to add the remaining delay timing interval to the new delay interval timing before the next wipe cycle occurs each time a longer delay interval is selected.

MIST WIPE MODE

When the right (wiper) control stalk of the multi-function switch is moved to the momentary Mist position, the BCM energizes the wiper on/off relay for as long as the Mist switch is held closed, then de-energizes the relay when the state of the Mist switch input changes to open. The BCM can operate the front wiper motor in this mode for only one low speed cycle at a time, or for an indefinite number of sequential low speed cycles, depending upon how long the Mist switch is held closed.

WASH MODE

When the right (wiper) control stalk of the multi-function switch is moved to the momentary front Wash position while the control knob is in the Low or High positions, the circuitry within the switch directs battery current and ground to the washer pump/motor unit. This will cause the washer pump/motor unit to be energized for as long as the front Wash switch is held closed, and to de-energize when the front Wash switch is released.

When the right (wiper) control stalk of the multi-function switch is moved to the momentary front Wash position while the control knob is in one of the Delay interval positions, the front washer pump/motor operation is the same. However, the BCM energizes the wiper on/off relay to override the selected delay interval and operate the front wiper motor in a continuous low speed mode for as long as the front Wash switch is held closed, then de-energizes the relay and reverts to the selected delay mode interval several wipe cycles after the front Wash switch is released. The BCM detects the front Wash switch state through a hard wired washer pump driver circuit input from the multi-function switch.

WIPE-AFTER-WASH MODE

When the right (wiper) control stalk of the multi-function switch is moved to the momentary front Wash position while the control knob is in the Off position, the BCM detects that switch state through a hard wired washer pump driver circuit input from the multi-function switch. The BCM responds to this input by energizing the wiper on/off relay for as long as the Wash switch is held closed, then de-energizes the relay several wipe cycles after the front Wash switch is released. The BCM monitors the changing state of the wiper motor park switch through a hard wired front wiper park switch sense circuit input. This input allows the BCM to count the number of wipe cycles that occur after the front Wash switch state changes to open, and to determine the proper interval at which to de-energize the wiper on/off relay to complete the wipe-after-wash mode cycle.

DIAGNOSIS AND TESTING - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

If the front wiper motor operates, but the wipers do not move on the windshield, replace the faulty front wiper module. If the wipers operate, but chatter, lift, or do not clear the glass, clean and inspect the front wiper system components as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING) and (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - INSPECTION). For diagnosis and testing of the multi-function switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

The hard wired circuits and components of the front wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), or the inputs to or outputs from the BCM that control the various front wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the BCM, or the BCM inputs and outputs related to the various front wiper and washer system operating modes requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WASHER SYSTEM

The diagnosis found here addresses an electrically inoperative front washer system. If the washer pump/motor operates, but no washer fluid is emitted from the front washer nozzles, be certain to check the fluid level in the reservoir. Also clean and inspect the front washer system components as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING) and (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - INSPECTION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Turn the ignition switch to the On position. Turn the control knob on the right (wiper) control stalk of the multi-function switch to the On position. Check whether the front wiper system is operating. If OK, go to Step 2. If not OK, test and repair the front wiper system before continuing with these tests. Refer to WIPER SYSTEM .

(2) Turn the control ring on the right (wiper) control stalk of the multi-function switch to the rear Wash position. Check whether the rear washer system is operating. If OK, test the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). If the multi-function switch tests OK, go to Step 3. If the multi-function switch does not test OK, replace the faulty switch.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the headlamp and dash wire harness connector for the washer pump/motor unit from the pump/motor unit connector receptacle. Check for continuity between the washer pump driver circuit cav-

FRONT WIPERS/WASHERS (Continued)

ity of the headlamp and dash wire harness connector for the washer pump/motor unit and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted washer pump driver circuit between the washer pump/motor unit and the multi-function switch as required.

(4) Check for continuity between the washer pump driver circuit cavities of the headlamp and dash wire harness connector for the washer pump/motor unit and the instrument panel wire harness connector for the multi-function switch (Connector C-2). There should be continuity. If OK, go to Step 5. If not OK, repair the open washer pump driver circuit between the washer pump/motor unit and the multi-function switch as required.

(5) Check for continuity between the washer pump sense circuit cavity of the headlamp and dash wire harness connector for the washer pump/motor unit and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted washer pump sense circuit between the washer pump/motor unit and the multi-function switch as required.

(6) Check for continuity between the washer pump sense circuit cavities of the headlamp and dash wire harness connector for the washer pump/motor unit and the instrument panel wire harness connector for the multi-function switch (Connector C-2). There should be continuity. If OK, replace the faulty washer pump/motor unit. If not OK, repair the open washer pump sense circuit between the washer pump/motor unit and the multi-function switch as required.

CLEANING - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegees of wiper blades exposed to the elements for a long time tend to lose their wiping effectiveness. Periodic cleaning of the squeegees is suggested to remove any deposits of salt or road film. The wiper blades, arms, and windshield glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blades continue to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegees of the wiper blades from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegees.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the washer pump/motor from the reservoir. Clean foreign material from the inside of the washer pump/motor inlet filter screen and the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hoses from the washer nozzles, then running the washer pump/motor to run clean washer fluid or water through the system. Plugged or restricted washer nozzles should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegees of the wiper blades.

CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The front wiper blades and wiper arms should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

(1) Inspect the wiper arms for any indications of damage, or contamination. If the wiper arms are contaminated with any foreign material, clean them as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING). If a wiper arm is damaged or corrosion is evident, replace the wiper arm with a new unit. Do not attempt to repair a wiper arm that is damaged or corroded.

(2) Carefully lift the wiper blade off of the glass. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.

FRONT WIPERS/WASHERS (Continued)

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(3) Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. Remove the wiper blade from the wiper arm. Either place a small postal scale between the blade end of the wiper arm and the glass, or carefully lift the blade end of the arm away from the glass using a small fish scale. Compare the scale readings between the right and left wiper arms. Replace a wiper arm if it has comparatively lower spring tension, as evidenced by a lower scale reading.

(4) Inspect the wiper blades and squeegees for any indications of damage, contamination, or rubber deterioration (Fig. 2). If the wiper blades or squeegees are contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING). After cleaning the wiper blade and the glass, if the wiper blade still fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade. Also, if a wiper blade is damaged or the squeegee rubber is damaged or deteriorated, replace the wiper blade with a new unit. Do not attempt to repair a wiper blade that is damaged.

WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

(1) Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING).

(2) Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

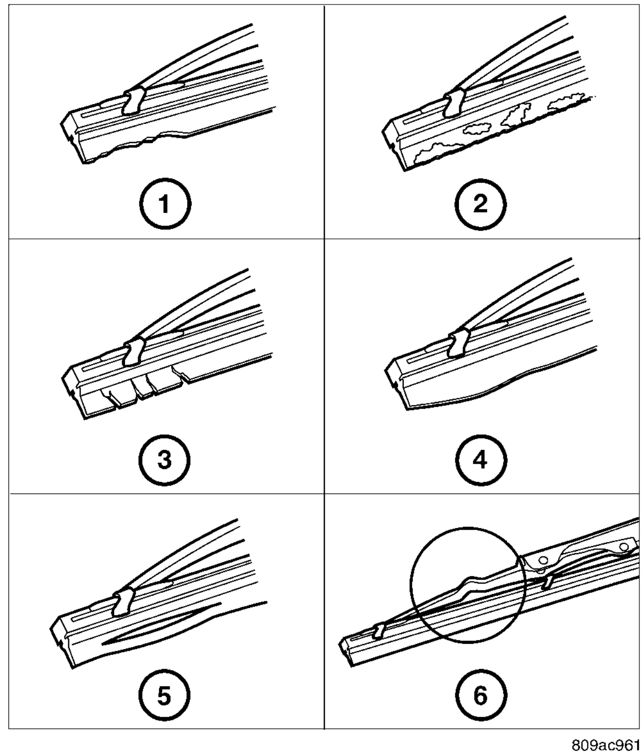


Fig. 2 Wiper Blade Inspection

1 - WORN OR UNEVEN EDGES
2 - ROAD FILM OR FOREIGN MATERIAL DEPOSITS
3 - HARD, BRITTLE, OR CRACKED
4 - DEFORMED OR FATIGUED
5 - SPLIT
6 - DAMAGED SUPPORT COMPONENTS

FRONT CHECK VALVE

DESCRIPTION

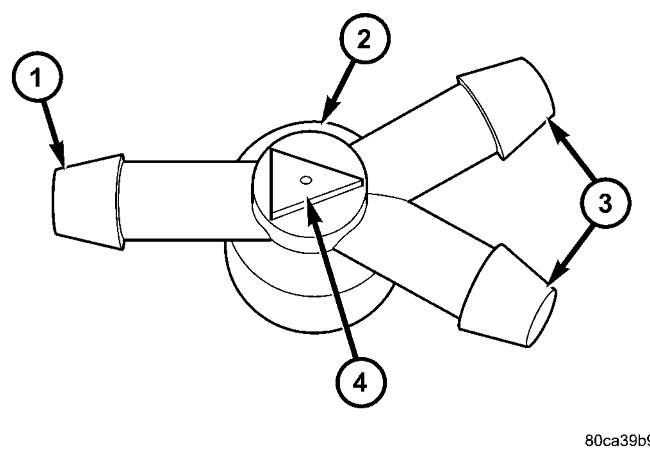


Fig. 3 Front Check Valve

1 - INLET NIPPLE
2 - FRONT CHECK VALVE
3 - OUTLET NIPPLE (2)
4 - FLOW DIRECTION ARROW

FRONT CHECK VALVE (Continued)

A single front washer system check valve is standard equipment on this model, and is installed in the front washer system plumbing (Fig. 3). The front check valve is integral to the front washer nozzle plumbing wye fitting located in the cowl plenum area beneath the cowl plenum cover/grille panel near the base of the windshield. The check valve consists of a molded plastic body with a raised arrowhead molded into its center section that indicates the direction of the flow through the valve, and three barbed hose nipples formed in a wye configuration on the outside circumference of the center section of the valve body. The front check valve cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The front check valve provides more than one function in this application. It serves as a wye connector fitting between the cowl grille panel and washer nozzle sections of the front washer supply hose. It prevents washer fluid from draining out of the front washer supply hoses back to the washer reservoir. This drain-back would result in a lengthy delay when the front washer switch is actuated until washer fluid was dispensed through the front washer nozzles, because the washer pump would have to refill the front washer plumbing from the reservoir to the nozzles. Such a drain-back condition could also result in water, dirt, or other outside contaminants being siphoned into the washer system through the washer nozzle orifice. This water could subsequently freeze and plug the nozzle, while other contaminants could interfere with proper nozzle operation and cause improper nozzle spray patterns. In addition, the check valve prevents washer fluid from siphoning through the washer nozzles after the washer system is turned Off.

When the washer pump pressurizes and pumps washer fluid from the reservoir through the washer plumbing, the fluid pressure unseats a diaphragm from over a sump well within the valve by overriding the spring pressure applied to it by a piston (Fig. 4). With the diaphragm unseated, washer fluid is allowed to flow toward the two washer nozzles. When the washer pump stops operating, the spring pressure on the piston seats the diaphragm over the sump well in the valve and fluid flow in either direction within the washer plumbing is prevented. The check valve cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REMOVAL

(1) Unlatch and open the hood.

(2) Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - FRONT/FRONT WIPER ARM - REMOVAL).

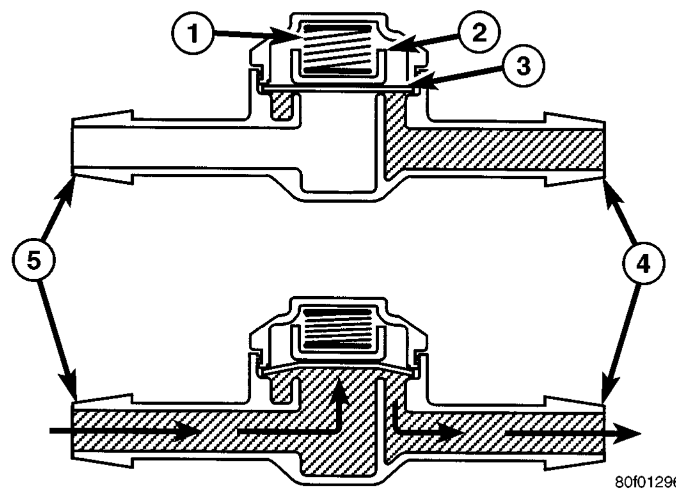


Fig. 4 Front Check Valve

1 - SPRING
2 - PISTON
3 - DIAPHRAGM
4 - TO WASHER NOZZLE
5 - FROM WASHER PUMP

(3) Remove the cowl plenum cover/grille panel from over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).

(4) From the underside of the cowl plenum cover/grille panel, disconnect the cowl plenum and washer nozzle hoses from the three barbed nipples of the front check valve (Fig. 5).

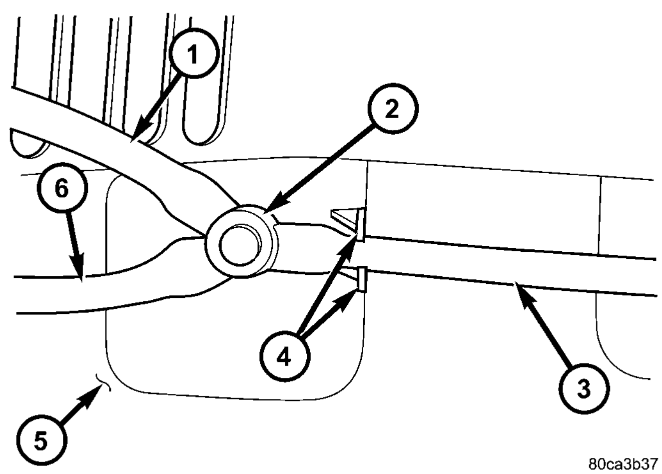


Fig. 5 Front Check Valve Remove/Install

1 - WASHER NOZZLE HOSE (RIGHT)
2 - FRONT CHECK VALVE
3 - COWL PLENUM WASHER HOSE
4 - ROUTING CLIP
5 - COWL GRILLE COVER (UNDERSIDE)
6 - WASHER NOZZLE HOSE (LEFT)

(5) Remove the front check valve from the underside of the cowl plenum cover/grille panel.

FRONT CHECK VALVE (Continued)

INSTALLATION

(1) Position the front check valve to the underside of the cowl plenum cover/grille panel (Fig. 5). Be certain that the flow direction arrow molded into the front check valve body is oriented towards the front washer nozzles.

(2) From the underside of the cowl plenum cover/grille panel, reconnect the cowl plenum and washer nozzle hoses to the three barbed nipples of the front check valve.

(3) Reinstall the cowl plenum cover/grille panel over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).

(4) Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARM - INSTALLATION).

(5) Close and latch the hood.

FRONT WASHER HOSES/ TUBES

DESCRIPTION

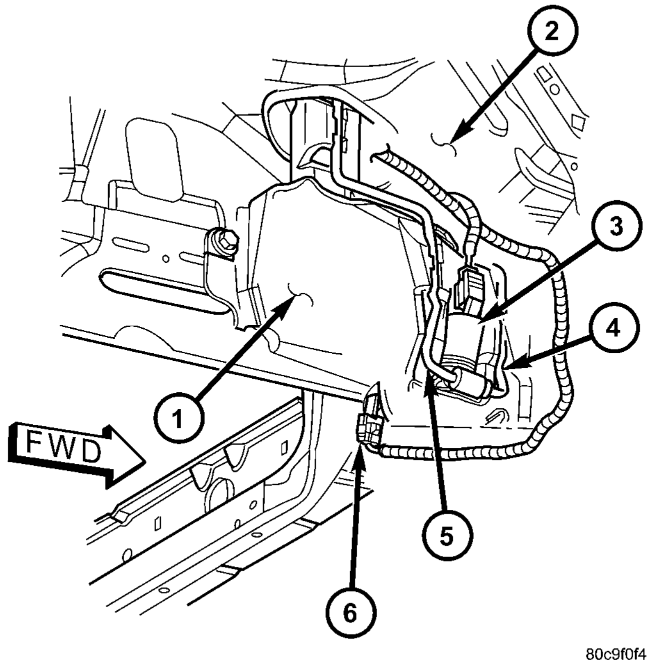


Fig. 6 Reservoir Washer Hose

1 - WASHER RESERVOIR
2 - RIGHT FRONT WHEEL HOUSE
3 - WASHER PUMP
4 - FRONT WASHER HOSE
5 - RESERVOIR REAR WASHER HOSE
6 - WASHER FLUID LEVEL SWITCH

The front washer plumbing consists of a small diameter rubber hose that is routed from the barbed outlet nipple of the reversible electric washer pump/motor unit on the washer reservoir through a trough molded into the reservoir forward of the washer pump and along the reservoir filler neck into the engine compartment (Fig. 6). Within the engine compartment, the front washer hose is routed side by side with the engine compartment rear washer hose along the top of the right front fender wheel house to the dash panel. Molded plastic routing clips secure the hoses to the headlamp and dash wire harness in the engine compartment (Fig. 7).

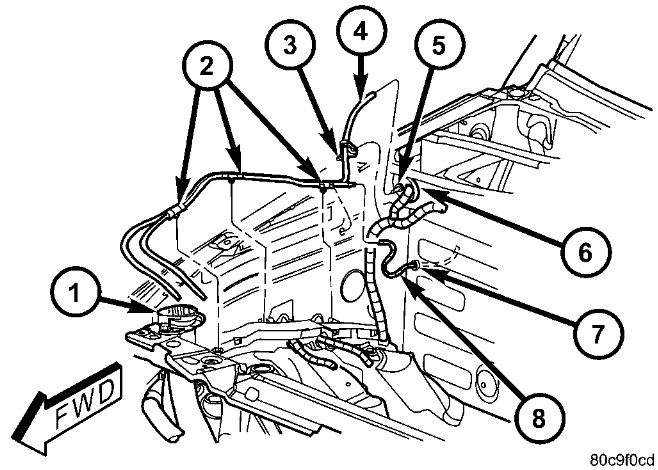


Fig. 7 Engine Compartment Washer Hose

1 - RESERVOIR FILLER CAP
2 - ROUTING CLIP (3)
3 - ROUTING CLIP (1)
4 - FRONT WASHER HOSE
5 - IN-LINE HOSE FITTING
6 - PLENUM PANEL GROMMET
7 - DASH PANEL GROMMET
8 - REAR WASHER HEADLINER HOSE

The front washer hose is connected in the engine compartment to the barbed nipple of a molded plastic in-line fitting installed through a rubber grommet in a hole in the right side of the dash plenum panel. The barbed nipple of the in-line fitting protrudes through the other side of the rubber grommet into the cowl plenum area, where the cowl plenum washer hose joins the front washer hose to the front check valve/wye fitting. The cowl plenum washer hose is routed through integral routing clips on the underside of the cowl plenum cover/grille panel to the molded plastic wye fitting. The cowl plenum washer hose is connected to one nipple on the wye fitting and the two washer nozzle hoses are connected to the other two wye fitting nipples. The washer nozzle hoses are then routed along the underside of the cowl plenum cover/grille panel to the two front washer nozzles.

Washer hose is available for service only as roll stock, which must then be cut to length. The molded plastic washer hose fittings cannot be repaired. If these fittings are faulty or damaged, they must be replaced.

FRONT WASHER HOSES/TUBES (Continued)

OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the washer pump/motor through the front washer system plumbing and fittings to the two front washer nozzles. Whenever routing the washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

FRONT WASHER NOZZLE

DESCRIPTION

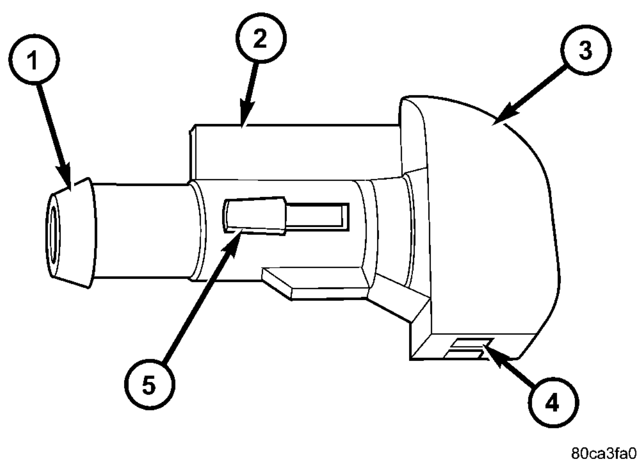


Fig. 8 Front Washer Nozzle

1 - NIPPLE
2 - ANTI-ROTATION TAB
3 - FRONT WASHER NOZZLE
4 - ORIFICE
5 - LATCH (2)

The two front washer nozzles have integral snap features and an anti-rotation tab that secure them in dedicated holes in the cowl plenum cover/grille panel located near the base of the windshield (Fig. 8). The domed upper surface of the washer nozzle is visible on the top of the plenum cover/grille panel, and the nozzle orifice is oriented towards the windshield glass. The washer plumbing fittings for the washer nozzles are concealed beneath the cowl plenum cover/grille panel. These fluidic washer nozzles are constructed of molded plastic. The cowl plenum cover/grille panel must be removed from the vehicle to access the nozzles for service. The washer nozzles cannot be adjusted or repaired. If faulty or damaged, they must be replaced.

OPERATION

The two front washer nozzles are designed to dispense washer fluid into the wiper pattern area on the outside of the windshield glass. Pressurized washer fluid is fed to each nozzle from the washer reservoir by the washer pump/motor unit through a single hose, which is attached to a barbed nipple on each front washer nozzle below the cowl plenum cover/grille panel. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

REMOVAL

(1) Unlatch and open the hood.

(2) Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARM - REMOVAL).

(3) Remove the cowl plenum cover/grille panel from over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).

(4) From the underside of the cowl plenum cover/grille panel, disconnect the washer nozzle hose from the barbed nipple of the front washer nozzle (Fig. 9).

(5) From the underside of the cowl plenum cover/grille panel, release the integral snap features of the front washer nozzle and push the nozzle out through the mounting hole toward the top side of the cowl plenum cover/grille panel.

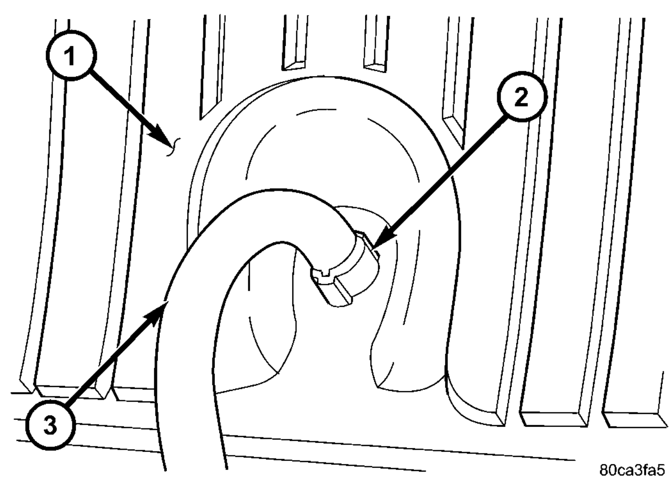


Fig. 9 Front Washer Nozzle Remove/Install

1 - COWL GRILLE COVER (UNDERSIDE)
2 - FRONT WASHER NOZZLE
3 - WASHER NOZZLE HOSE

(6) Remove the front washer nozzle from the top of the cowl plenum cover/grille panel.

INSTALLATION

(1) From the top of the cowl plenum cover/grille panel, position the nipple end of the front washer nozzle through the mounting hole and engage the anti-rotation tab of the nipple into the anti-rotation notch in the mounting hole.

FRONT WASHER NOZZLE (Continued)

(2) Push firmly and evenly on the top of the front washer nozzle until the integral snap features lock into place on the underside of the cowl plenum cover/grille panel.

(3) From the underside of the cowl grille cover, reconnect the washer hose to the barbed nipple of the front washer nozzle (Fig. 9).

(4) Reinstall the washer hose for the front washer nozzle into its routing clips on the underside of the cowl plenum cover/grille panel.

(5) Reinstall the cowl plenum cover/grille panel over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).

(6) Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARM - INSTALLATION).

(7) Close and latch the hood.

FRONT WIPER ARM

DESCRIPTION

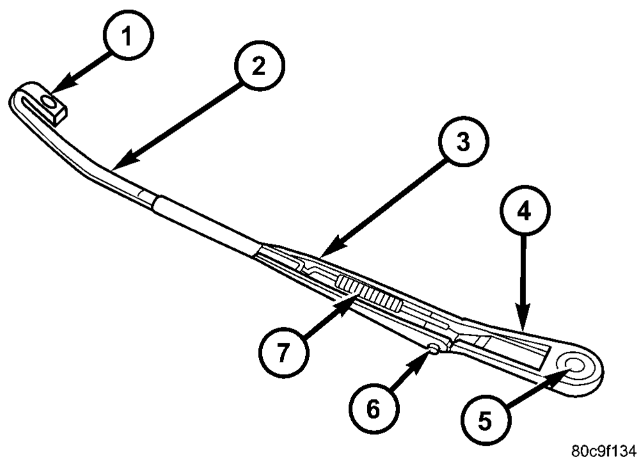


Fig. 10 Front Wiper Arm

1 - HOOK
2 - STRAP
3 - CHANNEL
4 - PIVOT END
5 - PIVOT HOLE
6 - HINGE PIN
7 - TENSION SPRING

The front wiper arms are the rigid members located between the wiper pivots that protrude from the cowl plenum cover/grille panel near the base of the windshield and the wiper blades on the windshield glass (Fig. 10). These wiper arms feature an over-center hinge that allows easy access to the windshield glass for cleaning. The wiper arm has a die cast metal pivot end with a large tapered mounting hole at one end. A molded black plastic cap fits over the wiper arm retaining nut to conceal the nut and this mounting hole following wiper arm installation.

The wide end of a tapered, stamped steel channel hinges on and is secured with a hinge pin to the blade end of the wiper arm pivot end. One end of a long, rigid, stamped steel strap, with a small hole near its pivot end, is riveted and crimped within the narrow end of the stamped steel channel. The tip of the wiper blade end of this strap is bent back under itself to form a small hook. Concealed within the stamped steel channel, one end of a long spring is engaged with a wire hook on the underside of the die cast pivot end, while the other end of the spring is hooked through the small hole in the steel strap. The entire wiper arm has a satin black finish applied to all of its visible surfaces.

A wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

OPERATION

The front wiper arms are designed to mechanically transmit the motion from the wiper pivots to the wiper blades. The wiper arm must be properly indexed to the wiper pivot in order to maintain the proper wiper blade travel on the glass. The tapered mounting hole in the wiper arm pivot end interlocks with the serrations on the tapered outer circumference of the wiper pivot shaft, allowing positive engagement and finite adjustment of this connection. The mounting nut locks the wiper arm to the threaded stud of the wiper pivot shaft. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

(1) Lift the front wiper arm to its over-center position to hold the wiper blade off of the glass and relieve the spring tension on the wiper arm to wiper pivot shaft connection.

(2) Carefully pry the plastic nut cap off of the pivot end of the wiper arm (Fig. 11).

(3) Remove the nut that secures the wiper arm to the wiper pivot shaft.

(4) If necessary, use a suitable battery terminal puller to disengage the wiper arm from the wiper pivot shaft (Fig. 12).

(5) Remove the front wiper arm pivot end from the wiper pivot shaft.

FRONT WIPER ARM (Continued)

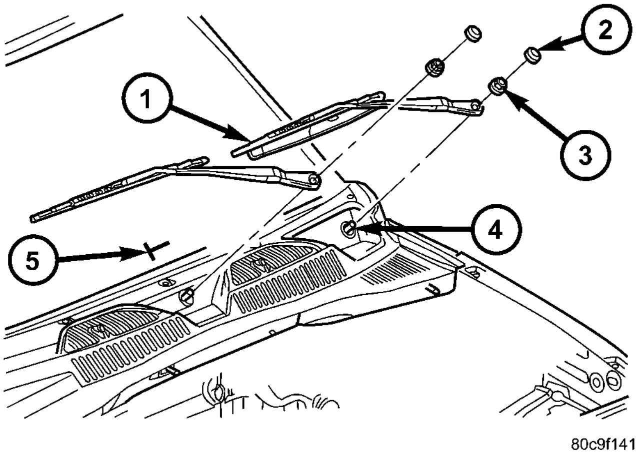


Fig. 11 Front Wiper Arm Remove/Install

1 - FRONT WIPER BLADE & ARM (2)
2 - CAP (2)
3 - NUT (2)
4 - PIVOT SHAFT (2)
5 - T-SHAPED ALIGNMENT MARK (2)

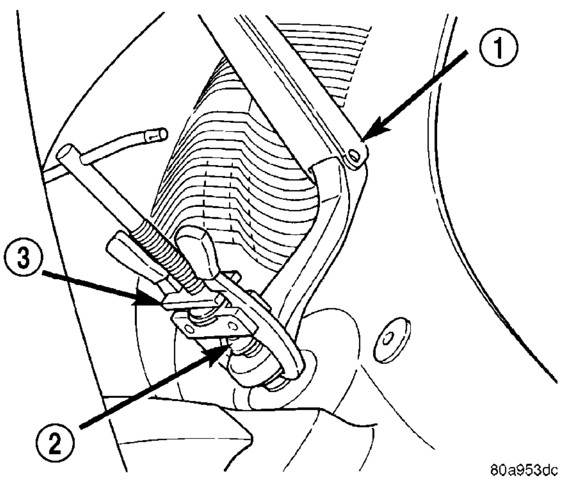


Fig. 12 Wiper Arm Puller - Typical

1 - WIPER ARM
2 - WIPER PIVOT SHAFT
3 - BATTERY TERMINAL PULLER

INSTALLATION

NOTE: Be certain that the wiper motor is in the park position before attempting to install the front wiper arms. Turn the ignition switch to the On position and move the control knob on the right (wiper) control stalk of the multi-function switch to its Off position. If the wiper pivots move, wait until they stop moving, then turn the ignition switch back to the Off position. The wiper motor is now in its park position.

(1) The front wiper arms must be indexed to the wiper pivot shafts with the wiper motor in the park position to be properly installed. Position the front wiper arm pivot ends onto the wiper pivot shafts so that the tip of the wiper blade is aligned with the T-shaped wiper alignment lines located in the lower edge of the windshield glass (Fig. 11).

(2) Once the wiper blade is aligned, lift the wiper arm away from the windshield slightly to relieve the spring tension on the pivot end and push the pivot hole on the end of the wiper arm down firmly and evenly over the wiper pivot shaft.

(3) Install and tighten the nut that secures the wiper arm to the wiper pivot shaft. Tighten the nut to 24 N·m (18 ft. lbs.).

(4) Wet the windshield glass, then operate the front wipers. Turn the front wipers Off, then check for the correct wiper arm position and readjust as required.

(5) Reinstall the plastic nut cap onto the wiper arm pivot nut.

FRONT WIPER BLADE

DESCRIPTION

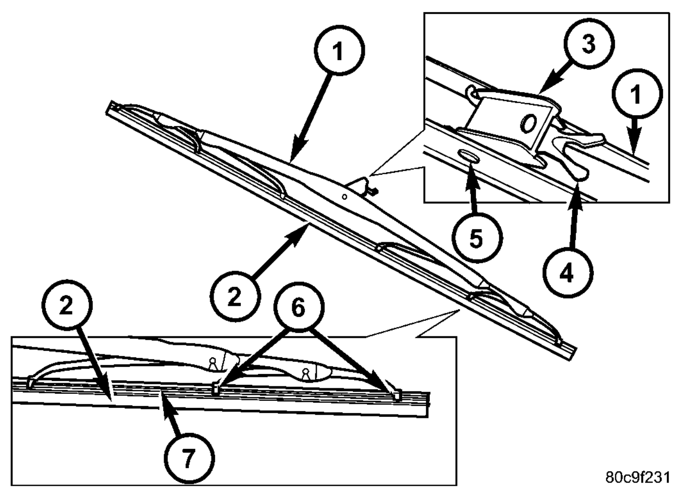


Fig. 13 Front Wiper Blade

1 - SUPERSTRUCTURE
2 - ELEMENT
3 - PIVOT BLOCK
4 - RELEASE TAB
5 - PIVOT PIN
6 - CLAWS
7 - FLEXOR

Each front wiper blade is secured by an integral latching pivot block to the hook formation on the tip of the front wiper arms, and rests on the glass near the base of the windshield when the wipers are not in operation (Fig. 13). The wiper blade consists of the following components:

- **Superstructure -** The superstructure includes several stamped steel bridges and links with claw formations that grip the wiper blade element. Also

FRONT WIPER BLADE (Continued)

included in this unit is the latching, molded plastic pivot block that secures the superstructure to the wiper arm. On vehicles manufactured for certain markets where it is required, the driver side front wiper blade has an additional molded black plastic airfoil secured to the superstructure, which is oriented toward the base of the windshield when the front wipers are in their parked position. All of the metal components of the wiper blade have a satin black finish applied.

- **Element** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.
- **Flexor** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws of the superstructure.

All models have two 47.50 centimeter (18.70 inch) long front wiper blades with non-replaceable rubber elements (squeegees). The wiper blades cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

The wiper blades are moved back and forth across the glass by the wiper arms when the wipers are being operated. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature that may be encountered across the glass surface. The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, yet resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions. The airfoil used on the driver side wiper blade of vehicles manufactured for certain markets is designed to reduce the lifting effect caused by air moving over the vehicle at higher highway speeds.

REMOVAL

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

(1) Lift the front wiper arm to raise the wiper blade and element off of the glass, until the wiper arm hinge is in its over-center position.

(2) To remove the wiper blade from the wiper arm, depress the pivot block latch release tab under the tip of the arm and slide the blade away from the tip towards the pivot end of the arm far enough to disengage the pivot block from the hook formation on the end of the arm (Fig. 14).

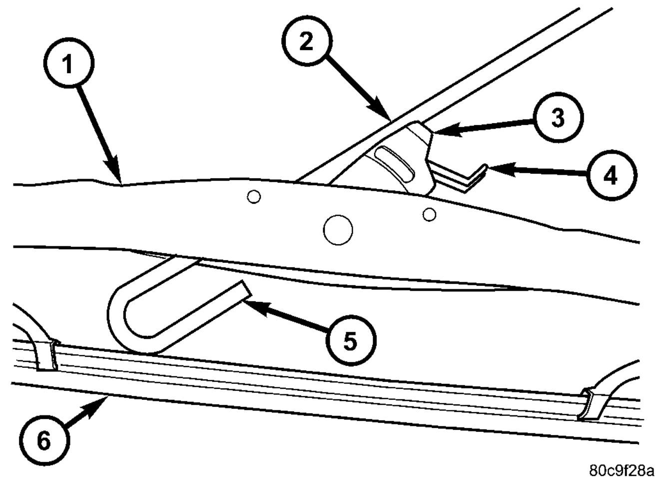


Fig. 14 Front Wiper Blade Remove/Install

1 - SUPERSTRUCTURE
2 - WIPER ARM
3 - PIVOT BLOCK
4 - RELEASE TAB
5 - HOOK
6 - ELEMENT

(3) Extract the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure just ahead of the wiper blade pivot block/latch unit.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(4) Gently lower the tip of the wiper arm onto the glass.

INSTALLATION

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

(1) Lift the front wiper arm off of the windshield glass, until the wiper arm hinge is in its over-center position.

(2) Position the front wiper blade near the hook formation on the tip of the arm with the notched end of the wiper element flexor oriented towards the end of the wiper arm that is nearest to the wiper pivot.

(3) Insert the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure ahead of the wiper blade pivot block/

FRONT WIPER BLADE (Continued)

latch unit far enough to engage the pivot block into the hook (Fig. 14).

(4) Slide the wiper blade pivot block/latch up into the hook formation on the tip of the wiper arm until the latch release tab snaps into its locked position. Latch engagement will be accompanied by an audible click.

(5) Gently lower the wiper blade onto the glass.

FRONT WIPER MODULE

DESCRIPTION

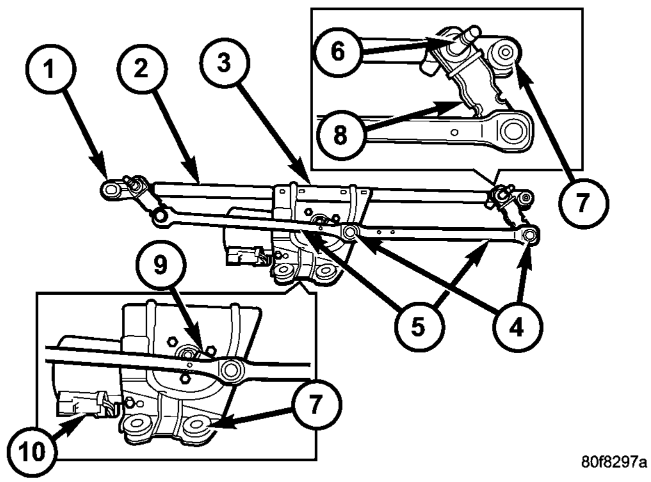


Fig. 15 Front Wiper Module

1 - PIVOT BRACKET (2)
2 - MOTOR COVER
3 - MOTOR BRACKET
4 - LINKAGE BUSHING (4)
5 - DRIVE LINK (2)
6 - PIVOT SHAFT (2)
7 - INSULATOR (4)
8 - PIVOT CRANK ARM (2)
9 - MOTOR CRANK ARM
10 - PIGTAIL WIRE CONNECTOR

The front wiper module bracket is secured with two nuts below the wiper motor through rubber insulators to two weld studs on the bottom of the cowl plenum panel beneath the cowl plenum cover/grille panel (Fig. 15). Two screws secure the top of the module bracket to the cowl plenum panel through rubber insulators located on the outboard end of each pivot bracket. The ends of the wiper pivot shafts that protrude through dedicated openings in the cowl plenum cover/grille panel to drive the wiper arms and blades are the only visible components of the front wiper module. The front wiper module consists of the following major components:

- **Bracket** - The front wiper module bracket consists of a long tubular steel main member that has a die cast pivot bracket formation near each end where the two wiper pivots are secured. A stamped steel mounting plate for the wiper motor is secured with welds near the center of the main member. A short stamped steel tab that extends laterally from one side of the mounting plate provides a mounting location for the wiper motor pigtail wire connector.
- **Crank Arm** - The front wiper motor crank arm is a stamped steel unit with a slotted hole on the driven end that is secured to the wiper motor output shaft with a nut, and has a ball stud secured to the drive end.
- **Linkage** - Two stamped steel drive links connect the wiper motor crank arm to the wiper pivot lever arms. The right side drive link has a plastic socket-type bushing on each end. The left side drive link has a plastic socket-type bushing on one end, and a plastic sleeve-type bushing on the other end. The socket-type bushing on one end of each drive link is snap-fit over the ball stud on the lever arm of its respective pivot. The left side drive link sleeve-type bushing end is then fit over the motor crank arm ball stud, and the other socket-type bushing of the right side drive link is snap-fit over the exposed end of the wiper motor crank arm ball stud.
- **Motor** - The front wiper motor is secured with three screws to the motor mounting plate near the center of the wiper module bracket. The wiper motor output shaft passes through a hole in the module bracket, where a nut secures the wiper motor crank arm to the motor output shaft. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal automatic resetting circuit breaker. A molded plastic shield covers the top of the motor.
- **Pivots** - The two front wiper pivots are secured within the die cast pivot brackets on the outboard ends of the wiper module main member. The lever arms that extend from the center of the pivot shafts each have a ball stud on their end. The upper end of each pivot shaft where the wiper arms will be fastened each is tapered and serrated with a threaded stud formation at the tip. The lower ends of the pivot shafts are installed through lubricated bushings in the pivot brackets and are secured with snap rings.

The front wiper module cannot be adjusted or repaired. If any component of the module is faulty or damaged, the entire front wiper module unit must be replaced.

OPERATION

The front wiper module operation is controlled by the battery current inputs received by the wiper motor from the wiper on/off and wiper high/low relays. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor

FRONT WIPER MODULE (Continued)

that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes the wiper park switch sense circuit to ground or to battery current, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned Off, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads. The wiper motor crank arm, the two wiper linkage members, and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

REMOVAL

(1) Unlatch and open the hood.

(2) Disconnect and isolate the battery negative cable.

(3) Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - FRONT/FRONT WIPER ARM - REMOVAL).

(4) Remove the cowl plenum cover/grille panel from over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).

(5) Disconnect the headlamp and dash wire harness connector for the front wiper motor from the motor pigtail wire connector (Fig. 16).

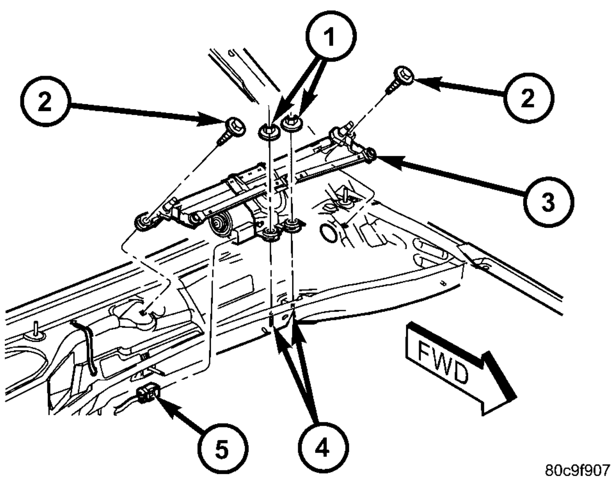


Fig. 16 Front Wiper Module Remove/Install

1 - NUT (2)
2 - SCREW (2)
3 - FRONT WIPER MODULE
4 - STUD (2)
5 - WIRE HARNESS CONNECTOR

(6) Remove the two screws that secure the front wiper module to the top of the cowl plenum panel at the pivot brackets.

(7) Remove the two nuts that secure the front wiper module to the two weld studs on the bottom of the cowl plenum panel.

(8) Lift the front wiper module up from the cowl plenum panel far enough to disengage the two lower insulators from the weld studs on the bottom of the plenum panel.

(9) Remove the front wiper module from the cowl plenum panel as a unit.

INSTALLATION

(1) Position the front wiper module to the cowl plenum as a unit (Fig. 16).

(2) Lower the front wiper module lower mounting insulators over the two weld studs on the bottom of the cowl plenum panel.

(3) Install the two screws that secure the front wiper module to the top of the cowl plenum panel at the pivot brackets. Tighten the screw on the driver side, followed by the screw on the passenger side. Tighten the screws to 8 N·m (72 in. lbs.).

(4) Install and tighten the two nuts that secure the front wiper module to the two weld studs on the bottom of the cowl plenum panel. Tighten the nuts to 8 N·m (72 in. lbs.).

(5) Reconnect the headlamp and dash wire harness connector for the front wiper motor to the motor pigtail wire connector.

(6) Reinstall the cowl plenum cover/grille panel over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).

(7) Close and latch the hood.

(8) Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARM - INSTALLATION).

(9) Reconnect the battery negative cable.

FRONT WIPER/WASHER SWITCH

DESCRIPTION

The front wiper and washer switches are integral to the right (wiper) control stalk of the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).

OPERATION

The front wiper and washer switches are integral to the right (wiper) control stalk of the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - OPERATION).

WASHER FLUID LEVEL SWITCH

DESCRIPTION

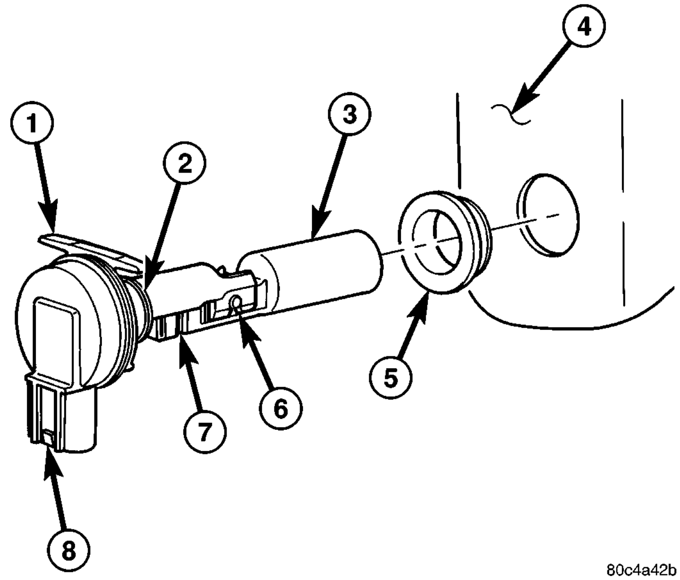


Fig. 17 Washer Fluid Level Switch

1 - MOUNTING FLANGE
2 - BARBED NIPPLE
3 - FLOAT
4 - RESERVOIR
5 - GROMMET SEAL
6 - PIVOT
7 - MAGNET
8 - CONNECTOR RECEPTACLE

The washer fluid level switch is a single pole, single throw reed-type switch mounted at the rear of the sump area near the bottom of the washer reservoir (Fig. 17). Only the molded plastic switch mounting flange and the integral connector receptacle are visible when the switch is installed in the reservoir. A short nipple formation extends from the inner surface of the switch mounting flange, and a barb on the nipple near the switch mounting flange is pressed through a rubber grommet seal installed in the mounting hole of the reservoir. A small, molded plastic float has two pivot pins near its center that are snapped into two receptacles near the ends of two stanchions that extend toward the float from the switch nipple formation. A small magnet is secured within the end of the float nearest the switch nipple formation, and a reed switch is concealed within the nipple. A diagnostic resistor is connected between the two switch terminals within the switch mounting flange. The washer fluid level switch cannot be adjusted or repaired. If faulty or damaged, the switch must be replaced.

OPERATION

The washer fluid level switch uses a pivoting, oblong float to monitor the level of the washer fluid in the washer reservoir. The float contains a small magnet. When the float pivots, the proximity of this magnet to a stationary reed switch within the nipple formation of the switch changes. When the fluid level in the washer reservoir is at or above the float level, the float moves to a vertical position, the influence of the float magnetic field is removed from the reed switch, and the normally open reed switch contacts open. When the fluid level in the washer reservoir falls below the level of the pivoting float, the float moves to a horizontal position, the influence of the float magnetic field is applied to the reed switch, and the contacts of the normally open reed switch close.

The washer fluid level switch is connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness. The switch is connected in series between ground and the washer fluid switch sense input to the ElectroMechanical Instrument Cluster (EMIC). The switch receives a path to ground at all times through another take out of the headlamp and dash wire harness with a single eyelet terminal connector that is secured under a ground screw near the front of the left front fender inner shield in the engine compartment. When the switch closes, the EMIC senses the ground on the washer fluid switch sense circuit. The EMIC is programmed to respond to this input by illuminating the washer fluid indicator and by sounding an audible chime tone warning.

The washer fluid level switch input to the EMIC may be diagnosed using conventional diagnostic tools and methods. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/WASHER FLUID INDICATOR - DIAGNOSIS AND TESTING).

REMOVAL

The washer fluid level switch can be removed from the washer reservoir without removing the reservoir from the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the splash shield from the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - REMOVAL).

(4) Disconnect the front or rear washer hose from one of the barbed outlet nipples of the washer pump/motor unit and allow the washer fluid to drain into a clean container for reuse.

(5) Disconnect the headlamp and dash wire harness connector for the washer fluid level switch from the switch connector receptacle (Fig. 18).

WASHER FLUID LEVEL SWITCH (Continued)

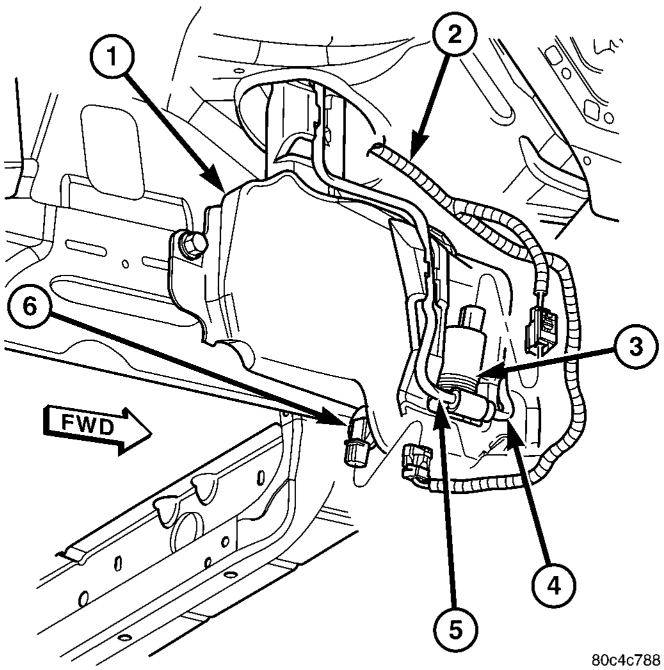


Fig. 18 Washer Fluid Level Switch Remove/Install

1 - WASHER RESERVOIR
2 - WIRE HARNESS
3 - WASHER PUMP/MOTOR
4 - FRONT WASHER HOSE
5 - REAR WASHER HOSE
6 - WASHER FLUID LEVEL SWITCH

NOTE: The pivoting float of the washer fluid level switch must be in a horizontal position within the reservoir in order to be removed. With the reservoir empty and in an upright position, the pivoting float will orient itself to the horizontal position when the switch connector receptacle is pointed straight downwards.

(6) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed nipple of the washer fluid level switch out of the rubber grommet seal on the back of the reservoir sump. Care must be taken not to damage the reservoir.

(7) Remove the washer fluid level switch from the washer reservoir.

(8) Remove the rubber grommet seal from the washer fluid level switch mounting hole in the washer reservoir and discard.

INSTALLATION

(1) Install a new rubber grommet seal into the washer fluid level switch mounting hole in the washer reservoir. Always use a new rubber grommet seal on the reservoir.

(2) Insert the float of the washer fluid level switch through the rubber grommet seal and into the washer reservoir. The connector receptacle of the washer fluid level switch should be pointed downward.

(3) Using hand pressure, press firmly and evenly on the washer fluid level switch mounting flange until the barbed nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.

(4) Reconnect the headlamp and dash wire harness connector for the washer fluid level switch to the switch connector receptacle (Fig. 18).

(5) Reconnect the removed washer hose to the barbed outlet nipple of the washer pump/motor unit.

(6) Reinstall the splash shield into the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/ FRONT WHEELHOUSE SPLASH SHIELD - INSTALLATION).

(7) Lower the vehicle.

(8) Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.

(9) Reconnect the battery negative cable.

WASHER PUMP/MOTOR

DESCRIPTION

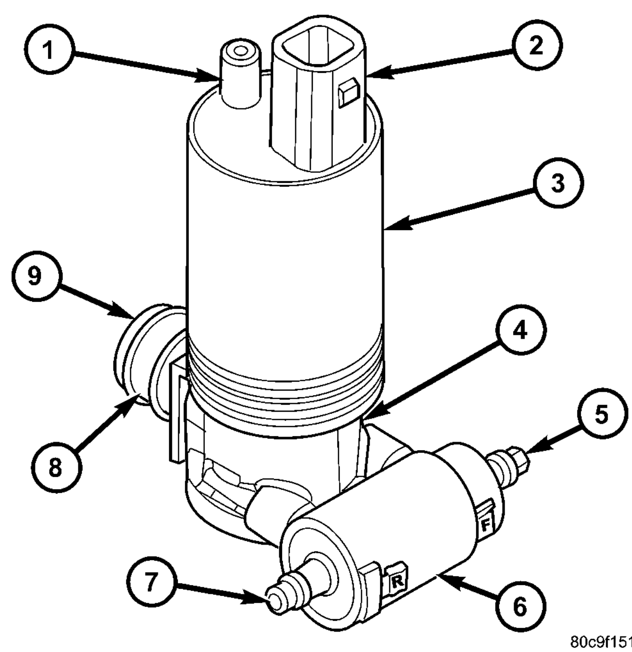


Fig. 19 Washer Pump/Motor

1 - SNAP POST
2 - CONNECTOR RECEPTACLE
3 - MOTOR
4 - PUMP
5 - FRONT WASHER OUTLET NIPPLE
6 - VALVE BODY
7 - REAR WASHER OUTLET NIPPLE
8 - INLET NIPPLE
9 - FILTER SCREEN

WASHER PUMP/MOTOR (Continued)

The washer pump/motor unit (Fig. 19) is located on the outboard side of the washer reservoir, on the outboard side of the right front frame rail behind the right front wheel house splash shield. A small permanently lubricated and sealed reversible electric motor is coupled to the rotor-type washer pump. The use of an integral valve body allows the washer pump/motor unit to provide washer fluid to either the front or the rear washer systems, depending upon the direction of the motor/pump impeller rotation. A seal flange with a barbed inlet nipple on the pump housing passes through a rubber grommet seal installed in a dedicated mounting hole of the washer reservoir. When the pump is installed in the reservoir the front barbed outlet nipple on the pump valve body housing connects the unit to the front washer hose and the rear barbed outlet nipple connects the unit to the rear washer hose. The letters "F" and "R" molded into the valve body housing adjacent to each nipple provide further clarification of the nipple assignments.

The washer pump/motor unit is retained on the reservoir by the interference fit between the barbed pump inlet nipple and the grommet seal, which is a light press fit. The top of the washer pump is also secured to the washer reservoir by the use of a snap post on the motor and a snap post receptacle molded into the reservoir that allows for mounting of the washer pump without the use of fasteners. An integral connector receptacle on the top of the motor housing connects the unit to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness. The washer pump/motor unit cannot be repaired. If faulty or damaged, the entire washer pump/motor unit must be replaced.

OPERATION

The washer pump/motor unit features a reversible electric motor. The direction of the motor is controlled by hard wired outputs from the momentary front and rear washer switch circuitry contained within the right (wiper) control stalk of the multifunction switch. When battery current and ground are applied to the two pump motor terminals, the motor rotates in one direction. When the polarity of these connections is reversed, the motor rotates in the opposite direction. When the pump motor is energized, the rotor-type pump pressurizes the washer fluid and forces it through one of the two pump outlet nipples, and into the front or rear washer plumbing.

Washer fluid is gravity-fed from the washer reservoir to the inlet port of the washer pump housing. An integral valve body is located in a housing on the outlet port side of the pump housing (Fig. 20). A diaphragm in this valve body controls which washer system plumbing receives the washer fluid being pressurized by the pump. When the pump is not operating the diaphragm is biased to close all washer fluid flow in the rear washer system and, in this way it also performs the function of the rear washer system check valve.

When the pump impeller rotates in the counterclockwise direction (viewed from the bottom), the biased diaphragm is sealing off the rear washer system outlet and nipple so the pressurized washer fluid is pushed out through the pump front outlet port and the front washer outlet nipple. When the pump impeller rotates in the clockwise direction (viewed from the bottom), pressurized washer fluid is pushed out through the pump rear outlet port and moves the diaphragm to open the rear washer outlet nipple and seal off the front washer outlet nipple, then the pressurized washer fluid is pushed out through the rear washer outlet nipple.

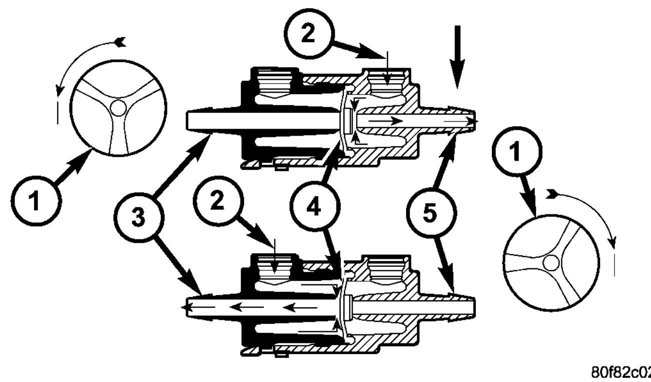


Fig. 20 Washer Pump Fluid Flow

1 - IMPELLER ROTATION (VIEWED FROM BOTTOM)
2 - PUMP OUTPUT
3 - REAR WASHER OUTLET NIPPLE
4 - DIAPHRAGM
5 - FRONT WASHER OUTLET NIPPLE

The washer pump/motor unit may be diagnosed using conventional diagnostic tools and methods.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the right front wheel and tire from the vehicle.

(4) Remove the four plastic blind rivets that secure the forward end of the front wheel opening flare molding to the front wheelhouse splash shield, the front fascia, and the front air dam. Then separate the two lower clips that secure the forward end of the flare molding to the front fascia and front fender. (Refer to 23 - BODY/EXTERIOR/FRONT WHEEL OPENING FLARE MOLDING - REMOVAL).

WASHER PUMP/MOTOR (Continued)

(5) Remove the plastic push-in fastener that secures the front wheelhouse splash shield to the inner fender panel just above and behind the washer reservoir. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - REMOVAL).

(6) Pull the forward end of the front wheelhouse splash shield away from the inner fender panel far enough to access the washer reservoir and pump for service.

(7) Place a clean container on the floor beneath the washer pump/motor location to catch any washer fluid that is spilled during the following procedure for possible reuse.

(8) Disconnect the two washer hoses from the two washer pump/motor unit outlet nipples and allow the washer fluid to drain from the reservoir (Fig. 21).

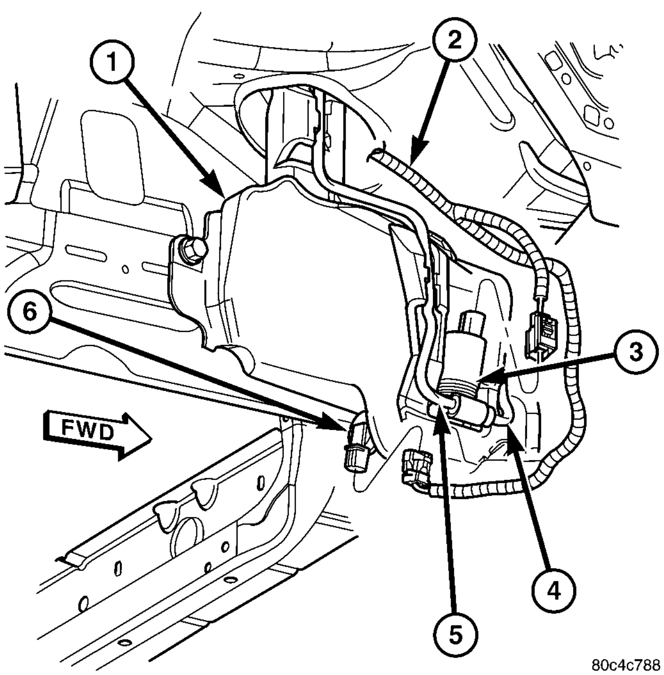


Fig. 21 Washer Pump/Motor Connections

1 - WASHER RESERVOIR
2 - WIRE HARNESS
3 - WASHER PUMP/MOTOR
4 - FRONT WASHER HOSE
5 - REAR WASHER HOSE
6 - WASHER FLUID LEVEL SWITCH

(9) Disconnect the headlamp and dash wire harness connector from the washer pump/motor unit connector receptacle on the top of the motor housing.

(10) Firmly grasp the top of the washer pump/motor housing and pull it lightly outward from the washer reservoir far enough to disengage the snap post on the top of the motor from the receptacle in the reservoir (Fig. 22).

(11) Pull the washer pump/motor unit straight out from the washer reservoir far enough to disengage

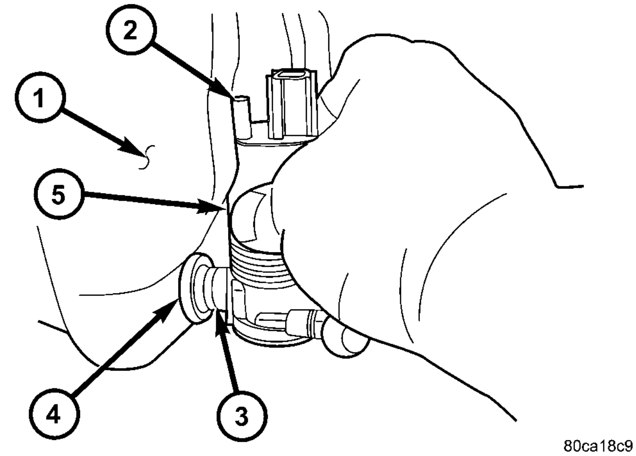


Fig. 22 Washer Pump/Motor Remove/Install

1 - WASHER RESERVOIR
2 - SNAP POST
3 - INLET NIPPLE
4 - GROMMET SEAL
5 - WASHER PUMP/MOTOR

the barbed pump inlet nipple from the rubber grommet seal in the reservoir.

(12) Remove the rubber grommet seal for the washer pump from the pump mounting hole in the washer reservoir and discard.

INSTALLATION

(1) Install a new rubber grommet seal into the washer pump mounting hole in the washer reservoir. Always use a new rubber grommet seal on the reservoir.

(2) Position the barbed inlet nipple of the washer pump to the rubber grommet seal in the washer reservoir (Fig. 22).

(3) Using hand pressure, press on the washer pump/motor unit firmly and evenly until the barbed inlet nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.

(4) Align the snap post on the top of the washer pump/motor housing with the snap post receptacle in the washer reservoir.

(5) Using hand pressure, press firmly and evenly on the top of washer pump/motor unit until the snap post snaps into the washer reservoir receptacle.

(6) Reconnect the headlamp and dash wire harness connector for the washer pump/motor unit to the connector receptacle on the top of the motor housing (Fig. 21).

(7) Reconnect the front and rear washer hoses to the two barbed pump outlet nipples. Be certain that the hose in the trough on the reservoir located behind the pump is connected to the rear nipple, and the hose in the trough in front of the pump is connected to the front nipple.

WASHER PUMP/MOTOR (Continued)

(8) Reposition the forward end of the front wheelhouse splash shield to the inner fender panel.

(9) Reinstall the plastic push-in fastener that secures the front wheelhouse splash shield to the inner fender panel just above and behind the washer reservoir. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - INSTALLATION).

(10) Engage the two lower clips that secure the forward end of the front wheel opening flare molding to the front fascia and front fender. Then install four new plastic blind rivets to secure the forward end of the flare molding to the front wheelhouse splash shield, the front fascia, and the front air dam. (Refer to 23 - BODY/EXTERIOR/FRONT WHEEL OPENING FLARE MOLDING - INSTALLATION).

(11) Reinstall the right front wheel and tire onto the vehicle.

(12) Lower the vehicle.

(13) Reconnect the battery negative cable.

(14) Refill the washer reservoir with clean washer fluid.

WASHER RESERVOIR

DESCRIPTION

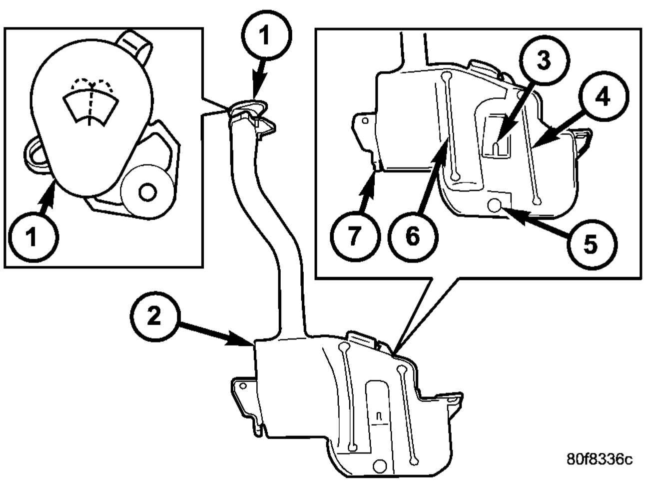


Fig. 23 Washer Reservoir

1 - CAP
2 - RESERVOIR
3- SNAP POST RECEPTACLE
4 - FRONT HOSE TROUGH
5 - WASHER PUMP HOLE
6 - REAR HOSE TROUGH
7 - HOOK

A single washer fluid reservoir is used for both the front and rear washer systems (Fig. 23). The molded plastic washer fluid reservoir is mounted on the outboard side of the right front frame rail in front of the right front wheel, where it is concealed by the right front wheel house splash shield. The only visible component of the washer reservoir is the filler neck and cap unit, which extends through a hole in the right front wheel house extension panel into the engine compartment. A bright yellow plastic filler cap with an integral bail strap and filler neck mounting bracket is labeled with an International Control and Display Symbol icon for “Windshield Washer.” The cap snaps over the open end of the filler neck.

There is a dedicated hole on the outboard side of the reservoir provided for the mounting of the washer pump/motor unit, and another dedicated hole on the rear of the reservoir for the washer fluid level switch. A snap post receptacle molded into the reservoir allows for mounting of the washer pump without the use of fasteners. The reservoir also features integral hose routing troughs on its outboard side and integral routing clips along its top. The washer reservoir is secured to the outboard side of the right front frame rail by two screws and an integral molded tab that engages in a slot in the right front frame rail. A blind rivet secures the reservoir filler neck bracket to the upper radiator crossmember in the front of the engine compartment. The right front fender wheel house splash shield must be removed to access the washer reservoir for service.

The washer reservoir cannot be repaired and, if faulty or damaged, it must be replaced. The washer reservoir, the grommet seals for the washer pump/motor unit and the washer fluid level switch, and the filler cap are each available for individual service replacement.

OPERATION

The washer fluid reservoir provides a secure, on-vehicle storage location for a large reserve of washer fluid for operation of the front and rear washer systems. The washer reservoir filler neck provides a clearly marked and readily accessible point from which to add washer fluid to the reservoir. The washer/pump motor unit is located in a sump area near the front of the reservoir to be certain that washer fluid will be available to the pump as the fluid level in the reservoir becomes depleted. The washer pump/motor unit is mounted in the lowest position in the sump. The washer fluid level switch is mounted just above the sump area of the reservoir so that there will be adequate warning to the vehicle operator that the washer fluid level is low, before the washer system will no longer operate.

REMOVAL

(1) Turn the front wheels full lock to the right.

(2) Unlatch and open the hood.

(3) Disconnect and isolate the battery negative cable.

WASHER RESERVOIR (Continued)

(4) Remove the air cleaner housing from the top of the right front fender wheel house. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).

(5) Remove the blind rivet that secures the washer reservoir filler neck support bracket to the upper radiator crossmember (Fig. 24).

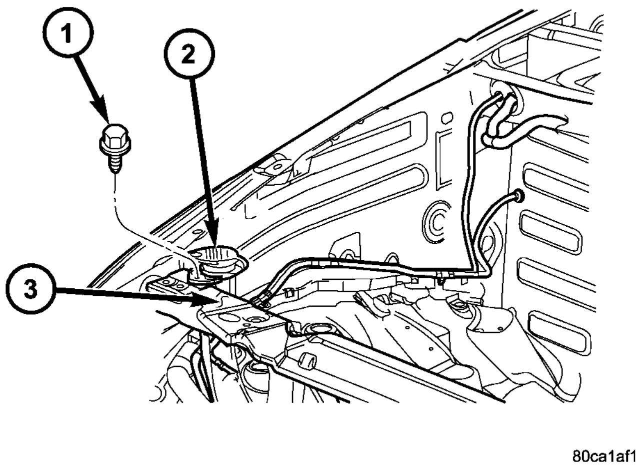


Fig. 24 Washer Reservoir Cap Remove/Install

1 - BLIND RIVET (1)
2 - CAP
3 - UPPER RADIATOR CROSSMEMBER

(6) Raise and support the vehicle.

(7) Remove the splash shield from the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/WHEELHOUSE SPLASH SHIELD - REMOVAL).

(8) Place a clean container on the floor beneath the washer pump/motor location to catch any washer fluid that is spilled during the following procedure.

(9) Disconnect the front and rear washer hoses from the washer pump/motor unit outlet nipples and allow the washer fluid to drain into the container for reuse (Fig. 25).

(10) Disconnect the headlamp and dash wire harness connector for the washer pump/motor unit from the connector receptacle on the top of the motor housing.

(11) Disconnect the headlamp and dash wire harness connector for the washer fluid level switch from the connector receptacle on the bottom of the switch.

(12) Disengage the front and rear washer hoses from the integral washer reservoir troughs and routing clips.

(13) Using a long extension with a swivel socket and pulling forward on the front bumper fascia, remove the screw that secures the washer reservoir to the right front frame rail.

(14) Remove the screw that secures the rear of the washer reservoir to the right front frame rail.

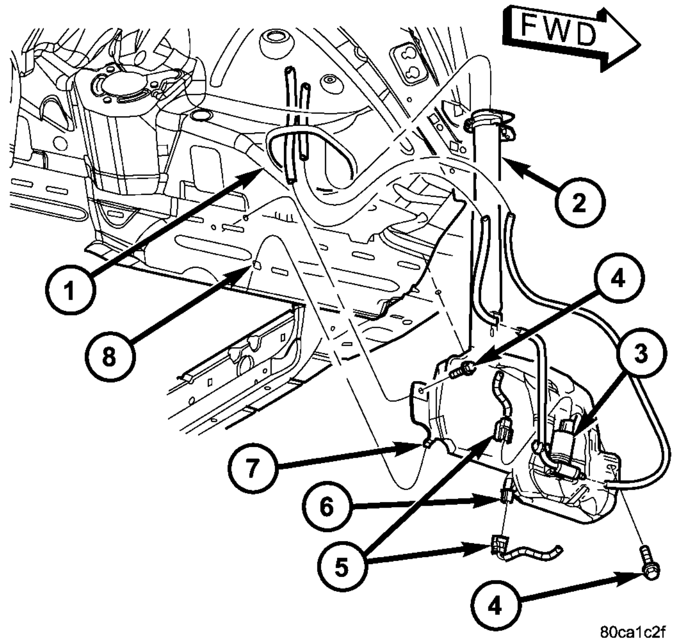


Fig. 25 Washer Reservoir Remove/Install

1 - FRONT WHEEL HOUSE INNER PANEL
2 - WASHER RESERVOIR
3 - WASHER PUMP/MOTOR
4 - SCREW (2)
5 - WIRE HARNESS CONNECTOR (2)
6 - WASHER FLUID LEVEL SWITCH
7 - MOUNTING TAB
8 - SLOT

(15) Disengage the mounting tab at the back of the washer reservoir from the slot in the right front frame rail.

(16) Lower the washer reservoir far enough for the filler neck to be removed from the clearance hole in the right front fender wheel house panel extension.

(17) Remove the washer reservoir from the right front fender wheel house.

INSTALLATION

(1) Position the washer reservoir into the right front fender wheel house.

(2) Insert the washer reservoir filler neck through the clearance hole in the right front fender wheel house panel extension (Fig. 25).

(3) Raise the washer reservoir far enough to engage the mounting tab at the back of the reservoir into the slot in the right front frame rail.

(4) Install and tighten the screw that secures the rear of the washer reservoir to the right front frame rail. Tighten the screw to 7 N·m (65 in. lbs.).

(5) Using a long extension with a swivel socket and pulling forward on the front bumper fascia, install and tighten the screw that secures the washer reservoir to the right front frame rail. Tighten the screw to 7 N·m (65 in. lbs.).

WASHER RESERVOIR (Continued)

(6) Engage the front and rear washer hoses into the integral washer reservoir troughs and routing clips. Be certain that the rear washer hose is routed rearward of the washer pump/motor unit, and the front washer hose is routed forward of the washer pump/motor unit. The rear washer hose can be identified by an in-line hose connector that joins the reservoir hose to the engine compartment hose located near the top of main body of the reservoir.

(7) Reconnect the headlamp and dash wire harness connector for the washer fluid level switch to the connector receptacle on the bottom of the switch.

(8) Reconnect the headlamp and dash wire harness connector for the washer pump/motor unit to the connector receptacle on the top of the motor housing.

(9) Reconnect the front and rear washer hoses to the washer pump/motor unit outlet nipples. Be certain that the rear washer hose in the trough rearward of the washer pump/motor unit is connected to the rear nipple, and the hose in the trough forward of the washer pump/motor unit is connected to the front nipple.

(10) Reinstall the splash shield into the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/WHEELHOUSE SPLASH SHIELD - INSTALLATION).

(11) Lower the vehicle.

(12) Install a new blind rivet to secure the washer reservoir filler neck support bracket to the upper radiator crossmember (Fig. 24). Tighten the screw to 7 N·m (65 in. lbs.).

(13) Reinstall the air cleaner housing onto the top of the right front fender wheel house. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - INSTALLATION).

(14) Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.

(15) Reconnect the battery negative cable.

(16) Close and latch the hood.

WIPER HIGH/LOW RELAY

DESCRIPTION

The wiper high/low relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. The wiper high/low relay is a conventional International Standards Organization (ISO) micro relay (Fig. 26). Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs by five integral male spade-type terminals that extend from the bottom of the relay base.

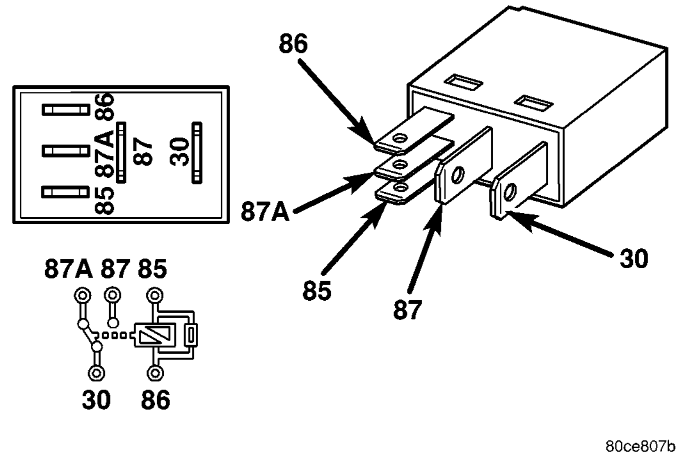


Fig. 26 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The wiper high/low relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The wiper high/low relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the front wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper high/low relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper high/low relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the output of the wiper on/off relay at all times through the wiper on/off relay output circuit.

WIPER HIGH/LOW RELAY (Continued)

- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Body Control Module (BCM) through a front wiper high/low relay control circuit. The BCM controls front wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit.
- **Normally Open Terminal** - The normally open terminal (87) is connected to the high speed brush of the front wiper motor through a front wiper high/low relay high speed output circuit, and is connected to the high speed brush whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to the low speed brush of the front wiper motor through a front wiper high/low relay low speed output circuit, and is connected to the low speed brush whenever the relay is de-energized.

The wiper high/low relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - WIPER HIGH/LOW RELAY

The wiper high/low relay (Fig. 27) is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove the wiper high/low relay from the PDC. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER HIGH/LOW RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

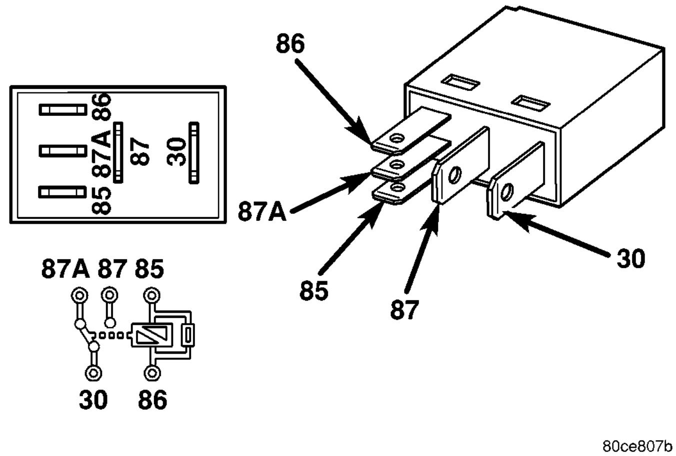


Fig. 27 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 28).

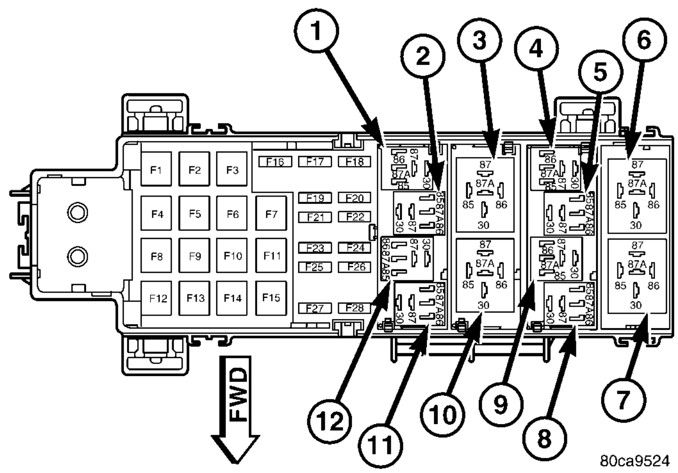


Fig. 28 Power Distribution Center

1 - FUEL PUMP RELAY
2 - STARTER MOTOR RELAY
3 - BLOWER MOTOR RELAY
4 - A/C COMPRESSOR CLUTCH RELAY
5 - OXYGEN SENSOR DOWNSTREAM RELAY
6 - AUTO SHUT DOWN RELAY
7 - SPARE
8 - SPARE
9a - (M/T) CLUTCH INTERLOCK RELAY
9b - (A/T) TRANSMISSION CONTROL RELAY
10 - SPARE
11 - WIPER HIGH/LOW RELAY
12 - WIPER ON/OFF RELAY

(3) Remove the wiper high/low relay by grasping it firmly and pulling it straight out from the receptacle in the PDC.

WIPER HIGH/LOW RELAY (Continued)

INSTALLATION

(1) Position the wiper high/low relay to the proper receptacle in the Power Distribution Center (PDC) (Fig. 28).

(2) Align the wiper high/low relay terminals with the terminal cavities in the PDC receptacle.

(3) Push firmly and evenly on the top of the wiper high/low relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(4) Reinstall the cover onto the PDC.

(5) Reconnect the battery negative cable.

WIPER ON/OFF RELAY

DESCRIPTION

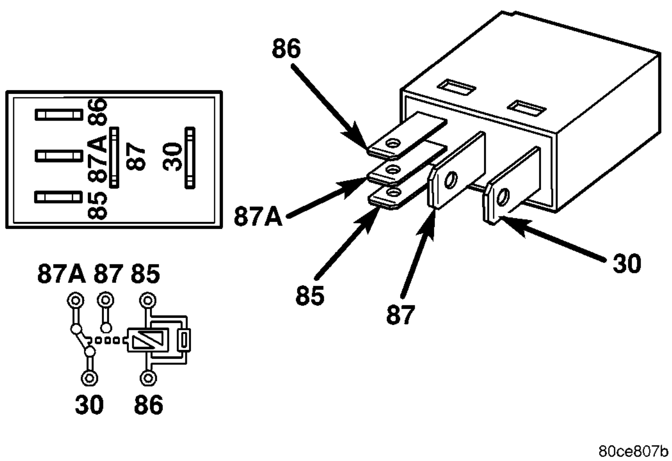


Fig. 29 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The wiper on/off relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. The wiper on/off relay is a conventional International Standards Organization (ISO) micro relay (Fig. 29). Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs by five integral male spade-type terminals that extend from the bottom of the relay base.

The wiper on/off relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The wiper on/off relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the front wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper on/off relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper on/off relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the common feed terminal of the wiper high/low relay at all times through the wiper on/off relay output circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Body Control Module (BCM) through a front wiper on/off relay control circuit. The BCM controls front wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit.
- **Normally Open Terminal** - The normally open terminal (87) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit, and provides battery current to the front wiper on/off relay output circuit whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to the wiper park switch in the front wiper motor through the front wiper park switch sense circuit, and is connected to the wiper park switch whenever the relay is de-energized.

The wiper on/off relay can be diagnosed using conventional diagnostic tools and methods.

WIPER ON/OFF RELAY (Continued)

DIAGNOSIS AND TESTING - WIPER ON/OFF RELAY

The wiper on/off relay (Fig. 30) is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

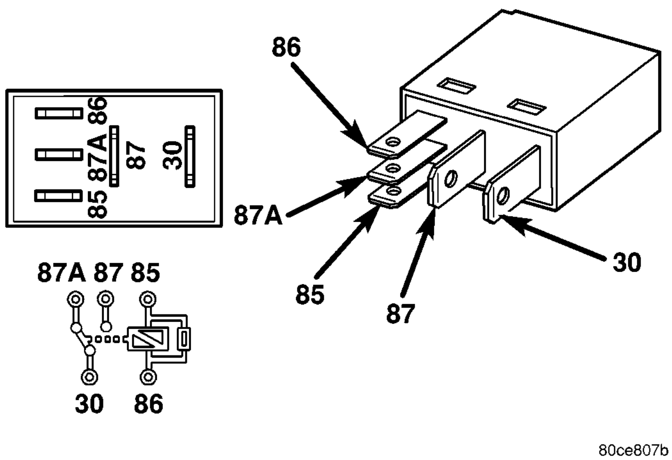


Fig. 30 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the wiper on/off relay from the PDC. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ON/OFF RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 31).

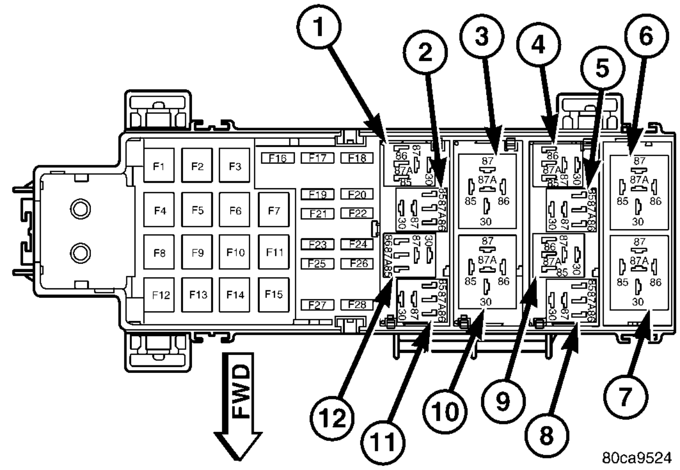


Fig. 31 Power Distribution Center

1 - FUEL PUMP RELAY
2 - STARTER MOTOR RELAY
3 - BLOWER MOTOR RELAY
4 - A/C COMPRESSOR CLUTCH RELAY
5 - OXYGEN SENSOR DOWNSTREAM RELAY
6 - AUTO SHUT DOWN RELAY
7 - SPARE
8 - SPARE
9a - (M/T) CLUTCH INTERLOCK RELAY
9b - (A/T) TRANSMISSION CONTROL RELAY
10 - SPARE
11 - WIPER HIGH/LOW RELAY
12 - WIPER ON/OFF RELAY

(3) Remove the wiper on/off relay by grasping it firmly and pulling it straight out from the receptacle in the PDC.

INSTALLATION

(1) Position the wiper on/off relay to the proper receptacle in the Power Distribution Center (PDC) (Fig. 31).

(2) Align the wiper on/off relay terminals with the terminal cavities in the PDC receptacle.

(3) Push firmly and evenly on the top of the wiper on/off relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(4) Reinstall the cover onto the PDC.

(5) Reconnect the battery negative cable.

REAR WIPERS/WASHERS

TABLE OF CONTENTS

REAR WIPERS/WASHERS

DESCRIPTION

An electrically operated fixed interval intermittent rear wiper and washer system is standard factory-installed equipment on this model (Fig. 1). The rear wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **Multi-Function Switch** - The multi-function switch is located on the top of the steering column, just below the steering wheel. The multi-function switch includes a left (lighting) control stalk and a right (wiper) control stalk. The right control stalk is dedicated to providing all of the driver controls for both the front and rear wiper systems. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).
- **Rear Check Valve** - The rear washer system check valve function is performed by the diaphragm integral to the valve body of the washer pump/motor unit in this model. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/WASHER PUMP/MOTOR - DESCRIPTION).
- **Rear Washer Nozzle** - The rear washer nozzle is secured by a snap fit into a mounting hole in the roof outer panel above the rear flip-up glass opening.
- **Rear Washer Plumbing** - The plumbing for the rear washer system consists of rubber hoses and molded plastic fittings. The plumbing is routed along the right side of the engine compartment from the washer reservoir, through the dash into the passenger compartment, up the right cowl side and A-pillar to the headliner, and above the headliner to the rear washer nozzle fitting within the rear roof header.
- **Rear Wiper Arm** - The single rear wiper arm is secured by a nut directly to the rear wiper motor output shaft, which extends through the center of the tailgate outer panel near the base of the rear flip-up glass.
- **Rear Wiper Arm Park Ramp** - The molded rubber rear wiper arm park ramp is secured with a screw to the tailgate outer panel to the right of the rear wiper motor output shaft bezel. When the rear wiper system is not in operation, the rear wiper arm is parked off of the rear flip-up glass on this ramp so that it will not interfere with or be damaged by the flip-up glass operation.
- **Rear Wiper Blade** - The single rear wiper blade is secured to the rear wiper arm with an integral latch, and is parked off of the rear flip-up glass when the rear wiper system is not in operation.
- **Rear Wiper Module** - The rear wiper motor output shaft is the only visible component of the rear wiper module. The remainder of the module is concealed within the tailgate below the rear flip-up glass

REAR WIPERS/WASHERS (Continued)

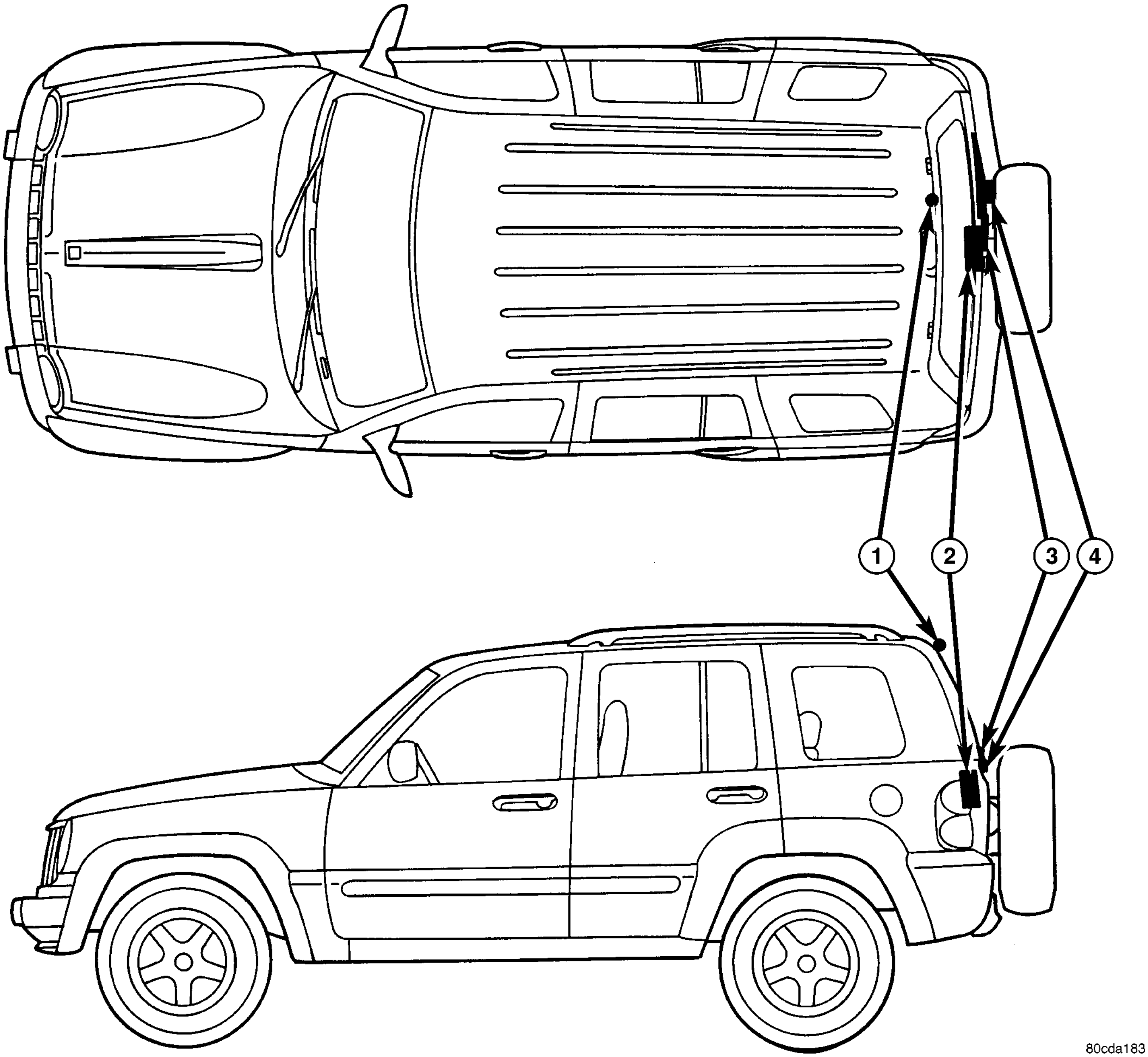


Fig. 1 Rear Wiper & Washer System

1 - WASHER NOZZLE
2 - WIPER MODULE
3 - WIPER ARM & BLADE
4 - PARK RAMP

opening. The rear wiper module includes the module bracket, the rear wiper motor, and the rear wiper electronic control circuitry.

- **Washer Pump/Motor** - The reversible electric washer pump/motor unit is located in a dedicated hole on the lower outboard side of the washer reservoir, behind the right front wheel house splash shield. This single reversible washer pump/motor provides washer fluid to either the front or rear washer system plumbing, depending upon the direction of the pump motor rotation. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/WASHER PUMP MOTOR - DESCRIPTION).
- **Washer Reservoir** - The washer reservoir is concealed behind the right front wheel house splash shield ahead of the right front wheel. The washer reservoir filler neck is the only visible portion of the reservoir, and it is accessed from the right front corner of the engine compartment. This single washer reservoir is shared by both the front and rear washer systems. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/WASHER RESERVOIR - DESCRIPTION).

REAR WIPERS/WASHERS (Continued)

Hard wired circuitry connects the rear wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the rear wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATING MODES

The components of the rear wiper and washer system are designed to work in concert to provide the following operating modes:

- **Continuous Wipe Mode** - The control ring on the right (wiper) control stalk of the multi-function switch has an On position. When selected, this switch position will cause the rear wiper motor to operate in a continuous manner at a fixed wipe cycle speed.
- **Intermittent Wipe Mode** - The control ring on the right (wiper) control stalk of the multi-function switch has a Delay position. When selected, this switch position will cause the rear wiper motor to operate in an intermittent manner at a fixed interval wipe cycle speed.
- **Washer Mode** - The control ring on the right (wiper) control stalk of the multi-function switch has two momentary Wash positions, one at the end of each direction of control ring rotation. When the control ring is rotated to the downward (counterclockwise) Wash position, the rear washer system will dispense washer fluid onto the flip-up glass and the rear wiper motor will operate in a continuous mode for as long as the switch is held closed, then provide several additional wipe cycles after the washer switch is released (wipe-after-wash mode). When the control ring is rotated to the upward (clockwise) Wash position, the rear washer system will dispense washer fluid onto the flip-up glass and the rear wiper motor will operate in a continuous mode for as long as the switch is held closed, then return to fixed wipe mode operation after the washer switch is released.
- **Wipe-After-Wash Mode** - The control ring on the right (wiper) control stalk of the multi-function switch has two momentary Wash positions, one at the end of each direction of control ring rotation. When the control ring is rotated to the downward (counterclockwise) Wash position, the rear washer system will dispense washer fluid onto the flip-up glass and the rear wiper motor will operate in a continuous mode for as long as the switch is held closed, then provide several additional wipe cycles after the washer switch is released.

OPERATION

The rear wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the rear flip-up glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blade to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the swing gate flip up glass surface that might be encountered while driving the vehicle under numerous types of inclement operating conditions.

The vehicle operator initiates all rear wiper and washer system functions with the right (wiper) control stalk of the multi-function switch that extends from the right side of the steering column, just below the steering wheel. Rotating the control ring on the control stalk to a detent position selects the Off, Delay, or On rear wiper system operating modes. Rotating the control ring on the control stalk to either of two Wash positions actuates the momentary rear washer system switch. The multi-function switch provides hard wired outputs to the rear wiper module and the washer pump/motor unit for all rear wiper and washer system functions.

The rear wiper and washer system will only operate when the ignition switch is in the Accessory or On positions, and the rear flip-up glass and tailgate ajar switches are closed. Battery current is directed from a fuse in the Junction Block (JB) to the multi-function switch through a fused ignition switch output (run-accessory) circuit. The internal circuitry of the right (wiper) control stalk of the multi-function switch then provides battery current signals through a rear wiper on driver circuit and a rear wiper intermittent driver circuit to the rear wiper module and to the Body Control Module (BCM). The BCM uses these rear wiper system inputs as a signal to lock the rear flip-up glass and the tailgate to prevent the rear flip-up glass or tailgate from being opened for as long as the rear wiper is operating. The multi-function switch circuitry also uses this battery current and a

REAR WIPERS/WASHERS (Continued)

ground circuit input to directly control the operation and direction of the reversible electric washer pump/motor unit.

A separate fuse in the JB provides battery current to the electronic control circuitry of the rear wiper module through a fused B(+) circuit. The rear wiper module uses this fused B(+) input to park the rear wiper blade off of the rear flip-up glass if the ignition switch is turned to the Off position while the rear wiper is operating, or if the ignition switch is turned to the Off position before the rear wiper blade has parked. However, if the ignition switch is turned to the Off position while the rear wiper is operating, then turned back On, the rear wiper switch must be cycled to the Off position and back to the On or Delay position before the rear wiper will operate again. In addition, the rear wiper module receives an input from the rear flip-up glass ajar switch on a flip-up glass ajar switch sense circuit, which prevents the rear wiper from operating when the flip-up glass is not closed or fully latched.

The hard wired circuits and components of the rear wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the rear wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the On position of the control ring on the right (wiper) control stalk of the multi-function switch is selected, the multi-function switch circuitry directs a battery current signal to the rear wiper module through the rear wiper on driver circuit, causing the rear wiper to cycle continuously at a fixed speed.

INTERMITTENT WIPE MODE

When the Delay position of the control ring on the right (wiper) control stalk of the multi-function switch is selected, the multi-function switch circuitry directs a battery current signal to the rear wiper module through the rear wiper intermittent driver circuit, causing the rear wiper to cycle intermittently at a fixed delay interval.

WASH MODE

When the momentary Wash (after On) position of the control ring on the right (wiper) control stalk of the multi-function switch is selected, the multi-function switch circuitry directs both battery current and ground to the washer pump/motor unit, and a battery current signal to be provided to the rear wiper module through the rear wiper on driver circuit. This will cause the washer pump/motor unit to be energized and the rear wiper to cycle continuously at a fixed speed for as long as the rear Wash switch is held closed.

WIPE-AFTER-WASH MODE

When the momentary Wash (before Off) position of the control ring on the right (wiper) control stalk of the multi-function switch is selected, the multi-function switch circuitry directs both battery current and ground to the washer pump/motor unit, and a battery current signal to be provided to the rear wiper module through the rear wiper on driver circuit. This will cause the washer pump/motor unit to be energized and the rear wiper to cycle continuously at a fixed speed for as long as the rear Wash switch is held closed. When the control ring is released to the Off position, the washer pump/motor is de-energized, but the circuitry within the rear wiper module will provide several additional wipe cycles to complete the wipe-after-wash mode cycle.

DIAGNOSIS AND TESTING - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The diagnosis found here addresses an electrically inoperative rear wiper system. If the rear wiper motor operates, but the wiper does not move on the rear flip-up glass, inspect the mechanical connection between the rear wiper arm and the rear wiper motor output shaft. If OK, replace the faulty rear wiper module. If the wiper operates, but chatters, lifts, or does not clear the glass, clean and inspect the rear wiper system components as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING) and (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - INSPECTION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

REAR WIPERS/WASHERS (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check that the interior lighting switch on the left (lighting) control stalk of the multi-function switch is not in the dome lamp disable position. With all four doors and the tailgate closed, open the rear flip-up glass. The interior lamps should light. Close the rear flip-up glass. Note whether the interior lamps remain lighted. They should turn off after about thirty seconds. If OK, go to Step 2. If not OK, go to Step 9.

(2) Check the fused B(+) fuse (Fuse 17 - 15 ampere) in the Junction Block (JB). If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(3) Check for battery voltage at the fused B(+) fuse (Fuse 17 - 15 ampere) in the JB. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the JB and the Power Distribution Center (PDC) as required.

(4) Check the fused ignition switch output (run-acc) fuse (Fuse 22 - 10 ampere) in the JB. If OK, go to Step 5. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(5) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-acc) fuse (Fuse 22 - 10 ampere) in the JB. If OK, turn the ignition switch to the Off position and go to Step 6. If not OK, repair the open fused ignition switch output (run-acc) circuit between the JB and the ignition switch as required.

(6) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the multi-function switch (Connector C-2) from the switch connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-acc) circuit cavity of the instrument panel wire harness connector for the multi-function switch (Connector C-2). If OK, go to Step 7. If not OK, repair the open fused ignition switch output (run-acc) circuit between the multi-function switch and the JB as required.

(7) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Test the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). If the multi-function switch tests OK, reconnect the instrument panel wire harness connectors for the multi-function switch to the switch connector receptacles and go to Step 8. If the multi-function switch does not test OK, replace the faulty switch.

(8) Remove the tailgate inner trim panel. Disconnect the tailgate wire harness connector for the rear wiper module from the module connector receptacle. Check for continuity between the ground circuit cavity of the tailgate wire harness connector for the rear wiper module and a good ground. There should be continuity. If OK, go to Step 9. If not OK, repair the open ground circuit to ground (G312) as required.

(9) Check for continuity between the flip-up glass ajar switch sense circuit cavity of the tailgate wire harness connector for the rear wiper module and a good ground. There should be continuity with the rear flip-up glass open, and no continuity with the rear flip-up glass closed. If OK, go to Step 10. If not OK, repair the open flip-up glass ajar circuit between the rear wiper module and the flip-up glass ajar switch as required.

(10) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the tailgate wire harness connector for the rear wiper module. If OK, go to Step 11. If not OK, repair the open fused B(+) circuit between the rear wiper module and the JB as required.

(11) Turn the ignition switch to the On position. Turn the control ring on the right (wiper) control stalk of the multi-function switch to the Delay position. Check for battery voltage at the rear wiper intermittent driver circuit cavity of the tailgate wire harness connector for the rear wiper module. If OK, go to Step 12. If not OK, repair the open rear wiper intermittent driver circuit between the rear wiper module and the multi-function switch as required.

(12) Turn the control ring on the right (wiper) control stalk of the multi-function switch to the On position. Check for battery voltage at the rear wiper on driver circuit cavity of the tailgate wire harness connector for the rear wiper module. If OK, replace the faulty rear wiper module. If not OK, repair the open rear wiper on driver circuit between the rear wiper module and the multi-function switch as required.

REAR WIPERS/WASHERS (Continued)

WASHER SYSTEM

The diagnosis found here addresses an electrically inoperative rear washer system. If the washer pump/motor operates, but no washer fluid is emitted from the rear washer nozzle, be certain to check the fluid level in the reservoir. Also inspect the rear washer system components as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - INSPECTION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Turn the ignition switch to the On position. Turn the control ring on the right (wiper) control stalk of the multi-function switch to the On position. Check whether the rear wiper system is operating. If OK, go to Step 2. If not OK, test and repair the rear wiper system before continuing with these tests. Refer to WIPER SYSTEM .

(2) Pull the right (wiper) control stalk of the multi-function switch toward the steering wheel. Check whether the front washer system is operating. If OK, test the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). If the multi-function switch tests OK, go to Step 3. If the multi-function switch does not test OK, replace the faulty switch.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the headlamp and dash wire harness connector for the washer pump/motor unit from the pump/motor unit connector receptacle. Check for continuity between the washer pump driver circuit cavity of the headlamp and dash wire harness connector for the washer pump/motor unit and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted washer pump driver circuit between the washer pump/motor unit and the multi-function switch as required.

(4) Check for continuity between the washer pump driver circuit cavities of the headlamp and dash wire harness connector for the washer pump/motor unit and the instrument panel wire harness connector for the multi-function switch (Connector C-2). There should be continuity. If OK, go to Step 5. If not OK, repair the open washer pump driver circuit between the washer pump/motor unit and the multi-function switch as required.

(5) Check for continuity between the washer pump sense circuit cavity of the headlamp and dash wire harness connector for the washer pump/motor unit and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted washer pump sense circuit between the washer pump/motor unit and the multi-function switch as required.

(6) Check for continuity between the washer pump sense circuit cavities of the headlamp and dash wire harness connector for the washer pump/motor unit and the instrument panel wire harness connector for the multi-function switch (Connector C-2). There should be continuity. If OK, replace the faulty washer pump/motor unit. If not OK, repair the open washer pump sense circuit between the washer pump/motor unit and the multi-function switch as required.

CLEANING - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegee of a wiper blade exposed to the elements for a long time tends to lose its wiping effectiveness. Periodic cleaning of the squeegee is suggested to remove any deposits of salt or road film. The wiper blade, arm, and rear flip-up glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blade continues to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegee of the wiper blade from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegee.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the washer pump/motor from the reservoir. Clean foreign

REAR WIPERS/WASHERS (Continued)

material from the inside of the washer pump/motor inlet filter screen and the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hose from the washer nozzle, then running the washer pump/motor to run clean washer fluid or water through the system. A plugged or restricted washer nozzle should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegee of the wiper blade.

CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The rear wiper blade and wiper arm should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

(1) Inspect the wiper arm for any indications of damage, or contamination. If the wiper arm is contaminated with any foreign material, clean as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING). If a wiper arm is damaged or corrosion is evident, replace the wiper arm with a new unit. Do not attempt to repair a wiper arm that is damaged or corroded.

(2) Carefully lift the wiper arm off of the park ramp. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(3) Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. The spring tension of the wiper arm should be sufficient to cause the rubber squeegee to conform to the curvature of the glass. Replace a wiper arm if it has low or no spring tension.

(4) Inspect the wiper blade and squeegee for any indications of damage, contamination, or rubber deterioration (Fig. 2). If the wiper blade or squeegee is contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING). If after cleaning the wiper blade and the glass, the wiper blade fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade. Also, if a wiper blade is damaged or if the squeegee rubber is damaged or deteriorated, replace the wiper blade with a new unit. Do not attempt to repair a wiper blade that is damaged.

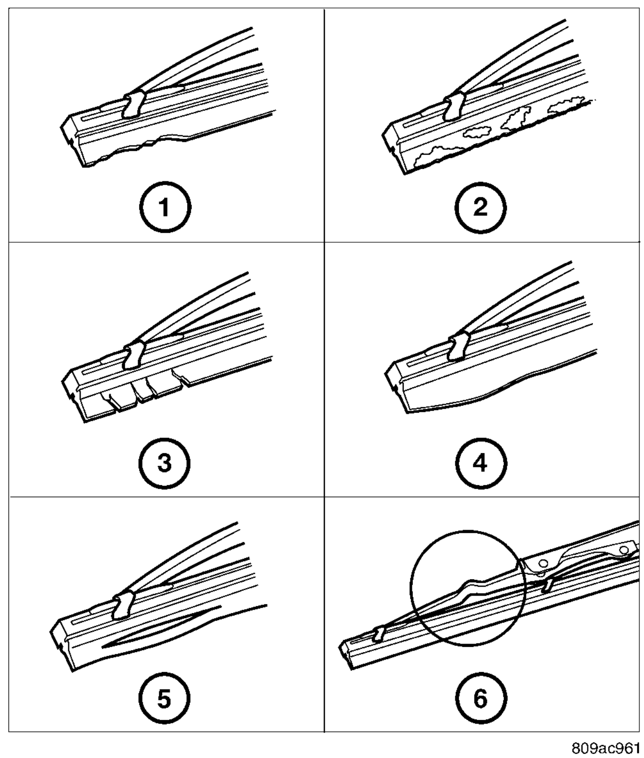


Fig. 2 Wiper Blade Inspection

1 - WORN OR UNEVEN EDGES
2 - ROAD FILM OR FOREIGN MATERIAL DEPOSITS
3 - HARD, BRITTLE, OR CRACKED
4 - DEFORMED OR FATIGUED
5 - SPLIT
6 - DAMAGED SUPPORT COMPONENTS

WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

REAR WIPERS/WASHERS (Continued)

(1) Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/ REAR WIPERS/WASHERS - CLEANING).

(2) Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

REAR WASHER HOSES/TUBES

DESCRIPTION

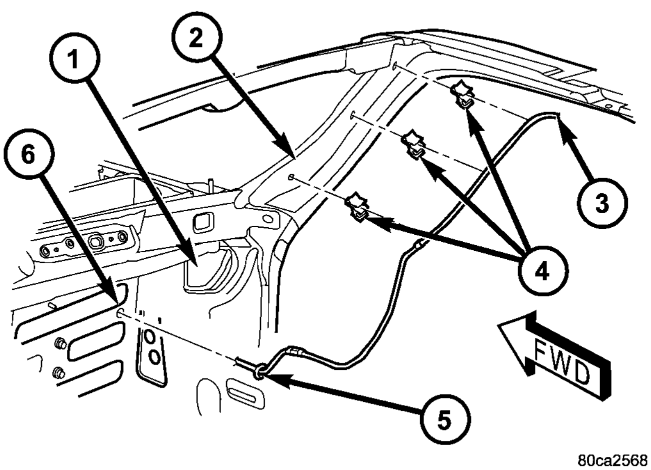


Fig. 3 Rear Washer Headliner Hose

1 - COWL SIDE INNER PANEL
2 - A-PILLAR
3 - HEADLINER HOSE
4 - CLIP (3)
5 - GROMMET
6 - DASH PANEL

The rear washer plumbing consists of small diameter rubber hose routed from the barbed outlet nipple of the reversible electric washer pump/motor unit on the washer reservoir through a trough molded into the reservoir rearward of the washer pump up to the top of the reservoir. Near the base of the reservoir filler neck an in-line plastic fitting connects the reservoir rear washer hose to the engine compartment rear washer hose, which is routed through the reservoir filler neck opening in the front extension of the right front fender wheel house panel in to the engine compartment. The engine compartment rear washer hose is routed side by side with the front washer hose along the top of the right front fender wheel house to the dash panel. Molded plastic routing clips secure the hoses to the headlamp and dash wire harness in the engine compartment.

The engine compartment rear washer hose is connected to the headliner washer hose near the right side of the dash panel with a molded plastic in-line fitting (Fig. 3). The headliner hose has a rubber grommet that allows it to pass through the dash panel from the passenger compartment into the engine compartment. The headliner hose is routed below the instrument panel in the passenger compartment near the right cowl side inner panel. The hose is routed up the right A-pillar to the headliner. Mounting clips secure the hose to the A-pillar. The headliner hose is glued to top of the headliner and routed along the right roof side rail to the rear of the vehicle. At the rear of the vehicle, the headliner hose passes through a hole at the rear portion of the roof rear inner header panel and is connected to the rear washer nozzle.

Washer hose is available for service only as roll stock, which must then be cut to length. The headliner washer hose is integral to the headliner unit and, if faulty or damaged, the headliner unit must be replaced. However, the headliner hose is marked with a white cut line on the A-pillar where the hose should be cut and spliced with a plastic in-line connector fitting to facilitate headliner removal without the need to remove the instrument panel. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL AND INSTALLATION). The molded plastic washer hose fittings cannot be repaired. If these fittings are faulty or damaged, they must be replaced.

OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the washer pump/motor through the rear washer system plumbing and fittings to the rear washer nozzle located on the roof panel above the rear flip-up glass opening. Whenever routing the washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

REAR WASHER NOZZLE

DESCRIPTION

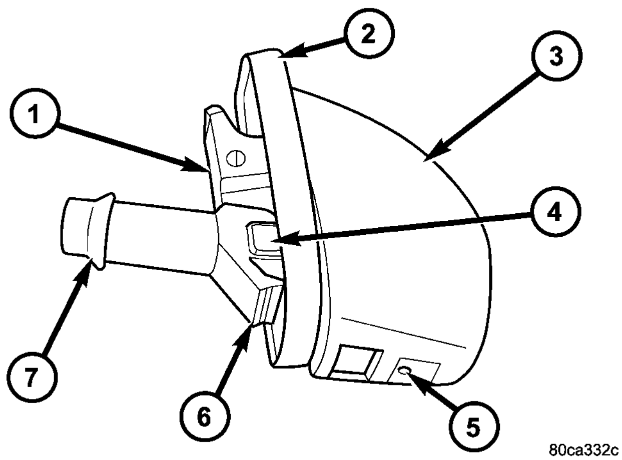


Fig. 4 Rear Washer Nozzle

1 - ENGAGEMENT TAB (TOP)
2 - GASKET
3 - REAR WASHER NOZZLE
4 - ALIGNMENT FEATURE
5 - ORIFICE
6 - LATCH FEATURE (BOTTOM)
7 - NIPPLE

The rear washer nozzle is a fluidic-type unit constructed of molded plastic (Fig. 4). The nozzle is secured by a snap fit in a dedicated mounting hole located in the rear edge of the roof panel above the rear flip-up glass opening and to the right of the Center High Mounted Stop Lamp (CHMSL) unit. A rubber gasket on the back of the nozzle seals the nozzle to the roof panel opening. The back of the nozzle includes an integral alignment feature on the left side, an integral engagement tab on the top, an integral latch feature on the bottom, and the washer plumbing nipple which are all concealed between the outer roof panel and the rear roof inner header. The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. The rear washer nozzle cannot be adjusted or repaired. If faulty or damaged, the entire nozzle unit must be replaced.

OPERATION

The rear washer nozzle is designed to dispense washer fluid into the wiper pattern area on the outside of the rear flip-up glass. Pressurized washer fluid is fed to the nozzle from the washer reservoir by the washer pump/motor through a single hose, which is attached to a barbed nipple on the back of the rear washer nozzle. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

REMOVAL

NOTE: The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. If removed from its mounting hole for any reason, the rear washer nozzle must be replaced with a new unit.

(1) Using a trim stick or another suitable wide flat-bladed tool, gently pry the bottom of the rear washer nozzle away from the roof panel until the latch feature at the bottom of the nozzle that secures it in the mounting hole of the roof panel unsnaps.

(2) Pull the rear washer nozzle out from the roof panel far enough to access the washer hose (Fig. 5).

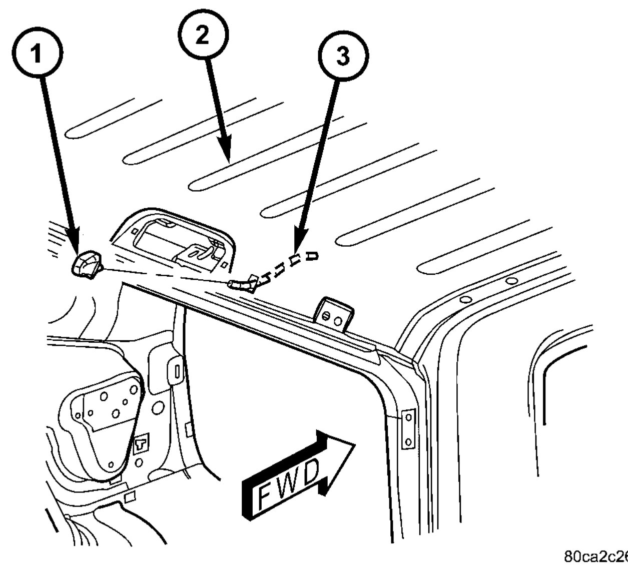


Fig. 5 Rear Washer Nozzle Remove/Install

1 - NOZZLE
2 - ROOF PANEL
3 - HEADLINER HOSE

(3) Disconnect the washer hose from the barbed nipple on the back of the rear washer nozzle.

(4) Discard the rear washer nozzle.

INSTALLATION

NOTE: The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. If removed from its mounting hole for any reason, the rear washer nozzle must be replaced with a new unit.

REAR WASHER NOZZLE (Continued)

(1) Position the new rear washer nozzle to the roof panel (Fig. 5). Be certain that a new rubber gasket is in position on the back of the nozzle.

(2) Reconnect the washer hose to the barbed nipple on the back of the rear washer nozzle.

(3) Insert the rear washer nozzle supply hose and nipple into the mounting hole in the roof panel and align the nozzle with the hole.

(4) Engage the tab at the top of the nozzle behind the sheet metal at the top of the roof panel mounting hole.

(5) Using hand pressure, press firmly and evenly on the hood of the rear washer nozzle until the lower latch feature snaps into place behind the sheet metal at the bottom of the roof panel mounting hole.

REAR WIPER ARM

DESCRIPTION

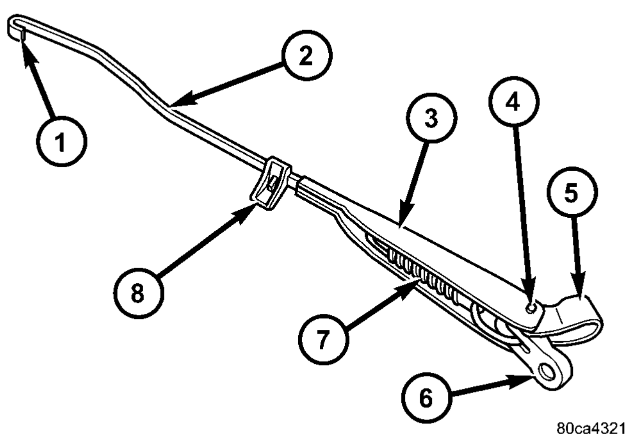


Fig. 6 Rear Wiper Arm

1 - HOOK
2 - STRAP
3 - CHANNEL
4 - HINGE PIN
5 - COVER
6 - PIVOT END
7 - TENSION SPRING
8 - SUPPORT

The rear wiper arm is the rigid member located between the rear wiper motor output shaft that protrudes from the outer tailgate panel near the base of the rear flip-up glass opening and the rear wiper blade (Fig. 6). This wiper arm features an over-center hinge that allows easy access to the tailgate and rear flip-up glass for cleaning, after the spare tire is removed. The wiper arm has a die cast metal pivot end with a large tapered mounting hole at one end. A molded plastic pivot cover is secured loosely to and pivots on the wiper arm hinge pin to conceal the wiper arm retaining nut.

The wide end of a tapered, stamped steel channel is secured with a hinge pin to the pivot end of the wiper arm. One end of a long, rigid, stamped steel strap, with a small hole near its pivot end, is riveted and crimped within the narrow end of the stamped steel channel. The tip of the wiper blade end of this strap is bent back under itself to form a small hook. Concealed within the stamped steel channel, one end of a long spring is engaged with a wire hook on the underside of the die cast pivot end, while the other end of the spring is hooked through the small hole in the steel strap. A molded plastic wiper arm support is snapped onto the wiper arm strap where it exits the channel. The entire wiper arm has a satin black finish applied to all of its visible surfaces.

A wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

OPERATION

The rear wiper arm is designed to mechanically transmit the motion from the rear wiper motor output shaft to the rear wiper blade. The wiper arm must be properly indexed to the motor output shaft in order to maintain the proper wiper blade travel on the glass. The wiper arm support is designed to lift and support the rear wiper arm and blade off of the glass when the rear wiper blade is parked. This support and the park ramp on the tailgate outer panel below the glass also provide an alignment reference to ensure accurate rear wiper arm and blade installation.

The tapered hole in the wiper arm pivot end interlocks with the serrations on the outer circumference of the tapered motor output shaft, allowing positive engagement and finite adjustment of this connection. A hex nut secures the wiper arm pivot end to the threads on the rear wiper motor output shaft and the pivot cover hinges and snaps over this connection for a neat appearance. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

(1) Lift the rear wiper arm pivot cover by lifting it at the rear wiper motor output shaft end of the arm (Fig. 7).

(2) Remove the nut that secures the rear wiper arm to the rear wiper motor output shaft.

(3) If necessary, use a battery terminal puller to disengage the wiper arm from the rear wiper motor output shaft splines (Fig. 8).

REAR WIPER ARM (Continued)

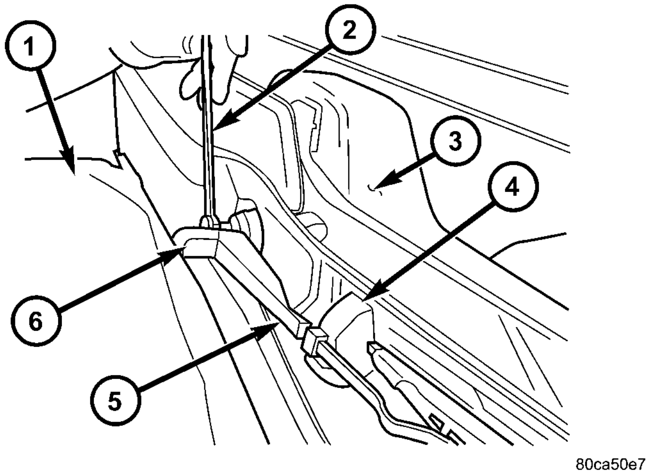


Fig. 7 Rear Wiper Arm Remove/Install

1 - SPARE TIRE
2 - WRENCH
3 - FLIP-UP GLASS
4 - PARK RAMP
5 - REAR WIPER ARM
6 - PIVOT COVER

NOTE: Depending upon the size and type of puller used, it may be necessary to remove the spare tire from the tailgate. Refer to the owner's manual in the vehicle glove box for information on removing the spare tire from the tailgate.

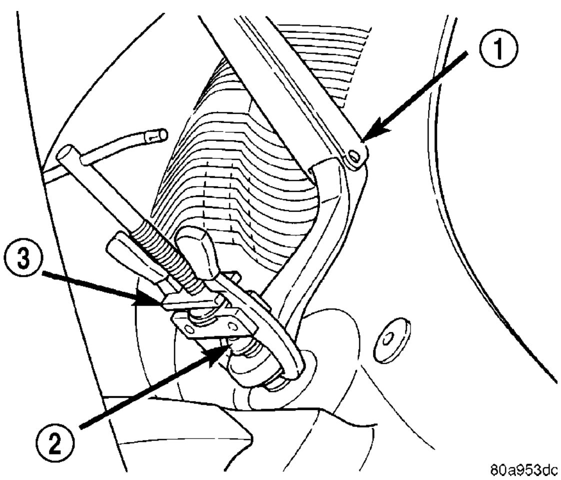


Fig. 8 Wiper Arm Puller - Typical

1 - WIPER ARM
2 - WIPER PIVOT
3 - BATTERY TERMINAL PULLER

(4) Remove the rear wiper arm pivot end from the motor output shaft.

INSTALLATION

NOTE: Always install the wiper arm and blade with the wiper motor in the Park position.

(1) The rear wiper arm must be indexed to the motor output shaft with the rear wiper motor in the park position to be properly installed. Place the wiper arm onto the tailgate with the wiper arm support positioned on the park ramp and the tapered mounting hole on the pivot end of the arm positioned over the rear wiper motor output shaft.

(2) Position the tab on the back of the rear wiper arm support on the tailgate park ramp in the Installation Position (Fig. 9).

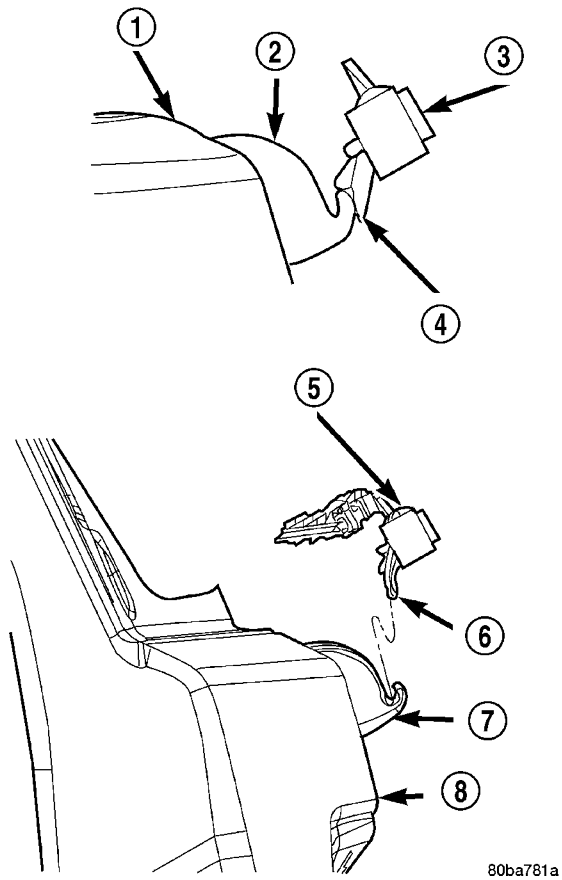


Fig. 9 Rear Wiper Arm Installation

1 - TAILGATE
2 - PARK RAMP
3 - REAR WIPER ARM
4 - INSTALLATION POSITION
5 - REAR WIPER ARM AND BLADE
6 - PARK POSITION
7 - PARK RAMP
8 - TAILGATE

(3) With the wiper arm in the Installation Position, push the tapered mounting hole on the pivot end of the wiper arm down over the rear wiper motor output shaft.

(4) Install and tighten the nut that secures the rear wiper arm to the rear wiper motor output shaft. Tighten the nut to 18 N·m (13 ft. lbs.).

(5) Close the rear wiper arm pivot cover.

REAR WIPER ARM (Continued)

(6) Lift the rear wiper arm support away from the park ramp, then place the wiper arm support in the park ramp in the Park Position (Fig. 9).

REAR WIPER BLADE

DESCRIPTION

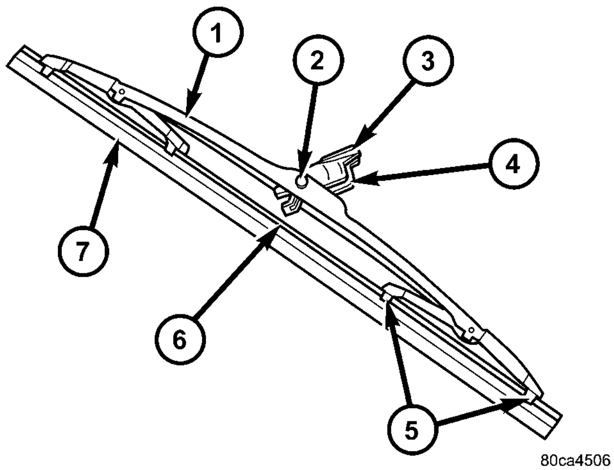


Fig. 10 Rear Wiper Blade

1 - SUPERSTRUCTURE
2 - PIVOT PIN
3 - LATCH RELEASE
4 - PIVOT BLOCK
5 - CLAW
6 - FLEXOR
7 - ELEMENT

The rear wiper blade is secured by an integral latching pivot block to the hook formation on the tip of the rear wiper arm, and rests off the glass on a park ramp on the tailgate near the base of the rear flip-up glass opening when the wiper is not in operation (Fig. 10). The rear wiper blade consists of the following components:

- **Superstructure** - The superstructure includes a stamped steel bridge and plastic links with claw formations that grip the wiper blade element. Also included in this unit is the latching, molded plastic pivot block that secures the superstructure to the wiper arm. All of the metal components of the wiper blade have a satin black finish applied.
- **Element** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.
- **Flexor** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws of the superstructure.

All models have a single 28.00 centimeter (11.00 inch) rear wiper blade with a non-replaceable rubber element (squeegee). The wiper blade cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

The rear wiper blade is moved back and forth across the glass by the wiper arm when the rear wiper system is in operation. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature found across the glass surface.

The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, but resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

REMOVAL

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the rear wiper motor output shaft.

(1) Disengage the rear wiper arm support from the rear wiper arm park ramp on the right side of the tailgate just below the rear flip-up glass.

(2) Lift the rear wiper arm to raise the wiper blade and element off of the tailgate and the rear flip-up glass.

(3) To remove the wiper blade from the wiper arm, carefully lift up the pivot block latch release tab on the top of the wiper arm to unlatch it from the arm (Fig. 11).

(4) Raise the pivot block latch release tab until it is perpendicular to the rear wiper blade superstructure (Fig. 12).

(5) Slide the rear wiper blade away from the tip of the arm towards the pivot end of the arm far enough to disengage the pivot block from the hook formation on the end of the arm.

(6) Extract the hook formation on the tip of the wiper arm from the window in the wiper blade pivot block/latch unit.

CAUTION: Do not allow the wiper arm to spring back against the tailgate or the flip-up glass without the wiper blade in place or they may be damaged.

REAR WIPER BLADE (Continued)

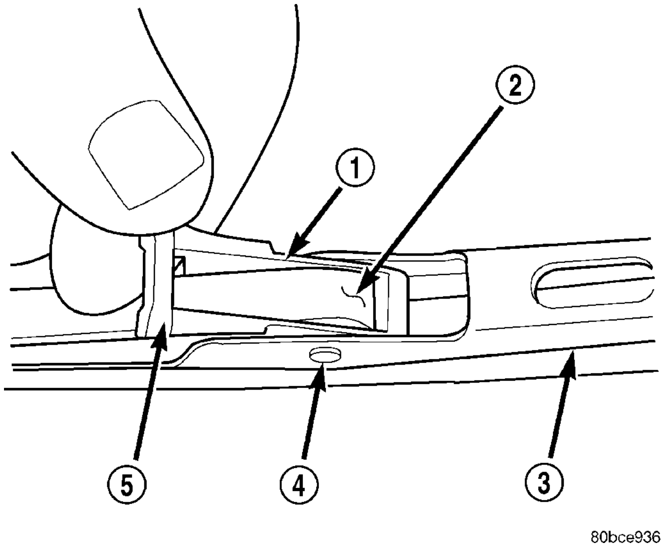


Fig. 11 Rear Wiper Blade Release

1 - PIVOT BLOCK WINDOW
2 - TIP OF REAR WIPER ARM
3 - SUPERSTRUCTURE
4 - PIVOT BLOCK HINGE PIN
5 - LATCH RELEASE TAB

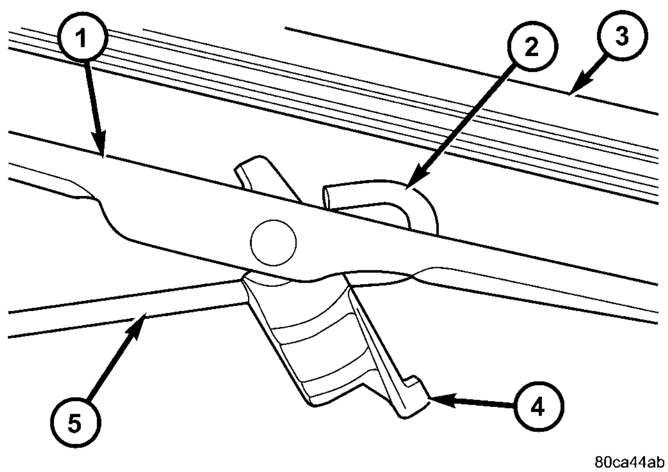


Fig. 12 Rear Wiper Blade Remove/Install

1 - SUPERSTRUCTURE
2 - HOOK
3 - ELEMENT
4 - LATCH RELEASE
5 - REAR WIPER ARM

(7) Gently lower the wiper arm and place the arm support in the park ramp.

INSTALLATION

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the rear wiper motor output shaft.

(1) Lift the rear wiper arm support out of the tail gate park ramp.

(2) Position the rear wiper blade near the hook formation on the tip of the arm with the notched end of the wiper element flexor oriented towards the end of the wiper arm that is nearest to the rear wiper motor output shaft.

(3) Raise the pivot block latch release tab until it is perpendicular to the rear wiper blade superstructure.

(4) Insert the hook formation on the tip of the wiper arm through the window in the wiper blade pivot block/latch unit.

(5) Slide the wiper blade pivot block/latch up into the hook formation on the tip of the wiper arm until the hook is firmly seated against the pivot block.

(6) Press the pivot block latch release tab downward until it snaps into its locked position over the top of the wiper arm.

(7) Gently lower the wiper arm and place the arm support in the tailgate park ramp.

REAR WIPER MOTOR

DESCRIPTION

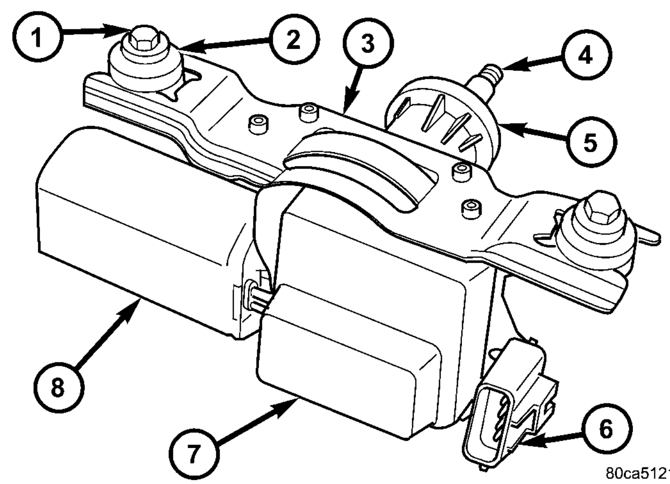


Fig. 13 Rear Wiper Motor

1 - SCREW (2)
2 - INSULATOR (2)
3 - BRACKET
4 - OUTPUT SHAFT
5 - SEAL
6 - CONNECTOR RECEPTACLE
7 - COVER
8 - MOTOR

The rear wiper motor is concealed within the tailgate, below the rear flip-up glass opening and behind the tailgate inner trim panel. The end of the motor output shaft that protrudes through the tailgate outer panel to drive the rear wiper arm and blade is the only visible component of the rear wiper motor

REAR WIPER MOTOR (Continued)

(Fig. 13). A rubber gasket, a bezel, and a nut secure and seal the motor output shaft to the tailgate outer panel. A molded plastic nut cover snaps onto the bezel to conceal the nut and improve appearance. An integral connector receptacle connects the rear wiper motor to the vehicle electrical system through a dedicated take out and connector of the tailgate wire harness. The rear wiper motor consists of the following major components:

- **Bracket** - The rear wiper motor bracket consists of a stamped steel mounting plate for the wiper motor that is secured with screws through two rubber insulators to the tailgate inner panel.
- **Rear Wiper Module** - The rear wiper motor electronic controls are concealed beneath a molded plastic cover and includes the rear wiper system electronic logic and rear wiper motor electronic controls.
- **Motor** - The permanent magnet rear wiper motor is secured with screws to the rear wiper motor bracket. The wiper motor includes an integral transmission, and the motor output shaft.

The rear wiper motor cannot be adjusted or repaired. If any component of the motor is faulty or damaged, the entire rear wiper motor unit must be replaced. The motor output shaft gasket, bezel, nut, and nut cover are available for individual service replacement.

OPERATION

The rear wiper motor receives non-switched battery current through a fuse in the Junction Block (JB) on a fused B(+) circuit and is connected to ground at all times. The rear wiper motor operation is controlled by the vehicle operator through battery current signal inputs received by the rear wiper motor electronic control module from the rear wiper switch circuitry that is integral to the right (wiper) control stalk of the multi-function switch on the steering column. The module also receives an external control input from the flip-up glass ajar switch sense circuit. If the rear wiper module senses that the flip-up glass is ajar, it will not allow the rear wiper motor to operate.

The rear wiper module electronic control logic uses these inputs, its internal inputs, and its programming to provide a continuous wipe mode, an intermittent wipe mode, a wipe-after-wash mode, and off-the-glass wiper blade parking. The wiper blade cycling is controlled by the internal electronic controls of the module. The module controls current flow to the wiper motor brushes and provides an electronic speed control that speeds the wiper blade near the center of the glass, but slows the wiper blade during directional reversals at each end of the wipe pattern and during wiper blade off-the-glass parking for quieter operation.

The wiper motor transmission converts the rotary output of the wiper motor to the back and forth wiping motion of the rear wiper arm and blade on the rear flip-up glass. The rear wiper motor may be diagnosed using conventional diagnostic tools and methods.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the rear wiper arm from the rear wiper motor output shaft. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER ARM - REMOVAL).

(3) Using a small thin-bladed tool, gently pry at the notch in the base of the rear wiper motor output shaft bezel to unsnap the nut cover from the bezel (Fig. 14). **Be certain to take proper precautions to protect the outer tailgate panel and its paint finish from damage during this procedure.**

(4) Remove the nut that secures the rear wiper motor output shaft to the outer swing gate panel (Fig. 14).

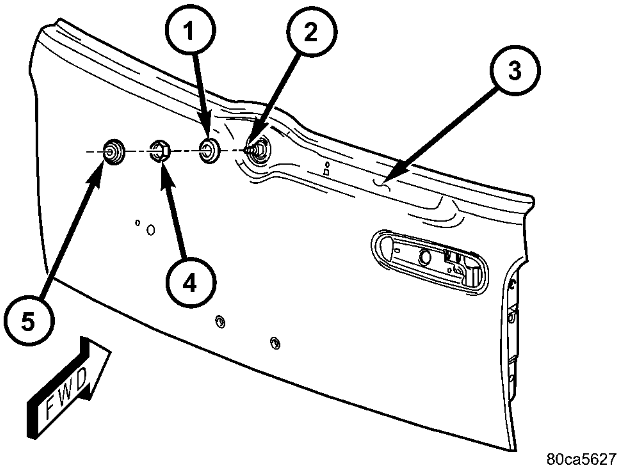


Fig. 14 Rear Wiper Motor Output Shaft Nut Remove/Install

1 - BEZEL AND GASKET
2 - OUTPUT SHAFT
3 - TAILGATE OUTER PANEL
4 - NUT
5 - NUT COVER

(5) Remove the bezel and gasket from the rear wiper motor output shaft.

(6) Remove the trim panel from the tailgate inner panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL).

(7) Disconnect the tailgate wire harness connector for the flip-up glass ajar switch from the flip-up glass latch connector receptacle.

REAR WIPER MOTOR (Continued)

(8) Disconnect the tailgate wire harness connector for the rear wiper motor from the motor connector receptacle (Fig. 15).

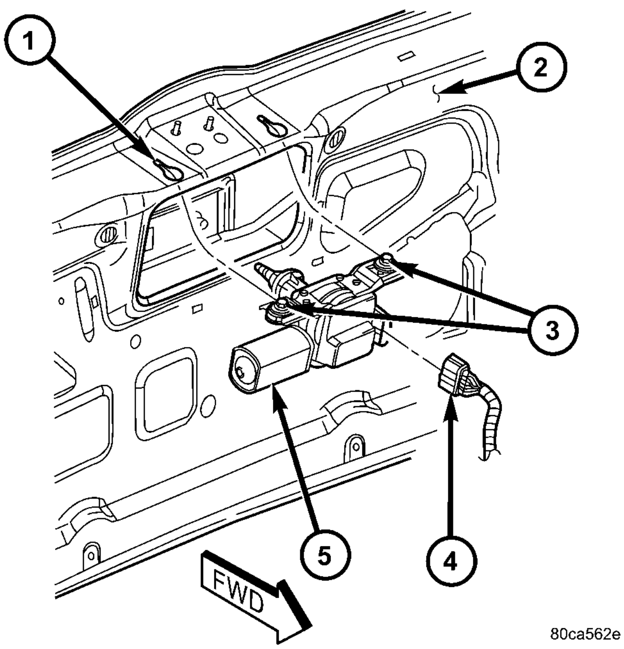


Fig. 15 Rear Wiper Motor Remove/Install

1 - KEYED SLOT (2)
2 - SWING GATE INNER PANEL
3 - SCREW (2)
4 - REAR WIPER MOTOR ELECTRICAL CONNECTOR
5 - REAR WIPER MOTOR

(9) Loosen the two screws that secure the rear wiper motor mounting bracket to the top of the tailgate inner panel.

(10) Slide the rear wiper motor and mounting bracket forward far enough to disengage the two mounting screws from the keyed slots in the top of the tailgate inner panel.

(11) Remove the rear wiper motor and mounting bracket from the tailgate as a unit.

INSTALLATION

(1) Position the rear wiper motor and bracket into the tailgate as a unit (Fig. 15).

(2) Insert the rear wiper motor output shaft through the hole in the tailgate outer panel and engage the two mounting screws into the keyed slots in the top of tailgate inner panel.

(3) From the outside of the tailgate, center the rear wiper motor output shaft in the tailgate outer panel clearance hole and install the gasket and bezel over the centered shaft (Fig. 14).

(4) Install and tighten the nut that secures the rear wiper motor output shaft to the outer tailgate panel. Tighten the nut to 5 N·m (43 in. lbs.).

(5) From the inside of the tailgate, tighten the two screws that secure the rear wiper motor mounting bracket to the top of the tailgate inner panel. Tighten the screws to 6 N·m (57 in. lbs.).

(6) Reconnect the tailgate wire harness connector for the rear wiper motor to the motor connector receptacle.

(7) Reconnect the tailgate wire harness connector for the flip-up glass ajar switch to the flip-up glass latch connector receptacle.

(8) Reinstall the trim panel onto the tailgate inner panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION).

(9) From the outside of the tailgate, press the nut cover firmly and evenly over the rear wiper motor output shaft bezel using hand pressure until it snaps into place.

(10) Reinstall the rear wiper arm onto the rear wiper motor output shaft. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER ARM - INSTALLATION).

(11) Reconnect the battery negative cable.

REAR WIPER/WASHER SWITCH

DESCRIPTION

The rear wiper and washer switches are integral to the right (wiper) control stalk of the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).

OPERATION

The rear wiper and washer switches are integral to the right (wiper) control stalk of the multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - OPERATION).

WIPER ARM PARK RAMP

REMOVAL

(1) Disengage the rear wiper arm support from the wiper arm park ramp on the right side of the tailgate just below the rear flip-up glass.

(2) Lift the wiper arm and blade away from the tailgate until the wiper arm hinge is in its over-center position.

(3) Remove the screw that secures the wiper arm park ramp to the tailgate outer panel (Fig. 16).

(4) Remove the wiper arm park ramp from the tailgate outer panel.

INSTALLATION

(1) Position the wiper arm park ramp onto the tailgate outer panel (Fig. 16).

(2) Install and tighten the screw that secures the wiper arm park ramp to the tailgate outer panel. Tighten the screw to 5 N·m (45 in. lbs.).

(3) Lower the rear wiper arm and blade and place the wiper arm support onto the wiper arm park ramp.

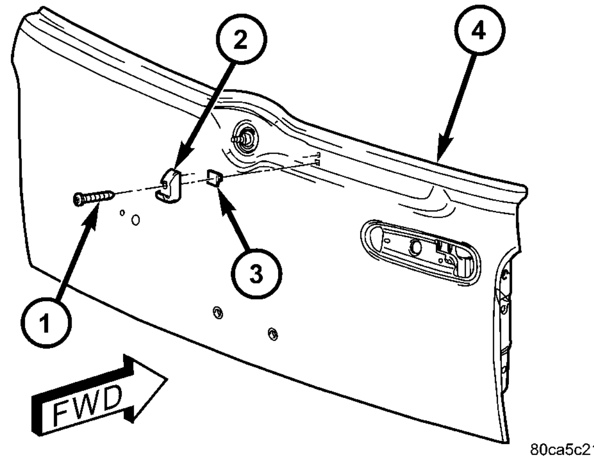


Fig. 16 Wiper Arm Park Ramp Remove/Install

1 - SCREW (1)
2 - PARK RAMP
3 - RIVET NUT (1)
4 - TAILGATE OUTER PANEL

WIRING

TABLE OF CONTENTS

8W-01 WIRING DIAGRAM INFORMATION

TABLE OF CONTENTS

WIRING DIAGRAM INFORMATION

DESCRIPTION

DESCRIPTION - HOW TO USE WIRING DIAGRAMS

DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page (Fig. 1).

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition (Fig. 2).

Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.

SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world (Fig. 3).

WIRING DIAGRAM INFORMATION (Continued)

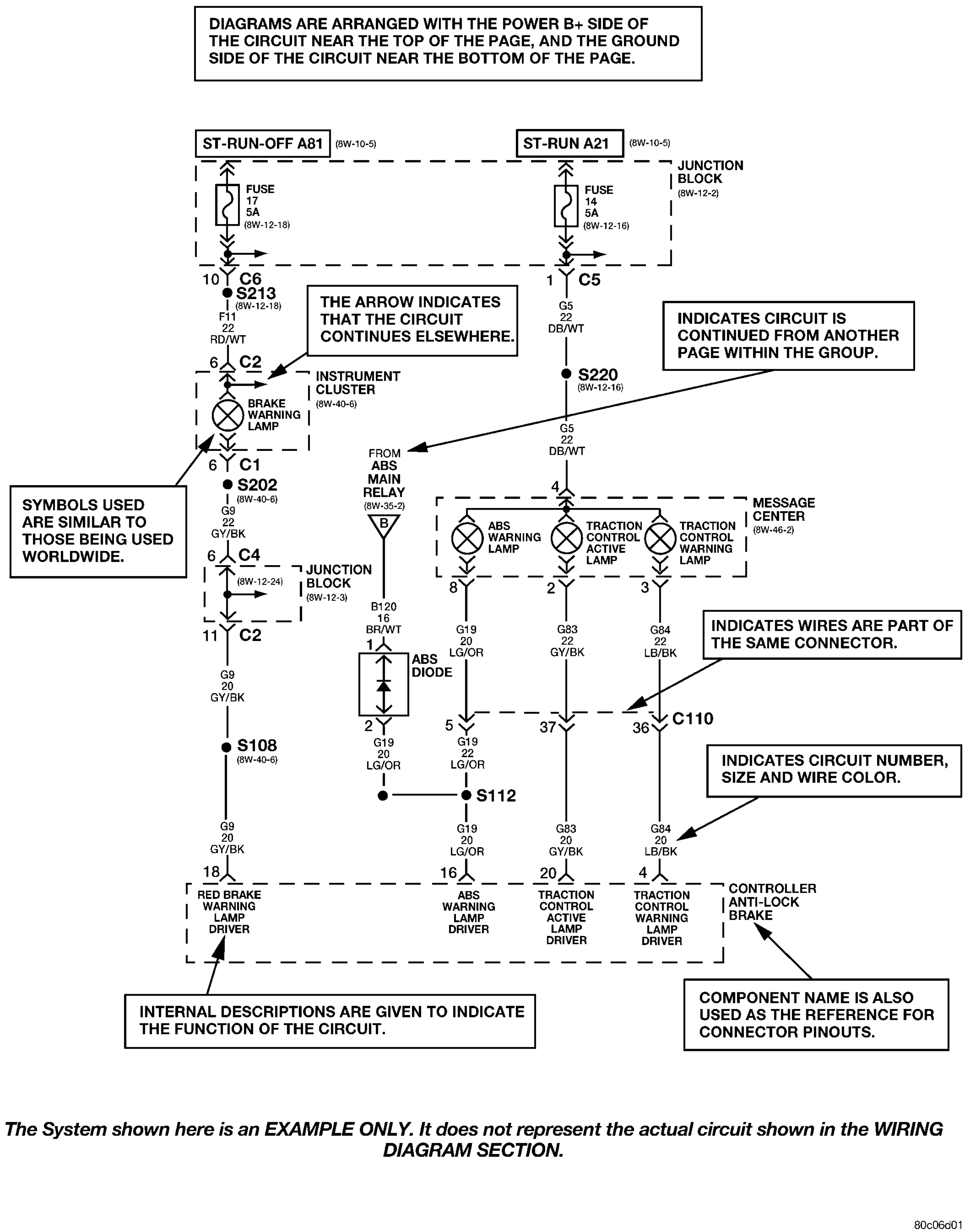
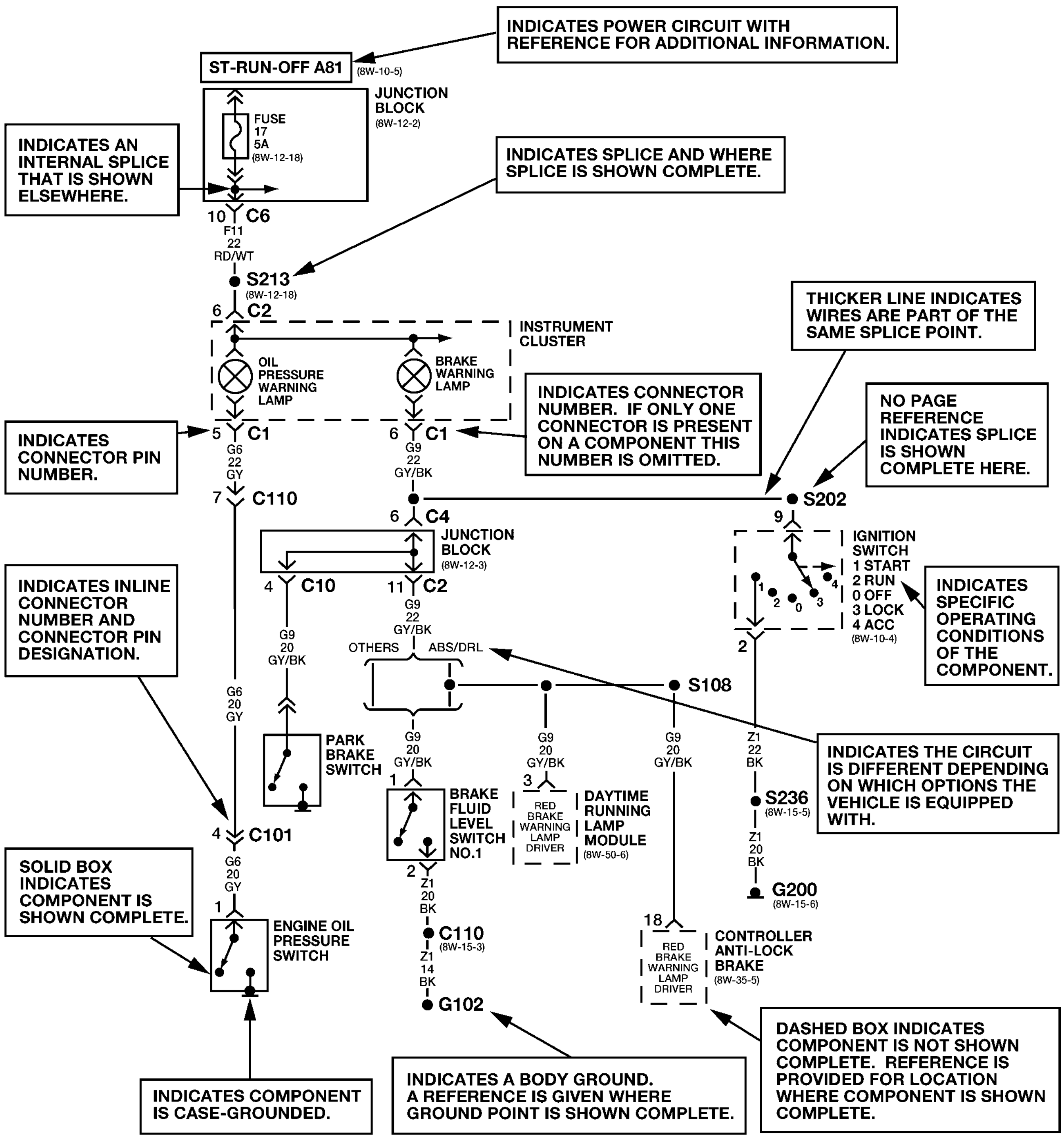


Fig. 1 WIRING DIAGRAM EXAMPLE 1

WIRING DIAGRAM INFORMATION (Continued)



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

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Fig. 2 WIRING DIAGRAM EXAMPLE 2

WIRING DIAGRAM INFORMATION (Continued)

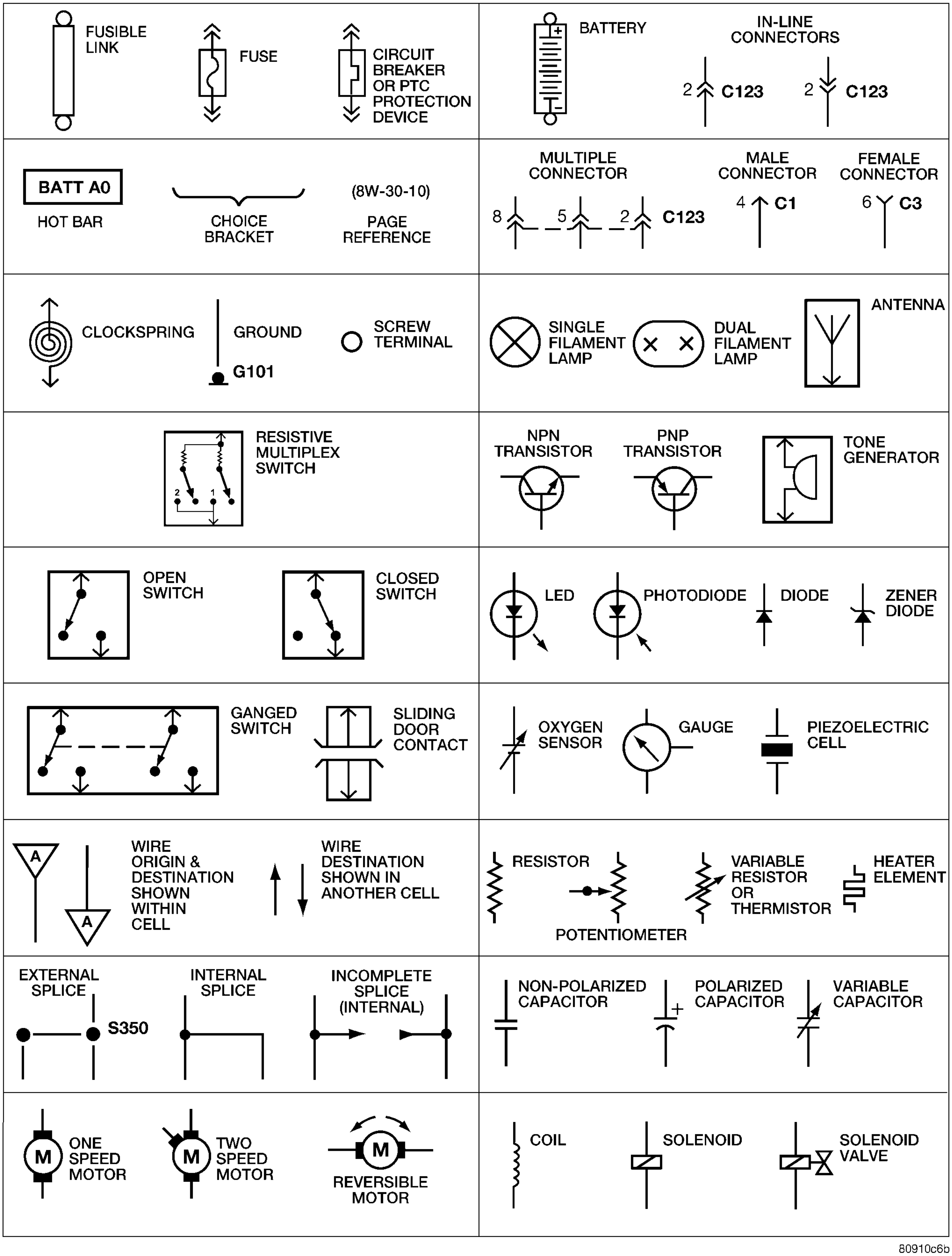


Fig. 3 WIRING DIAGRAM SYMBOLS

WIRING DIAGRAM INFORMATION (Continued)

TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD . . . . Left Hand Drive Vehicles
RHD . . . . Right Hand Drive Vehicles
ATX . . Automatic Transmissions-Front Wheel Drive
MTX . . . Manual Transmissions-Front Wheel Drive
AT . . . . Automatic Transmissions-Rear Wheel Drive
MT . . . . . Manual Transmissions-Rear Wheel Drive
SOHC . . . . Single Over Head Cam Engine
DOHC . . . . Double Over Head Cam Engine
Built-Up-Export . . . . Vehicles Built For Sale In Markets Other Than North America
Except Built-Up-Export . Vehicles Built For Sale In North America

DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, part of the main circuit, gage of wire, and color (Fig. 4).

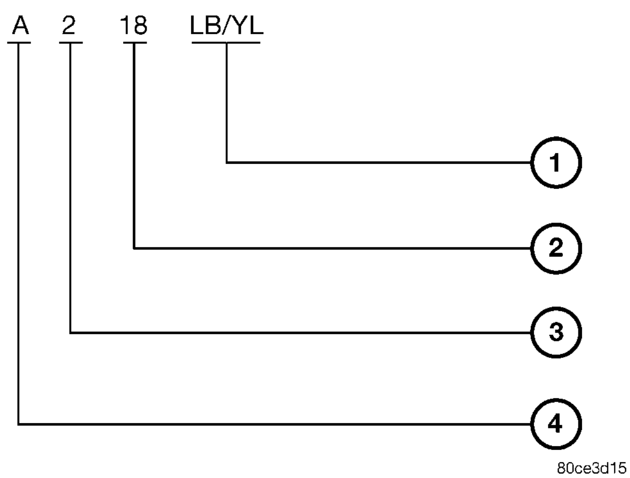


Fig. 4 WIRE CODE IDENTIFICATION

1 - COLOR OF WIRE (LIGHT BLUE WITH YELLOW TRACER
2 - GAGE OF WIRE (18 GAGE)
3 - PART OF MAIN CIRCUIT (VARIES DEPENDING ON EQUIPMENT)
4 - MAIN CIRCUIT IDENTIFICATION

WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it's function. To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	OPEN
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	NOT USED
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/ TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/ WASHER
W	OPEN
X	AUDIO SYSTEMS
Y	OPEN
Z	GROUNDS

DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the diagram pages.

WIRING SECTION CHART

GROUP	TOPIC
8W-01 thru 8W-09	General information and Diagram Overview
8W-10 thru 8W-19	Main Sources of Power and Vehicle Grounding
8W-20 thru 8W-29	Starting and Charging
8W-30 thru 8W-39	Powertrain/Drivetrain Systems
8W-40 thru 8W-49	Body Electrical items and A/C
8W-50 thru 8W-59	Exterior Lighting, Wipers and Trailer Tow
8W-60 thru 8W-69	Power Accessories
8W-70	Splice Information
8W-80	Connector Pin Outs
8W-91	Connector, Ground and Splice Locations

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

CAUTION: Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers
- In-line connectors located in the Instrument Panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a "G" and follow the same series numbering as the in-line connectors.
- Splices are identified with an "S" and follow the same series numbering as the in-line connectors.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component. The abbreviation N/S means Not Shown in the illustrations

WARNING

WARNINGS - GENERAL

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY AND AVOID LOOSE CLOTHING.

DIAGNOSIS AND TESTING - WIRING HARNESS

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: NEVER USE A JUMPER WIRE ACROSS A LOAD, SUCH AS A MOTOR, CONNECTED BETWEEN A BATTERY FEED AND GROUND.

- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

WIRING DIAGRAM INFORMATION (Continued)

• Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

• Probing Tools - These tools are used for probing terminals in connectors (Fig. 5). Select the proper size tool from Special Tool Package 6807, and insert it into the terminal being tested. Use the other end of the tool to insert the meter probe.

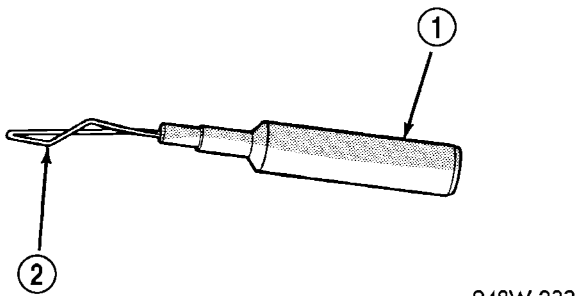


Fig. 5 PROBING TOOL

1 - SPECIAL TOOL 6801
2 - PROBING END

INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items.

• Connectors are fully seated
• Spread terminals, or terminal push out
• Terminals in the wiring assembly are fully seated into the connector/component and locked into position
• Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
• Damaged connector/component casing exposing the item to dirt or moisture
• Wire insulation that has rubbed through causing a short to ground
• Some or all of the wiring strands broken inside of the insulation
• Wiring broken inside of the insulation

TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

(1) Verify the problem.

(2) Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.

(3) Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.

(4) Isolate the problem area.

(5) Repair the problem area.

(6) Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

STANDARD PROCEDURE

STANDARD PROCEDURE - ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are solid state and a symbol (Fig. 6) is used to indicate this. When handling any component with this symbol, comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

(1) Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.

(2) Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.

(3) When using a voltmeter, be sure to connect the ground lead first.

(4) Do not remove the part form it's protective packing until it is time to install the part.

(5) Before removing the part from it's pakage, ground the pakage to a known good ground on the vehicle.

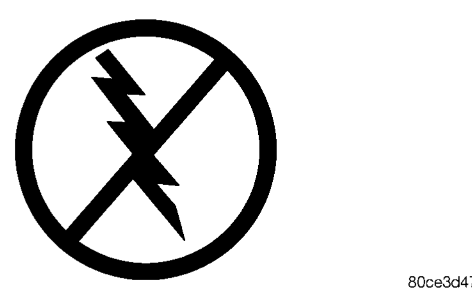


Fig. 6 ELECTROSTATIC DISCHARGE SYMBOL

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 7).

(2) Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.

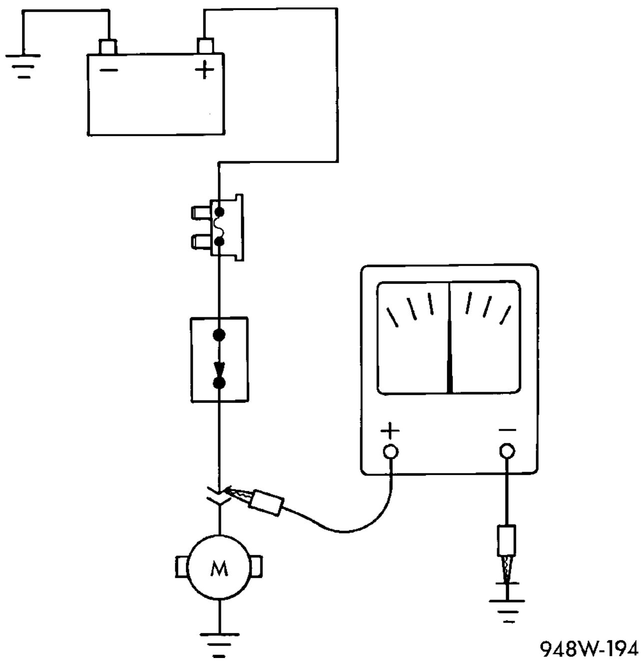


Fig. 7 TESTING FOR VOLTAGE POTENTIAL

STANDARD PROCEDURE - TESTING FOR CONTINUITY

(1) Remove the fuse for the circuit being checked or, disconnect the battery.

(2) Connect one lead of the ohmmeter to one side of the circuit being tested (Fig. 8).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

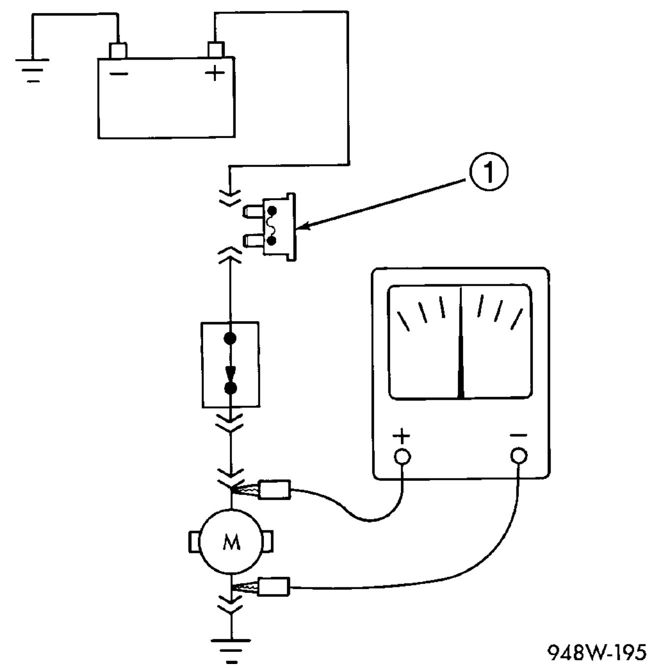


Fig. 8 TESTING FOR CONTINUITY

1 - FUSE REMOVED FROM CIRCUIT

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND

(1) Remove the fuse and disconnect all items involved with the fuse.

(2) Connect a test light or a voltmeter across the terminals of the fuse.

(3) Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.

(4) If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

(1) Refer to the wiring diagrams and disconnect or isolate all items on the suspected fused circuits.

(2) Replace the blown fuse.

(3) Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.

(4) Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 9).

(2) Connect the other lead of the voltmeter to the other side of the switch, component or circuit.

(3) Operate the item.

(4) The voltmeter will show the difference in voltage between the two points.

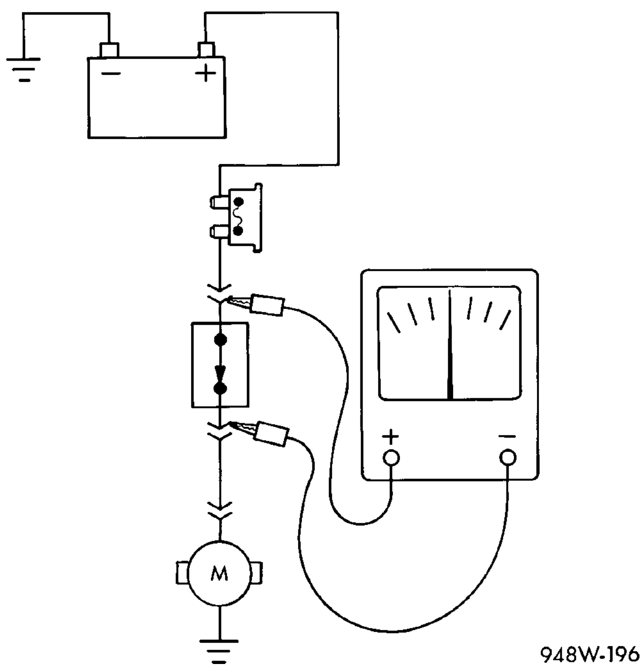
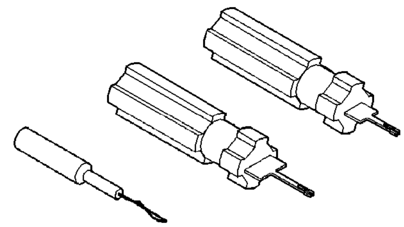


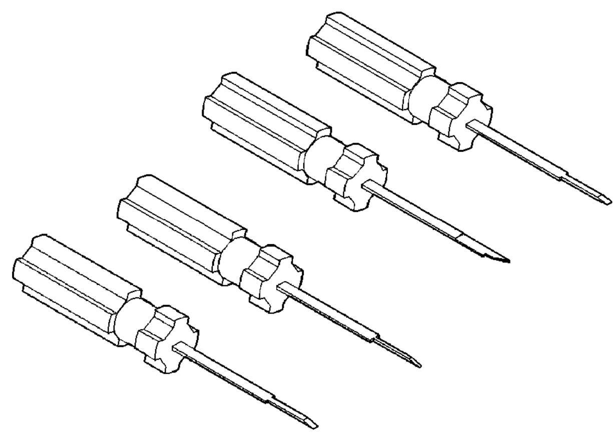
Fig. 9 TESTING FOR VOLTAGE DROP

SPECIAL TOOLS

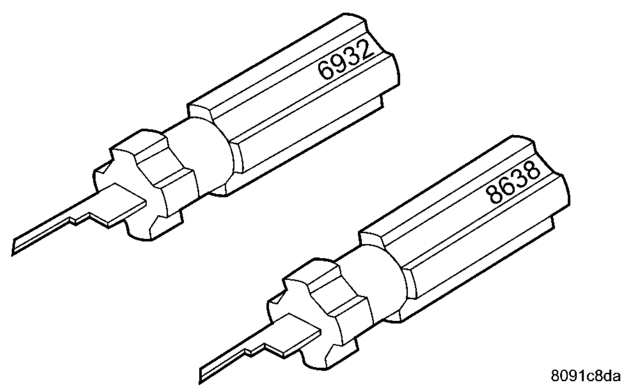
WIRING/TERMINAL



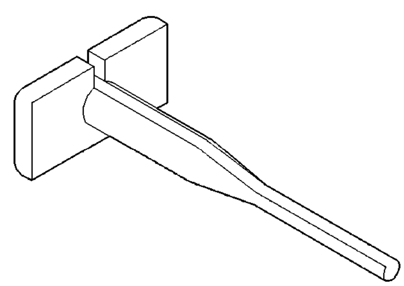
PROBING TOOL PACKAGE 6807



TERMINAL PICK TOOL SET 6680



TERMINAL REMOVING TOOLS 6932 AND 8638



TERMINAL REMOVING TOOL 6934

CONNECTOR

REMOVAL

(1) Disconnect battery.

(2) Release Connector Lock (Fig. 10).

(3) Disconnect the connector being repaired from its mating half/component.

(4) Remove the dress cover (if applicable) (Fig. 10).

(5) Release the Secondary Terminal Lock, if required (Fig. 11).

(6) Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector (Fig. 12).

INSTALLATION

(1) Insert the removed terminal in the same cavity on the repair connector.

(2) Repeat steps for each terminal in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.

(3) When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.

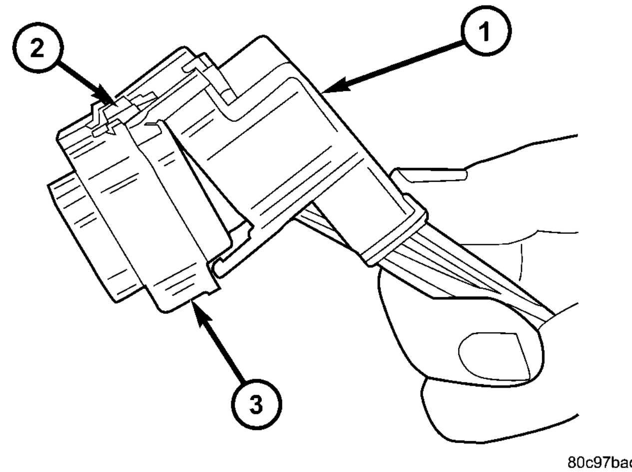


Fig. 10 REMOVAL OF DRESS COVER

1 - DRESS COVER
2 - CONNECTOR LOCK
3 - CONNECTOR

(4) Replace dress cover (if applicable).

(5) Connect connector to its mating half/component.

(6) Connect battery and test all affected systems.

CONNECTOR (Continued)

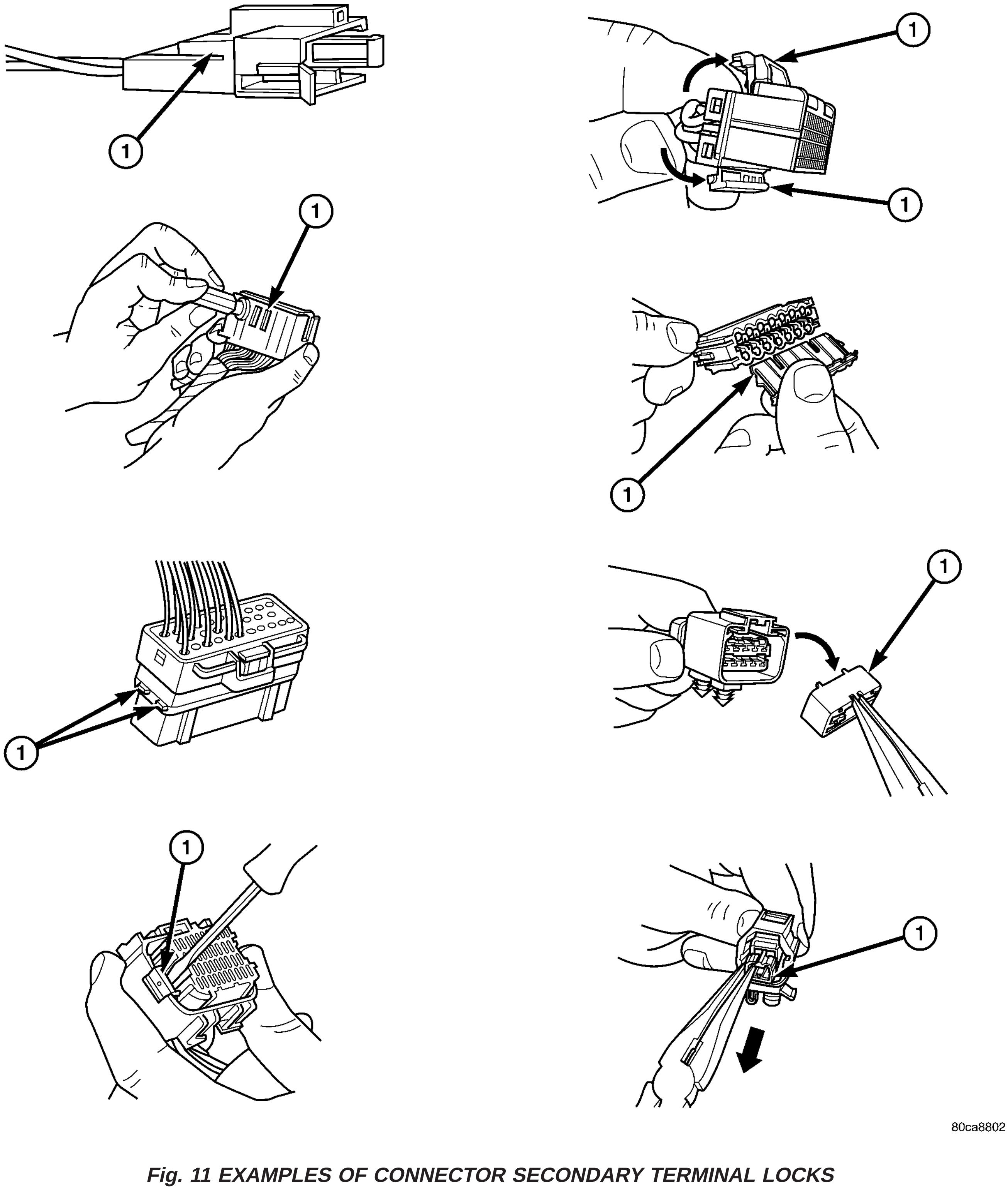


Fig. 11 EXAMPLES OF CONNECTOR SECONDARY TERMINAL LOCKS

1 - Secondary Terminal Lock

CONNECTOR (Continued)

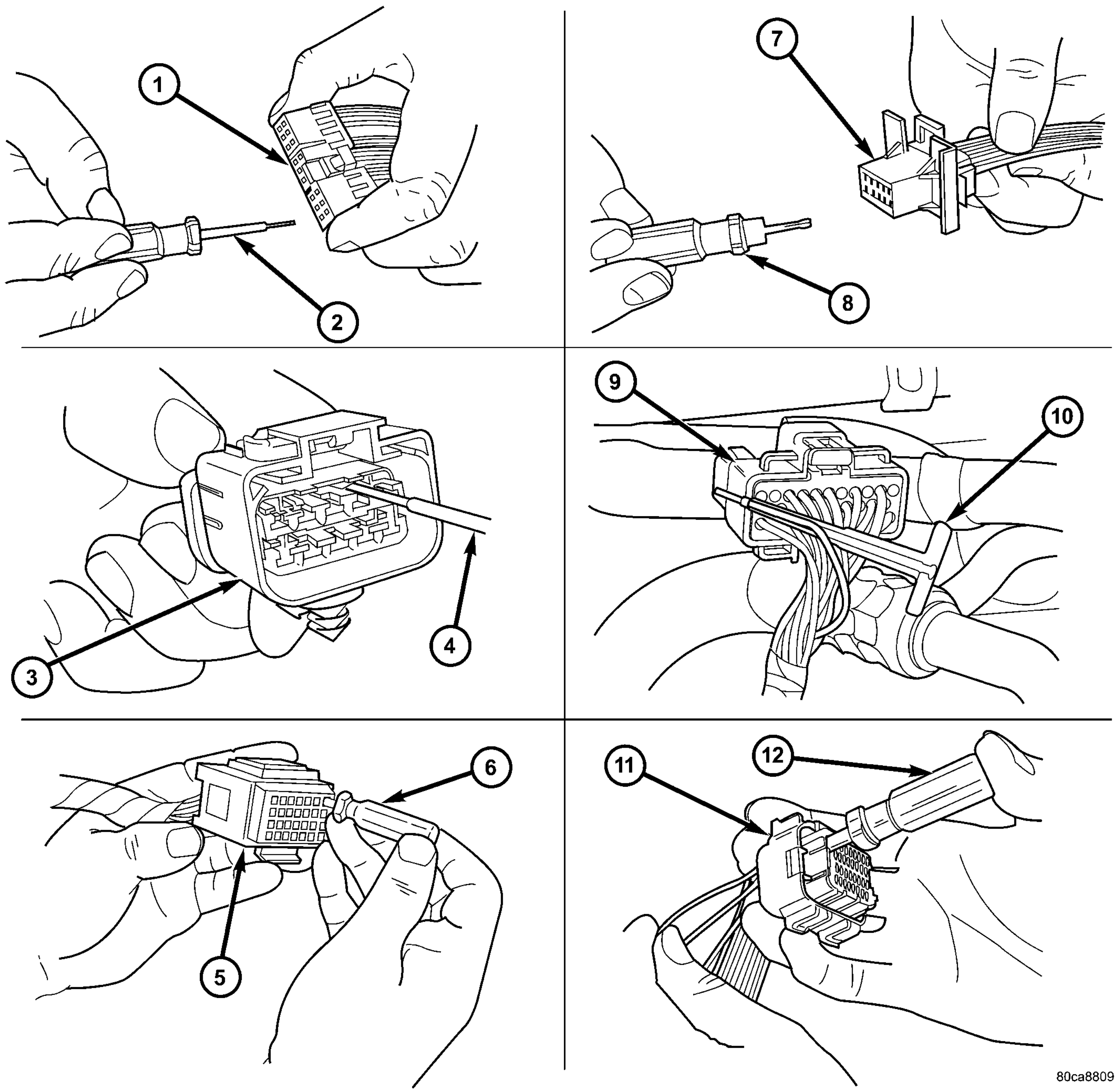


Fig. 12 TERMINAL REMOVAL

1 - TYPICAL CONNECTOR
2 - PICK FROM SPECIAL TOOL KIT 6680
3 - APEX CONNECTOR
4 - PICK FROM SPECIAL TOOL KIT 6680
5 - AUGAT CONNECTOR
6 - SPECIAL TOOL 6932
7 - MOLEX CONNECTOR
8 - SPECIAL TOOL 6742
9 - THOMAS AND BETTS CONNECTOR
10 - SPECIAL TOOL 6934
11 - TYCO CONNECTOR
12 - SPECIAL TOOL 8638

DIODE

REMOVAL

(1) Disconnect the battery.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 13).

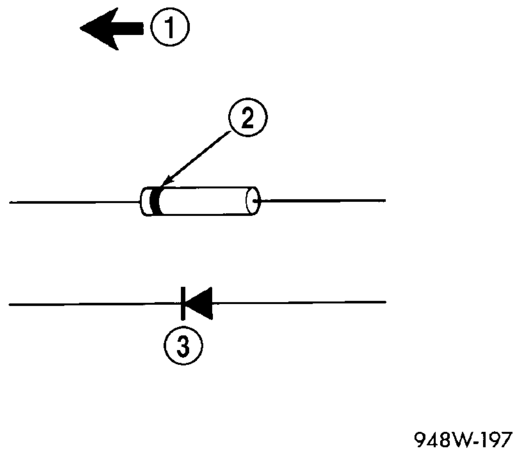


Fig. 13 DIODE IDENTIFICATION

1 - CURRENT FLOW
2 - BAND AROUND DIODE INDICATES CURRENT FLOW
3 - DIODE AS SHOWN IN THE DIAGRAMS

INSTALLATION

(1) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(2) Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow (Fig. 13).

(3) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(4) Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.

(5) Re-connect the battery and test affected systems.

TERMINAL

REMOVAL

(1) Follow steps for removing terminals described in the connector removal section.

(2) Cut the wire 6 inches from the back of the connector.

INSTALLATION

(1) Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.

(2) Cut the repair wire to the proper length and remove one–half (1/2) inch of insulation.

(3) Splice the repair wire to the wire harness (see wire splicing procedure).

(4) Insert the repaired wire into the connector.

(5) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(6) Re-tape the wire harness starting at 1–1/2 inches behind the connector and 2 inches past the repair.

(7) Connect battery and test all affected systems.

WIRE

STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

(1) Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.

(2) Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(3) Place the strands of wire overlapping each other inside of the splice clip (Fig. 14).

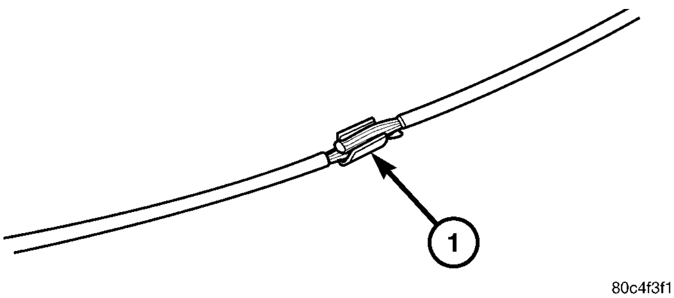


Fig. 14 SPLICE BAND

1 - SPLICE BAND

(4) Using crimping tool, Mopar p/n 05019912AA, crimp the splice clip and wires together (Fig. 15).

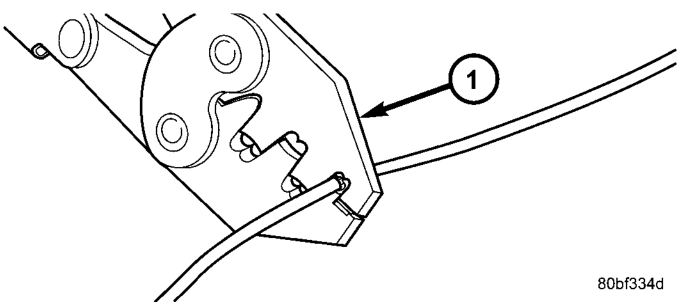


Fig. 15 CRIMPING TOOL

1 - CRIMPING TOOL

(5) Solder the connection together using rosin core type solder only (Fig. 16).

CAUTION: DO NOT USE ACID CORE SOLDER.

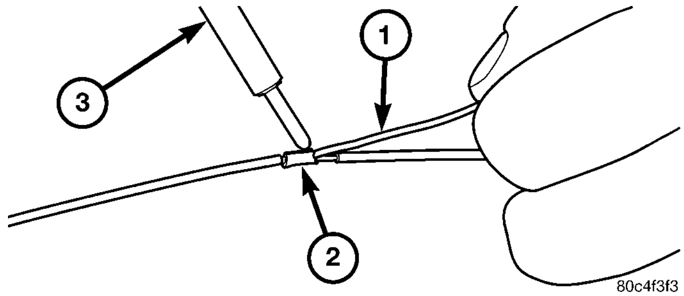


Fig. 16 SOLDER SPLICE

1 - SOLDER
2 - SPLICE BAND
3 - SOLDERING IRON

(6) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing (Fig. 17).

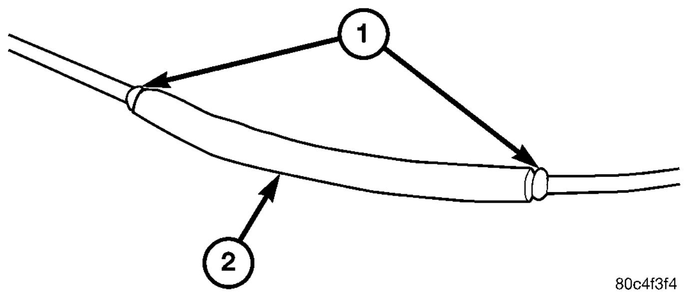


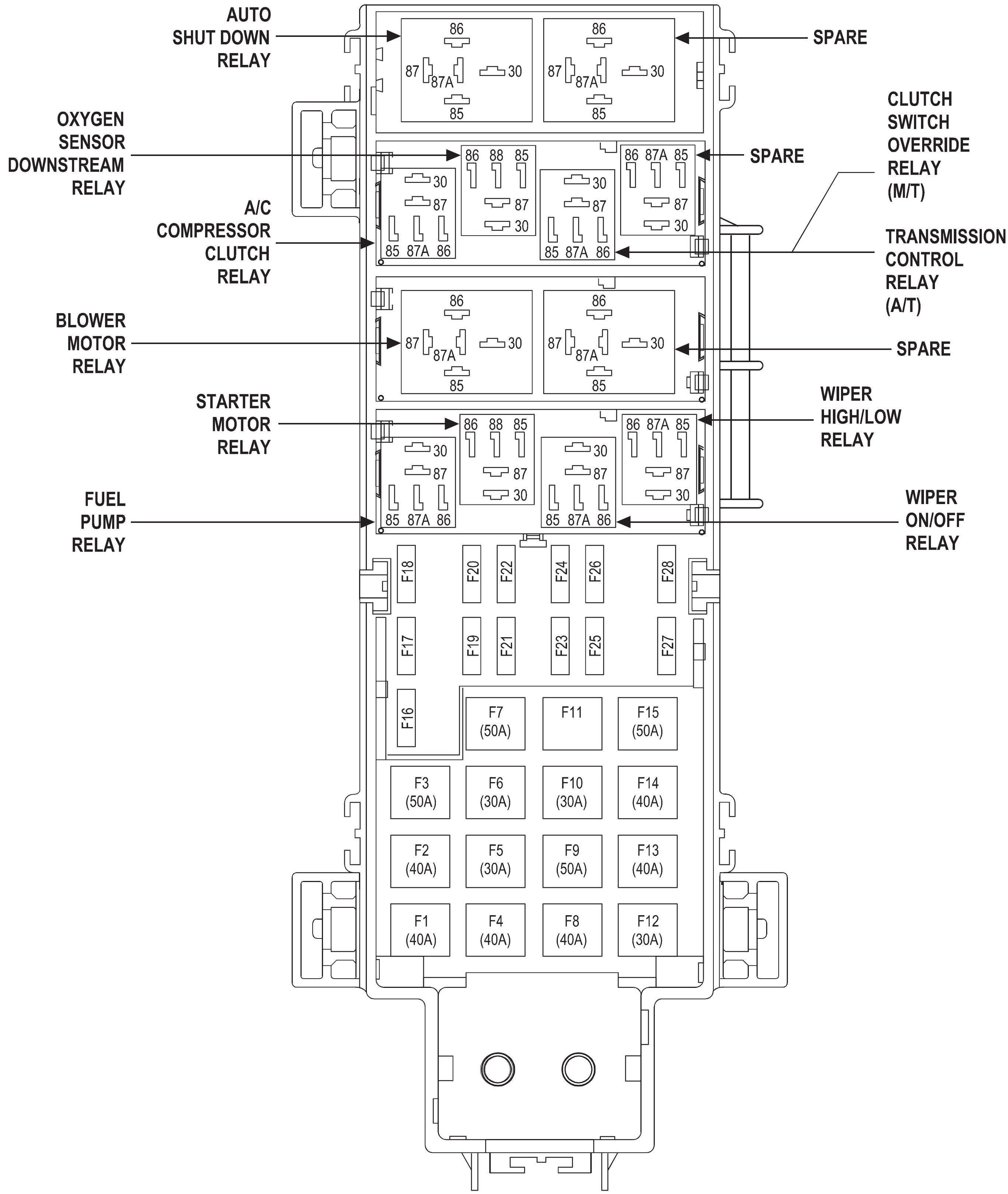
Fig. 17 HEAT SHRINK TUBE

1 - SEALANT
2 - HEAT SHRINK TUBE

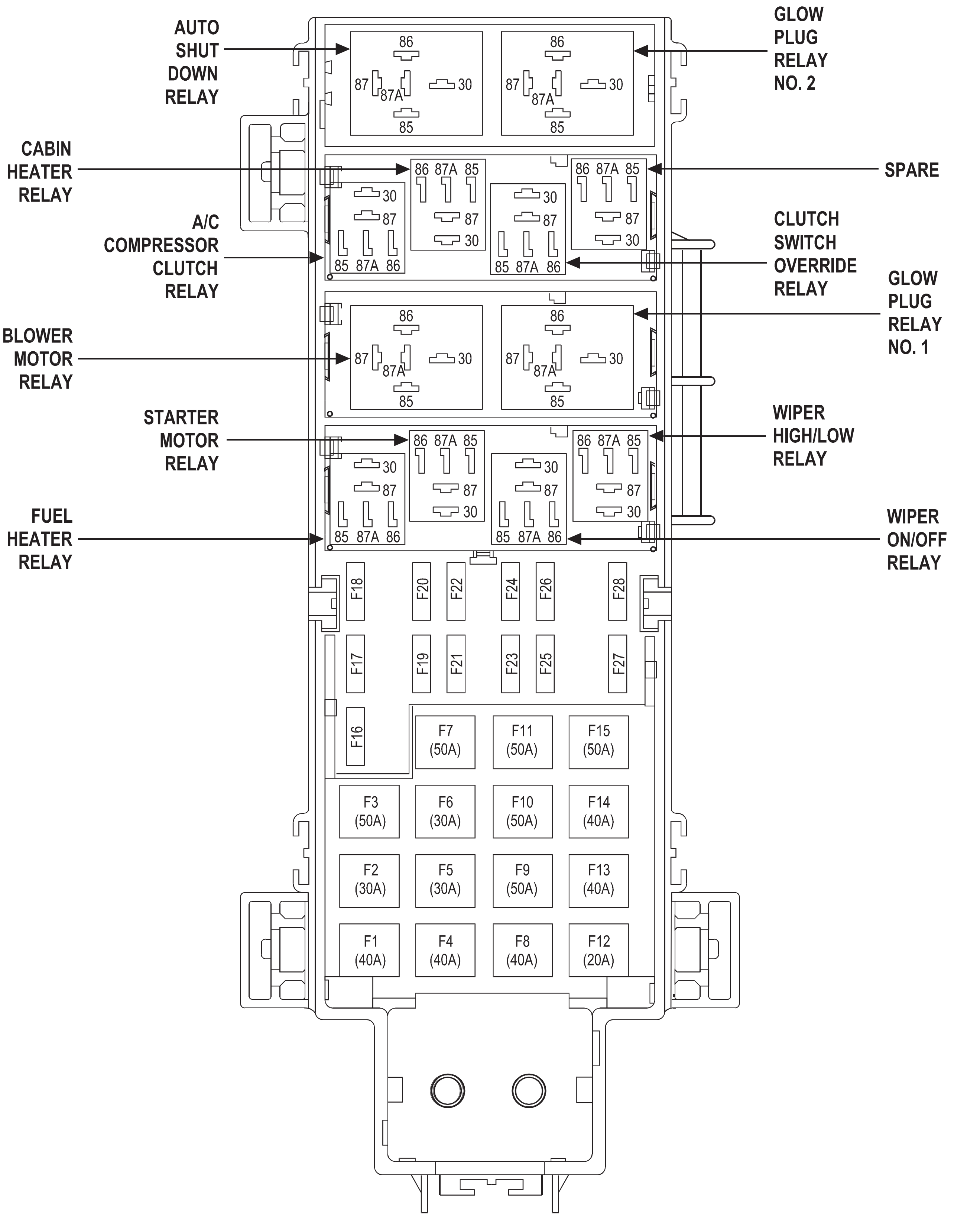
8W-02 COMPONENT INDEX

8W-10 POWER DISTRIBUTION

POWER DISTRIBUTION CENTER
GAS



POWER DISTRIBUTION CENTER
DIESEL



KJ301003 J038W-2

FUSES (GAS)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	40A	C24 12DB/PK	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG ▽	FUSED B(+)
5	30A	A30 14RD/WT △△	FUSED B(+)
		A30 14RD/WT △△	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	30A	A99 14RD/VT	FUSED B(+)
11	-	-	-
12	30A	A32 14RD/DB ◇◇	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
		A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	20A	A14 16RD/WT	FUSED B(+)
		A14 16RD/WT	FUSED B(+)
25	20A	A20 12RD/DB ▽	FUSED B(+)
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
		F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
		F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

▽ ABS
△△ A/T
◇◇ RENEGADE

J038W-2 KJ301004

FUSES
(DIESEL)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	30A	A99 14RD/VT △△	FUSED B(+)
2	30A	A32 14RD/DB △	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG	FUSED B(+)
5	30A	A32 14RD/DB △△	FUSED B(+)
5	30A	A30 14RD/WT △	FUSED B(+)
		A30 14RD/WT △	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
		A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	50A	A54 10RD	FUSED B(+)
11	50A	A58 10RD/GY	FUSED B(+)
12	20A	A34 16LB/RD	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
		A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	-	-	-
25	20A	A20 12RD/DB	FUSED B(+)
26	10A	F92 18YL/BR	FUSED B(+)
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
		F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

△ M/T
△△ A/T

KJ301005 J038W-2

A/C COMPRESSOR CLUTCH RELAY

CAVITY	CIRCUIT	FUNCTION
30	A17 18RD/BK	FUSED B(+)
85	C13 18DG ◆◆	A/C COMPRESSOR CLUTCH RELAY CONTROL
86	F1 18DB ■	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F1 18DB ■	FUSED IGNITION SWITCH OUTPUT (RUN-START)
86	A71 18DG/RD ■■	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	C3 18DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
87A	-	-

AUTO SHUT DOWN RELAY

CAVITY	CIRCUIT	FUNCTION
30	A9 14RD/YL	FUSED B(+)
	A9 14RD/YL ■■	FUSED B(+)
85	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
86	F1 18DB ■	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F1 18DB ■	FUSED IGNITION SWITCH OUTPUT (RUN-START)
86	A9 14RD/YL ■■	FUSED B(+)
87	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
	A142 14DG/OR ■■	AUTO SHUT DOWN RELAY OUTPUT
87A	-	-

BLOWER MOTOR RELAY

CAVITY	CIRCUIT	FUNCTION
30	A122 12OR	FUSED B(+)
85	Z142 18BK/WT	GROUND
86	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
	F20 18WT ■■	FUSED IGNITION SWITCH OUTPUT (RUN)
87	A111 12RD/LB	BLOWER MOTOR RELAY OUTPUT
87A	-	-

CABIN HEATER RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A17 18RD/BK	FUSED B(+)
85	K132 18DG/LB	CABIN HEATER RELAY CONTROL
86	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	C151 18DB/WT	CABIN HEATER RELAY OUTPUT
87A	-	-

■ GAS
■■ DIESEL
◆◆ EXCEPT RHD A/T

CLUTCH SWITCH OVERRIDE RELAY (M/T)

CAVITY	CIRCUIT	FUNCTION
30	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
85	K90 18TN	CLUTCH SWITCH OVERRIDE RELAY CONTROL
86	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
87	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT
	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT
87A	-	-

FUEL HEATER RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A34 16LB/RD	FUSED B(+)
85	Z142 18BK/WT	GROUND
86	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
87	A93 16RD/BK	FUEL HEATER RELAY OUTPUT
87A	-	-

FUEL PUMP RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A14 16RD/WT	FUSED B(+)
85	K31 18BR	FUEL PUMP RELAY CONTROL
86	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	A141 16DG/WT	FUEL PUMP RELAY OUTPUT
87A	-	-

GLOW PLUG RELAY NO. 1 (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A54 10RD	FUSED B(+)
85	K152 18WT	GLOW PLUG RELAY NO. 1 CONTROL
86	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	K154 10GY	GLOW PLUG RELAY NO. 1 OUTPUT
87A	-	-

GLOW PLUG RELAY NO. 2 (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A58 10RD/GY	FUSED B(+)
85	K236 18GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
86	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	K104 10RD/WT	GLOW PLUG RELAY NO. 2 OUTPUT
87A	-	-

OXYGEN SENSOR DOWNSTREAM RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
85	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
86	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	F18 18LG/BK	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
87A	-	-

STARTER MOTOR RELAY

CAVITY	CIRCUIT	FUNCTION
30	A2 12PK/BK	FUSED B(+)
85	T41 18BK/WT △	PARK/NEUTRAL POSITION SWITCH SENSE
	Z142 18BK/WT △△	GROUND
86	F45 18YL/BR △	FUSED IGNITION SWITCH OUTPUT (START)
86	T141 18YL/RD △△	CLUTCH INTERLOCK RELAY OUTPUT
	T141 18YL/RD △△	CLUTCH INTERLOCK RELAY OUTPUT
87	T40 12BR	STARTER MOTOR RELAY OUTPUT
87A	-	-

△ A/T
△△ M/T

TRANSMISSION CONTROL RELAY (A/T)

CAVITY	CIRCUIT	FUNCTION
30	A30 14RD/WT	FUSED B(+)
85	Z142 18BK/WT	GROUND
86	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
87	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
87A	-	-

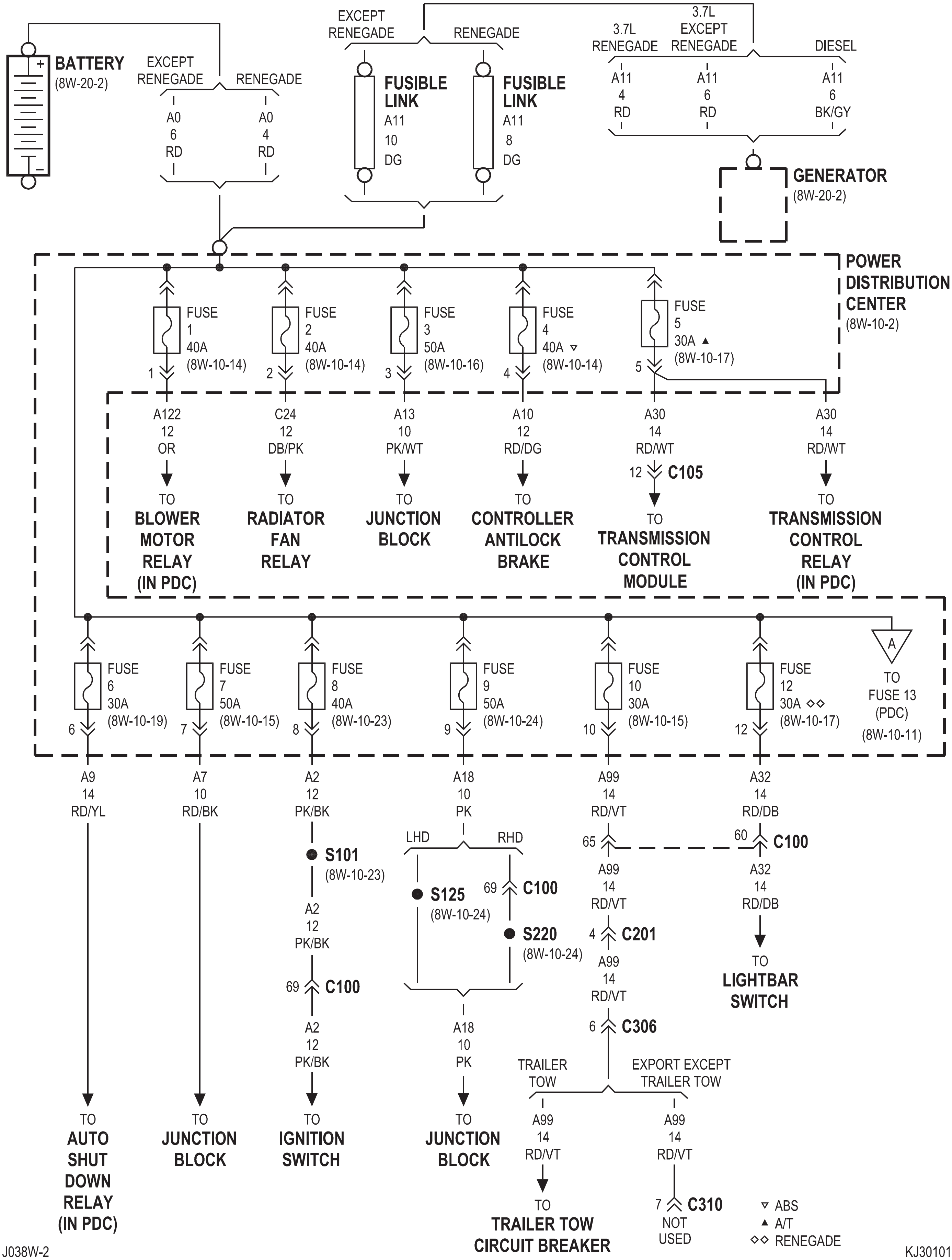
WIPER HIGH/LOW RELAY

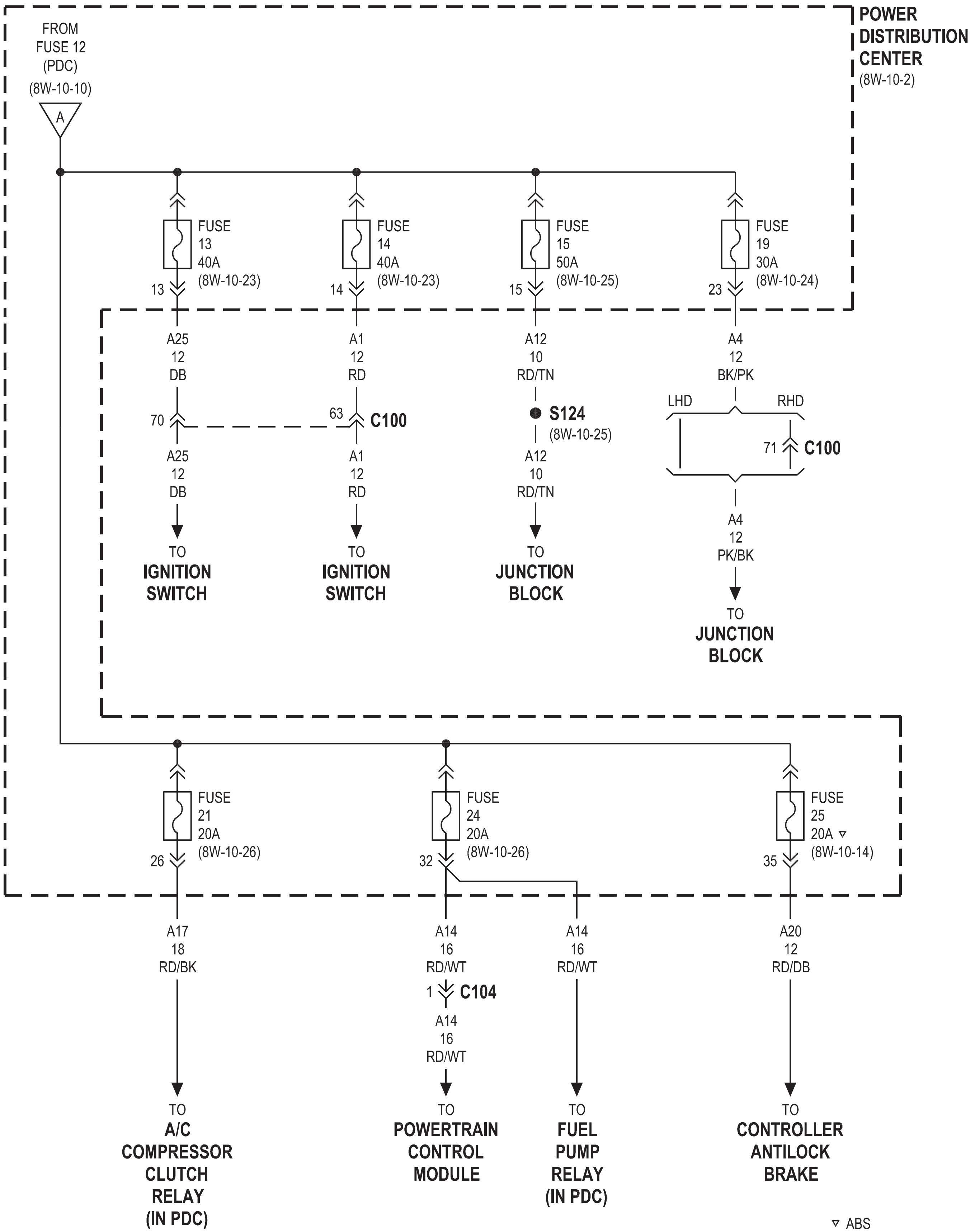
CAVITY	CIRCUIT	FUNCTION
30	V60 16YL/DG	FRONT WIPER ON/OFF RELAY OUTPUT
85	V16 18VT/YL	FRONT WIPER HIGH/LOW RELAY CONTROL
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87	V4 14RD/YL	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
87A	V3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT

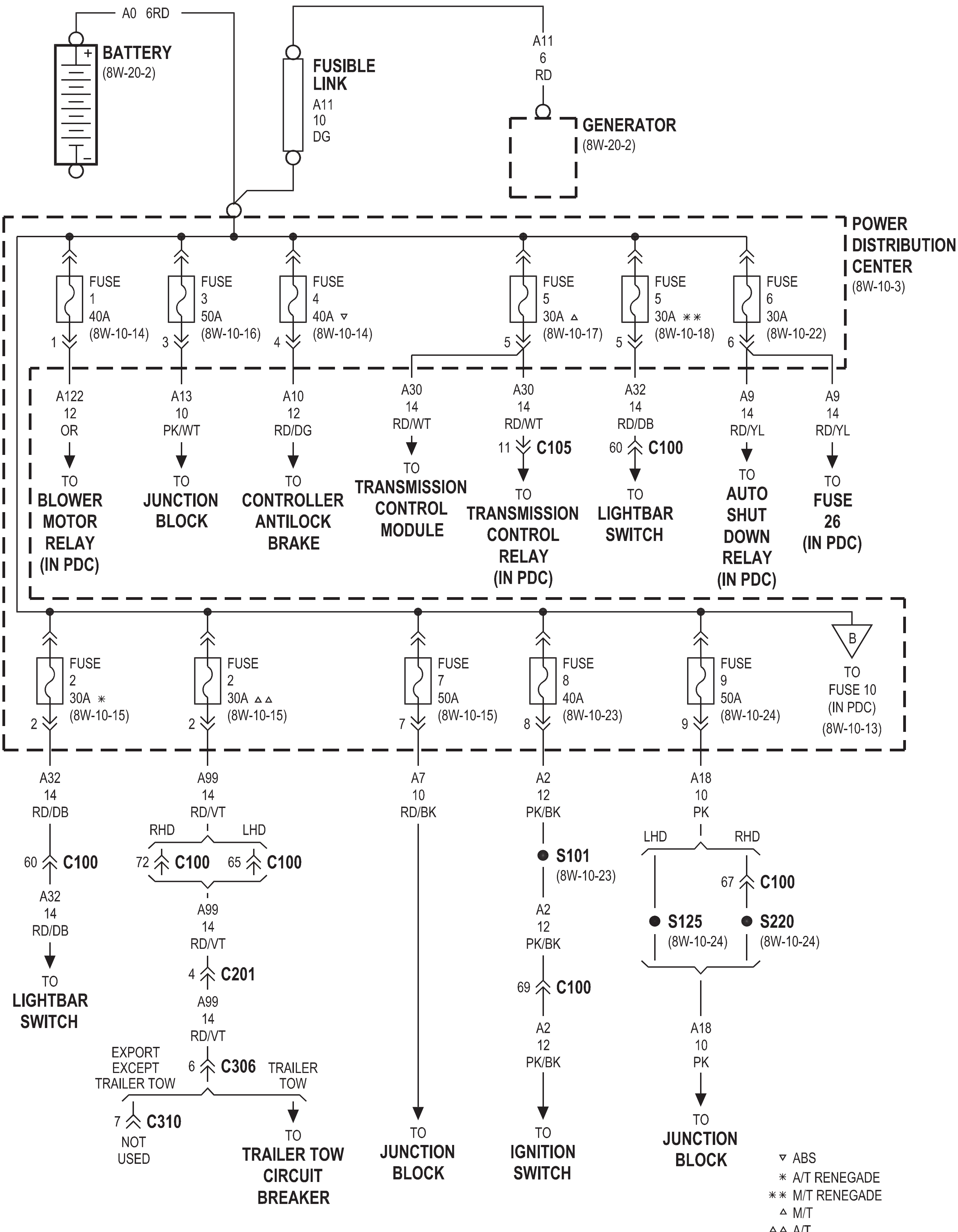
WIPER ON/OFF RELAY

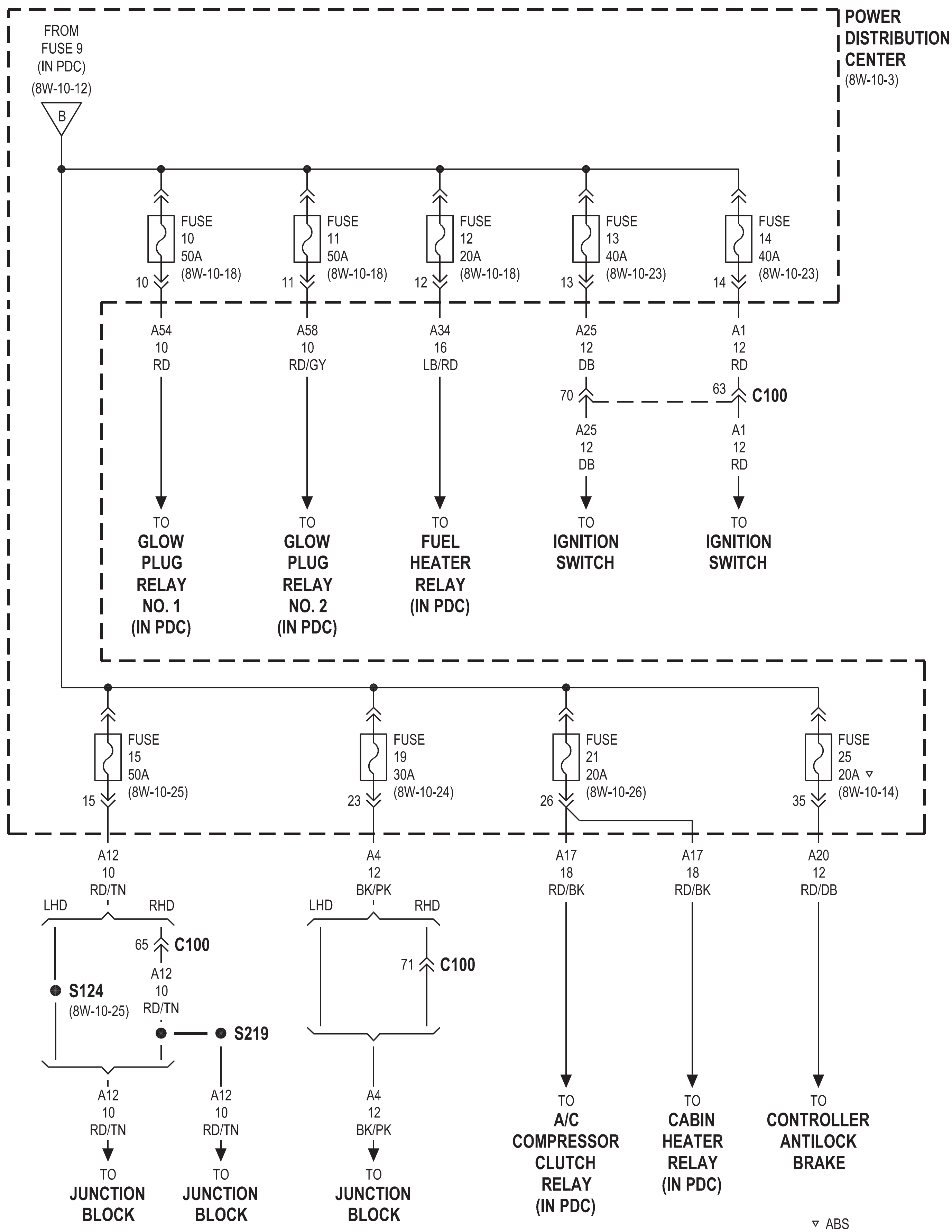
CAVITY	CIRCUIT	FUNCTION
30	V60 16YL/DG	FRONT WIPER ON/OFF RELAY OUTPUT
85	V14 18RD/VT	FRONT WIPER ON/OFF RELAY CONTROL
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87A	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE

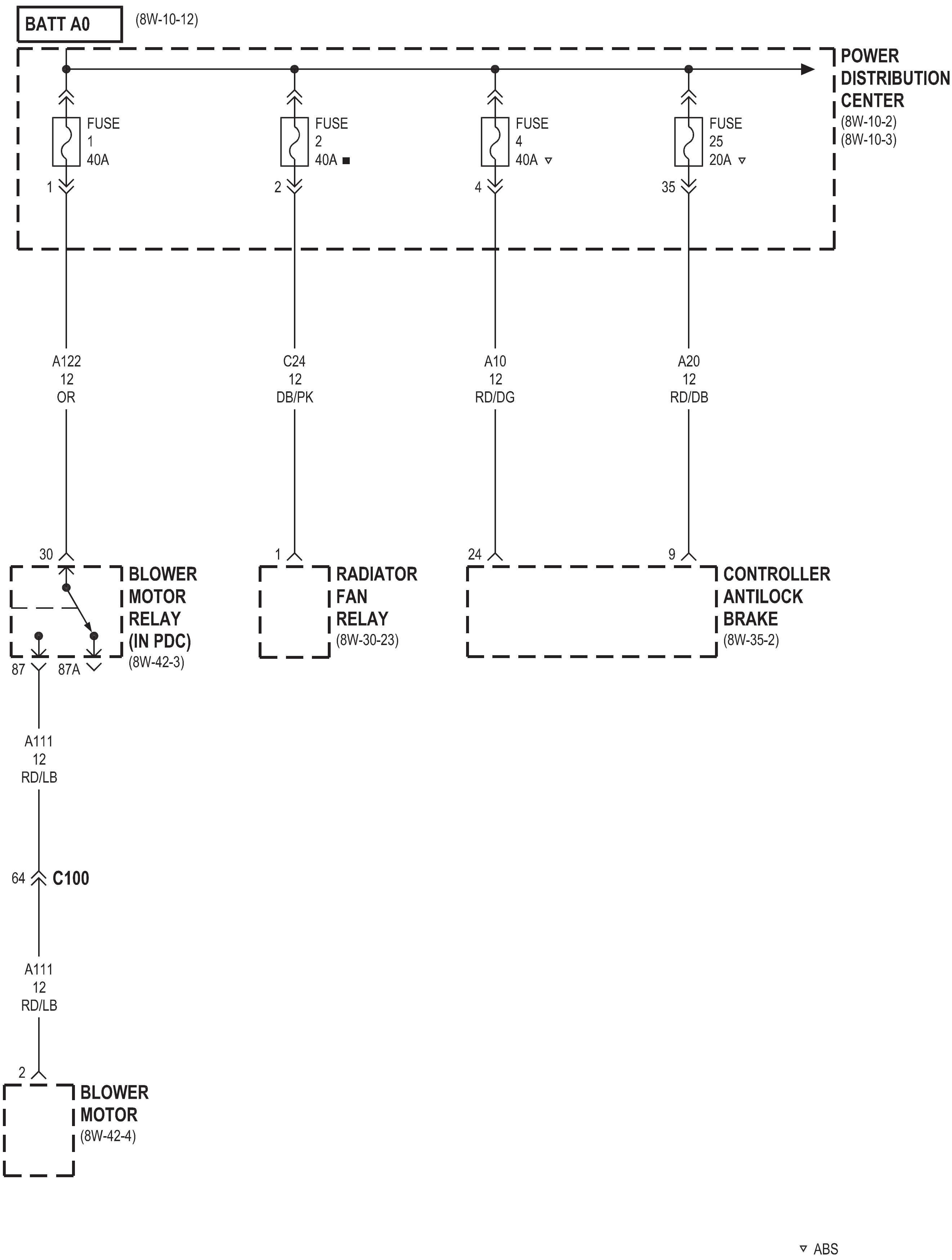
GAS


BATTERY
(8W-20-2)
EXCEPT RENEGADE
RENEGADE
A0 6 RD
A0 4 RD
EXCEPT RENEGADE
RENEGADE
FUSIBLE LINK
A11 10 DG
FUSIBLE LINK
A11 8 DG
3.7L RENEGADE
3.7L EXCEPT RENEGADE
DIESEL
A11 4 RD
A11 6 RD
A11 6 BK/GY
GENERATOR
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 1 40A (8W-10-14)
FUSE 2 40A (8W-10-14)
FUSE 3 50A (8W-10-16)
FUSE 4 40A ▽ (8W-10-14)
FUSE 5 30A ▲ (8W-10-17)
A122 12 OR
C24 12 DB/PK
A13 10 PK/WT
A10 12 RD/DG
A30 14 RD/WT
A30 14 RD/WT
C105
TO BLOWER MOTOR RELAY (IN PDC)
TO RADIATOR FAN RELAY
TO JUNCTION BLOCK
TO CONTROLLER ANTILOCK BRAKE
TO TRANSMISSION CONTROL MODULE
TO TRANSMISSION CONTROL RELAY (IN PDC)
FUSE 6 30A (8W-10-19)
FUSE 7 50A (8W-10-15)
FUSE 8 40A (8W-10-23)
FUSE 9 50A (8W-10-24)
FUSE 10 30A (8W-10-15)
FUSE 12 30A ◇◇ (8W-10-17)
A
TO FUSE 13 (PDC) (8W-10-11)
A9 14 RD/YL
A7 10 RD/BK
A2 12 PK/BK
A18 10 PK
A99 14 RD/VT
A32 14 RD/DB
S101 (8W-10-23)
A2 12 PK/BK
C100
A2 12 PK/BK
LHD
RHD
S125 (8W-10-24)
C100
S220 (8W-10-24)
A18 10 PK
C100
A99 14 RD/VT
A32 14 RD/DB
C201
A99 14 RD/VT
C306
TO LIGHTBAR SWITCH
TRAILER TOW
EXPORT EXCEPT TRAILER TOW
A99 14 RD/VT
A99 14 RD/VT
TO AUTO SHUT DOWN RELAY (IN PDC)
TO JUNCTION BLOCK
TO IGNITION SWITCH
TO JUNCTION BLOCK
TO TRAILER TOW CIRCUIT BREAKER
C310
NOT USED
▽ ABS
▲ A/T
◇◇ RENEGADE
J038W-2
KJ301010

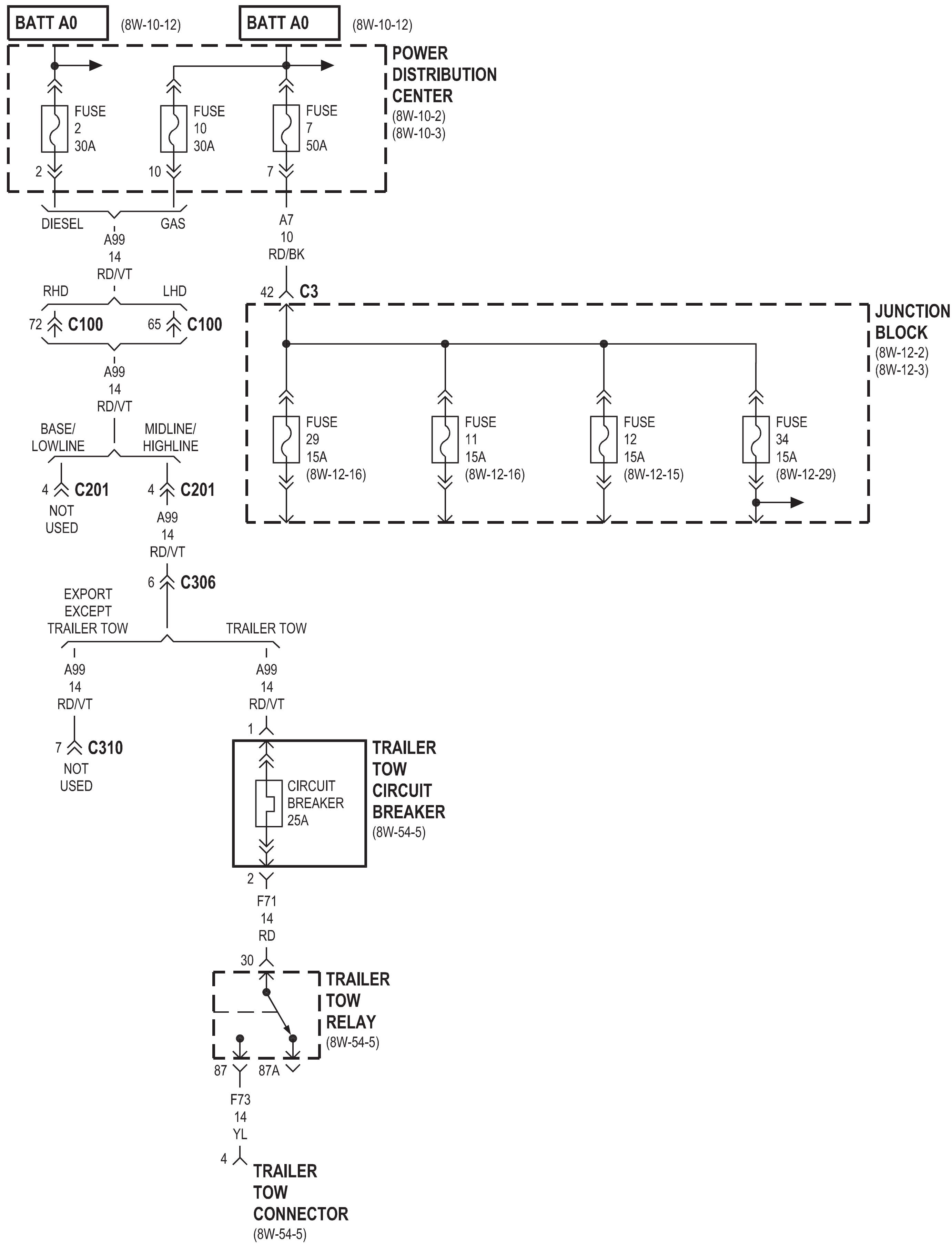

POWER DISTRIBUTION CENTER
(8W-10-2)
FROM FUSE 12 (PDC)
(8W-10-10)
A
FUSE 13 40A (8W-10-23)
13
FUSE 14 40A (8W-10-23)
14
FUSE 15 50A (8W-10-25)
15
FUSE 19 30A (8W-10-24)
23
A25 12 DB
A1 12 RD
A12 10 RD/TN
A4 12 BK/PK
70
63
C100
S124
(8W-10-25)
LHD
RHD
71
C100
A25 12 DB
A1 12 RD
A12 10 RD/TN
A4 12 PK/BK
TO IGNITION SWITCH
TO IGNITION SWITCH
TO JUNCTION BLOCK
TO JUNCTION BLOCK
FUSE 21 20A (8W-10-26)
26
FUSE 24 20A (8W-10-26)
32
FUSE 25 20A ▿ (8W-10-14)
35
A17 18 RD/BK
A14 16 RD/WT
1
C104
A14 16 RD/WT
A14 16 RD/WT
A20 12 RD/DB
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
TO POWERTRAIN CONTROL MODULE
TO FUEL PUMP RELAY (IN PDC)
TO CONTROLLER ANTILOCK BRAKE
▿ ABS


A0 6RD
BATTERY
(8W-20-2)
FUSIBLE LINK
A11
10
DG
A11
6
RD
GENERATOR
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 1 40A (8W-10-14)
FUSE 3 50A (8W-10-16)
FUSE 4 40A ▽ (8W-10-14)
FUSE 5 30A △ (8W-10-17)
FUSE 5 30A ✳✳ (8W-10-18)
FUSE 6 30A (8W-10-22)
A122 12 OR
TO BLOWER MOTOR RELAY (IN PDC)
A13 10 PK/WT
TO JUNCTION BLOCK
A10 12 RD/DG
TO CONTROLLER ANTILOCK BRAKE
A30 14 RD/WT
TO TRANSMISSION CONTROL MODULE
A30 14 RD/WT
11 C105
TO TRANSMISSION CONTROL RELAY (IN PDC)
A32 14 RD/DB
60 C100
TO LIGHTBAR SWITCH
A9 14 RD/YL
TO AUTO SHUT DOWN RELAY (IN PDC)
A9 14 RD/YL
TO FUSE 26 (IN PDC)
FUSE 2 30A ✳ (8W-10-15)
FUSE 2 30A △△ (8W-10-15)
FUSE 7 50A (8W-10-15)
FUSE 8 40A (8W-10-23)
FUSE 9 50A (8W-10-24)
B
TO FUSE 10 (IN PDC) (8W-10-13)
A32 14 RD/DB
60 C100
A32 14 RD/DB
TO LIGHTBAR SWITCH
A99 14 RD/VT
RHD LHD
72 C100
65 C100
A99 14 RD/VT
4 C201
A99 14 RD/VT
6 C306
EXPORT EXCEPT TRAILER TOW
TRAILER TOW
7 C310
NOT USED
TO TRAILER TOW CIRCUIT BREAKER
A7 10 RD/BK
TO JUNCTION BLOCK
A2 12 PK/BK
S101 (8W-10-23)
A2 12 PK/BK
69 C100
A2 12 PK/BK
TO IGNITION SWITCH
A18 10 PK
LHD RHD
67 C100
S125 (8W-10-24)
S220 (8W-10-24)
A18 10 PK
TO JUNCTION BLOCK
▽ ABS
✳ A/T RENEGADE
✳✳ M/T RENEGADE
△ M/T
△△ A/T

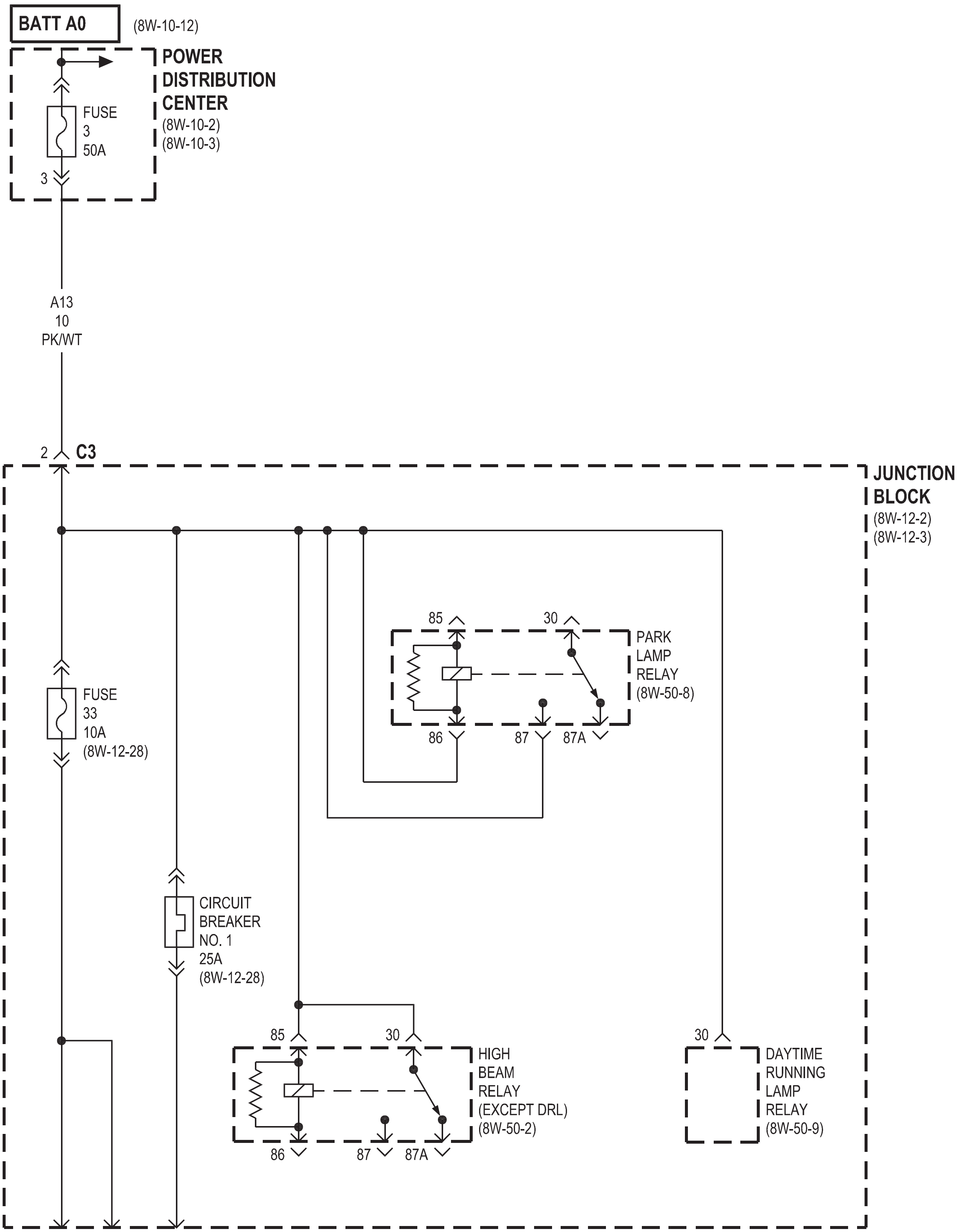

POWER DISTRIBUTION CENTER
(8W-10-3)
FROM FUSE 9 (IN PDC)
(8W-10-12)
B
FUSE 10 50A (8W-10-18)
FUSE 11 50A (8W-10-18)
FUSE 12 20A (8W-10-18)
FUSE 13 40A (8W-10-23)
FUSE 14 40A (8W-10-23)
10
11
12
13
14
A54 10 RD
A58 10 RD/GY
A34 16 LB/RD
A25 12 DB
A1 12 RD
70
63
C100
A25 12 DB
A1 12 RD
TO GLOW PLUG RELAY NO. 1 (IN PDC)
TO GLOW PLUG RELAY NO. 2 (IN PDC)
TO FUEL HEATER RELAY (IN PDC)
TO IGNITION SWITCH
TO IGNITION SWITCH
FUSE 15 50A (8W-10-25)
FUSE 19 30A (8W-10-24)
FUSE 21 20A (8W-10-26)
FUSE 25 20A ▽ (8W-10-14)
15
23
26
35
A12 10 RD/TN
A4 12 BK/PK
A17 18 RD/BK
A17 18 RD/BK
A20 12 RD/DB
LHD
RHD
65
C100
S124 (8W-10-25)
A12 10 RD/TN
S219
LHD
RHD
71
C100
A12 10 RD/TN
A12 10 RD/TN
A4 12 BK/PK
TO JUNCTION BLOCK
TO JUNCTION BLOCK
TO JUNCTION BLOCK
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
TO CABIN HEATER RELAY (IN PDC)
TO CONTROLLER ANTILOCK BRAKE
▽ ABS



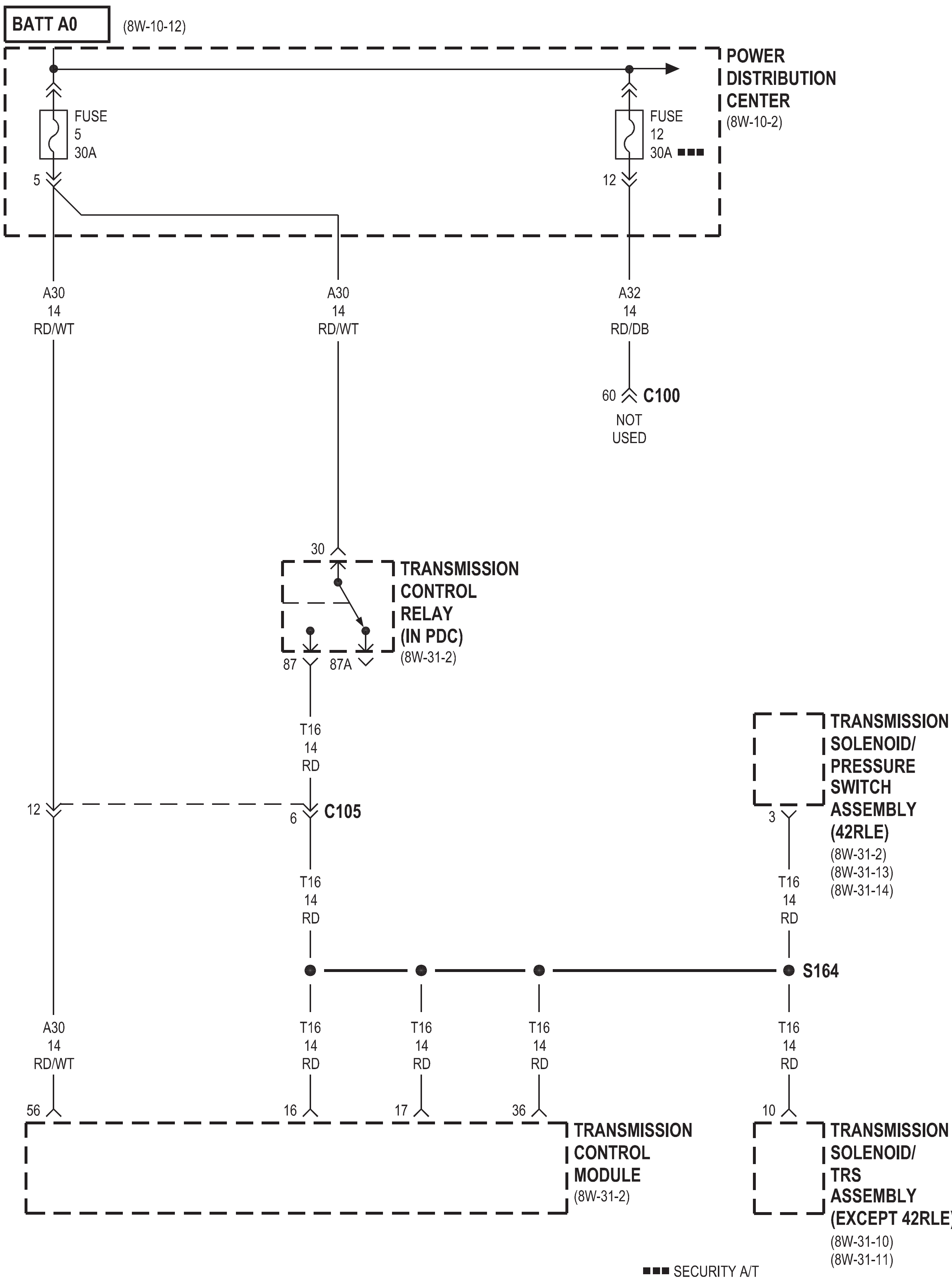
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 1 40A
FUSE 2 40A ■
FUSE 4 40A ▿
FUSE 25 20A ▿
1
2
4
35
A122 12 OR
C24 12 DB/PK
A10 12 RD/DG
A20 12 RD/DB
30
BLOWER MOTOR RELAY (IN PDC)
(8W-42-3)
87
87A
1
RADIATOR FAN RELAY
(8W-30-23)
24
9
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
A111 12 RD/LB
64
C100
A111 12 RD/LB
2
BLOWER MOTOR
(8W-42-4)
▿ ABS
■ GAS

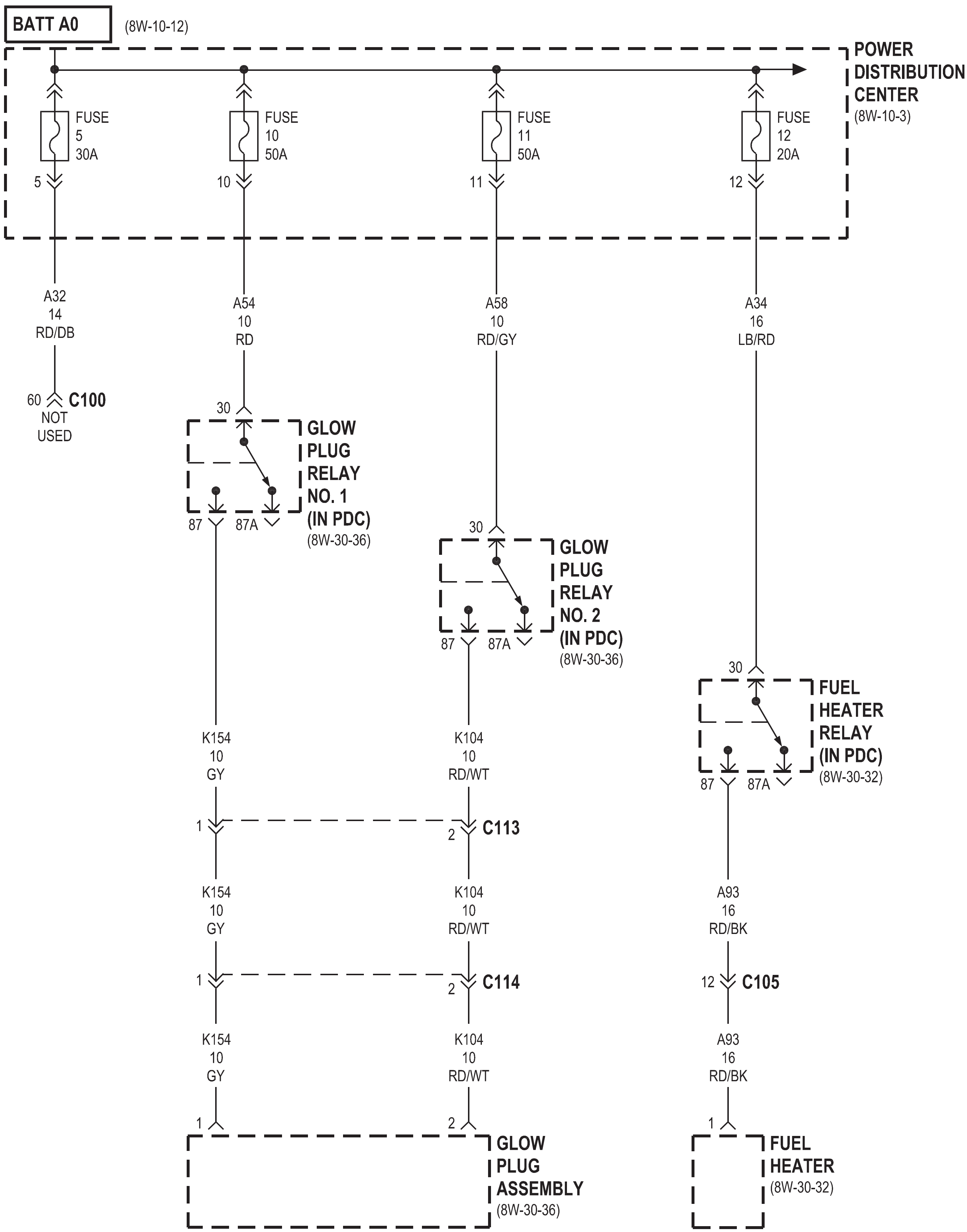


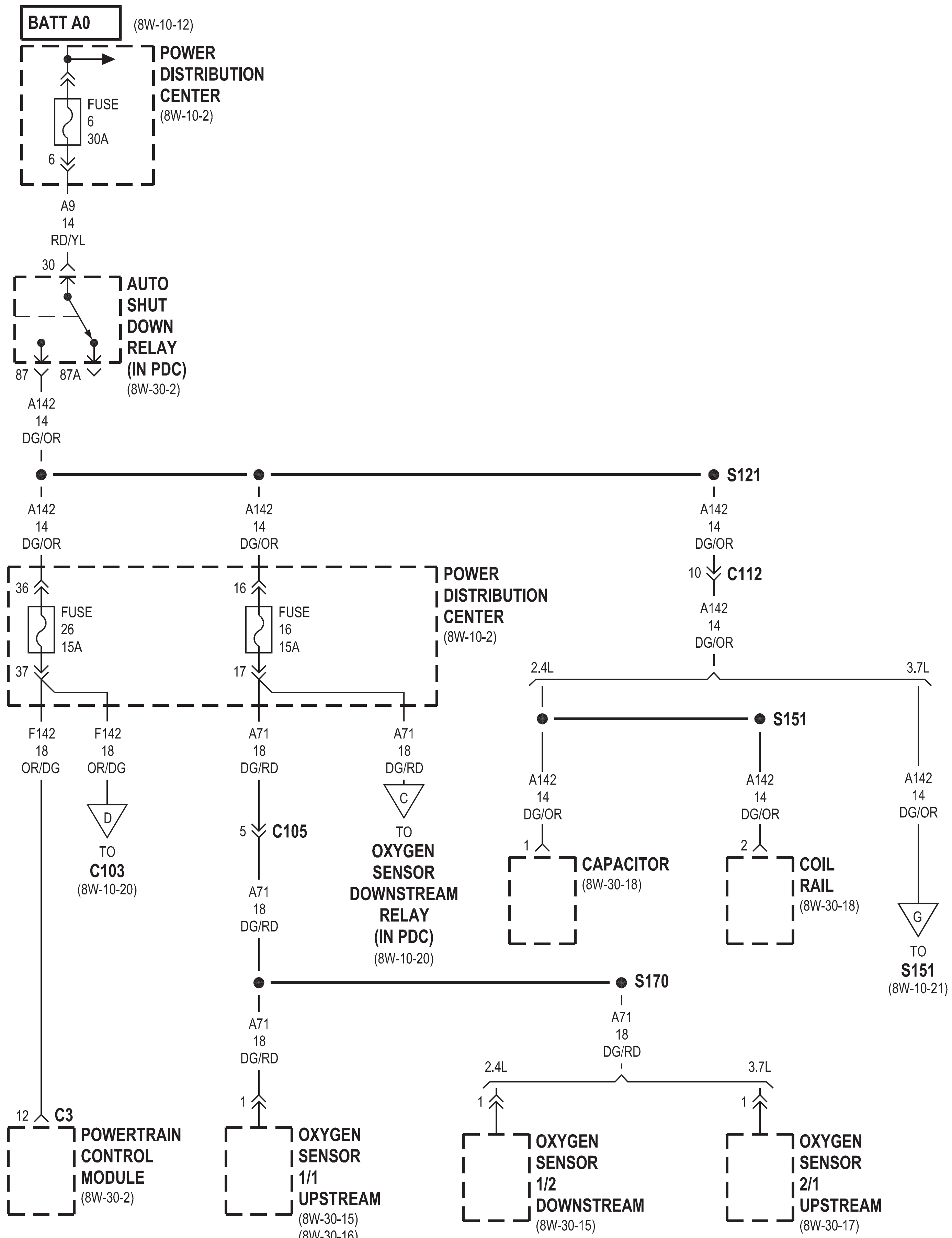
BATT A0
(8W-10-12)
BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
2
30A
FUSE
10
30A
FUSE
7
50A
2
10
7
DIESEL
GAS
A99
14
RD/VT
A7
10
RD/BK
42
C3
RHD
LHD
72
C100
65
C100
A99
14
RD/VT
BASE/
LOWLINE
MIDLINE/
HIGHLINE
4
C201
NOT
USED
4
C201
A99
14
RD/VT
6
C306
EXPORT
EXCEPT
TRAILER TOW
TRAILER TOW
A99
14
RD/VT
7
C310
NOT
USED
A99
14
RD/VT
1
CIRCUIT
BREAKER
25A
TRAILER
TOW
CIRCUIT
BREAKER
(8W-54-5)
2
F71
14
RD
30
TRAILER
TOW
RELAY
(8W-54-5)
87
87A
F73
14
YL
4
TRAILER
TOW
CONNECTOR
(8W-54-5)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
29
15A
(8W-12-16)
FUSE
11
15A
(8W-12-16)
FUSE
12
15A
(8W-12-15)
FUSE
34
15A
(8W-12-29)



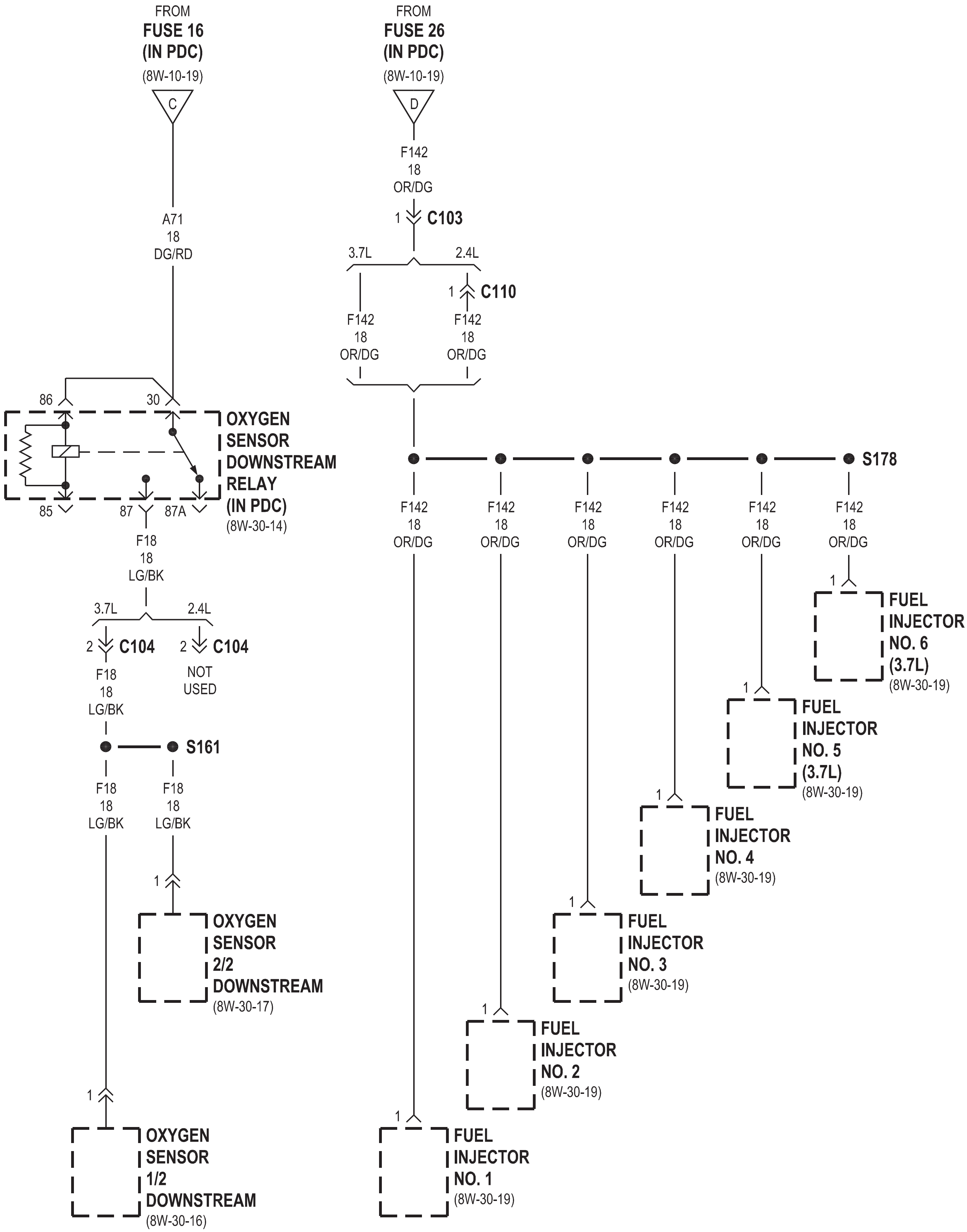
BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
3
50A
3
A13
10
PK/WT
2
C3
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
85
30
PARK
LAMP
RELAY
(8W-50-8)
86
87
87A
FUSE
33
10A
(8W-12-28)
CIRCUIT
BREAKER
NO. 1
25A
(8W-12-28)
85
30
HIGH
BEAM
RELAY
(EXCEPT DRL)
(8W-50-2)
86
87
87A
30
DAYTIME
RUNNING
LAMP
RELAY
(8W-50-9)

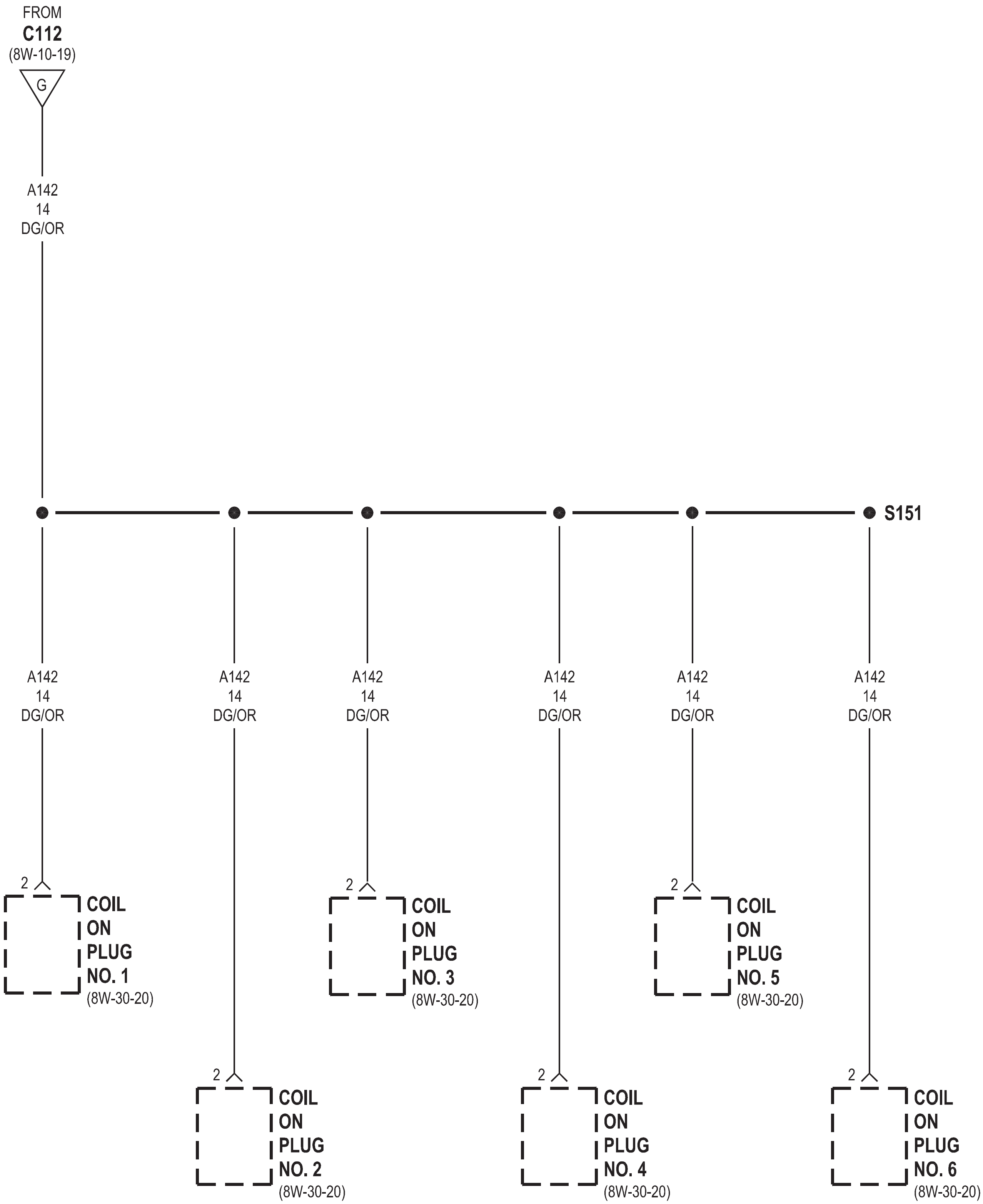

BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
5
30A
FUSE
12
30A ■■■
5
12
A30
14
RD/WT
A30
14
RD/WT
A32
14
RD/DB
60
C100
NOT
USED
30
TRANSMISSION
CONTROL
RELAY
(IN PDC)
(8W-31-2)
87
87A
T16
14
RD
12
6
C105
TRANSMISSION
SOLENOID/
PRESSURE
SWITCH
ASSEMBLY
(42RLE)
(8W-31-2)
(8W-31-13)
(8W-31-14)
3
T16
14
RD
S164
A30
14
RD/WT
T16
14
RD
56
16
17
36
10
TRANSMISSION
CONTROL
MODULE
(8W-31-2)
TRANSMISSION
SOLENOID/
TRS
ASSEMBLY
(EXCEPT 42RLE)
(8W-31-10)
(8W-31-11)
■■■ SECURITY A/T

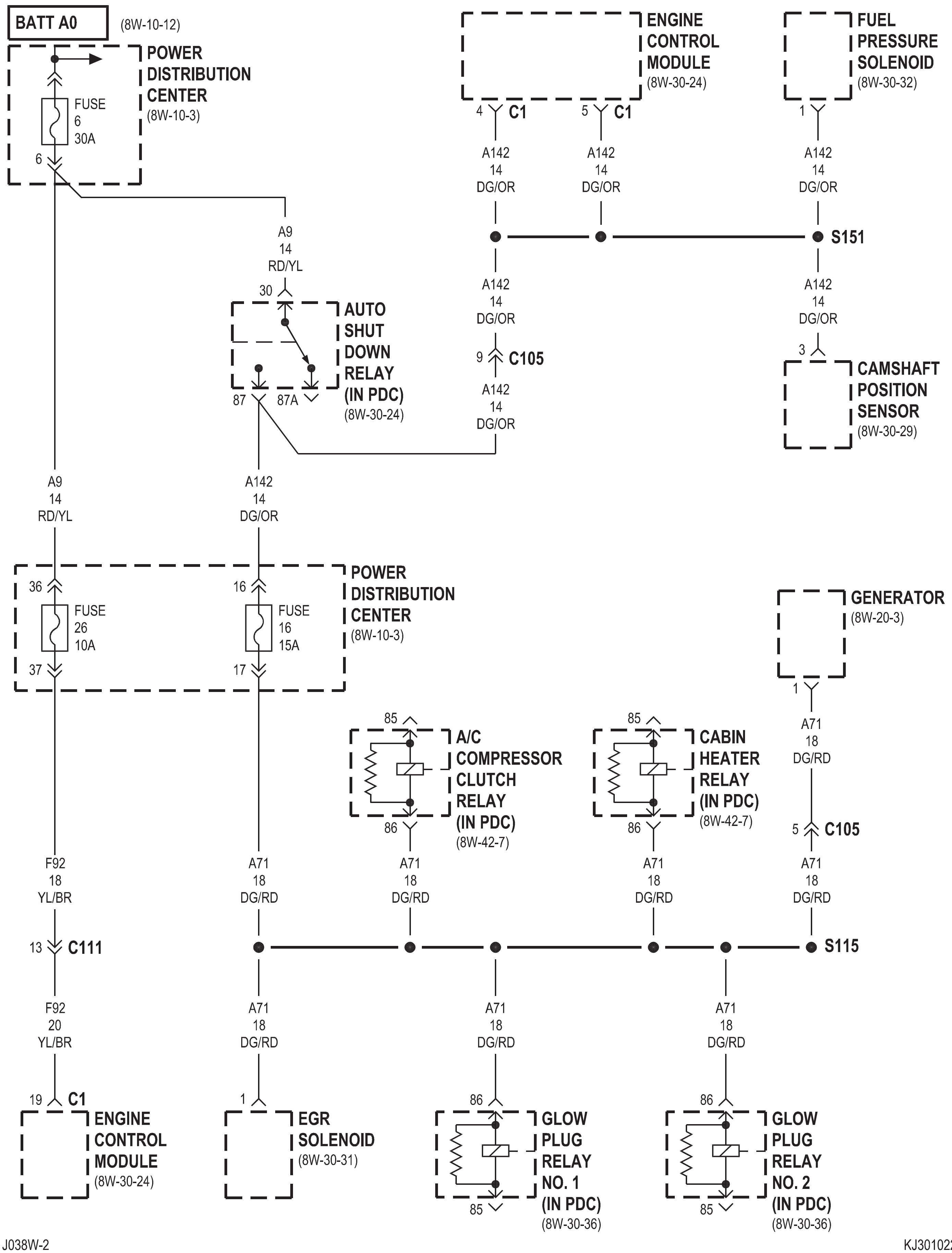

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 5 30A
FUSE 10 50A
FUSE 11 50A
FUSE 12 20A
5
10
11
12
A32 14 RD/DB
A54 10 RD
A58 10 RD/GY
A34 16 LB/RD
60 C100
NOT USED
30
GLOW PLUG RELAY NO. 1 (IN PDC)
(8W-30-36)
87
87A
GLOW PLUG RELAY NO. 2 (IN PDC)
(8W-30-36)
FUEL HEATER RELAY (IN PDC)
(8W-30-32)
K154 10 GY
K104 10 RD/WT
1
2
C113
C114
A93 16 RD/BK
12 C105
GLOW PLUG ASSEMBLY
(8W-30-36)
FUEL HEATER
(8W-30-32)

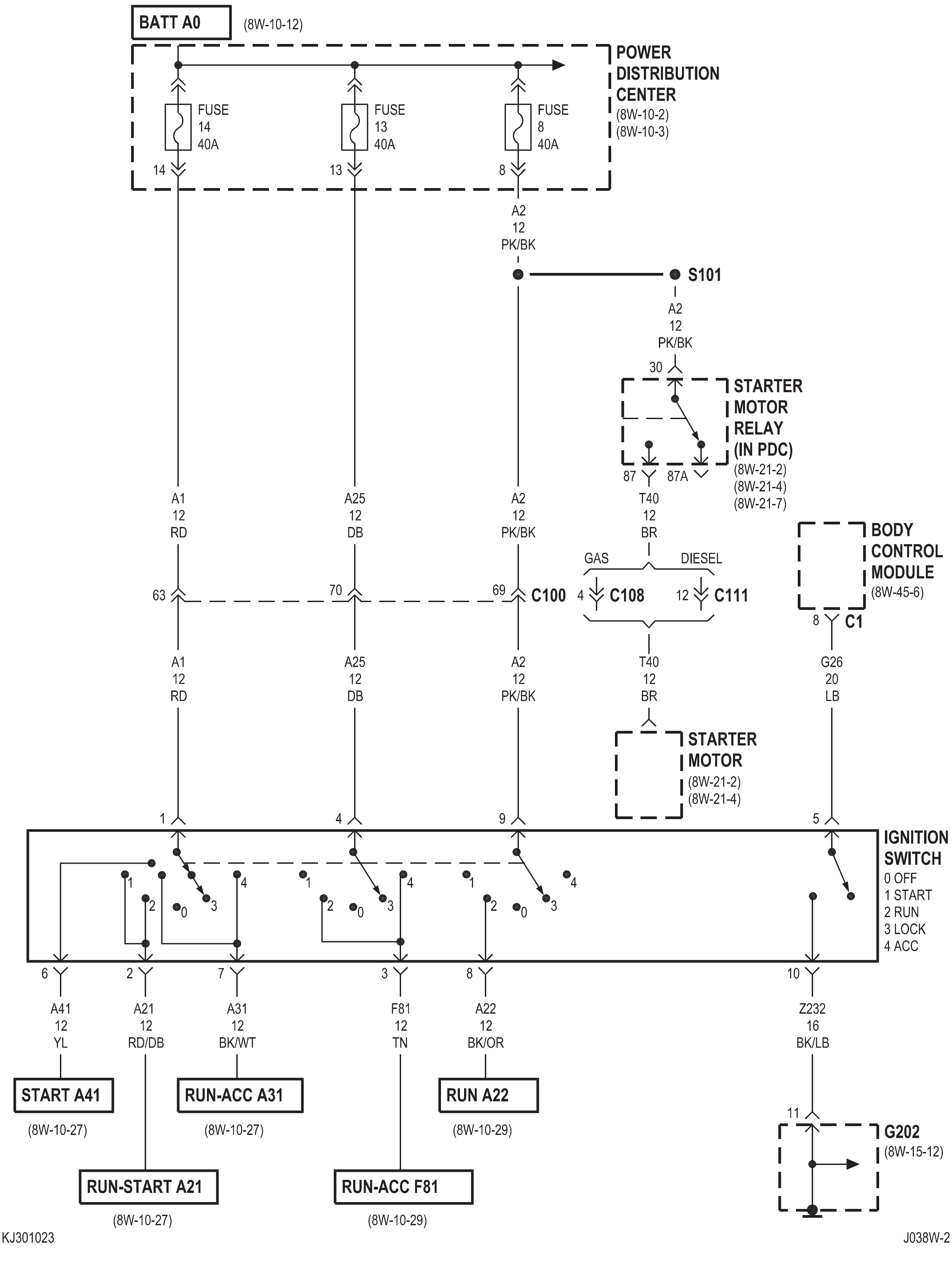

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A
6
A9 14 RD/YL
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-2)
87
87A
A142 14 DG/OR
S121
A142 14 DG/OR
36
FUSE 26 15A
37
16
FUSE 16 15A
17
POWER DISTRIBUTION CENTER
(8W-10-2)
10
C112
2.4L
3.7L
S151
F142 18 OR/DG
F142 18 OR/DG
D
TO C103
(8W-10-20)
A71 18 DG/RD
5
C105
A71 18 DG/RD
C
TO OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-10-20)
1
CAPACITOR
(8W-30-18)
2
COIL RAIL
(8W-30-18)
G
TO S151
(8W-10-21)
S170
2.4L
3.7L
12
C3
POWERTRAIN CONTROL MODULE
(8W-30-2)
1
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-15)
(8W-30-16)
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-15)
OXYGEN SENSOR 2/1 UPSTREAM
(8W-30-17)

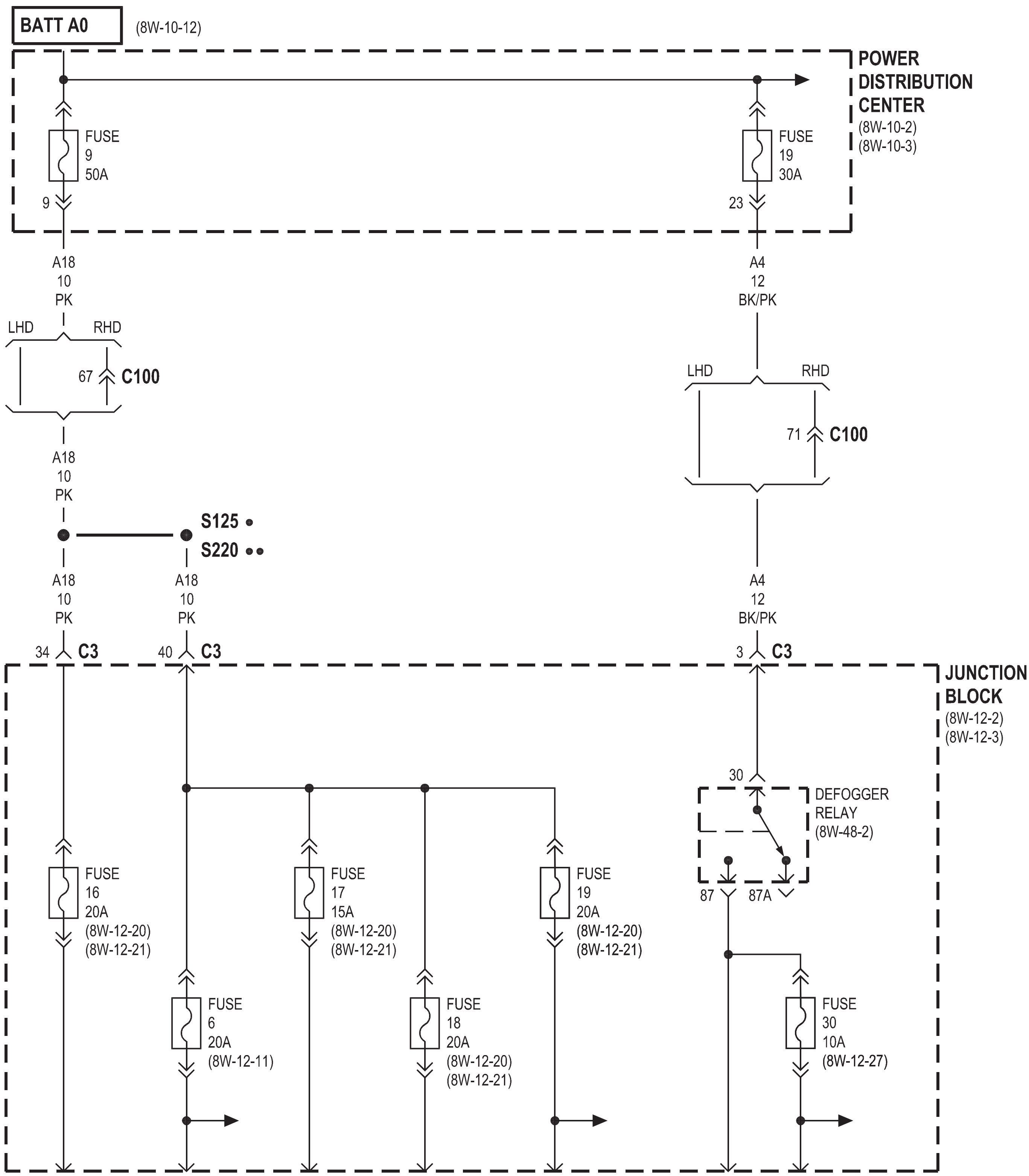
8W-10 POWER DISTRIBUTION
GAS



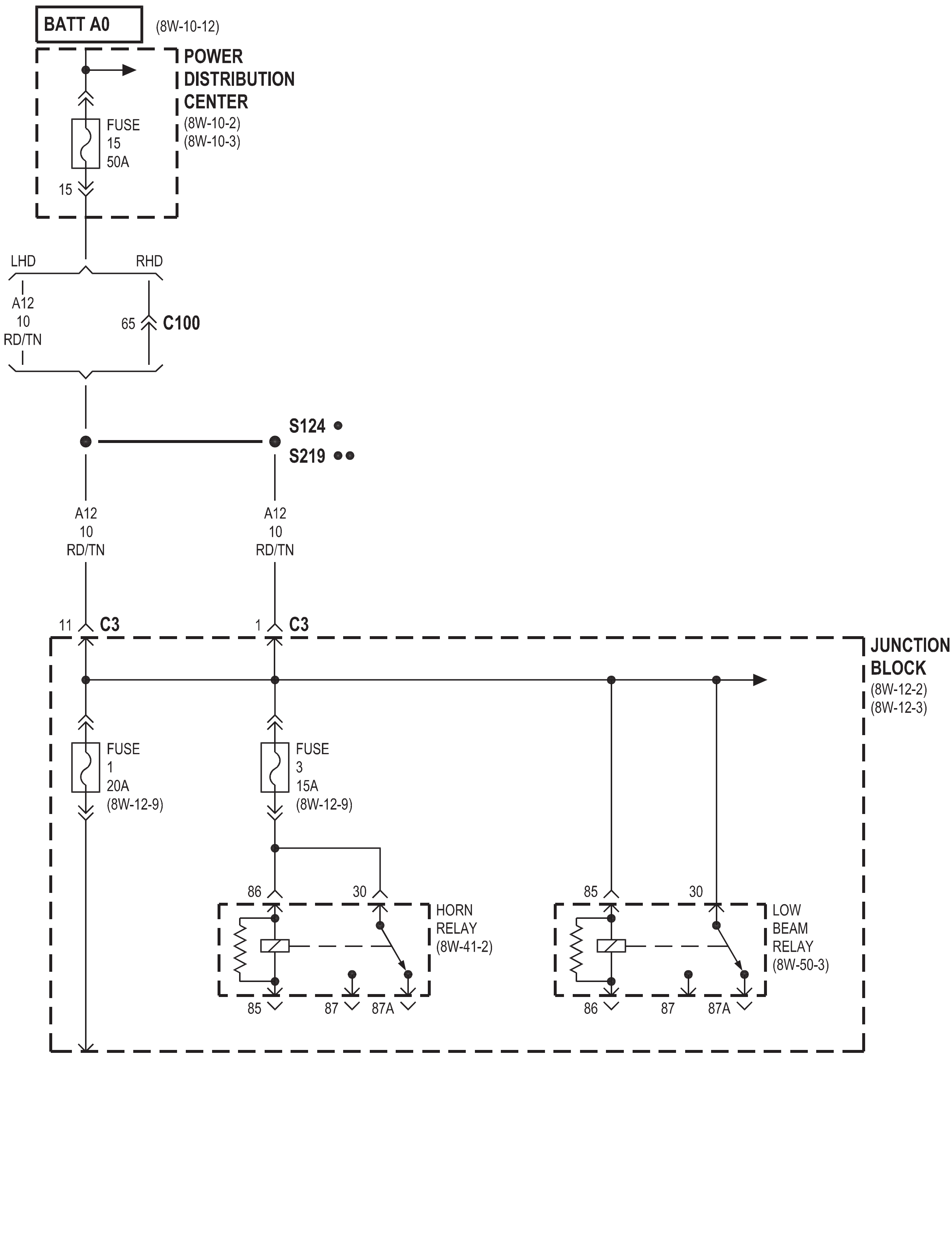

FROM
C112
(8W-10-19)
G
A142
14
DG/OR
S151
A142
14
DG/OR
A142
14
DG/OR
A142
14
DG/OR
A142
14
DG/OR
A142
14
DG/OR
A142
14
DG/OR
2
COIL ON PLUG NO. 1
(8W-30-20)
2
COIL ON PLUG NO. 3
(8W-30-20)
2
COIL ON PLUG NO. 5
(8W-30-20)
2
COIL ON PLUG NO. 2
(8W-30-20)
2
COIL ON PLUG NO. 4
(8W-30-20)
2
COIL ON PLUG NO. 6
(8W-30-20)

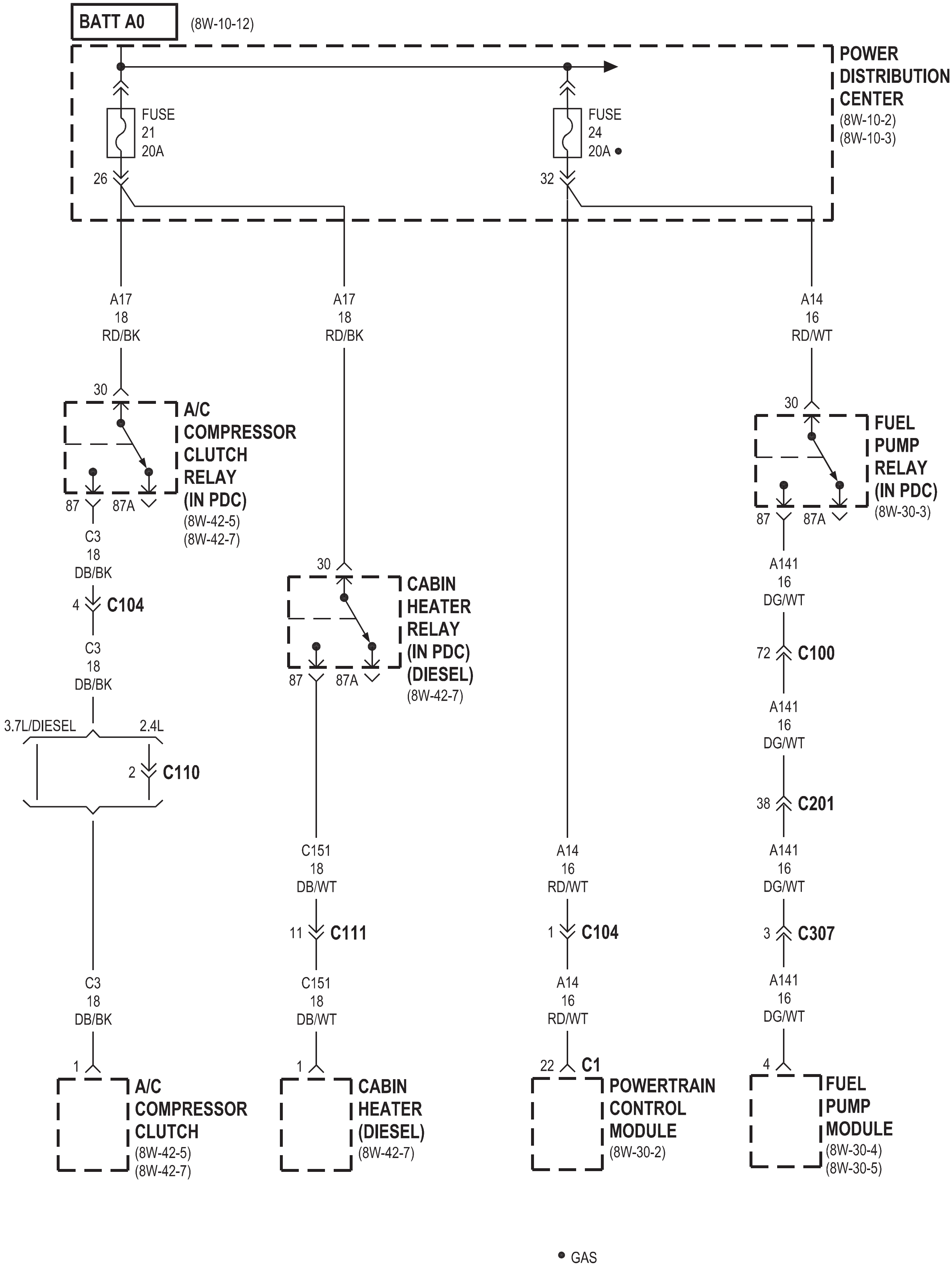

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 6 30A
6
A9 14 RD/YL
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-24)
87
87A
ENGINE CONTROL MODULE
(8W-30-24)
4 C1
5 C1
FUEL PRESSURE SOLENOID
(8W-30-32)
1
A142 14 DG/OR
S151
9 C105
3
CAMSHAFT POSITION SENSOR
(8W-30-29)
A9 14 RD/YL
A142 14 DG/OR
POWER DISTRIBUTION CENTER
(8W-10-3)
36
FUSE 26 10A
37
16
FUSE 16 15A
17
GENERATOR
(8W-20-3)
1
A71 18 DG/RD
5 C105
85
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-7)
86
CABIN HEATER RELAY (IN PDC)
(8W-42-7)
F92 18 YL/BR
13 C111
F92 20 YL/BR
S115
19 C1
ENGINE CONTROL MODULE
(8W-30-24)
1
EGR SOLENOID
(8W-30-31)
GLOW PLUG RELAY NO. 1 (IN PDC)
(8W-30-36)
GLOW PLUG RELAY NO. 2 (IN PDC)
(8W-30-36)
KJ301022


BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 14 40A
FUSE 13 40A
FUSE 8 40A
A2 12 PK/BK
S101
30
STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-4)
(8W-21-7)
87
87A
A1 12 RD
A25 12 DB
T40 12 BR
GAS
DIESEL
C100
C108
C111
BODY CONTROL MODULE
(8W-45-6)
C1
G26 20 LB
STARTER MOTOR
(8W-21-2)
(8W-21-4)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
A41 12 YL
A21 12 RD/DB
A31 12 BK/WT
F81 12 TN
A22 12 BK/OR
Z232 16 BK/LB
START A41
(8W-10-27)
RUN-ACC A31
(8W-10-27)
RUN A22
(8W-10-29)
RUN-START A21
(8W-10-27)
RUN-ACC F81
(8W-10-29)
G202
(8W-15-12)

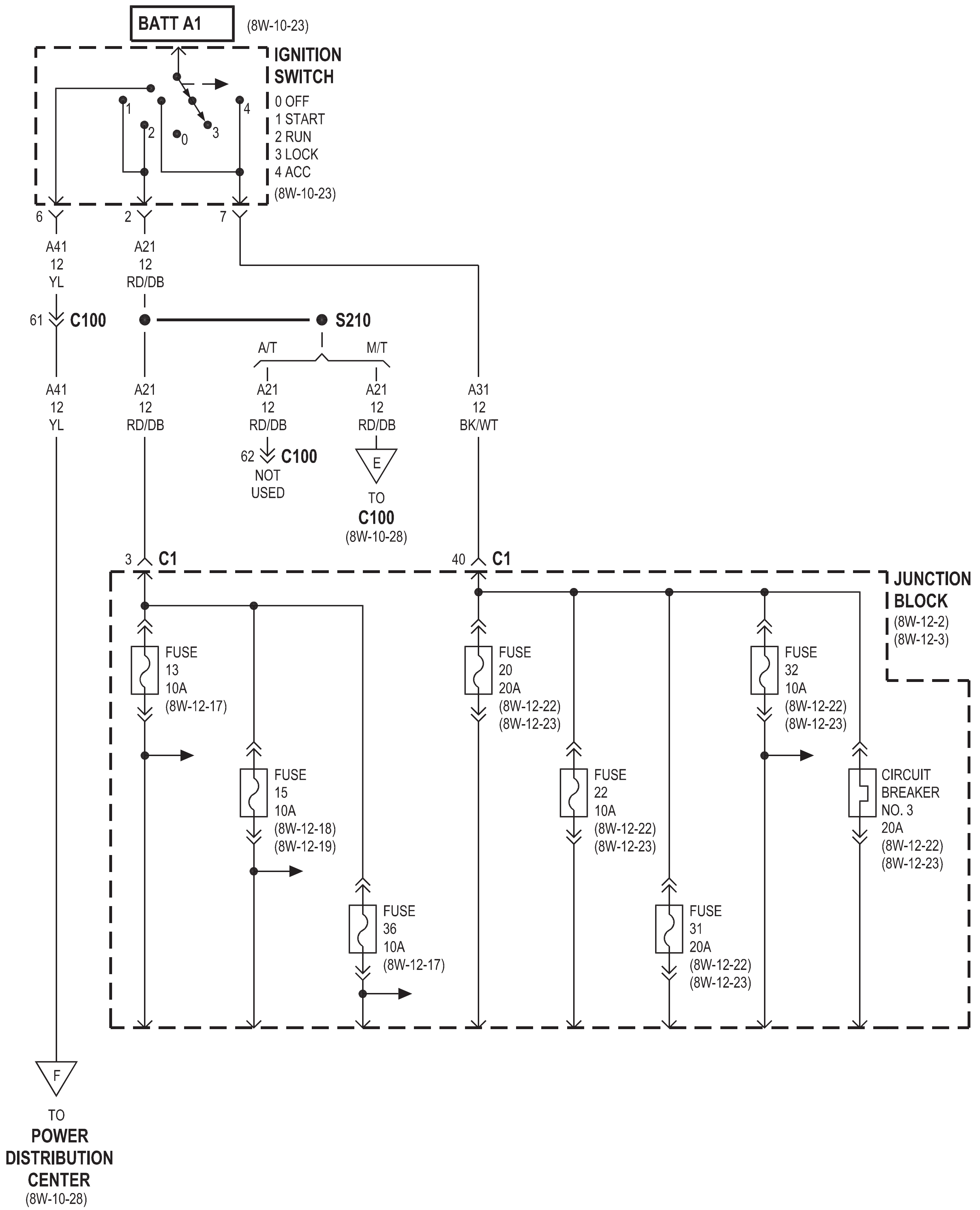


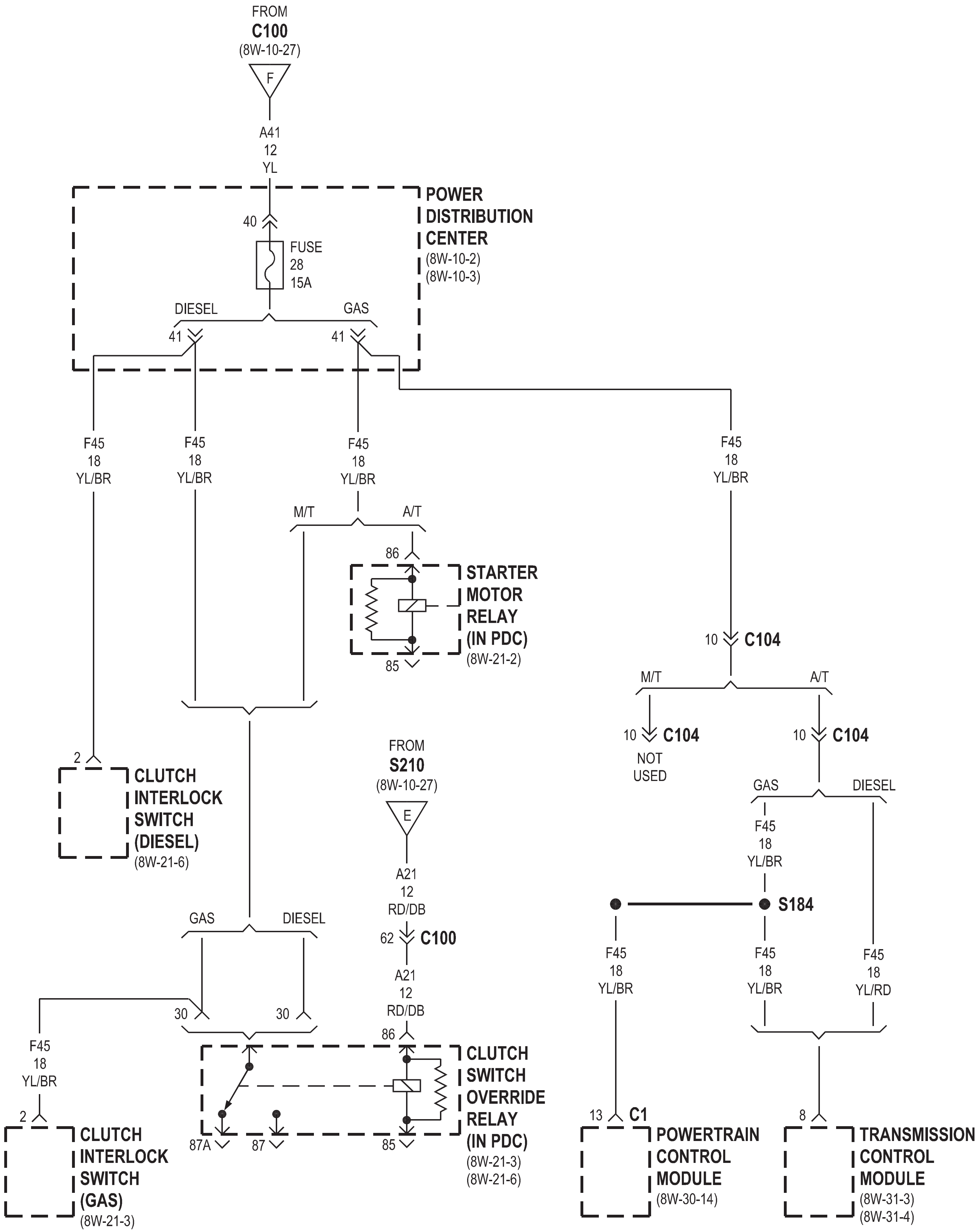
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 9 50A
9
FUSE 19 30A
23
A18 10 PK
LHD
RHD
67
C100
A4 12 BK/PK
LHD
RHD
71
C100
A18 10 PK
S125 •
S220 ••
A18 10 PK
A18 10 PK
A4 12 BK/PK
34 C3
40 C3
3 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
DEFOGGER RELAY
(8W-48-2)
87
87A
FUSE 16 20A (8W-12-20) (8W-12-21)
FUSE 17 15A (8W-12-20) (8W-12-21)
FUSE 19 20A (8W-12-20) (8W-12-21)
FUSE 6 20A (8W-12-11)
FUSE 18 20A (8W-12-20) (8W-12-21)
FUSE 30 10A (8W-12-27)
• LHD
•• RHD

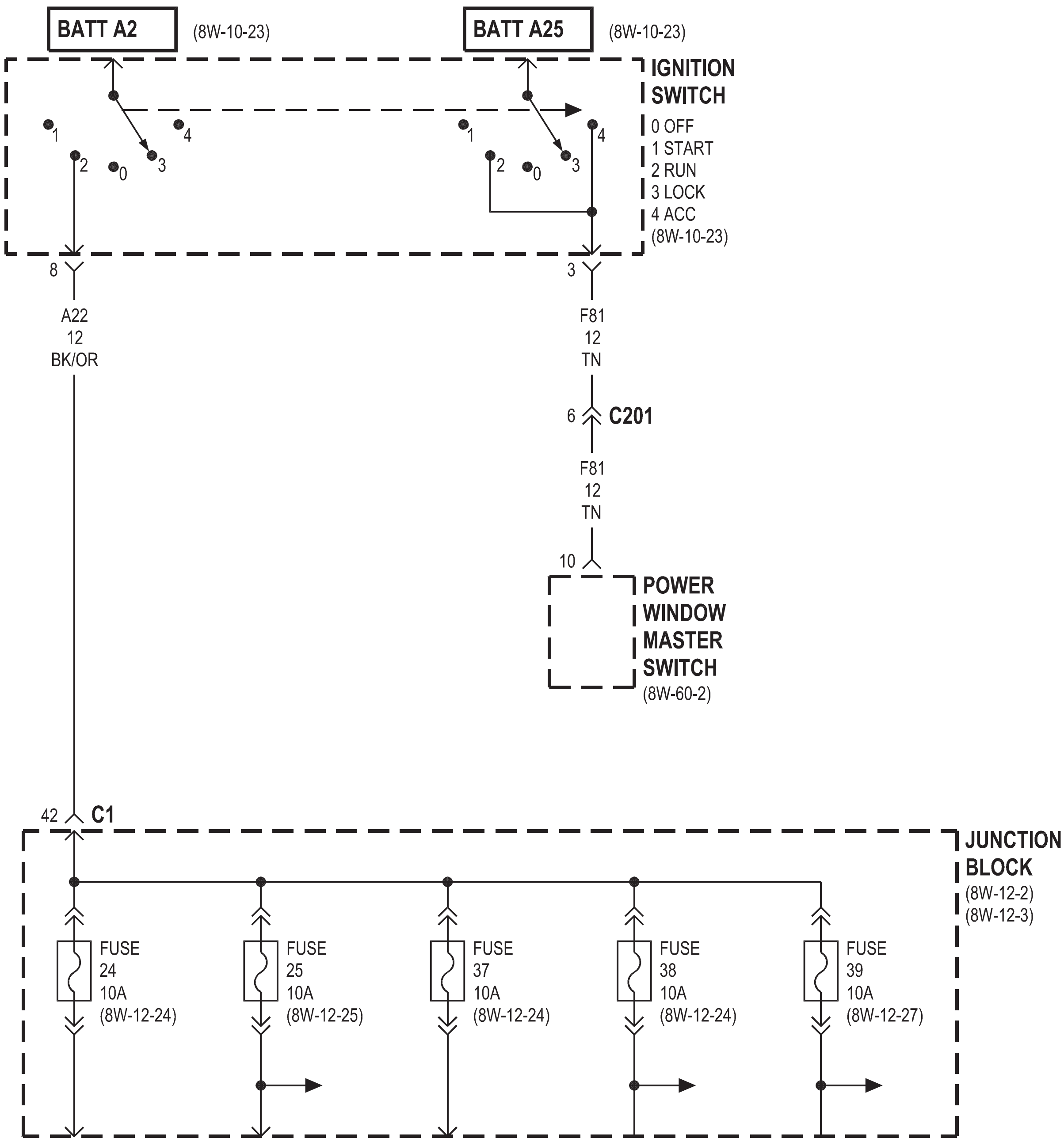

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
15
50A
15
LHD
RHD
A12
10
RD/TN
65
C100
S124 ●
S219 ●●
A12
10
RD/TN
A12
10
RD/TN
11
C3
1
C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
1
20A
(8W-12-9)
FUSE
3
15A
(8W-12-9)
86
30
HORN RELAY
(8W-41-2)
85
87
87A
85
30
LOW BEAM RELAY
(8W-50-3)
86
87
87A
● LHD
●● RHD



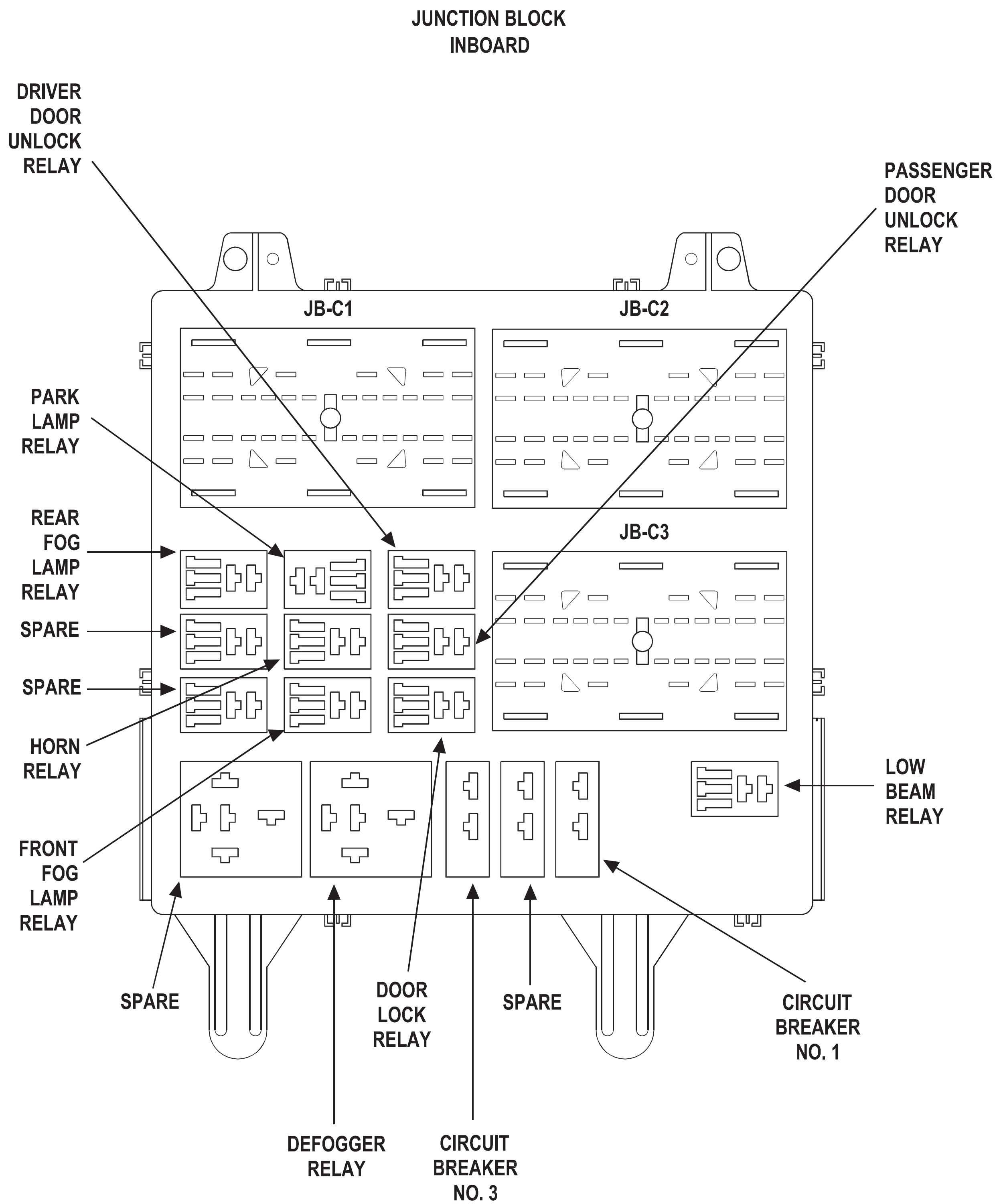
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 21 20A
FUSE 24 20A ●
26
32
A17 18 RD/BK
A17 18 RD/BK
A14 16 RD/WT
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-5)
(8W-42-7)
87
87A
C3 18 DB/BK
4 C104
C3 18 DB/BK
3.7L/DIESEL
2.4L
2 C110
C3 18 DB/BK
1
A/C COMPRESSOR CLUTCH
(8W-42-5)
(8W-42-7)
30
CABIN HEATER RELAY (IN PDC) (DIESEL)
(8W-42-7)
87
87A
C151 18 DB/WT
11 C111
C151 18 DB/WT
1
CABIN HEATER (DIESEL)
(8W-42-7)
A14 16 RD/WT
1 C104
A14 16 RD/WT
22 C1
POWERTRAIN CONTROL MODULE
(8W-30-2)
30
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
87
87A
A141 16 DG/WT
72 C100
A141 16 DG/WT
38 C201
A141 16 DG/WT
3 C307
A141 16 DG/WT
4
FUEL PUMP MODULE
(8W-30-4)
(8W-30-5)
● GAS

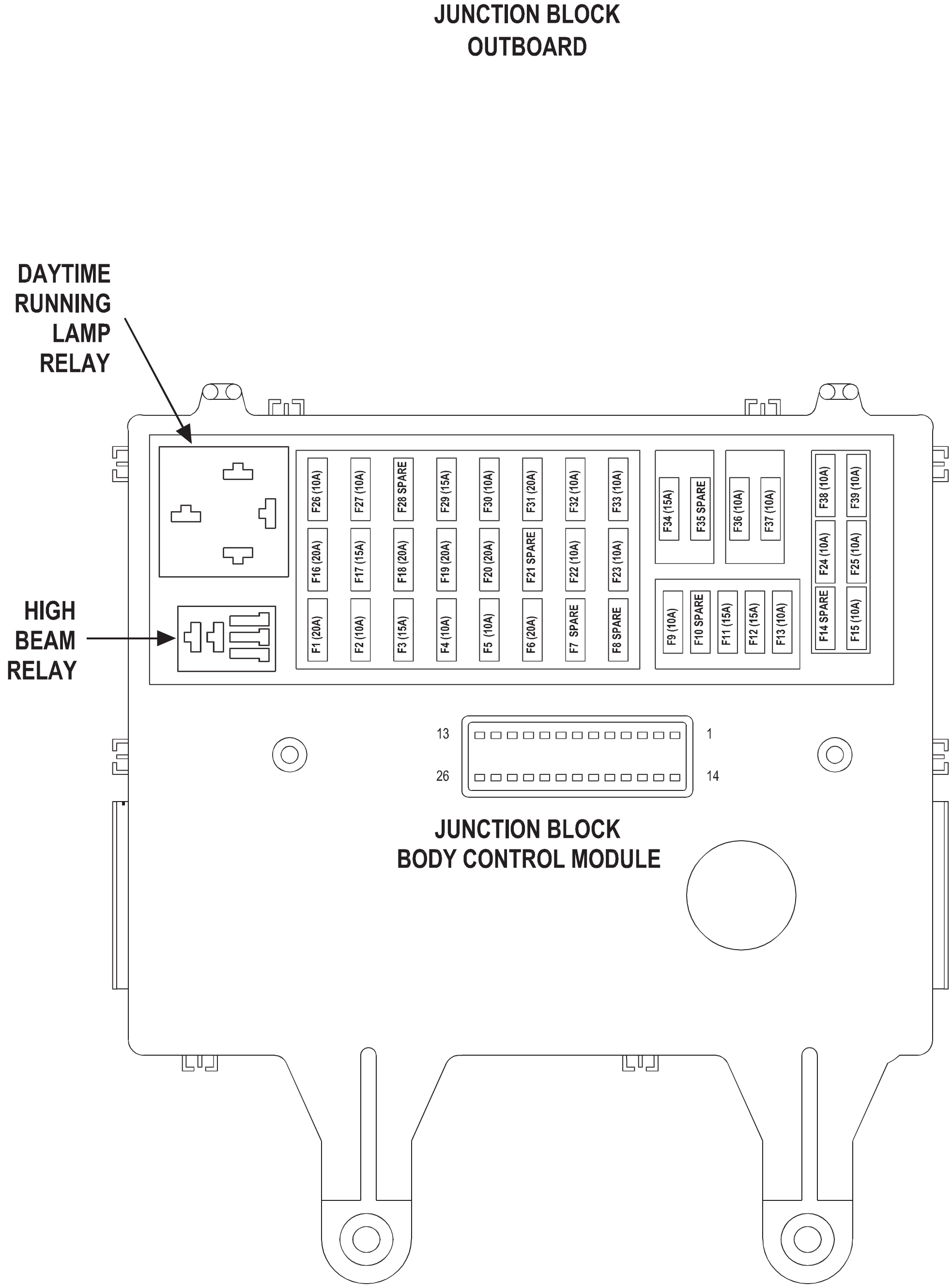

BATT A1
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
1
2
0
3
4
6
2
7
A41 12 YL
A21 12 RD/DB
61 C100
S210
A/T
M/T
A41 12 YL
A21 12 RD/DB
A21 12 RD/DB
A21 12 RD/DB
A31 12 BK/WT
62 C100
NOT USED
E
TO C100 (8W-10-28)
3 C1
40 C1
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 13 10A (8W-12-17)
FUSE 15 10A (8W-12-18) (8W-12-19)
FUSE 36 10A (8W-12-17)
FUSE 20 20A (8W-12-22) (8W-12-23)
FUSE 22 10A (8W-12-22) (8W-12-23)
FUSE 31 20A (8W-12-22) (8W-12-23)
FUSE 32 10A (8W-12-22) (8W-12-23)
CIRCUIT BREAKER NO. 3 20A (8W-12-22) (8W-12-23)
F
TO POWER DISTRIBUTION CENTER (8W-10-28)


FROM
C100
(8W-10-27)
F
A41
12
YL
40
FUSE
28
15A
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
DIESEL
GAS
41
41
F45
18
YL/BR
F45
18
YL/BR
F45
18
YL/BR
F45
18
YL/BR
M/T
A/T
86
STARTER
MOTOR
RELAY
(IN PDC)
(8W-21-2)
85
10
C104
M/T
A/T
10
C104
NOT
USED
10
C104
GAS
DIESEL
2
CLUTCH
INTERLOCK
SWITCH
(DIESEL)
(8W-21-6)
FROM
S210
(8W-10-27)
E
A21
12
RD/DB
62
C100
A21
12
RD/DB
F45
18
YL/BR
S184
F45
18
YL/BR
F45
18
YL/BR
F45
18
YL/RD
GAS
DIESEL
30
30
86
F45
18
YL/BR
2
CLUTCH
INTERLOCK
SWITCH
(GAS)
(8W-21-3)
87A
87
85
CLUTCH
SWITCH
OVERRIDE
RELAY
(IN PDC)
(8W-21-3)
(8W-21-6)
13
C1
POWERTRAIN
CONTROL
MODULE
(8W-30-14)
8
TRANSMISSION
CONTROL
MODULE
(8W-31-3)
(8W-31-4)


BATT A2
(8W-10-23)
BATT A25
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
1
2
0
3
4
8
3
A22
12
BK/OR
F81
12
TN
6
C201
F81
12
TN
10
POWER WINDOW MASTER SWITCH
(8W-60-2)
42
C1
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 24 10A (8W-12-24)
FUSE 25 10A (8W-12-25)
FUSE 37 10A (8W-12-24)
FUSE 38 10A (8W-12-24)
FUSE 39 10A (8W-12-27)

8W-12 JUNCTION BLOCK


JUNCTION BLOCK
INBOARD
DRIVER DOOR UNLOCK RELAY
PASSENGER DOOR UNLOCK RELAY
JB-C1
JB-C2
JB-C3
PARK LAMP RELAY
REAR FOG LAMP RELAY
SPARE
SPARE
HORN RELAY
FRONT FOG LAMP RELAY
LOW BEAM RELAY
SPARE
DOOR LOCK RELAY
SPARE
CIRCUIT BREAKER NO. 1
DEFOGGER RELAY
CIRCUIT BREAKER NO. 3


JUNCTION BLOCK
OUTBOARD
DAYTIME
RUNNING
LAMP
RELAY
HIGH
BEAM
RELAY
F26 (10A)
F27 (10A)
F28 SPARE
F29 (15A)
F30 (10A)
F31 (20A)
F32 (10A)
F33 (10A)
F16 (20A)
F17 (15A)
F18 (20A)
F19 (20A)
F20 (20A)
F21 SPARE
F22 (10A)
F23 (10A)
F1 (20A)
F2 (10A)
F3 (15A)
F4 (10A)
F5 (10A)
F6 (20A)
F7 SPARE
F8 SPARE
F34 (15A)
F35 SPARE
F36 (10A)
F37 (10A)
F9 (10A)
F10 SPARE
F11 (15A)
F12 (15A)
F13 (10A)
F38 (10A)
F39 (10A)
F24 (10A)
F25 (10A)
F14 SPARE
F15 (10A)
13
1
26
14
JUNCTION BLOCK
BODY CONTROL MODULE

FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F38 16RD/WT	FUSED B(+)
2	10A	INTERNAL	FUSED B(+)
3	15A	INTERNAL	FUSED B(+)
4	10A	L44 18VT/RD	FUSED B(+)
5	10A	L43 18VT	FUSED (B+)
6	20A	INTERNAL	FUSED B(+)
7	-	SPARE	-
8	-	SPARE	-
9	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
10	-	SPARE	-
11	15A	A15 18PK/OR	FUSED B(+)
12	15A	F32 18PK/DB	FUSED B(+)
13	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	-	SPARE	-
15	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	20A	F41 16PK/VT	FUSED B(+)
17	15A	F70 18PK/BK	FUSED B(+)
18	20A	F60 16DG/RD	FUSED B(+)
19	15A	INTERNAL	FUSED B(+)
20	20A	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
21	-	SPARE	-
22	10A	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
23	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
24	10A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
25	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
26	10A	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
27	10A	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
28	-	SPARE	-
29 ◒◒◒	30A	A3 16RD/WT	FUSED B(+)
30	10A	INTERNAL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT

◒◒◒ HIGHLINE

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FUSES (CONTINUED)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
31	20A	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
32	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
33	10A	INTERNAL	FUSED B(+)
34	15A	INTERNAL	FUSED B(+)
35	-	SPARE	-
36	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
37	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
38	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
39	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)

CIRCUIT BREAKERS

C.B.	AMPS	FUSED CIRCUIT	FUNCTION
1	25A	F37 14RD/LB	FUSED B(+)
2	-	SPARE	-
3	20A	V6 18VT/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)

DAYTIME RUNNING LAMP RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	GROUND
86	INTERNAL	HIGH BEAM RELAY CONTROL
87	INTERNAL	DAYTIME RUNNING LAMP RELAY OUTPUT
87A	-	-

DEFOGGER RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	REAR WINDOW DEFOGGER RELAY CONTROL
86	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
87	INTERNAL	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

DOOR LOCK RELAY

CAVITY	CIRCUIT	FUNCTION
30	P33 18OR/BK	DOOR LOCK RELAY OUTPUT
85	INTERNAL	FUSED B(+)
86	INTERNAL	DOOR LOCK RELAY CONTROL
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

DRIVER DOOR UNLOCK RELAY

CAVITY	CIRCUIT	FUNCTION
30	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
85	INTERNAL	DRIVER DOOR UNLOCK RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

FRONT FOG LAMP RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FRONT FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	L39 16LB	FRONT FOG LAMP RELAY OUTPUT
87A	-	-

HIGH BEAM RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	HIGH BEAM RELAY CONTROL
87	INTERNAL	HIGH BEAM RELAY OUTPUT
87A	-	-

HORN RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	HORN RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	X2 18DG/RD	HORN RELAY OUTPUT
87A	-	-

LOW BEAM RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	LOW BEAM RELAY CONTROL
87	INTERNAL	LOW BEAM RELAY OUTPUT
87A	-	-

PARK LAMP RELAY

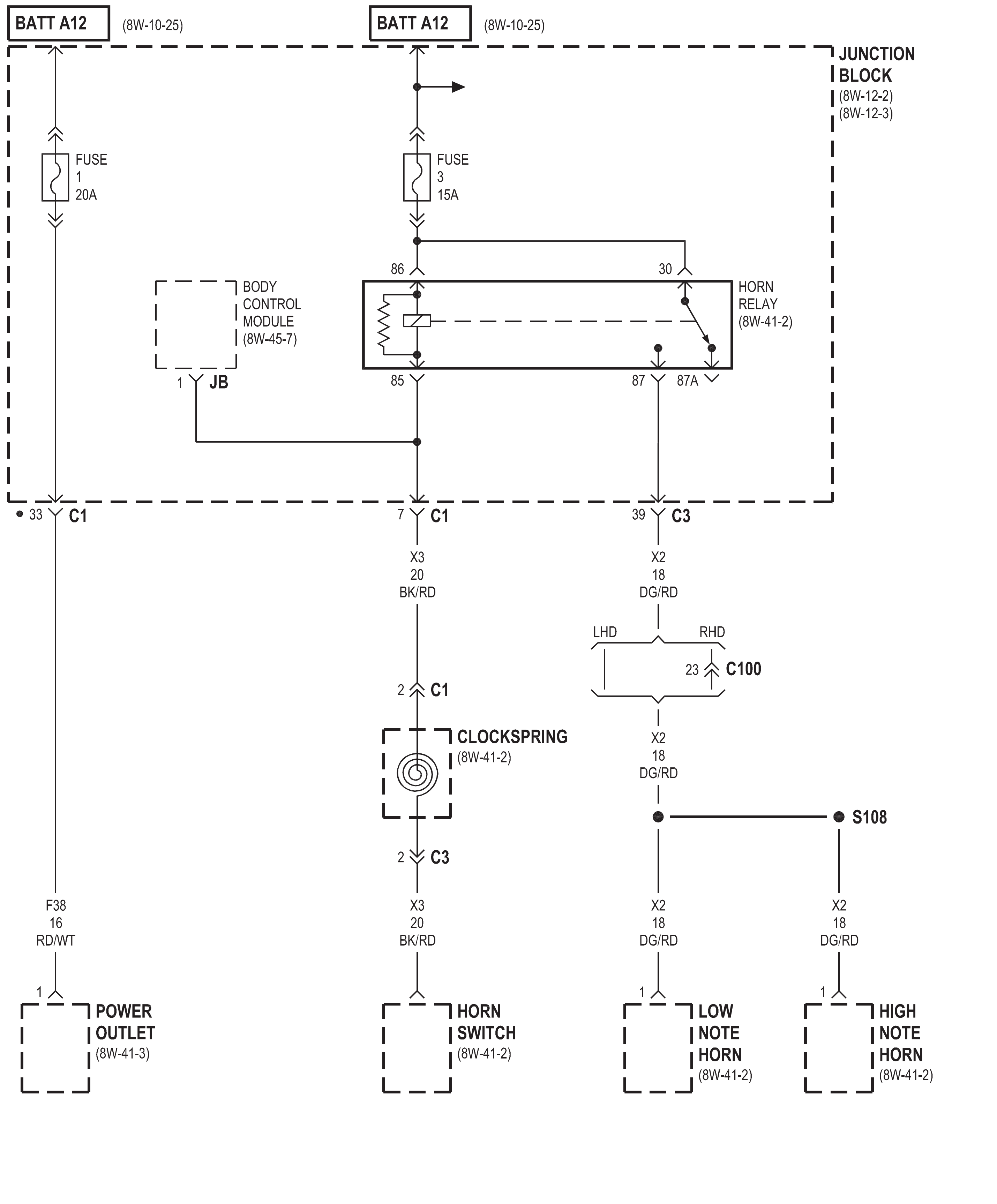
CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	PARK LAMP RELAY OUTPUT
85	INTERNAL	PARK LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

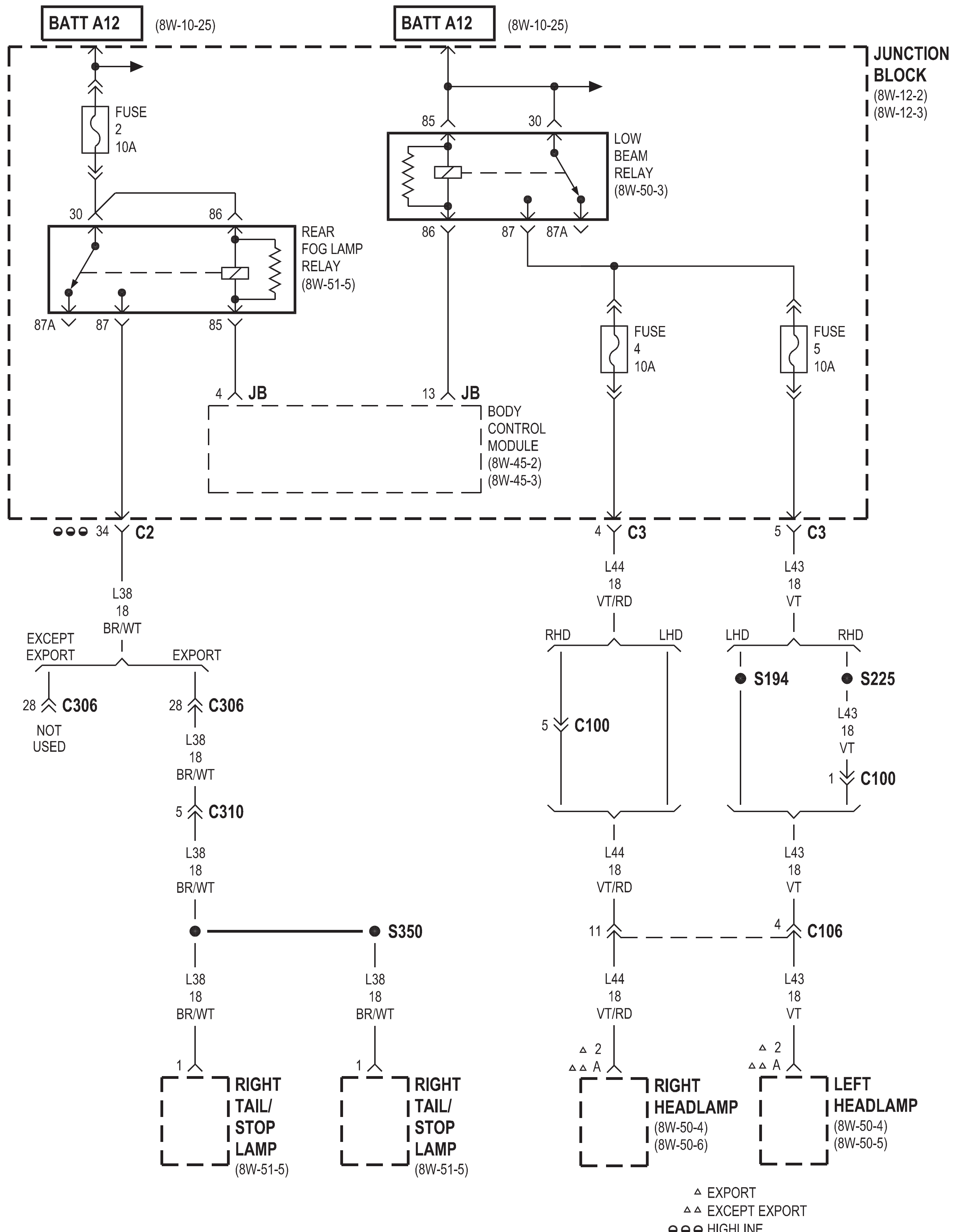
PASSENGER DOOR UNLOCK RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	PASSENGER DOOR UNLOCK RELAY OUTPUT
85	INTERNAL	PASSENGER DOOR UNLOCK RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

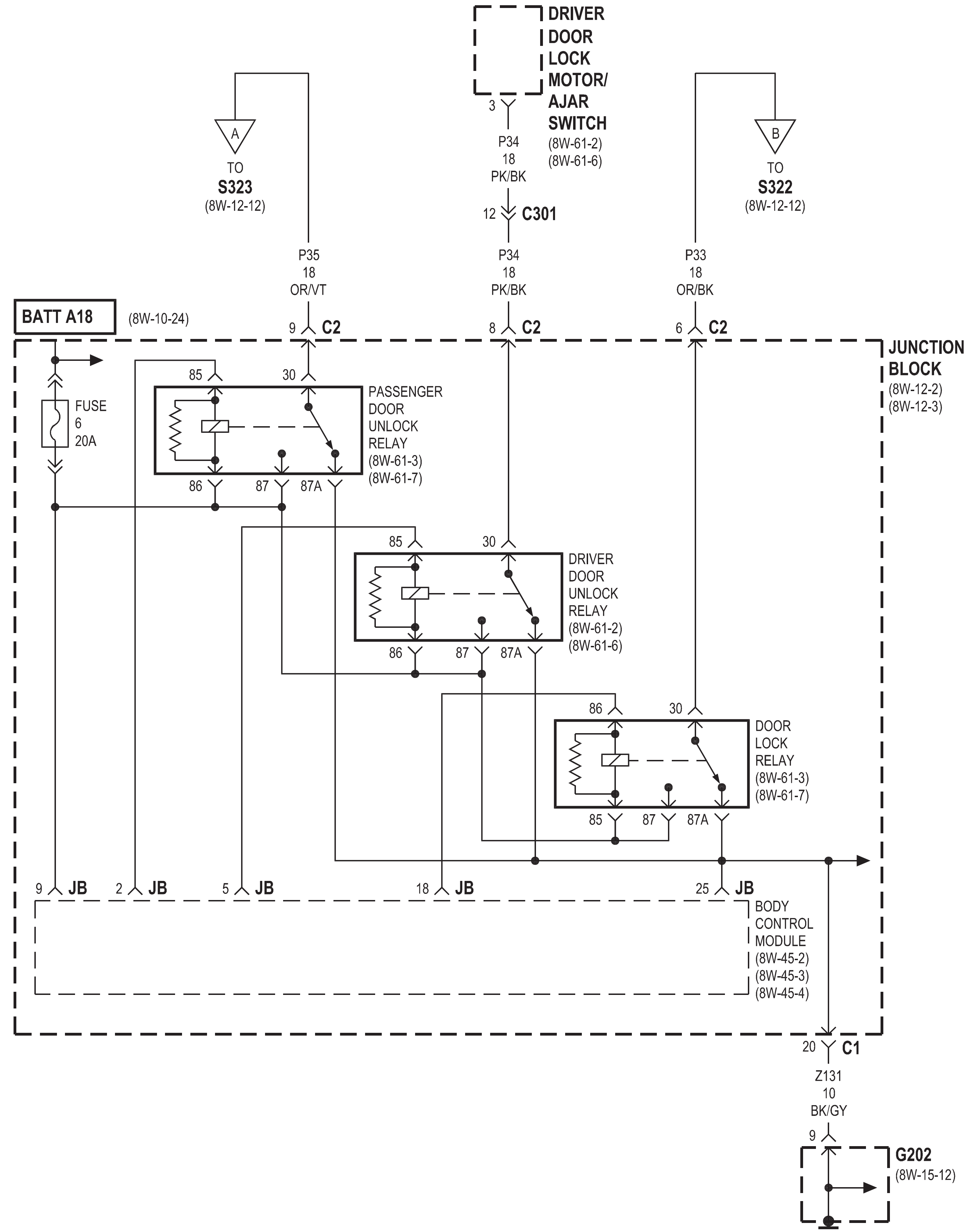
REAR FOG LAMP RELAY

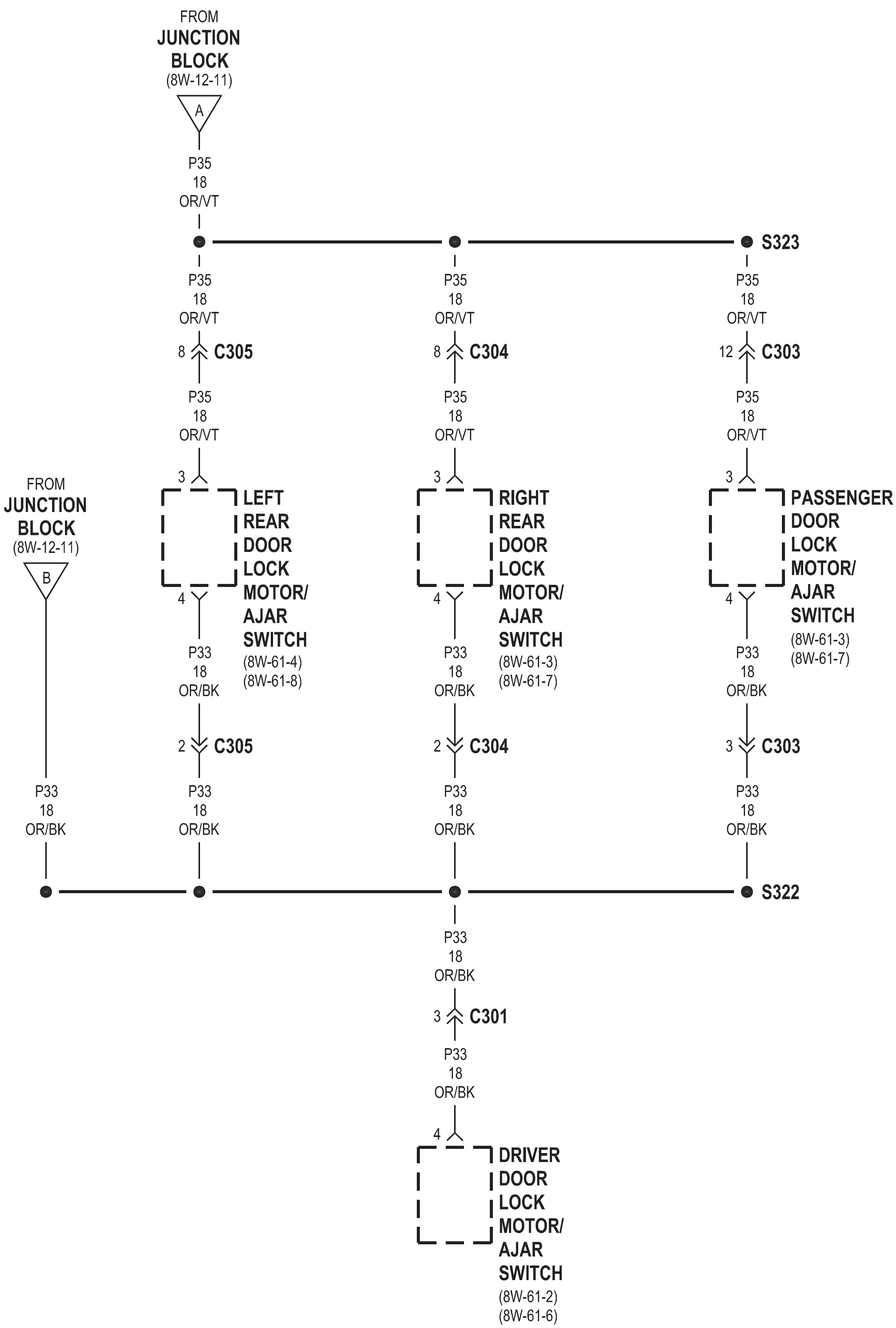
CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	REAR FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
86	INTERNAL	FUSED B(+)
87	L38 18BR/WT	REAR FOG LAMP RELAY OUTPUT
87A	-	-

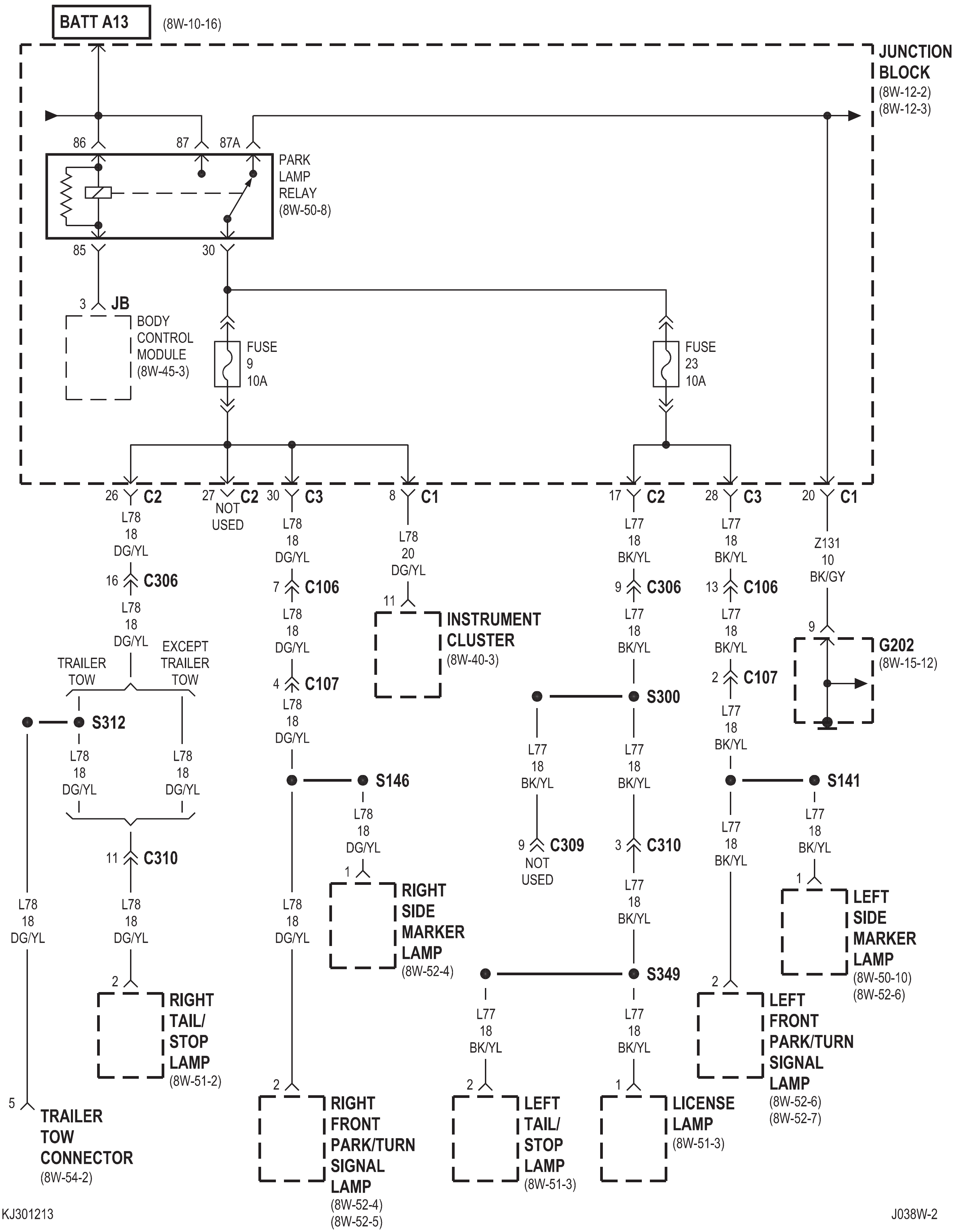

BATT A12
(8W-10-25)
BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 1 20A
FUSE 3 15A
86
30
BODY CONTROL MODULE
(8W-45-7)
HORN RELAY
(8W-41-2)
1 JB
85
87
87A
33 C1
7 C1
39 C3
X3 20 BK/RD
X2 18 DG/RD
LHD
RHD
23 C100
2 C1
CLOCKSPRING
(8W-41-2)
X2 18 DG/RD
S108
2 C3
F38 16 RD/WT
X3 20 BK/RD
X2 18 DG/RD
X2 18 DG/RD
1
1
1
POWER OUTLET
(8W-41-3)
HORN SWITCH
(8W-41-2)
LOW NOTE HORN
(8W-41-2)
HIGH NOTE HORN
(8W-41-2)
● LHD


BATT A12
(8W-10-25)
BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
2
10A
30
86
REAR FOG LAMP RELAY
(8W-51-5)
87A
87
85
85
30
LOW BEAM RELAY
(8W-50-3)
86
87
87A
FUSE
4
10A
FUSE
5
10A
4 JB
13 JB
BODY CONTROL MODULE
(8W-45-2)
(8W-45-3)
34 C2
4 C3
5 C3
L38
18
BR/WT
EXCEPT EXPORT
EXPORT
28 C306
NOT USED
28 C306
L38
18
BR/WT
5 C310
L38
18
BR/WT
S350
L38
18
BR/WT
L38
18
BR/WT
1
RIGHT TAIL/ STOP LAMP
(8W-51-5)
1
RIGHT TAIL/ STOP LAMP
(8W-51-5)
L44
18
VT/RD
RHD
LHD
5 C100
L44
18
VT/RD
11
L44
18
VT/RD
2
A
RIGHT HEADLAMP
(8W-50-4)
(8W-50-6)
L43
18
VT
LHD
RHD
S194
S225
L43
18
VT
1 C100
L43
18
VT
4 C106
L43
18
VT
2
A
LEFT HEADLAMP
(8W-50-4)
(8W-50-5)
EXPORT
EXCEPT EXPORT
HIGHLINE

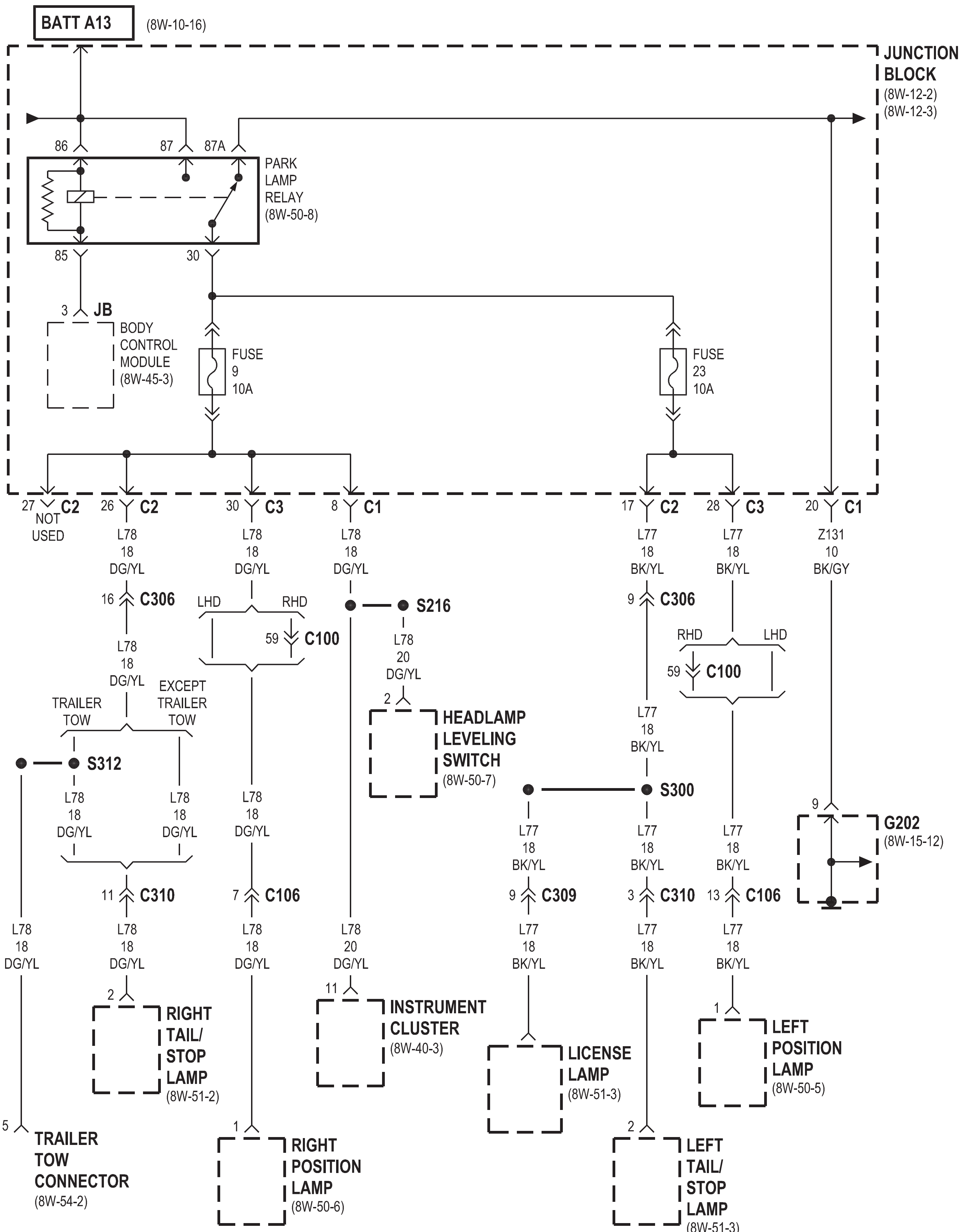
EXCEPT BASE

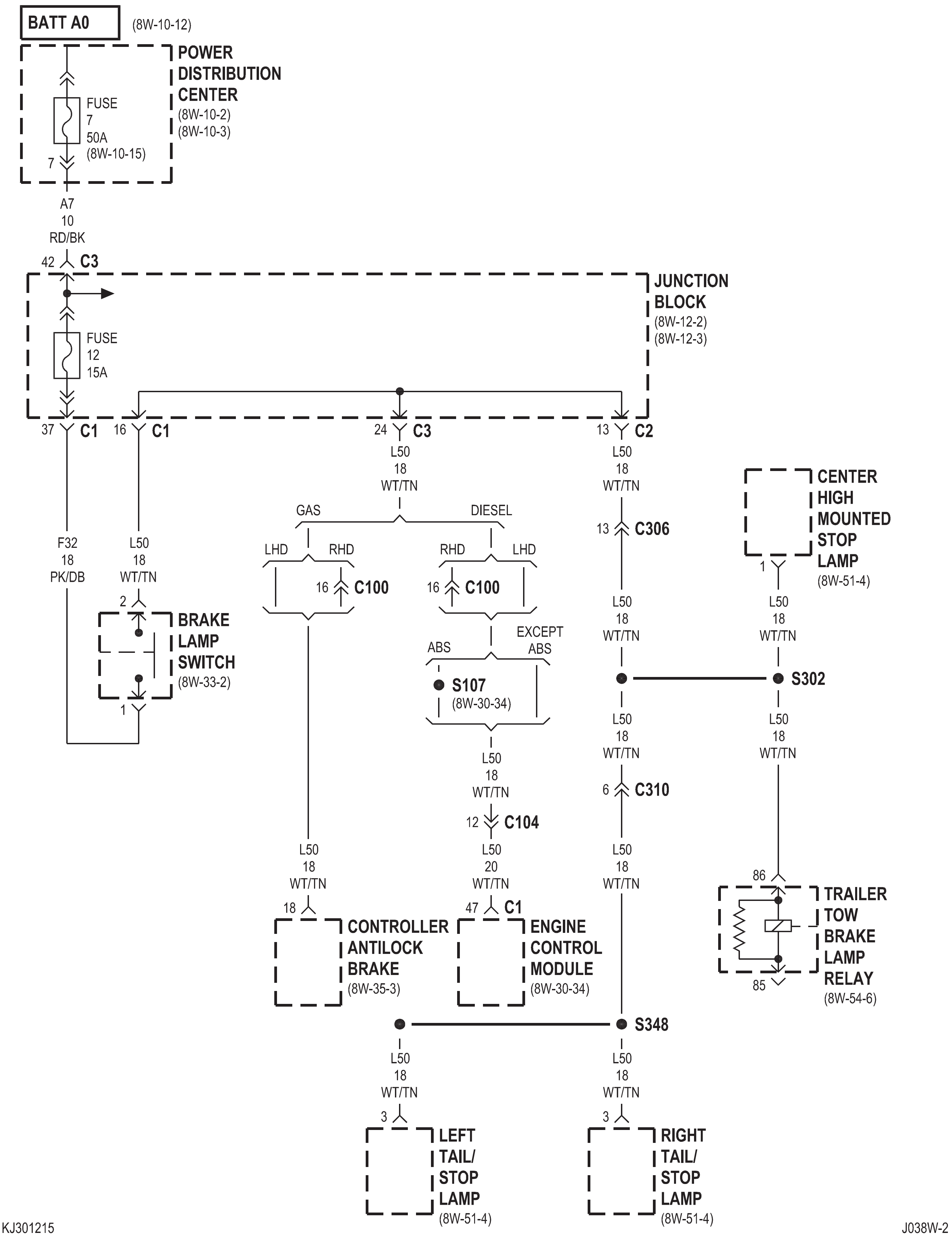

DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-2)
(8W-61-6)
3
P34
18
PK/BK
12 C301
A
TO
S323
(8W-12-12)
B
TO
S322
(8W-12-12)
P35
18
OR/VT
P34
18
PK/BK
P33
18
OR/BK
BATT A18
(8W-10-24)
9 C2
8 C2
6 C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
20A
85
30
86
87
87A
PASSENGER DOOR UNLOCK RELAY
(8W-61-3)
(8W-61-7)
DRIVER DOOR UNLOCK RELAY
(8W-61-2)
(8W-61-6)
DOOR LOCK RELAY
(8W-61-3)
(8W-61-7)
9 JB
2 JB
5 JB
18 JB
25 JB
BODY CONTROL MODULE
(8W-45-2)
(8W-45-3)
(8W-45-4)
20 C1
Z131
10
BK/GY
9
G202
(8W-15-12)


FROM
JUNCTION
BLOCK
(8W-12-11)
A
P35
18
OR/VT
S323
P35
18
OR/VT
8 C305
P35
18
OR/VT
3
LEFT
REAR
DOOR
LOCK
MOTOR/
AJAR
SWITCH
(8W-61-4)
(8W-61-8)
4
P33
18
OR/BK
2 C305
P35
18
OR/VT
8 C304
P35
18
OR/VT
3
RIGHT
REAR
DOOR
LOCK
MOTOR/
AJAR
SWITCH
(8W-61-3)
(8W-61-7)
4
P33
18
OR/BK
2 C304
P35
18
OR/VT
12 C303
P35
18
OR/VT
3
PASSENGER
DOOR
LOCK
MOTOR/
AJAR
SWITCH
(8W-61-3)
(8W-61-7)
4
P33
18
OR/BK
3 C303
FROM
JUNCTION
BLOCK
(8W-12-11)
B
P33
18
OR/BK
P33
18
OR/BK
P33
18
OR/BK
P33
18
OR/BK
S322
P33
18
OR/BK
3 C301
P33
18
OR/BK
4
DRIVER
DOOR
LOCK
MOTOR/
AJAR
SWITCH
(8W-61-2)
(8W-61-6)

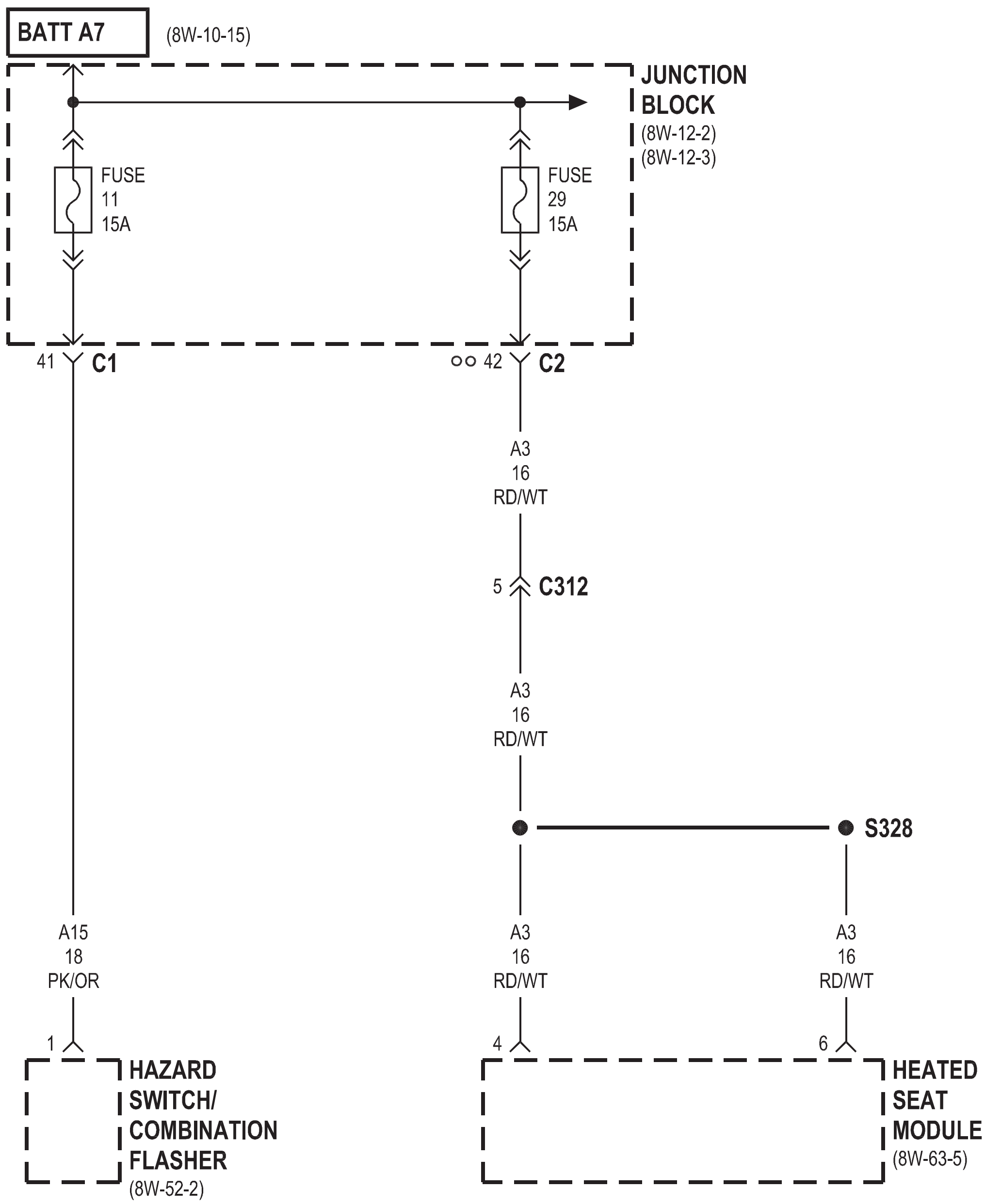

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
87
87A
PARK LAMP RELAY
(8W-50-8)
85
30
3 JB
BODY CONTROL MODULE
(8W-45-3)
FUSE 9 10A
FUSE 23 10A
26 C2
27 C2 NOT USED
30 C3
8 C1
17 C2
28 C3
20 C1
L78 18 DG/YL
L78 20 DG/YL
L77 18 BK/YL
Z131 10 BK/GY
16 C306
9 C306
7 C106
13 C106
4 C107
2 C107
11
INSTRUMENT CLUSTER
(8W-40-3)
9
G202
(8W-15-12)
TRAILER TOW
EXCEPT TRAILER TOW
S312
S300
S146
S141
9 C309 NOT USED
3 C310
11 C310
1
RIGHT SIDE MARKER LAMP
(8W-52-4)
LEFT SIDE MARKER LAMP
(8W-50-10)
(8W-52-6)
S349
2
RIGHT TAIL/ STOP LAMP
(8W-51-2)
LEFT FRONT PARK/TURN SIGNAL LAMP
(8W-52-6)
(8W-52-7)
5
TRAILER TOW CONNECTOR
(8W-54-2)
RIGHT FRONT PARK/TURN SIGNAL LAMP
(8W-52-4)
(8W-52-5)
LEFT TAIL/ STOP LAMP
(8W-51-3)
LICENSE LAMP
(8W-51-3)

EXPORT

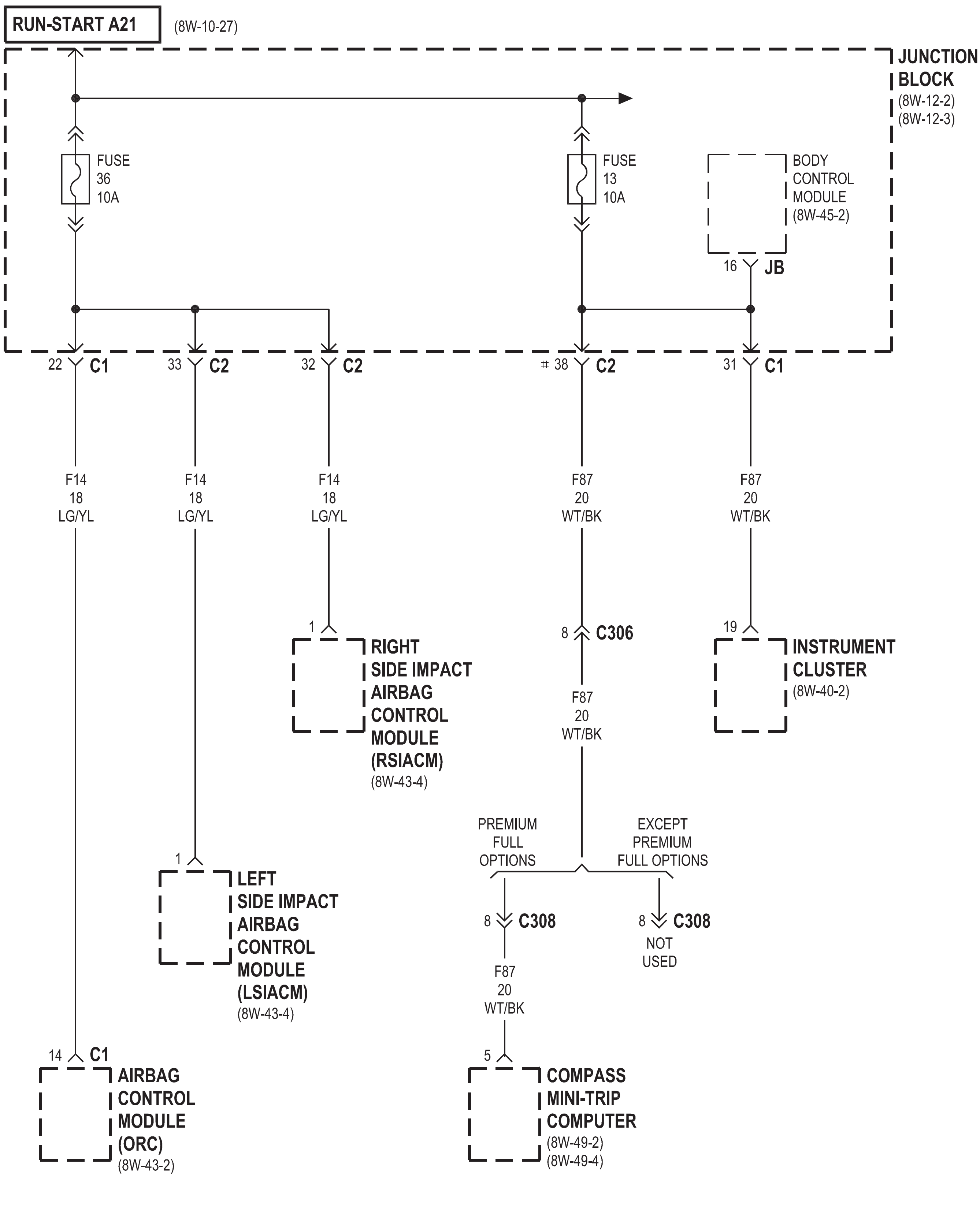

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
87
87A
PARK LAMP RELAY
(8W-50-8)
85
30
3 JB
BODY CONTROL MODULE
(8W-45-3)
FUSE 9 10A
FUSE 23 10A
27 C2 NOT USED
26 C2
30 C3
8 C1
17 C2
28 C3
20 C1
L78 18 DG/YL
L77 18 BK/YL
Z131 10 BK/GY
16 C306
9 C306
LHD
RHD
59 C100
S216
L78 20 DG/YL
2
HEADLAMP LEVELING SWITCH
(8W-50-7)
TRAILER TOW
EXCEPT TRAILER TOW
S312
S300
9
G202
(8W-15-12)
11 C310
7 C106
9 C309
3 C310
13 C106
11
INSTRUMENT CLUSTER
(8W-40-3)
RIGHT TAIL/ STOP LAMP
(8W-51-2)
LICENSE LAMP
(8W-51-3)
1
LEFT POSITION LAMP
(8W-50-5)
5
TRAILER TOW CONNECTOR
(8W-54-2)
RIGHT POSITION LAMP
(8W-50-6)
LEFT TAIL/ STOP LAMP
(8W-51-3)



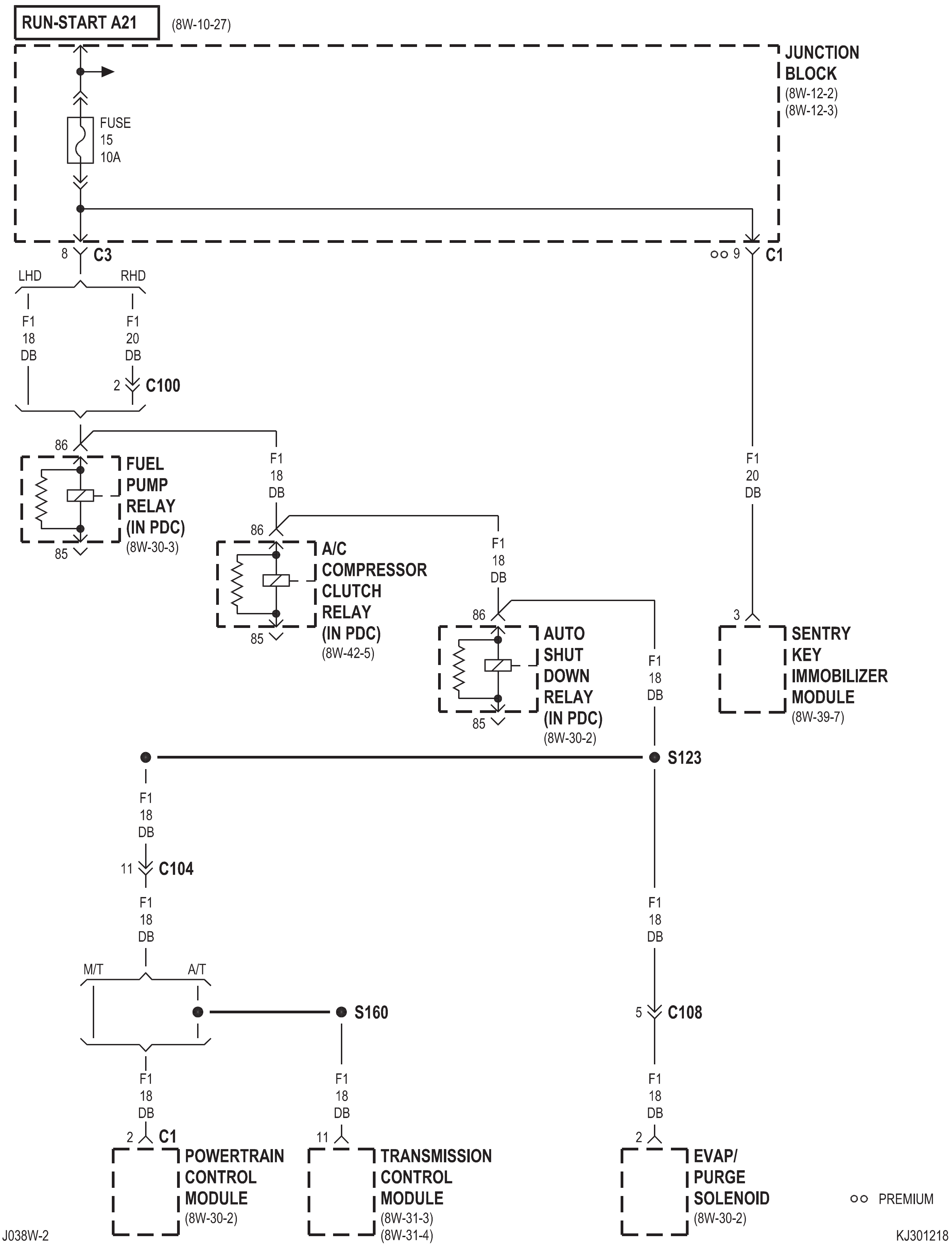
BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
7
50A
(8W-10-15)
7
A7
10
RD/BK
42
C3
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
12
15A
37
C1
16
C1
24
C3
13
C2
L50
18
WT/TN
L50
18
WT/TN
F32
18
PK/DB
L50
18
WT/TN
2
BRAKE
LAMP
SWITCH
(8W-33-2)
1
GAS
DIESEL
LHD
RHD
RHD
LHD
16
C100
16
C100
ABS
EXCEPT
ABS
S107
(8W-30-34)
L50
18
WT/TN
12
C104
L50
20
WT/TN
47
C1
ENGINE
CONTROL
MODULE
(8W-30-34)
L50
18
WT/TN
18
CONTROLLER
ANTILOCK
BRAKE
(8W-35-3)
13
C306
L50
18
WT/TN
CENTER
HIGH
MOUNTED
STOP
LAMP
(8W-51-4)
1
L50
18
WT/TN
S302
L50
18
WT/TN
L50
18
WT/TN
6
C310
L50
18
WT/TN
86
TRAILER
TOW
BRAKE
LAMP
RELAY
(8W-54-6)
85
S348
L50
18
WT/TN
L50
18
WT/TN
3
LEFT
TAIL/
STOP
LAMP
(8W-51-4)
3
RIGHT
TAIL/
STOP
LAMP
(8W-51-4)


BATT A7
(8W-10-15)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
11
15A
FUSE
29
15A
41
C1
42
C2
A3
16
RD/WT
5
C312
A3
16
RD/WT
S328
A15
18
PK/OR
A3
16
RD/WT
A3
16
RD/WT
1
4
6
HAZARD
SWITCH/
COMBINATION
FLASHER
(8W-52-2)
HEATED
SEAT
MODULE
(8W-63-5)

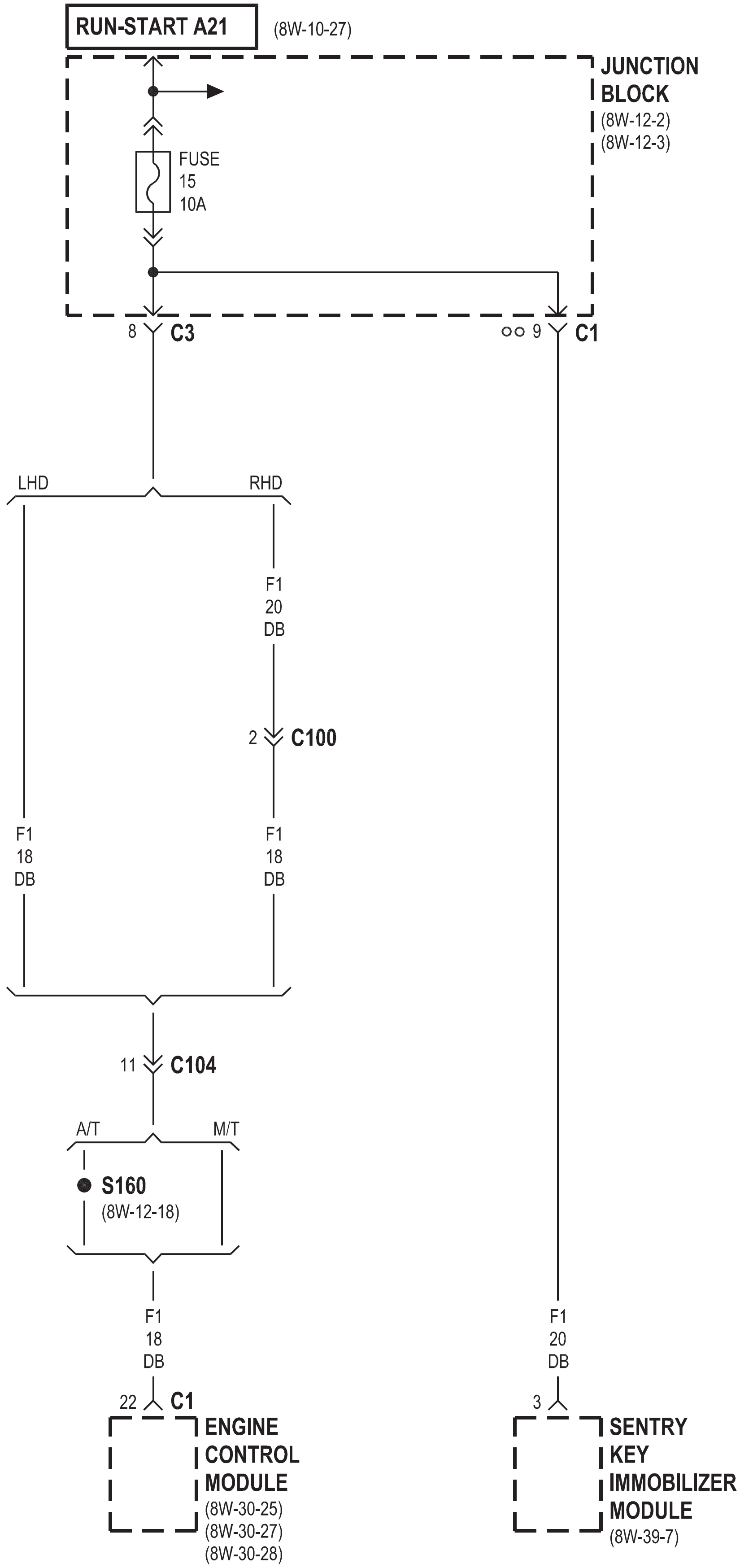
HIGHLINE



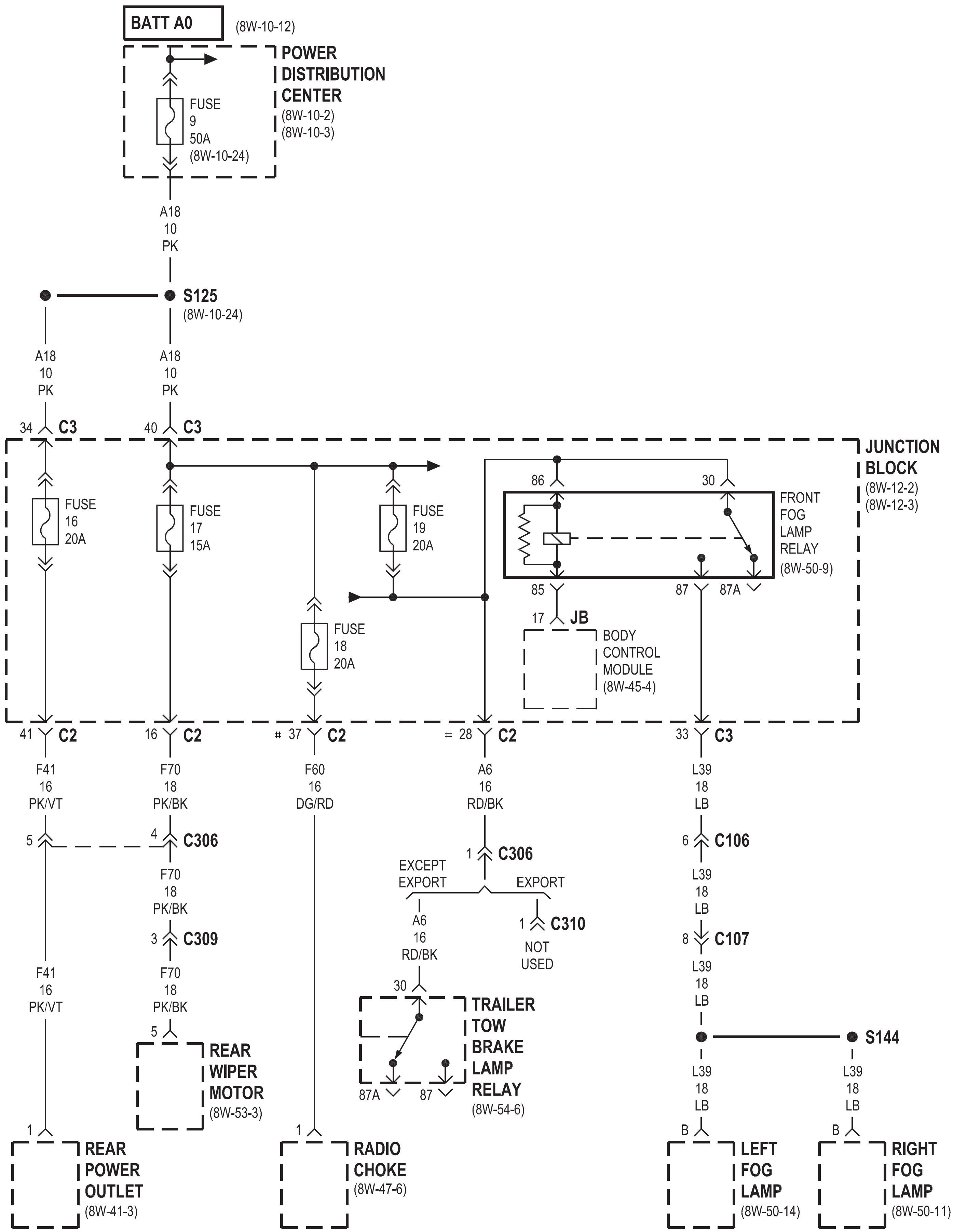
MIDLINE/HIGHLINE

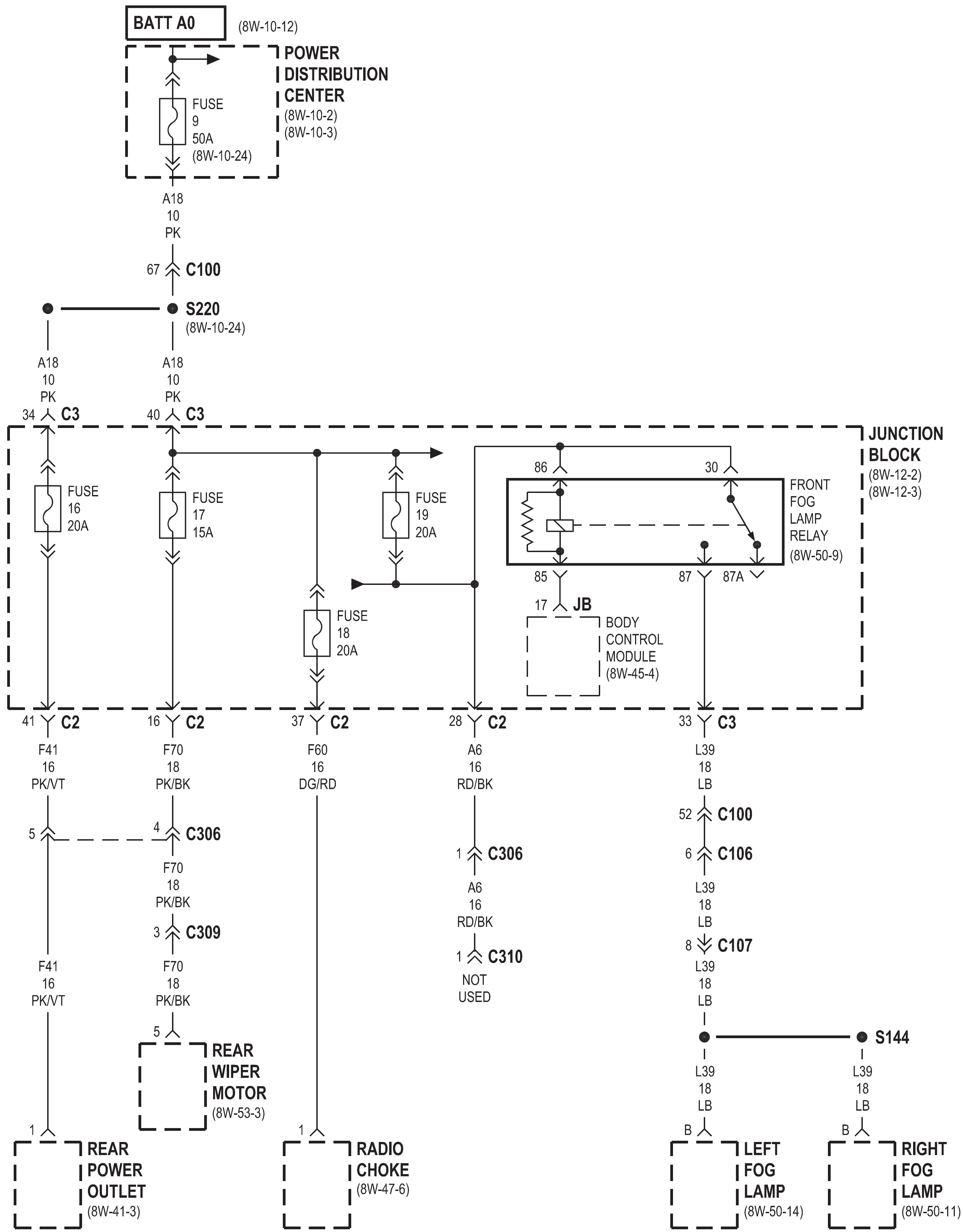

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
8
C3
9
C1
LHD
RHD
F1
18
DB
F1
20
DB
2
C100
86
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
85
F1
18
DB
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-5)
85
F1
18
DB
86
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-2)
85
F1
18
DB
F1
20
DB
3
SENTRY KEY IMMOBILIZER MODULE
(8W-39-7)
S123
F1
18
DB
11
C104
F1
18
DB
M/T
A/T
S160
F1
18
DB
5
C108
F1
18
DB
F1
18
DB
F1
18
DB
2
C1
POWERTRAIN CONTROL MODULE
(8W-30-2)
11
TRANSMISSION CONTROL MODULE
(8W-31-3)
(8W-31-4)
2
EVAP/ PURGE SOLENOID
(8W-30-2)
○○ PREMIUM

DIESEL

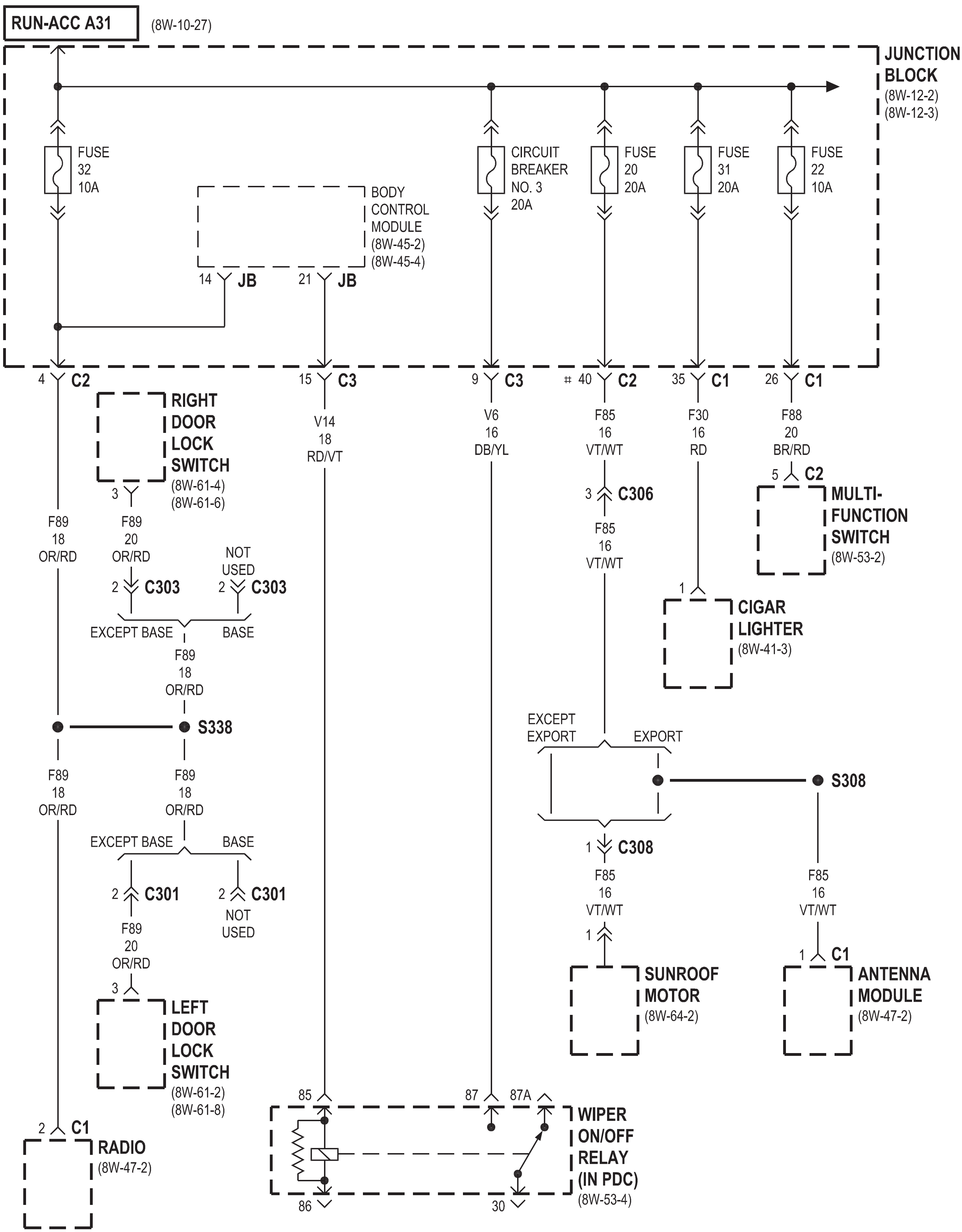

RUN-START A21
(8W-10-27)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
8
C3
9
C1
LHD
RHD
F1
20
DB
2
C100
F1
18
DB
F1
18
DB
11
C104
A/T
M/T
S160
(8W-12-18)
F1
18
DB
F1
20
DB
22
C1
ENGINE
CONTROL
MODULE
(8W-30-25)
(8W-30-27)
(8W-30-28)
3
SENTRY
KEY
IMMOBILIZER
MODULE
(8W-39-7)
PREMIUM

LHD

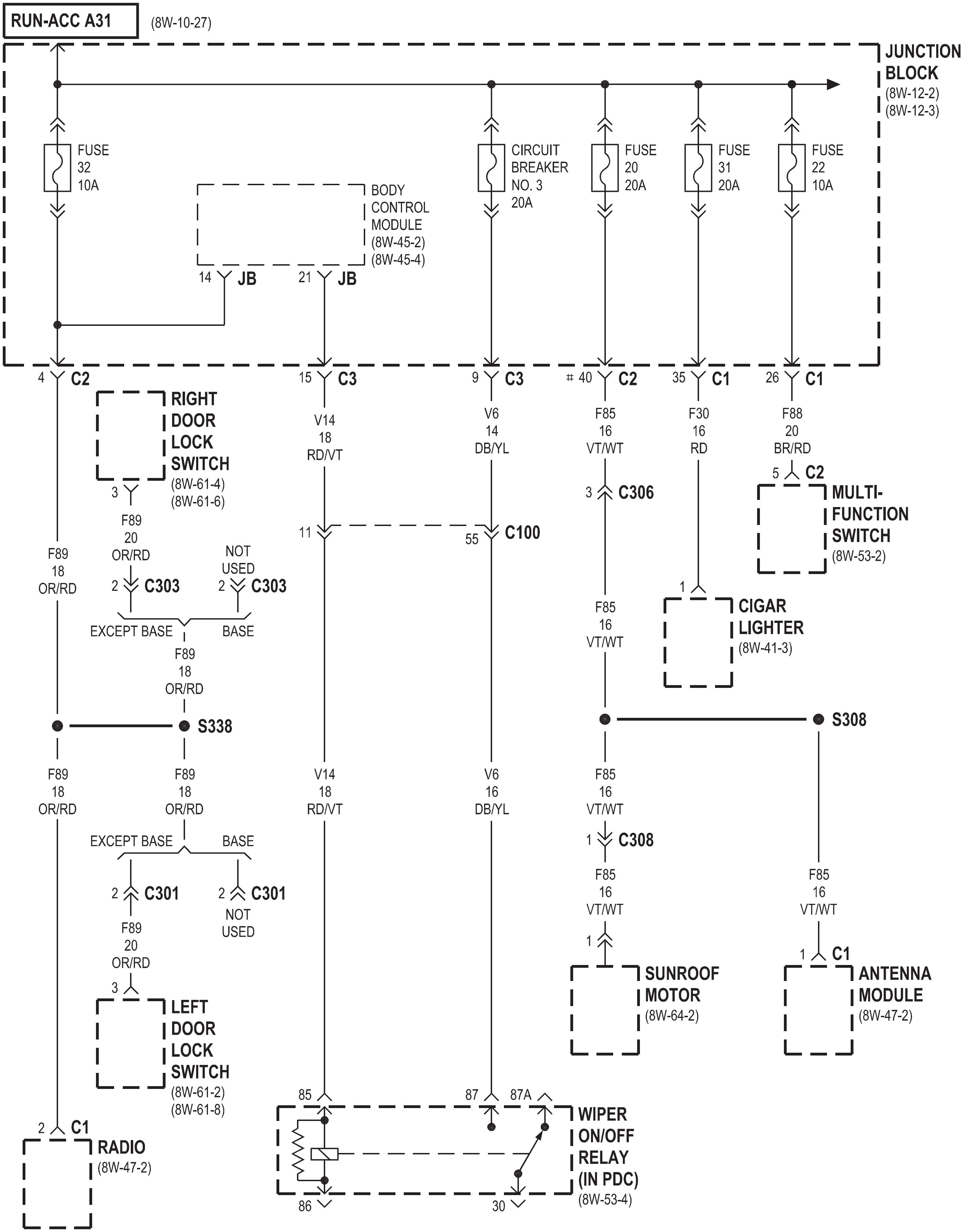

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 9 50A (8W-10-24)
A18 10 PK
S125
(8W-10-24)
A18 10 PK
A18 10 PK
34 C3
40 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 16 20A
FUSE 17 15A
FUSE 19 20A
FUSE 18 20A
86
30
85
87
87A
FRONT FOG LAMP RELAY
(8W-50-9)
17 JB
BODY CONTROL MODULE
(8W-45-4)
41 C2
16 C2
37 C2
28 C2
33 C3
F41 16 PK/VT
F70 18 PK/BK
F60 16 DG/RD
A6 16 RD/BK
L39 18 LB
5
4 C306
F70 18 PK/BK
3 C309
F41 16 PK/VT
F70 18 PK/BK
5
REAR WIPER MOTOR
(8W-53-3)
1 C306
EXCEPT EXPORT
EXPORT
A6 16 RD/BK
1 C310
NOT USED
30
TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)
87A
87
6 C106
L39 18 LB
8 C107
L39 18 LB
S144
L39 18 LB
L39 18 LB
1
REAR POWER OUTLET
(8W-41-3)
1
RADIO CHOKE
(8W-47-6)
B
LEFT FOG LAMP
(8W-50-14)
B
RIGHT FOG LAMP
(8W-50-11)
MIDLINE/HIGHLINE

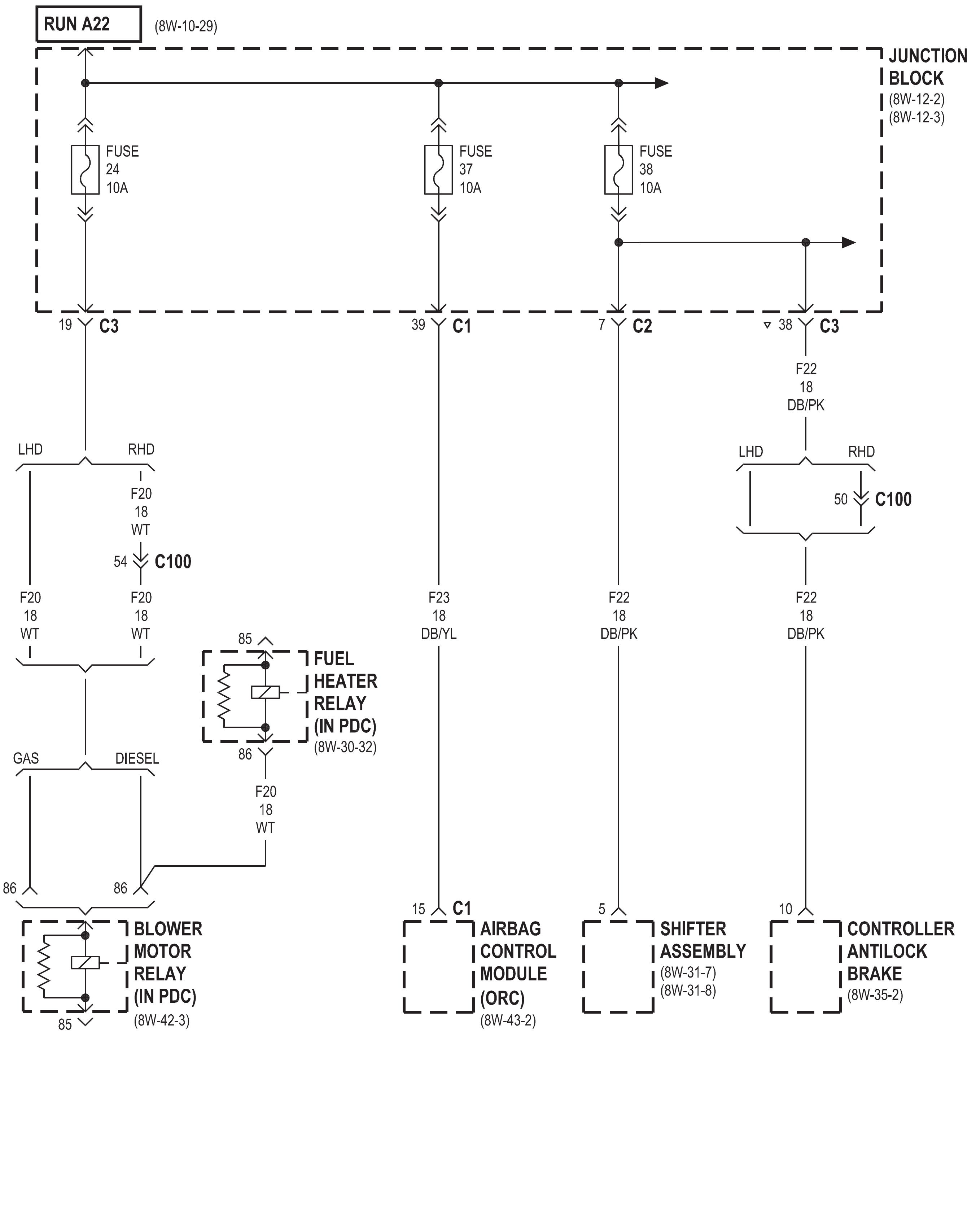


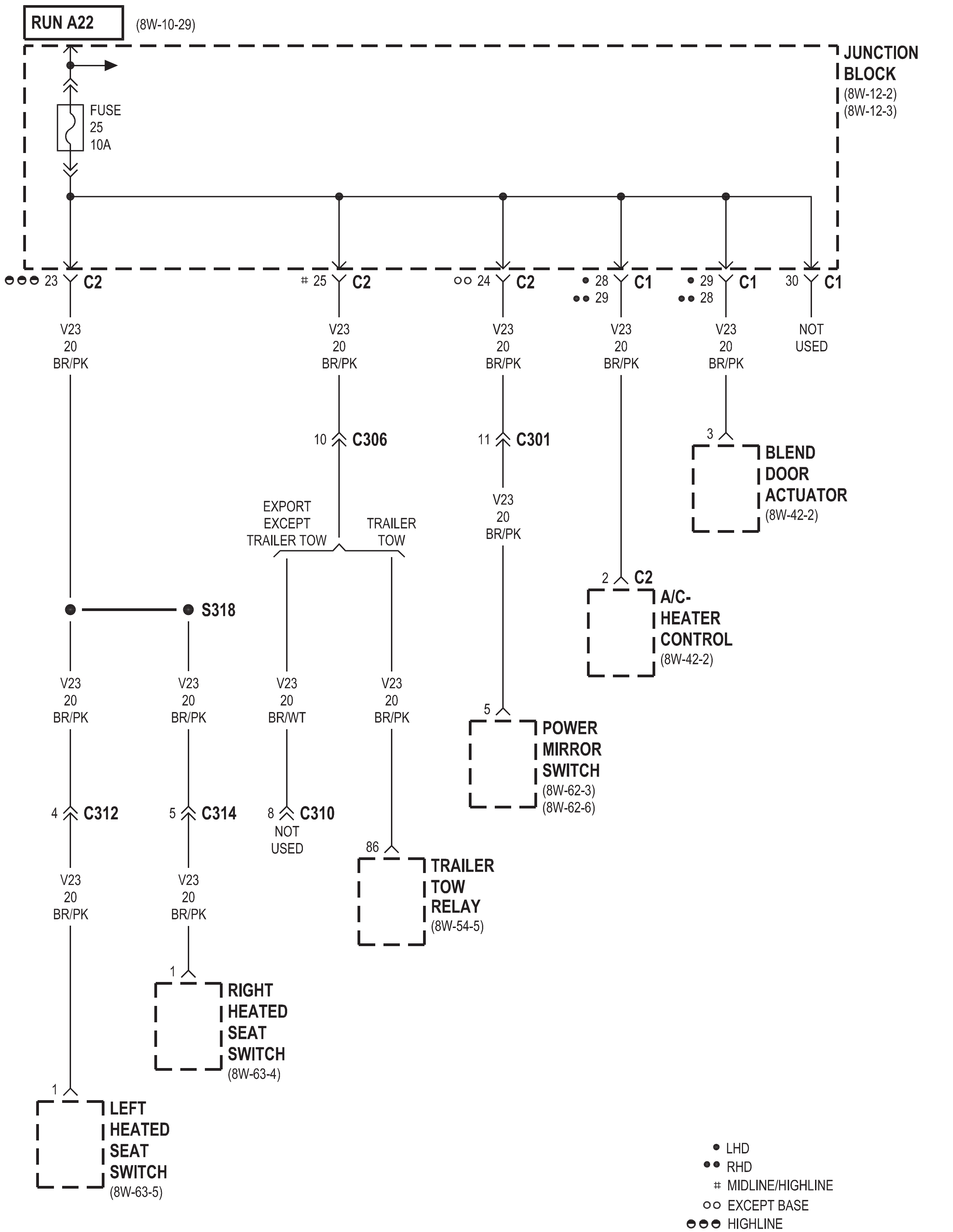
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 9 50A (8W-10-24)
A18 10 PK
67 C100
S220
(8W-10-24)
A18 10 PK
A18 10 PK
34 C3
40 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 16 20A
FUSE 17 15A
FUSE 19 20A
FUSE 18 20A
86
30
FRONT FOG LAMP RELAY
(8W-50-9)
85
87
87A
17 JB
BODY CONTROL MODULE
(8W-45-4)
41 C2
16 C2
37 C2
28 C2
33 C3
F41 16 PK/VT
F70 18 PK/BK
F60 16 DG/RD
A6 16 RD/BK
L39 18 LB
52 C100
5
4 C306
1 C306
6 C106
F70 18 PK/BK
A6 16 RD/BK
L39 18 LB
3 C309
8 C107
1 C310
NOT USED
F41 16 PK/VT
F70 18 PK/BK
L39 18 LB
5
REAR WIPER MOTOR
(8W-53-3)
S144
L39 18 LB
L39 18 LB
1
1
B
B
REAR POWER OUTLET
(8W-41-3)
RADIO CHOKE
(8W-47-6)
LEFT FOG LAMP
(8W-50-14)
RIGHT FOG LAMP
(8W-50-11)



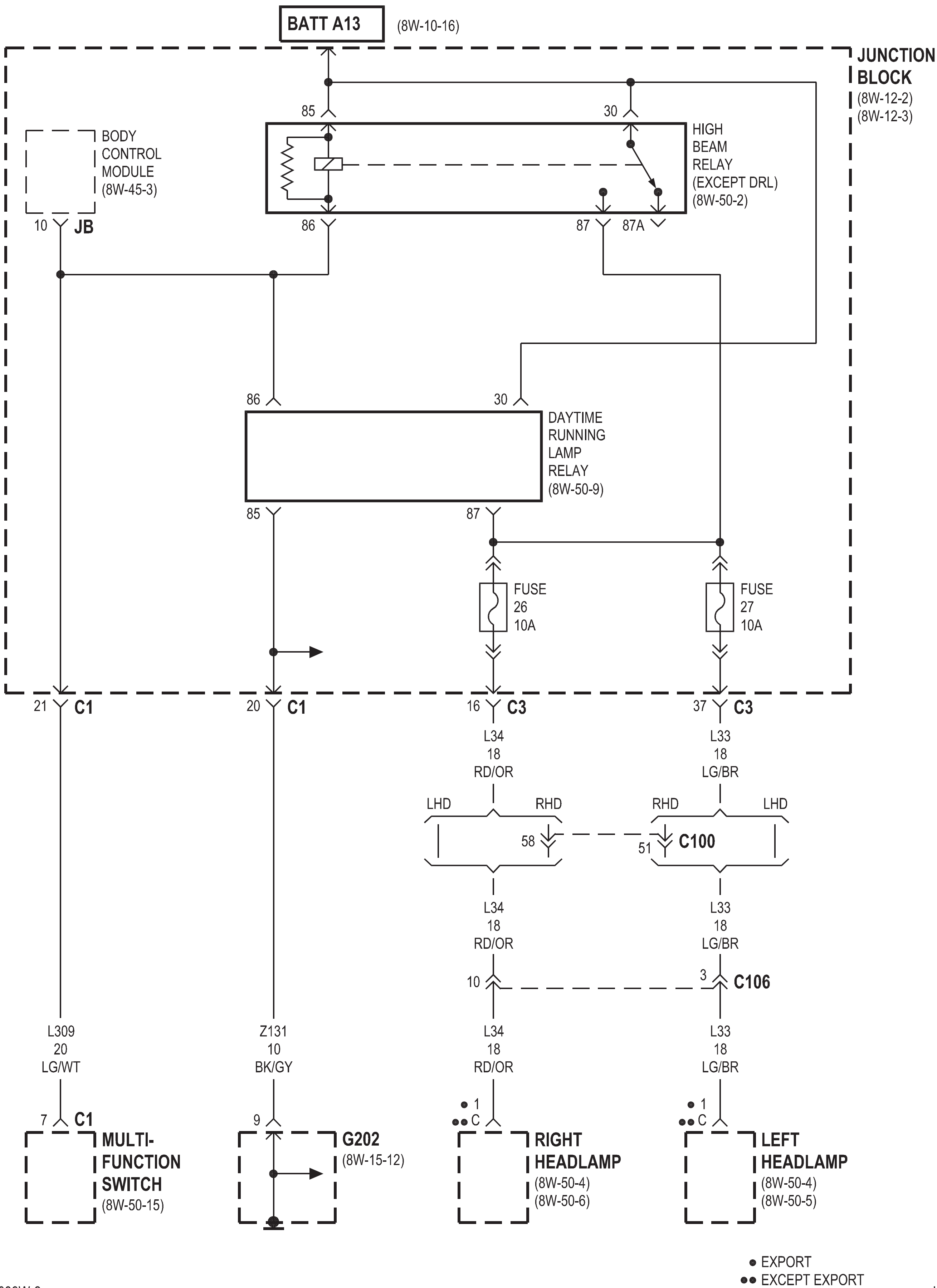
MIDLINE/HIGHLINE

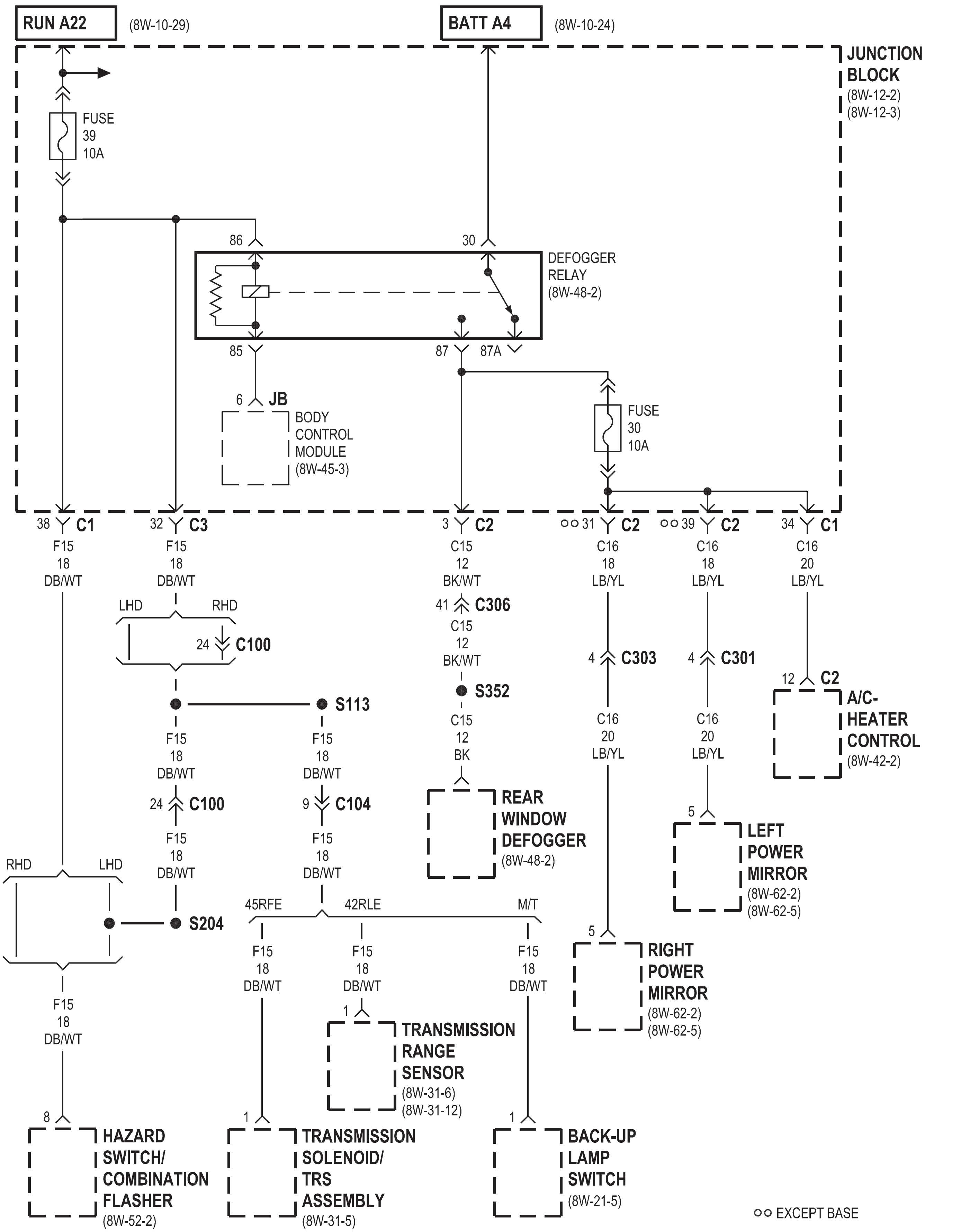

RUN-ACC A31
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 32 10A
BODY CONTROL MODULE
(8W-45-2)
(8W-45-4)
14 JB
21 JB
CIRCUIT BREAKER NO. 3 20A
FUSE 20 20A
FUSE 31 20A
FUSE 22 10A
4 C2
15 C3
9 C3
40 C2
35 C1
26 C1
RIGHT DOOR LOCK SWITCH
(8W-61-4)
(8W-61-6)
3
F89 20 OR/RD
V14 18 RD/VT
V6 14 DB/YL
F85 16 VT/WT
F30 16 RD
F88 20 BR/RD
5 C2
MULTI-FUNCTION SWITCH
(8W-53-2)
3 C306
11
55 C100
F89 18 OR/RD
NOT USED
2 C303
2 C303
EXCEPT BASE
BASE
F89 18 OR/RD
1
CIGAR LIGHTER
(8W-41-3)
F85 16 VT/WT
S338
S308
F89 18 OR/RD
F89 18 OR/RD
V14 18 RD/VT
V6 16 DB/YL
F85 16 VT/WT
EXCEPT BASE
BASE
1 C308
2 C301
2 C301
F89 20 OR/RD
NOT USED
F85 16 VT/WT
F85 16 VT/WT
1
1 C1
SUNROOF MOTOR
(8W-64-2)
ANTENNA MODULE
(8W-47-2)
3
LEFT DOOR LOCK SWITCH
(8W-61-2)
(8W-61-8)
85
87
87A
WIPER ON/OFF RELAY (IN PDC)
(8W-53-4)
86
30
2 C1
RADIO
(8W-47-2)
MIDLINE/HIGHLINE

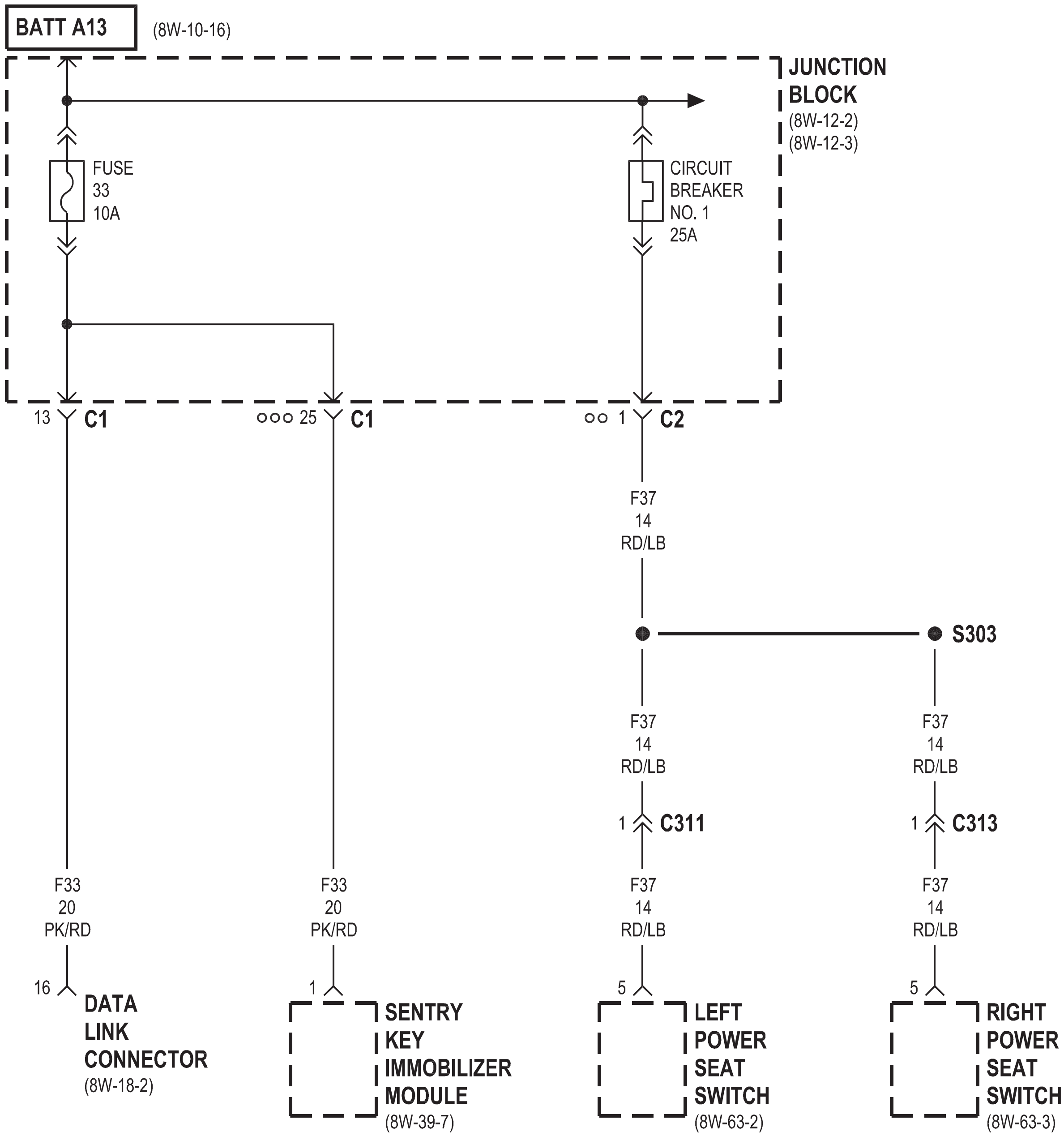

RUN A22
(8W-10-29)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
24
10A
FUSE
37
10A
FUSE
38
10A
19
C3
39
C1
7
C2
38
C3
F22
18
DB/PK
LHD
RHD
F20
18
WT
54
C100
LHD
RHD
50
C100
F20
18
WT
F20
18
WT
F23
18
DB/YL
F22
18
DB/PK
F22
18
DB/PK
85
FUEL
HEATER
RELAY
(IN PDC)
(8W-30-32)
86
GAS
DIESEL
F20
18
WT
86
86
15
C1
5
10
BLOWER
MOTOR
RELAY
(IN PDC)
(8W-42-3)
85
AIRBAG
CONTROL
MODULE
(ORC)
(8W-43-2)
SHIFTER
ASSEMBLY
(8W-31-7)
(8W-31-8)
CONTROLLER
ANTILOCK
BRAKE
(8W-35-2)
▽ ABS



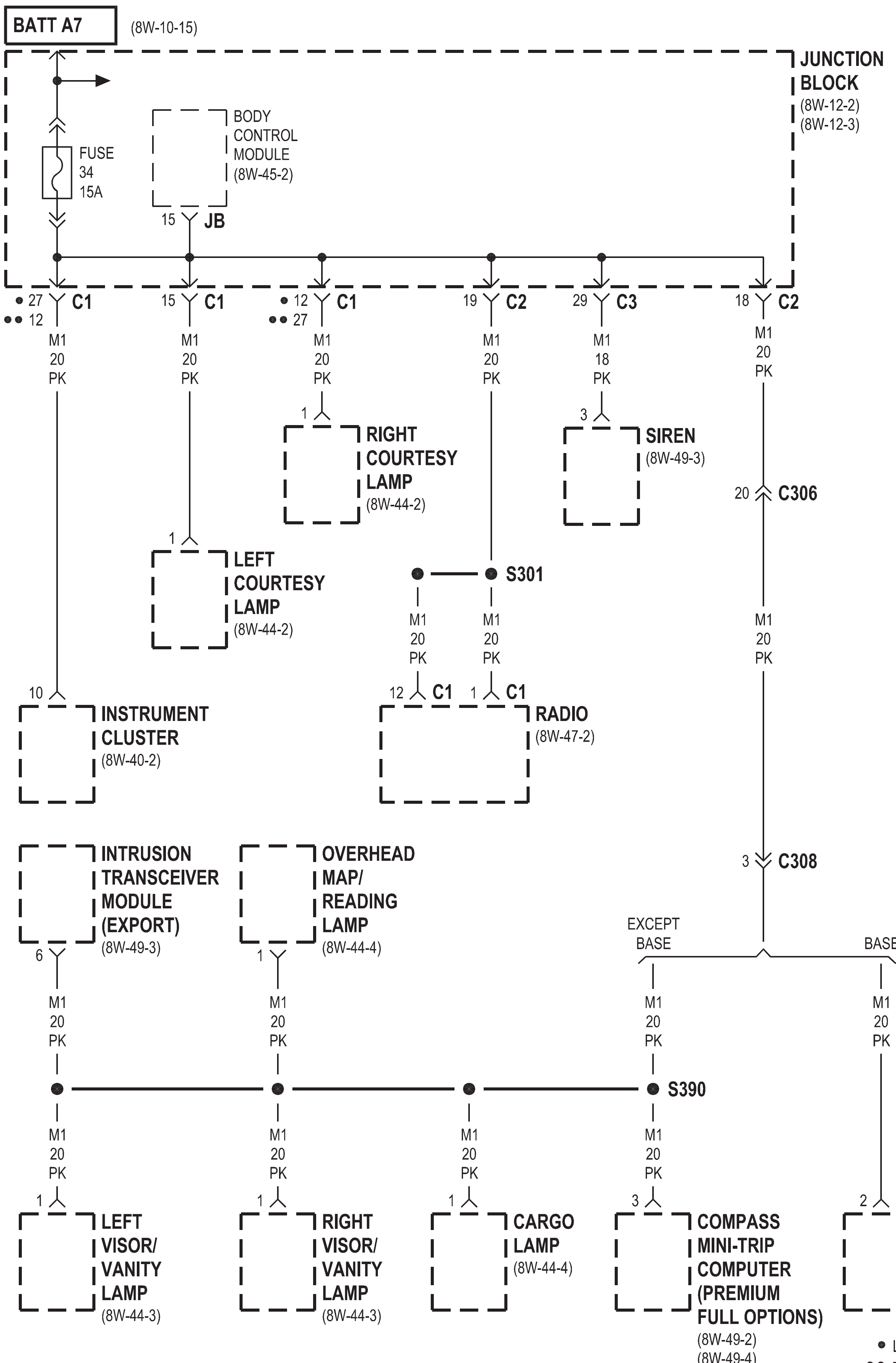
RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 25 10A
23 C2
25 C2
24 C2
28 C1
29
29 C1
28
30 C1
V23 20 BR/PK
NOT USED
10 C306
11 C301
3
BLEND DOOR ACTUATOR
(8W-42-2)
EXPORT EXCEPT TRAILER TOW
TRAILER TOW
2 C2
A/C-HEATER CONTROL
(8W-42-2)
S318
V23 20 BR/WT
5
POWER MIRROR SWITCH
(8W-62-3)
(8W-62-6)
4 C312
5 C314
8 C310
NOT USED
86
TRAILER TOW RELAY
(8W-54-5)
1
RIGHT HEATED SEAT SWITCH
(8W-63-4)
1
LEFT HEATED SEAT SWITCH
(8W-63-5)
LHD
RHD
MIDLINE/HIGHLINE
EXCEPT BASE
HIGHLINE


BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-3)
10 JB
85
30
86
87
87A
HIGH BEAM RELAY (EXCEPT DRL)
(8W-50-2)
86
30
DAYTIME RUNNING LAMP RELAY
(8W-50-9)
85
87
FUSE 26 10A
FUSE 27 10A
21 C1
20 C1
16 C3
37 C3
L34 18 RD/OR
L33 18 LG/BR
LHD
RHD
RHD
LHD
58
51
C100
L34 18 RD/OR
L33 18 LG/BR
10
3
C106
L309 20 LG/WT
Z131 10 BK/GY
L34 18 RD/OR
L33 18 LG/BR
7 C1
9
● 1
●● C
● 1
●● C
MULTI-FUNCTION SWITCH
(8W-50-15)
G202
(8W-15-12)
RIGHT HEADLAMP
(8W-50-4)
(8W-50-6)
LEFT HEADLAMP
(8W-50-4)
(8W-50-5)
● EXPORT
●● EXCEPT EXPORT

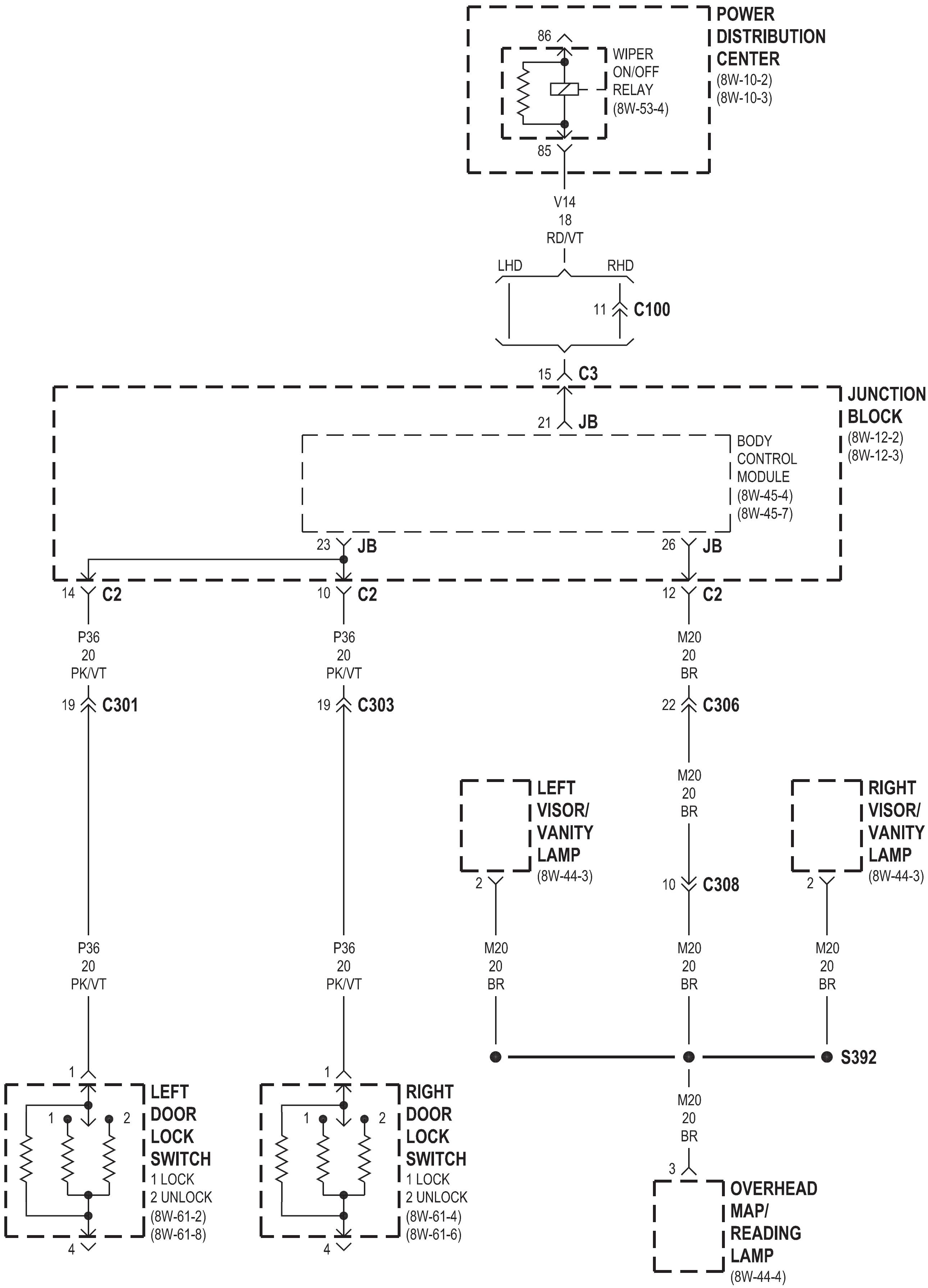

RUN A22
(8W-10-29)
BATT A4
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 39 10A
86
30
DEFOGGER RELAY
(8W-48-2)
85
87
87A
6 JB
BODY CONTROL MODULE
(8W-45-3)
FUSE 30 10A
38 C1
32 C3
3 C2
31 C2
39 C2
34 C1
F15 18 DB/WT
C15 12 BK/WT
C16 18 LB/YL
C16 20 LB/YL
LHD
RHD
24 C100
41 C306
C15 12 BK/WT
S352
C15 12 BK
4 C303
4 C301
12 C2
A/C-HEATER CONTROL
(8W-42-2)
S113
F15 18 DB/WT
24 C100
9 C104
REAR WINDOW DEFOGGER
(8W-48-2)
5
LEFT POWER MIRROR
(8W-62-2)
(8W-62-5)
RHD
LHD
S204
45RFE
42RLE
M/T
5
RIGHT POWER MIRROR
(8W-62-2)
(8W-62-5)
1
TRANSMISSION RANGE SENSOR
(8W-31-6)
(8W-31-12)
8
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
1
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)
1
BACK-UP LAMP SWITCH
(8W-21-5)
○○ EXCEPT BASE



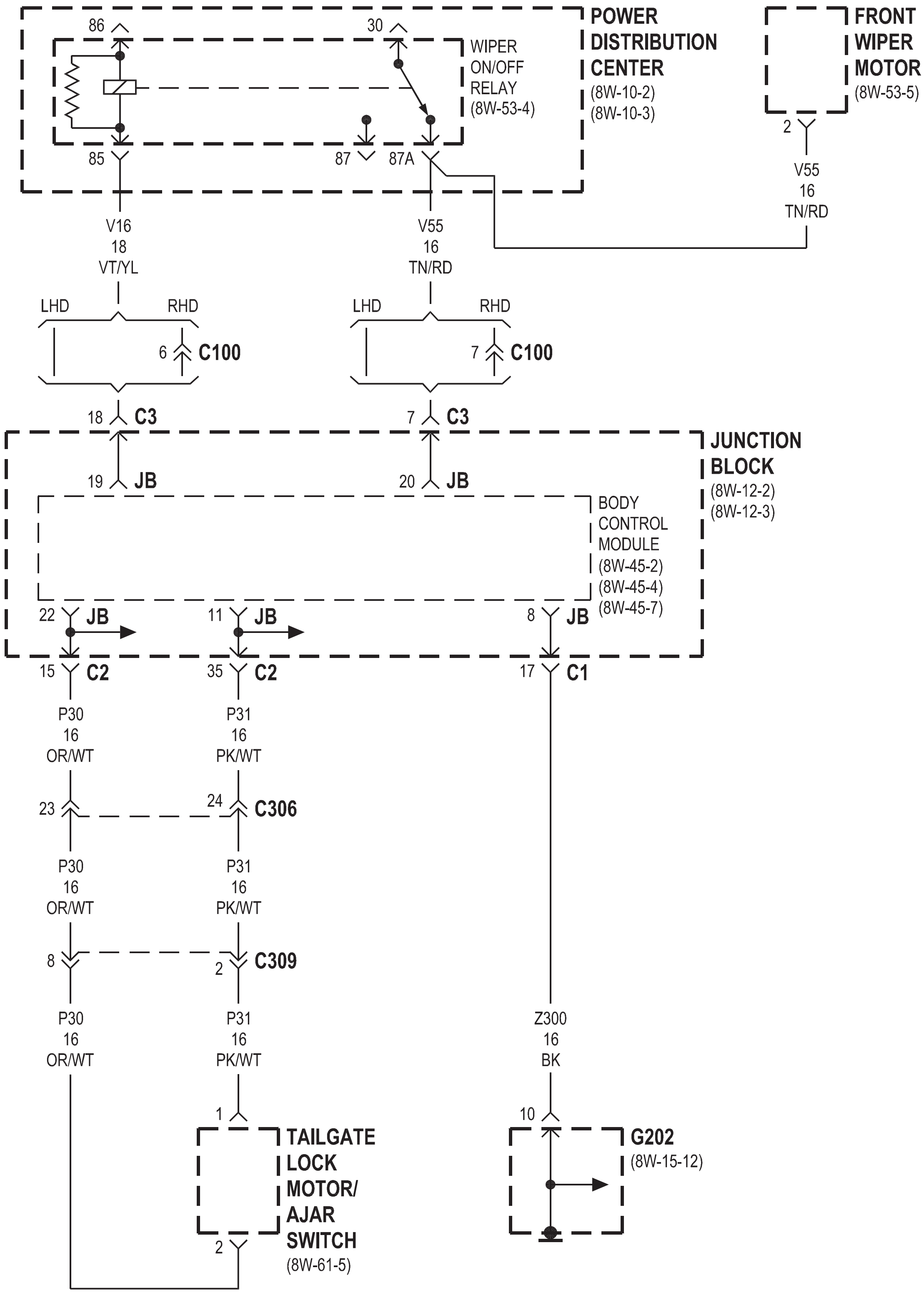
○○ MIDLINE/HIGHLINE
○○○ PREMIUM

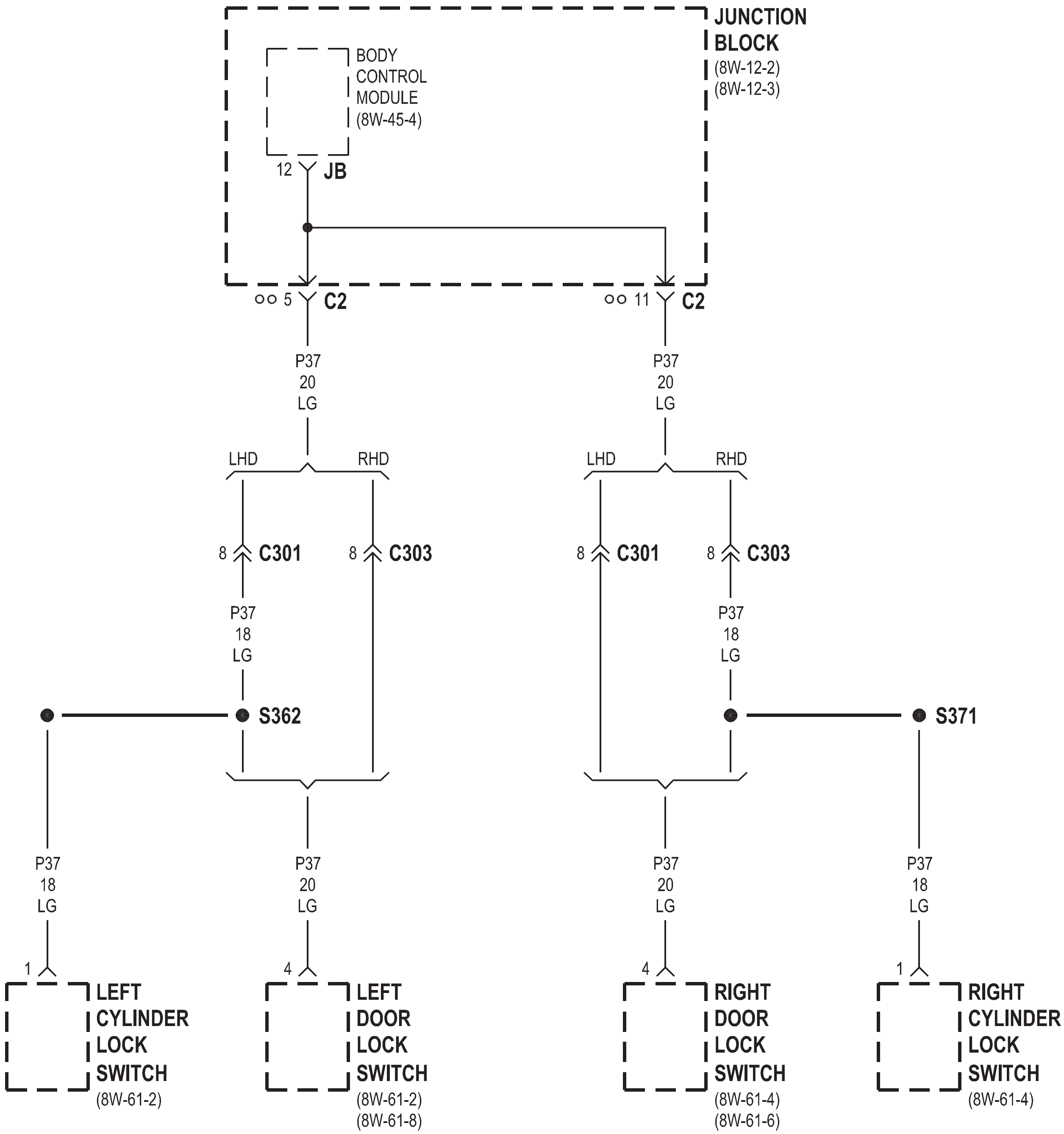

BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 34 15A
BODY CONTROL MODULE
(8W-45-2)
15 JB
• 27 •• 12 C1
15 C1
• 12 •• 27 C1
19 C2
29 C3
18 C2
M1 20 PK
M1 18 PK
1 RIGHT COURTESY LAMP
(8W-44-2)
3 SIREN
(8W-49-3)
20 C306
1 LEFT COURTESY LAMP
(8W-44-2)
S301
10 INSTRUMENT CLUSTER
(8W-40-2)
12 C1
1 C1
RADIO
(8W-47-2)
3 C308
INTRUSION TRANSCEIVER MODULE (EXPORT)
(8W-49-3)
6
OVERHEAD MAP/ READING LAMP
(8W-44-4)
1
EXCEPT BASE
BASE
S390
1 LEFT VISOR/ VANITY LAMP
(8W-44-3)
1 RIGHT VISOR/ VANITY LAMP
(8W-44-3)
1 CARGO LAMP
(8W-44-4)
3 COMPASS MINI-TRIP COMPUTER (PREMIUM FULL OPTIONS)
(8W-49-2)
(8W-49-4)
2 DOME LAMP
(8W-44-2)
• LHD
•• RHD

EXCEPT BASE

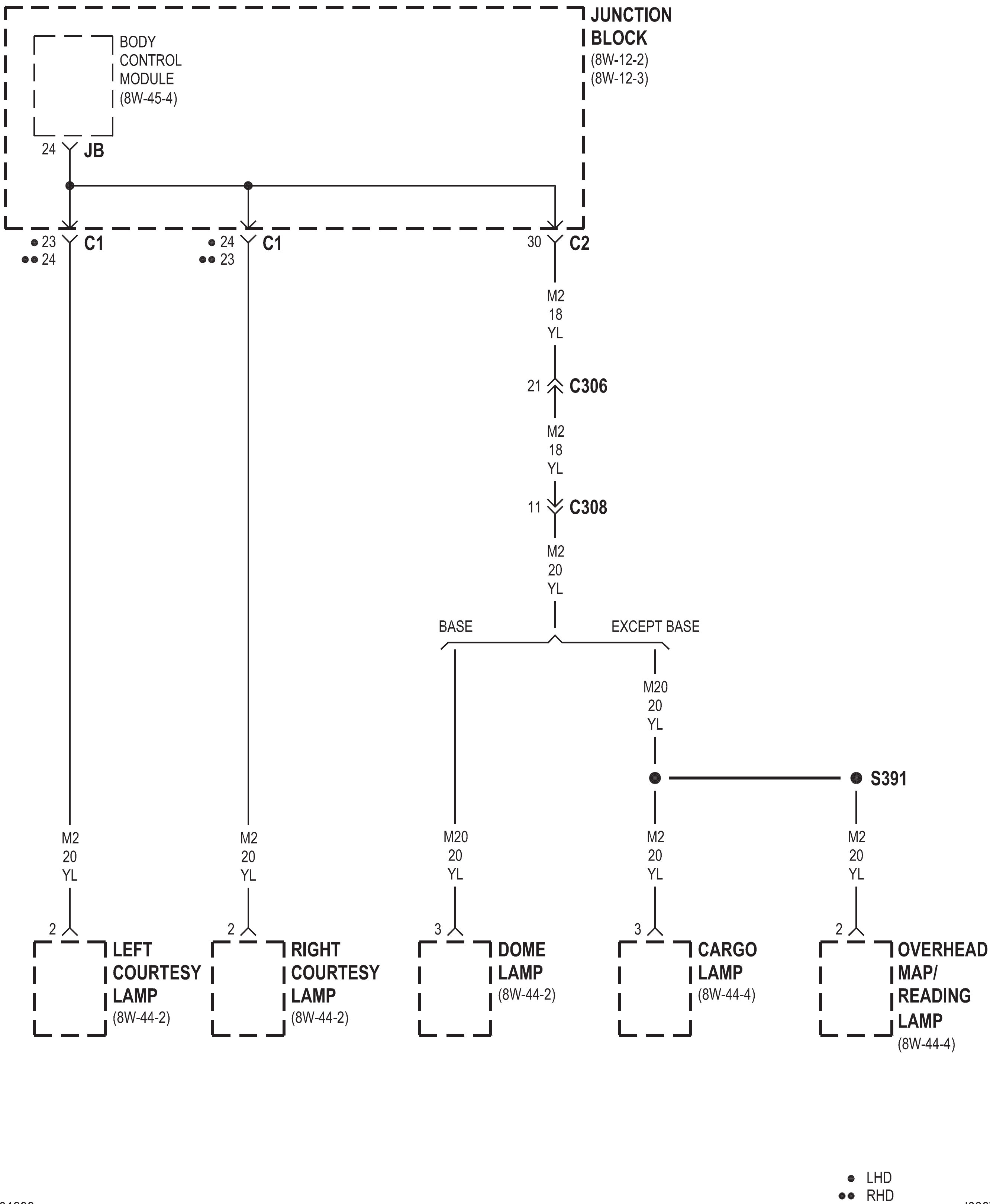


J038W-2 KJ301230

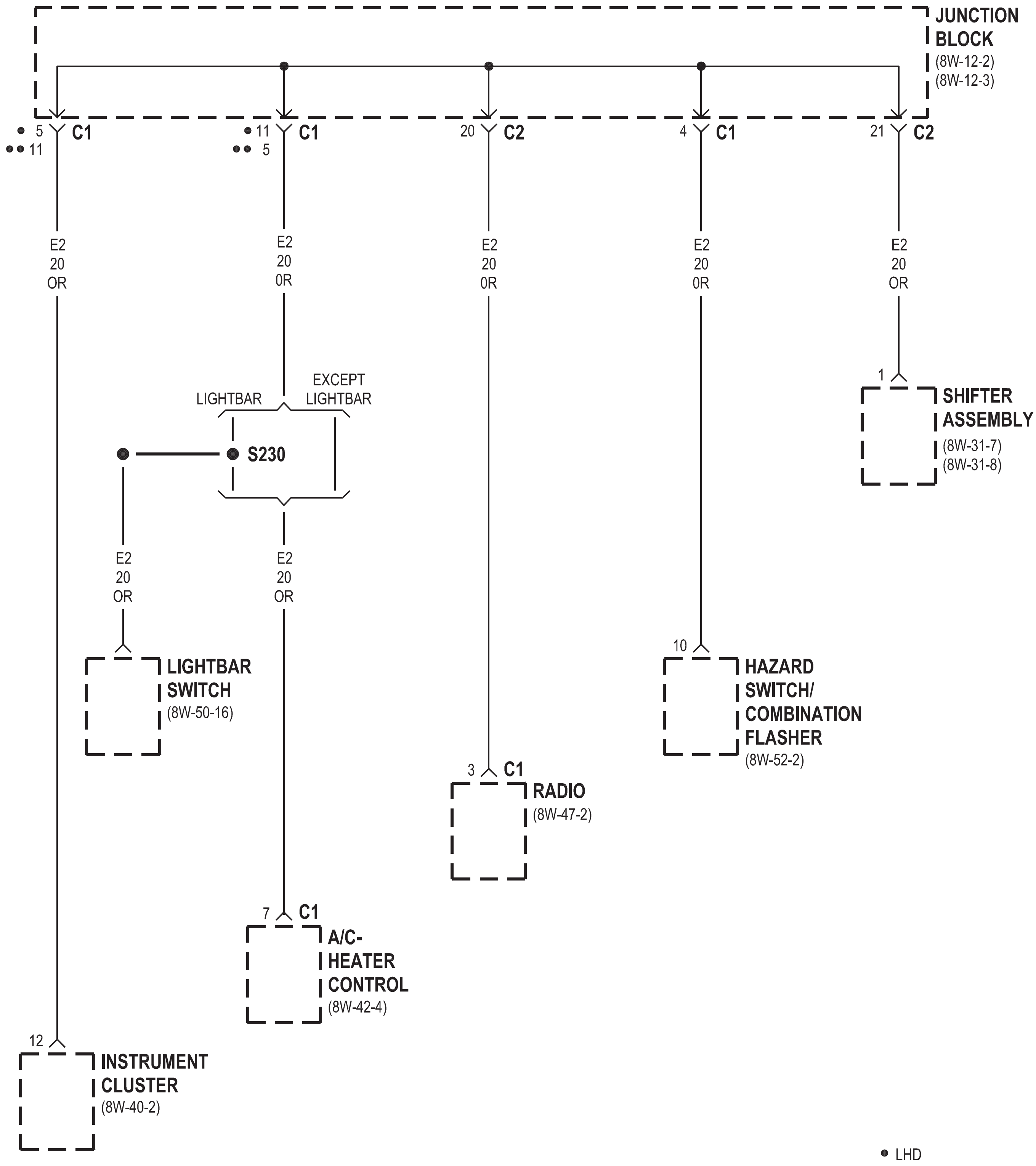

POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
WIPER ON/OFF RELAY
(8W-53-4)
86
30
85
87
87A
FRONT WIPER MOTOR
(8W-53-5)
2
V55
16
TN/RD
V16
18
VT/YL
V55
16
TN/RD
LHD
RHD
6
C100
7
C100
18
C3
7
C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
19
JB
20
JB
BODY CONTROL MODULE
(8W-45-2)
(8W-45-4)
(8W-45-7)
22
JB
11
JB
8
JB
15
C2
35
C2
17
C1
P30
16
OR/WT
P31
16
PK/WT
23
24
C306
P30
16
OR/WT
P31
16
PK/WT
8
2
C309
P30
16
OR/WT
P31
16
PK/WT
Z300
16
BK
1
TAILGATE LOCK MOTOR/ AJAR SWITCH
(8W-61-5)
2
10
G202
(8W-15-12)



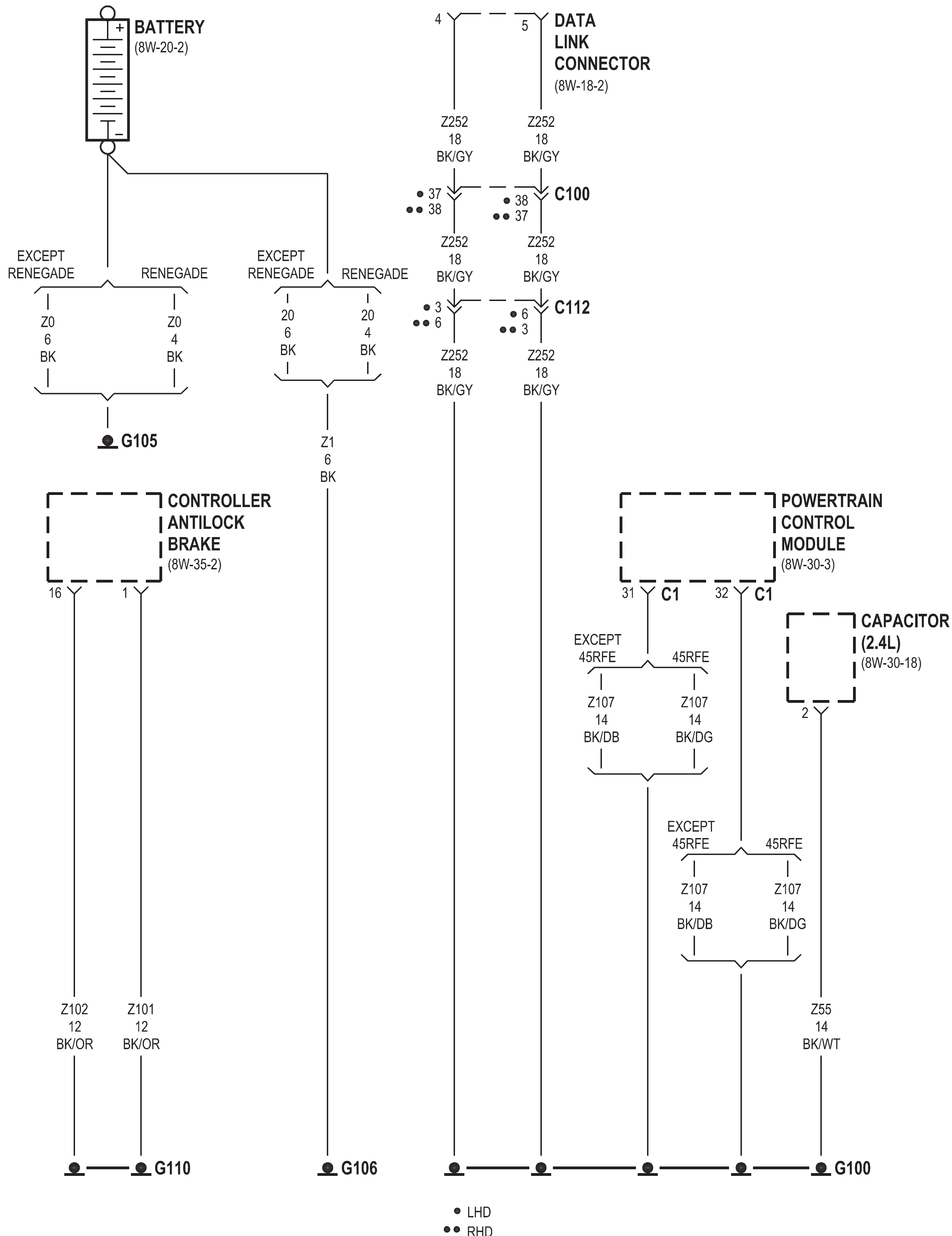
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
BODY
CONTROL
MODULE
(8W-45-4)
12 JB
oo 5 C2
oo 11 C2
P37
20
LG
LHD
RHD
8 C301
8 C303
P37
18
LG
S362
S371
1
4
LEFT
CYLINDER
LOCK
SWITCH
(8W-61-2)
LEFT
DOOR
LOCK
SWITCH
(8W-61-2)
(8W-61-8)
RIGHT
DOOR
LOCK
SWITCH
(8W-61-4)
(8W-61-6)
RIGHT
CYLINDER
LOCK
SWITCH
(8W-61-4)
oo EXCEPT BASE

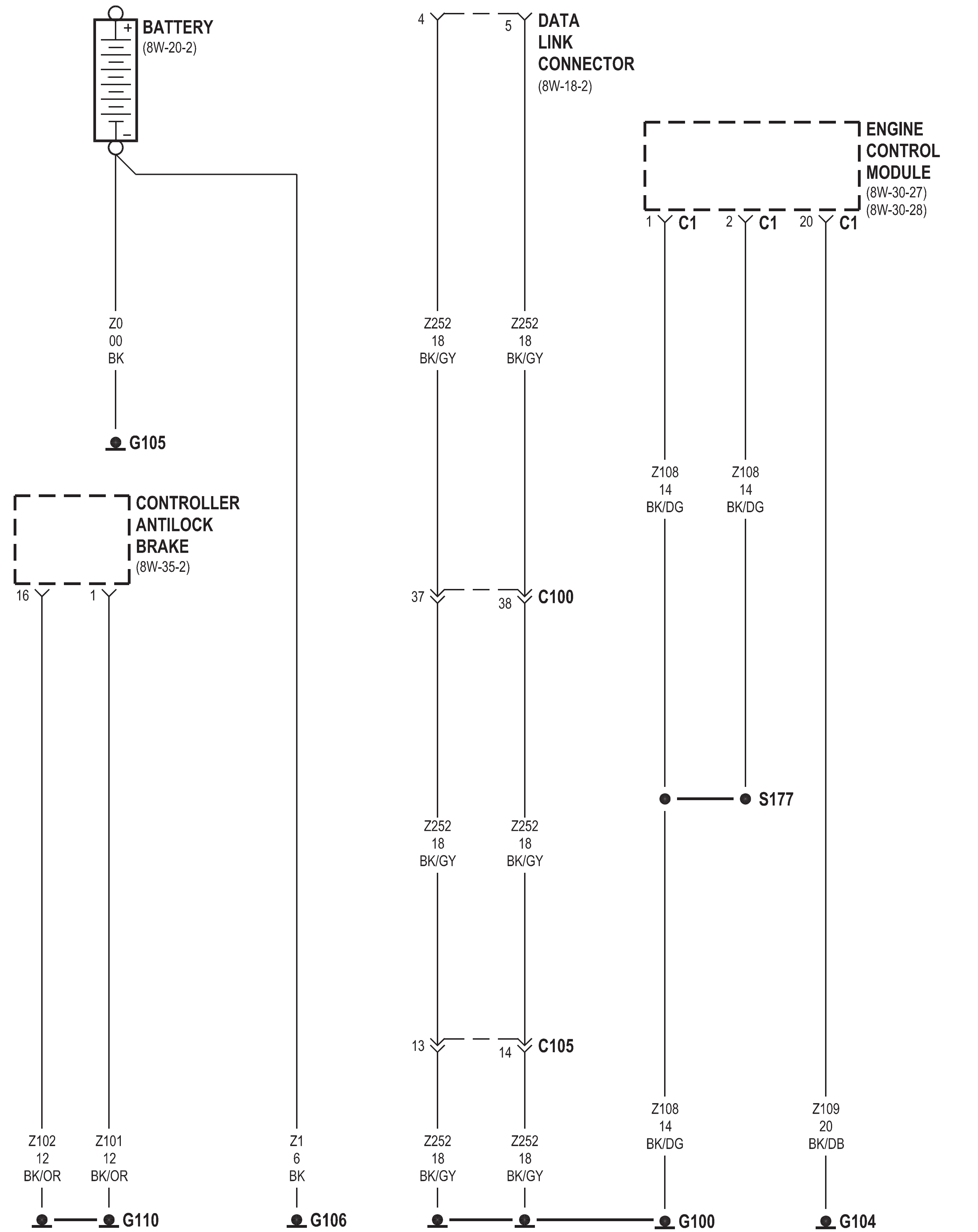


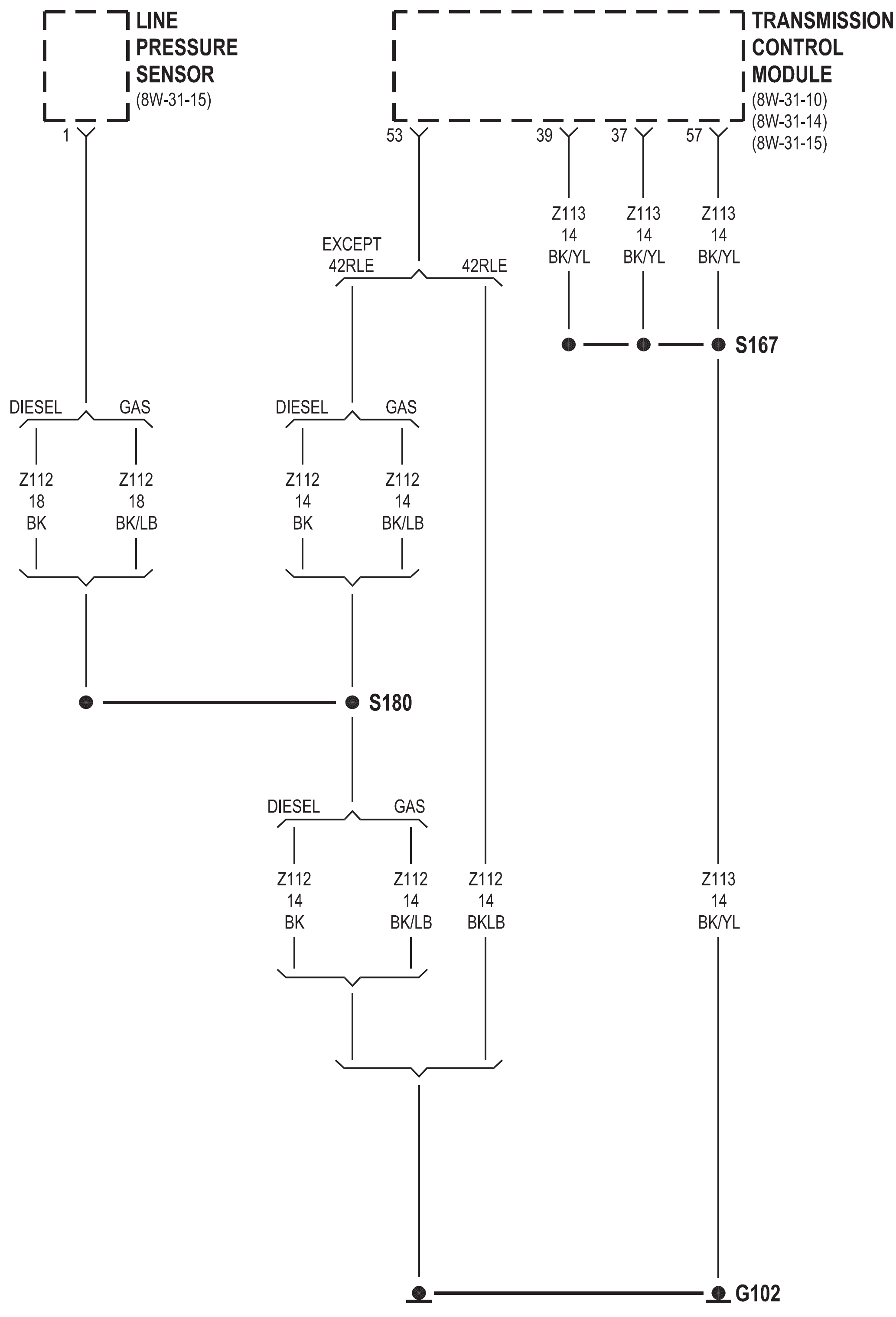
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-4)
24 JB
• 23 C1
•• 24
• 24 C1
•• 23
30 C2
M2 18 YL
21 C306
M2 18 YL
11 C308
M2 20 YL
BASE
EXCEPT BASE
M20 20 YL
S391
M2 20 YL
M2 20 YL
M20 20 YL
M2 20 YL
M2 20 YL
2
LEFT COURTESY LAMP
(8W-44-2)
2
RIGHT COURTESY LAMP
(8W-44-2)
3
DOME LAMP
(8W-44-2)
3
CARGO LAMP
(8W-44-4)
2
OVERHEAD MAP/ READING LAMP
(8W-44-4)
• LHD
•• RHD

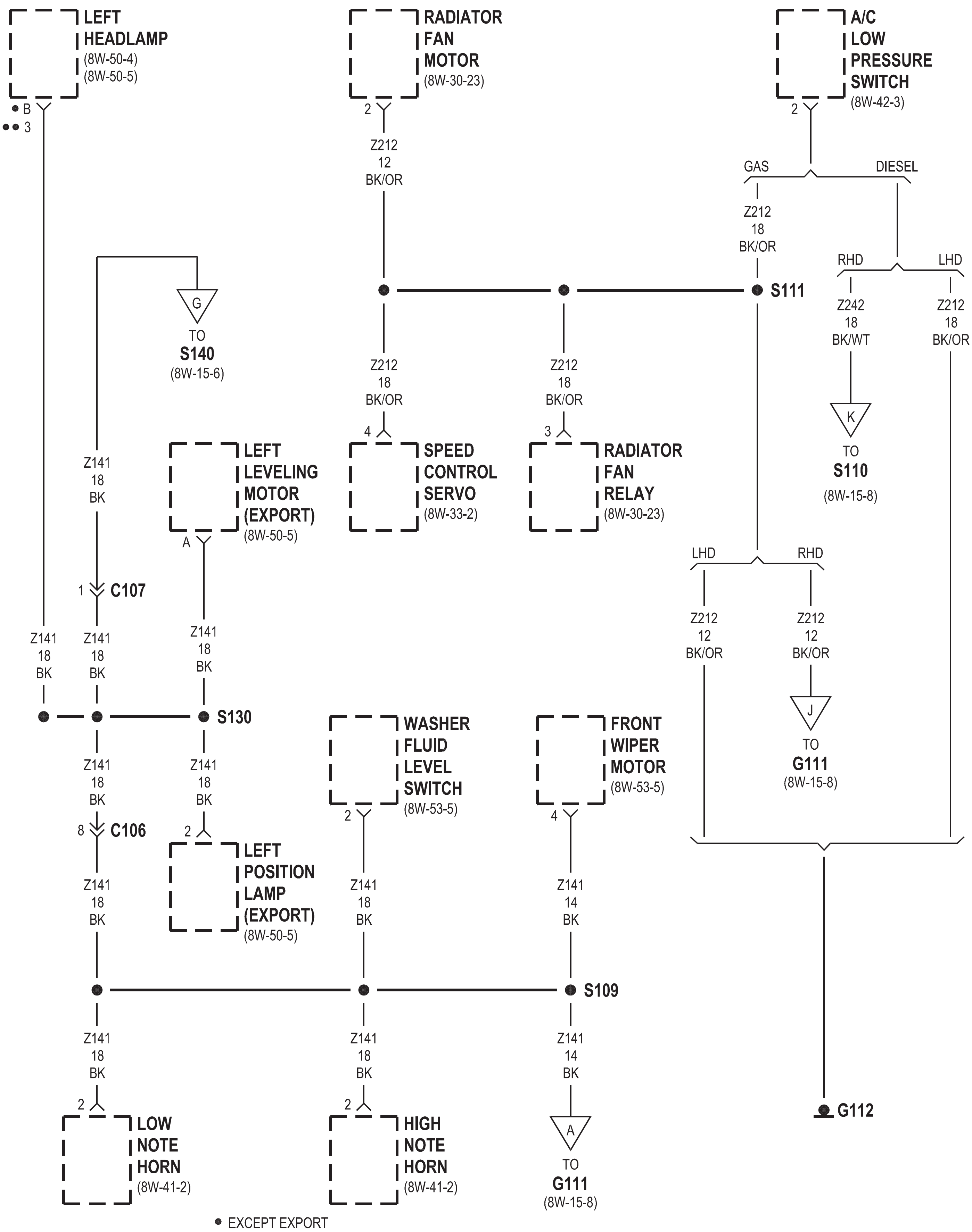

JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
5 C1
11
11 C1
5
20 C2
4 C1
21 C2
E2
20
OR
E2
20
0R
E2
20
0R
E2
20
0R
E2
20
OR
LIGHTBAR
EXCEPT
LIGHTBAR
S230
E2
20
OR
E2
20
OR
1
SHIFTER
ASSEMBLY
(8W-31-7)
(8W-31-8)
LIGHTBAR
SWITCH
(8W-50-16)
10
HAZARD
SWITCH/
COMBINATION
FLASHER
(8W-52-2)
3 C1
RADIO
(8W-47-2)
7 C1
A/C-
HEATER
CONTROL
(8W-42-4)
12
INSTRUMENT
CLUSTER
(8W-40-2)
LHD
RHD

8W-15 GROUND DISTRIBUTION

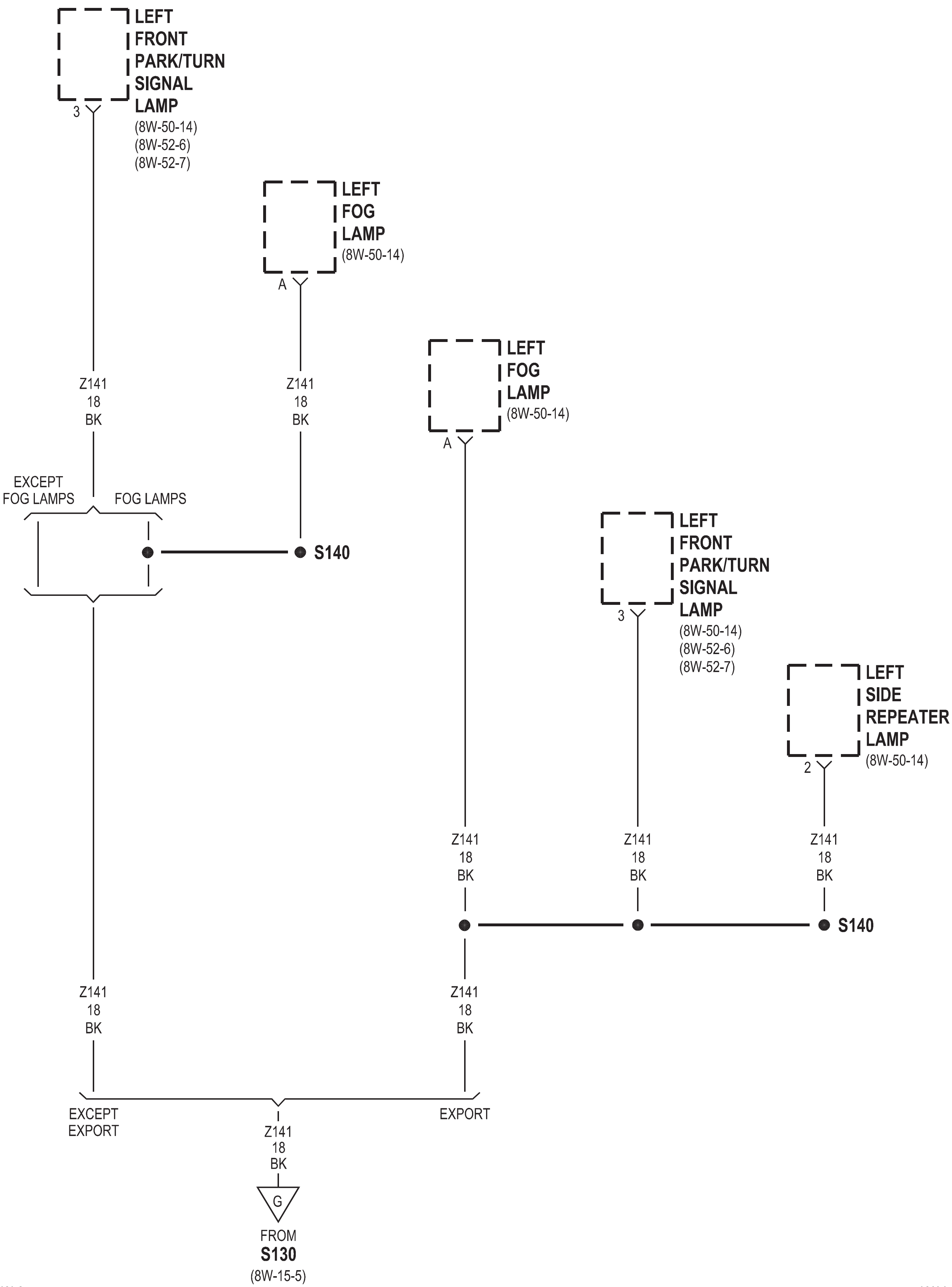

BATTERY
(8W-20-2)
EXCEPT RENEGADE
RENEGADE
Z0
6
BK
Z0
4
BK
G105
EXCEPT RENEGADE
RENEGADE
20
6
BK
20
4
BK
Z1
6
BK
DATA LINK CONNECTOR
(8W-18-2)
4
5
Z252
18
BK/GY
C100
37
38
C112
3
6
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
16
1
Z102
12
BK/OR
Z101
12
BK/OR
G110
G106
POWERTRAIN CONTROL MODULE
(8W-30-3)
31 C1
32 C1
EXCEPT 45RFE
45RFE
Z107
14
BK/DB
Z107
14
BK/DG
CAPACITOR (2.4L)
(8W-30-18)
2
Z55
14
BK/WT
G100
LHD
RHD

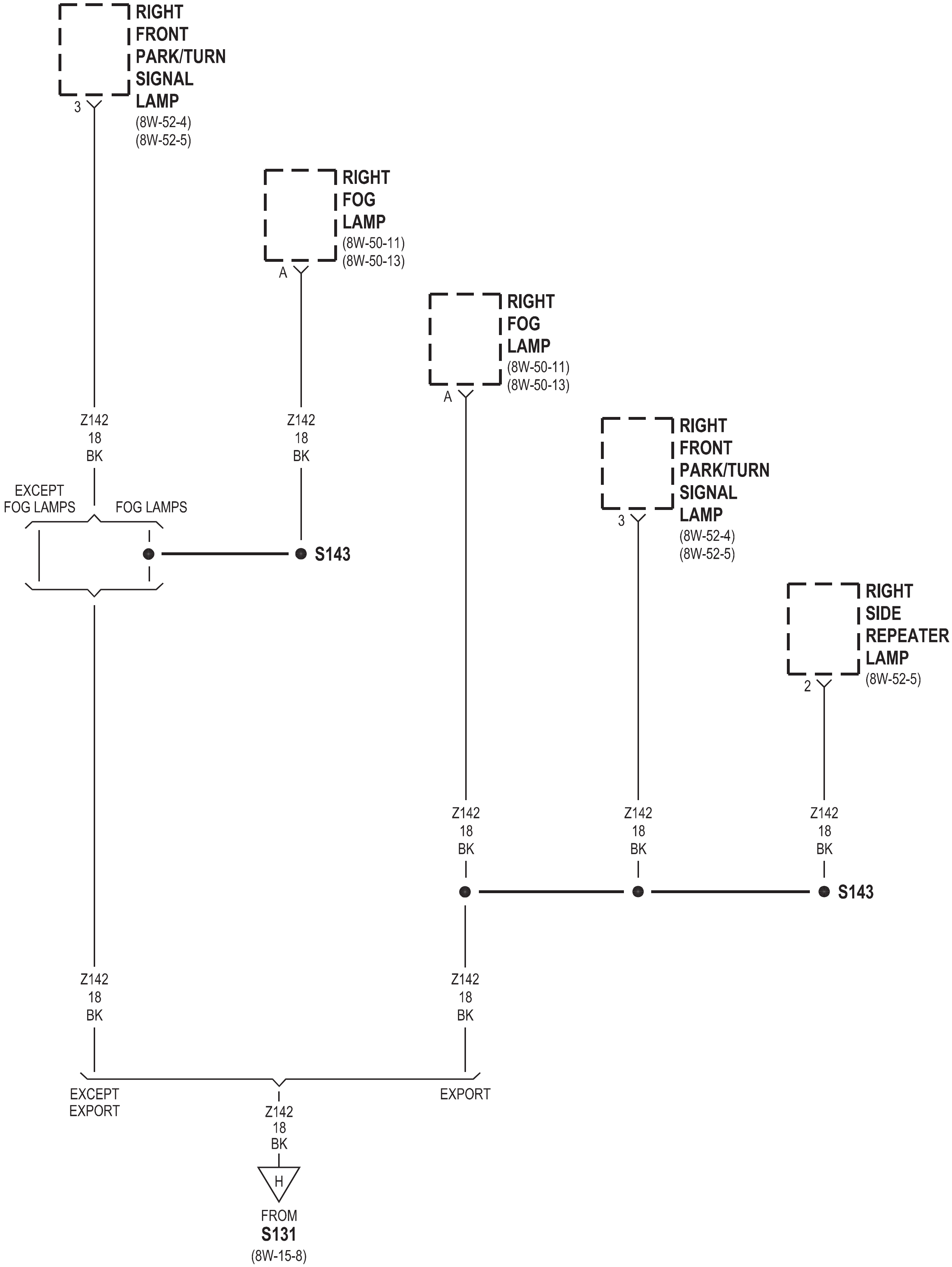

BATTERY
(8W-20-2)
DATA LINK CONNECTOR
(8W-18-2)
ENGINE CONTROL MODULE
(8W-30-27)
(8W-30-28)
1 C1
2 C1
20 C1
4
5
Z0 00 BK
G105
Z252 18 BK/GY
Z108 14 BK/DG
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
16
1
37
38
C100
S177
13
14
C105
Z102 12 BK/OR
Z101 12 BK/OR
Z1 6 BK
Z109 20 BK/DB
G110
G106
G100
G104

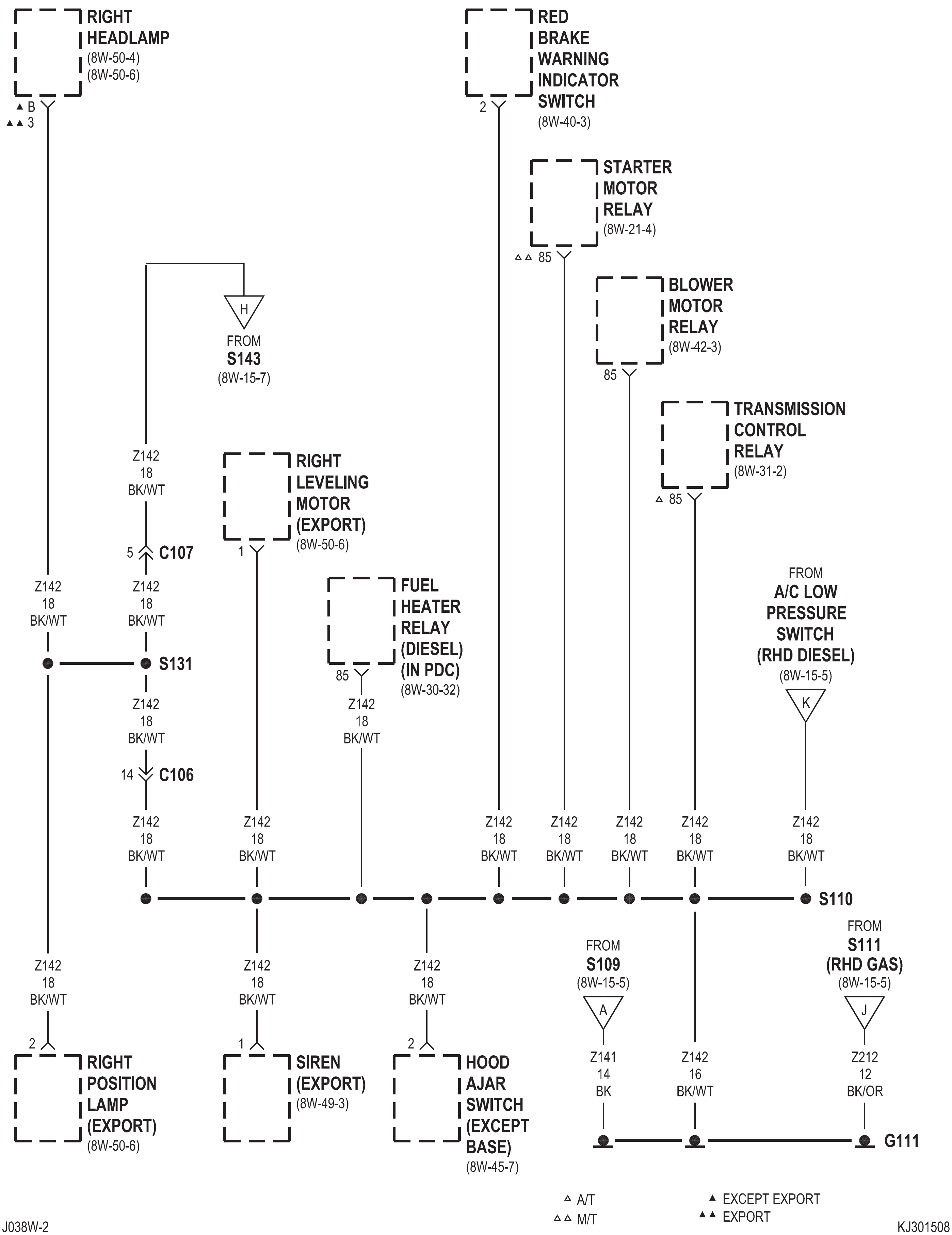

LINE
PRESSURE
SENSOR
(8W-31-15)
TRANSMISSION
CONTROL
MODULE
(8W-31-10)
(8W-31-14)
(8W-31-15)
1
53
39
37
57
Z113
14
BK/YL
EXCEPT
42RLE
42RLE
S167
DIESEL
GAS
Z112
18
BK
Z112
18
BK/LB
Z112
14
BK
Z112
14
BK/LB
S180
Z112
14
BKLB
Z113
14
BK/YL
G102

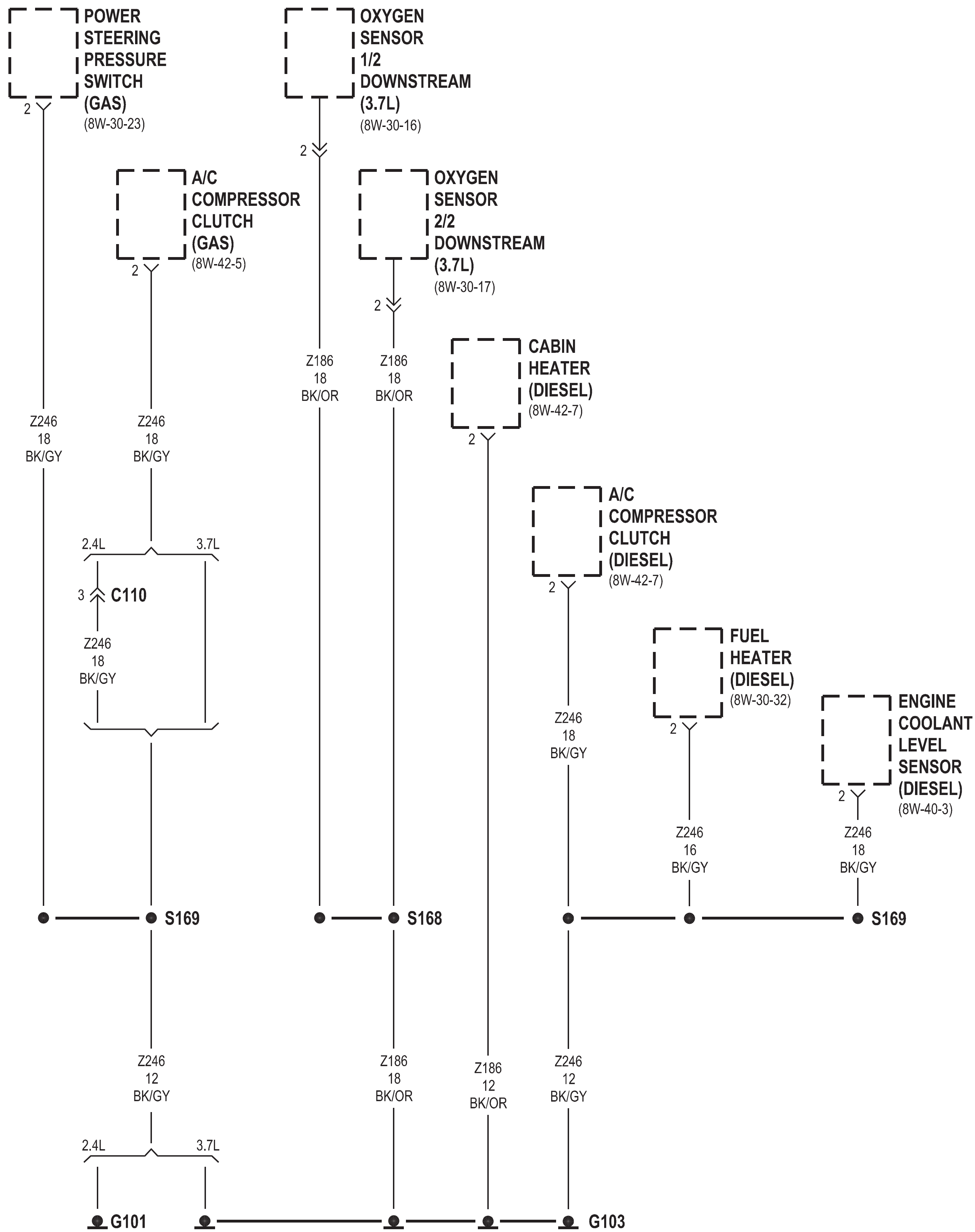


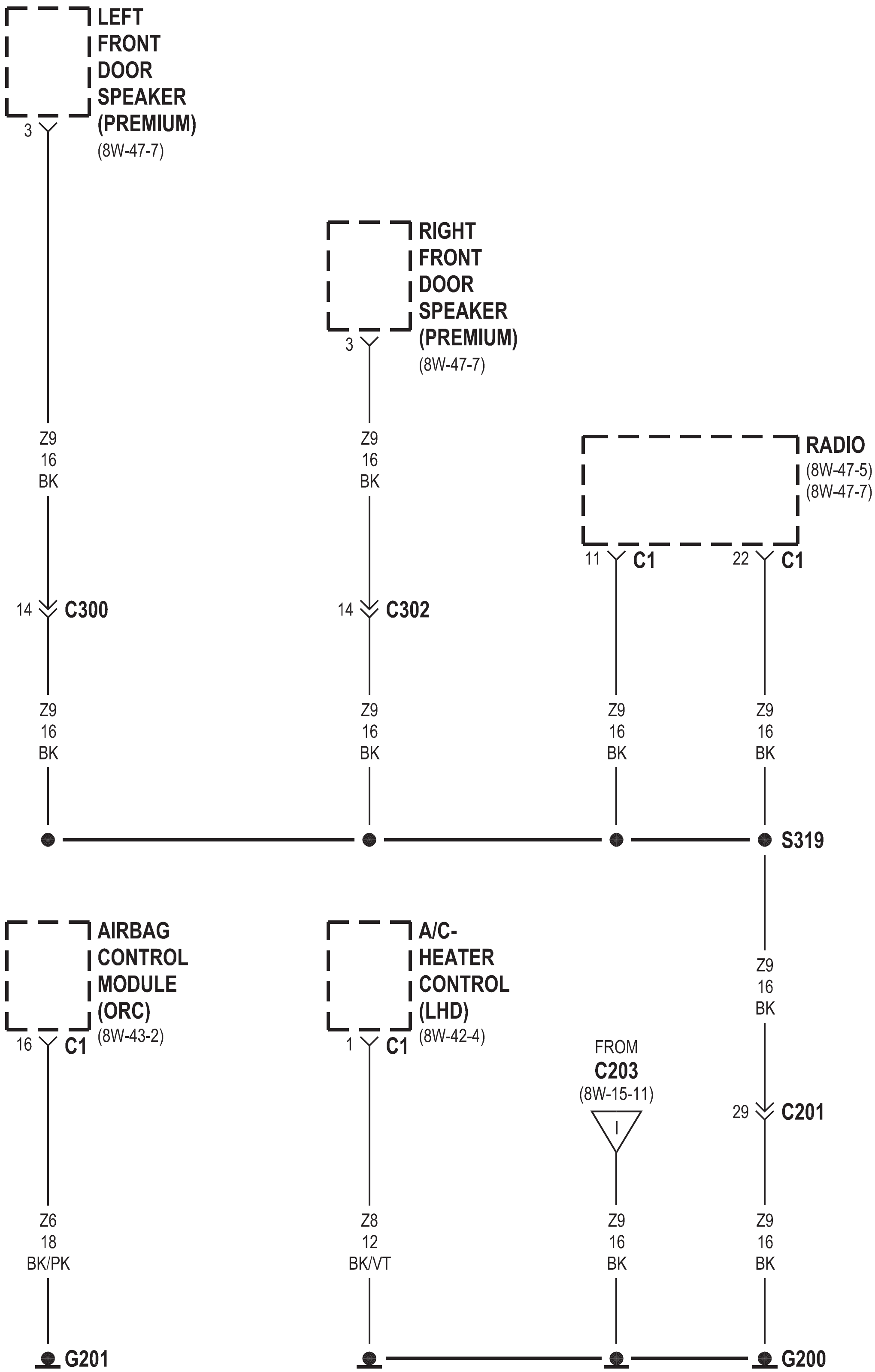
LEFT HEADLAMP
(8W-50-4)
(8W-50-5)
● B
●● 3
RADIATOR FAN MOTOR
(8W-30-23)
2
Z212
12
BK/OR
A/C LOW PRESSURE SWITCH
(8W-42-3)
2
GAS
DIESEL
Z212
18
BK/OR
RHD
LHD
Z242
18
BK/WT
Z212
18
BK/OR
S111
G
TO
S140
(8W-15-6)
Z212
18
BK/OR
Z212
18
BK/OR
4
SPEED CONTROL SERVO
(8W-33-2)
3
RADIATOR FAN RELAY
(8W-30-23)
K
TO
S110
(8W-15-8)
Z141
18
BK
LEFT LEVELING MOTOR (EXPORT)
(8W-50-5)
A
1
C107
LHD
RHD
Z212
12
BK/OR
Z212
12
BK/OR
Z141
18
BK
Z141
18
BK
Z141
18
BK
J
TO
G111
(8W-15-8)
S130
WASHER FLUID LEVEL SWITCH
(8W-53-5)
FRONT WIPER MOTOR
(8W-53-5)
Z141
18
BK
Z141
18
BK
8
C106
2
2
4
LEFT POSITION LAMP (EXPORT)
(8W-50-5)
Z141
18
BK
Z141
18
BK
Z141
14
BK
S109
Z141
18
BK
Z141
18
BK
Z141
14
BK
G112
2
LOW NOTE HORN
(8W-41-2)
2
HIGH NOTE HORN
(8W-41-2)
A
TO
G111
(8W-15-8)
● EXCEPT EXPORT
●● EXPORT

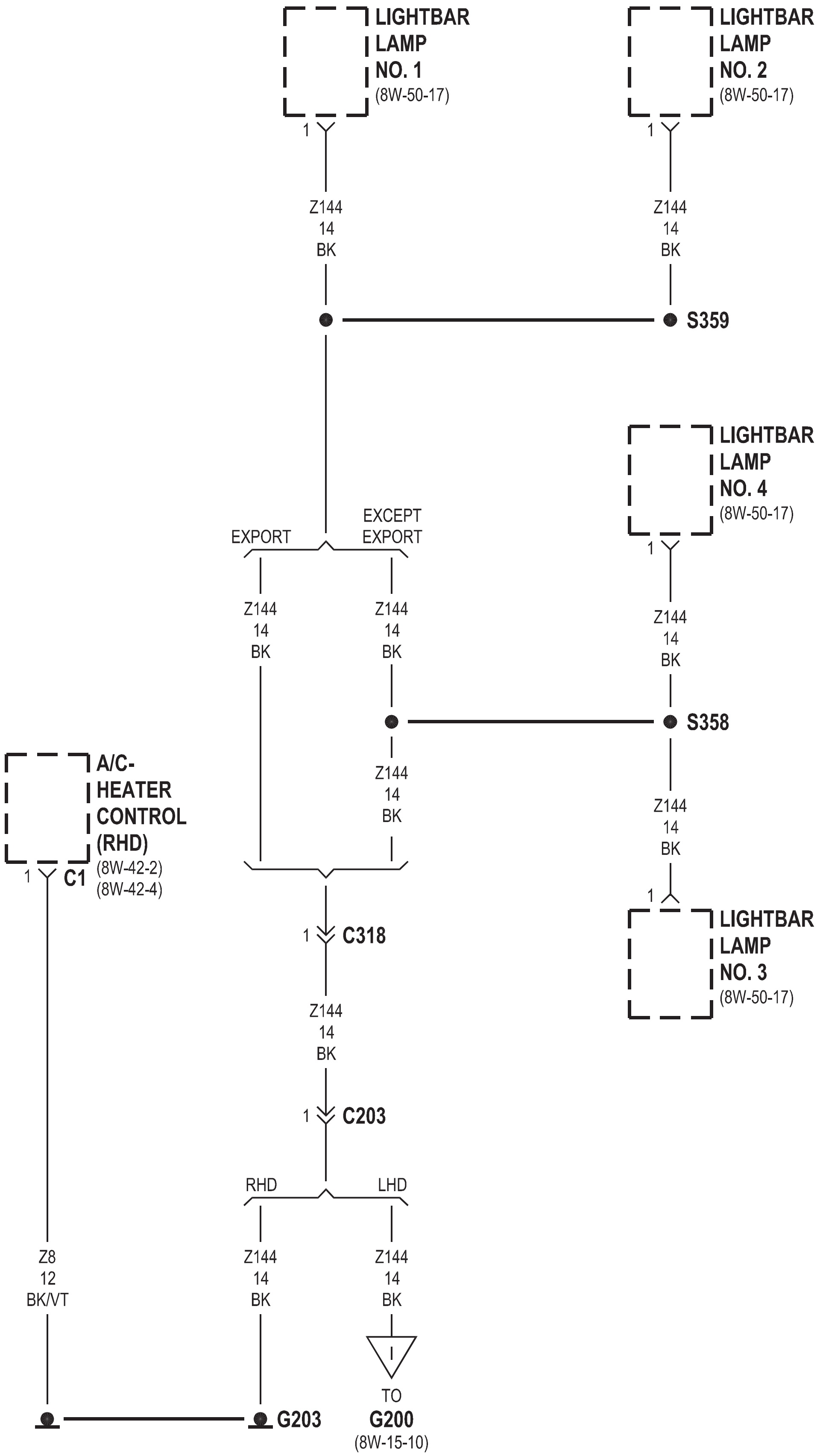

LEFT FRONT PARK/TURN SIGNAL LAMP
(8W-50-14)
(8W-52-6)
(8W-52-7)
3
LEFT FOG LAMP
(8W-50-14)
A
Z141
18
BK
EXCEPT FOG LAMPS
FOG LAMPS
S140
LEFT FOG LAMP
(8W-50-14)
A
LEFT FRONT PARK/TURN SIGNAL LAMP
(8W-50-14)
(8W-52-6)
(8W-52-7)
3
LEFT SIDE REPEATER LAMP
(8W-50-14)
2
Z141
18
BK
S140
EXCEPT EXPORT
EXPORT
Z141
18
BK
G
FROM
S130
(8W-15-5)


RIGHT
FRONT
PARK/TURN
SIGNAL
LAMP
(8W-52-4)
(8W-52-5)
3
RIGHT
FOG
LAMP
(8W-50-11)
(8W-50-13)
A
RIGHT
FOG
LAMP
(8W-50-11)
(8W-50-13)
A
RIGHT
FRONT
PARK/TURN
SIGNAL
LAMP
(8W-52-4)
(8W-52-5)
3
RIGHT
SIDE
REPEATER
LAMP
(8W-52-5)
2
Z142
18
BK
EXCEPT
FOG LAMPS
FOG LAMPS
S143
S143
EXCEPT
EXPORT
EXPORT
H
FROM
S131
(8W-15-8)

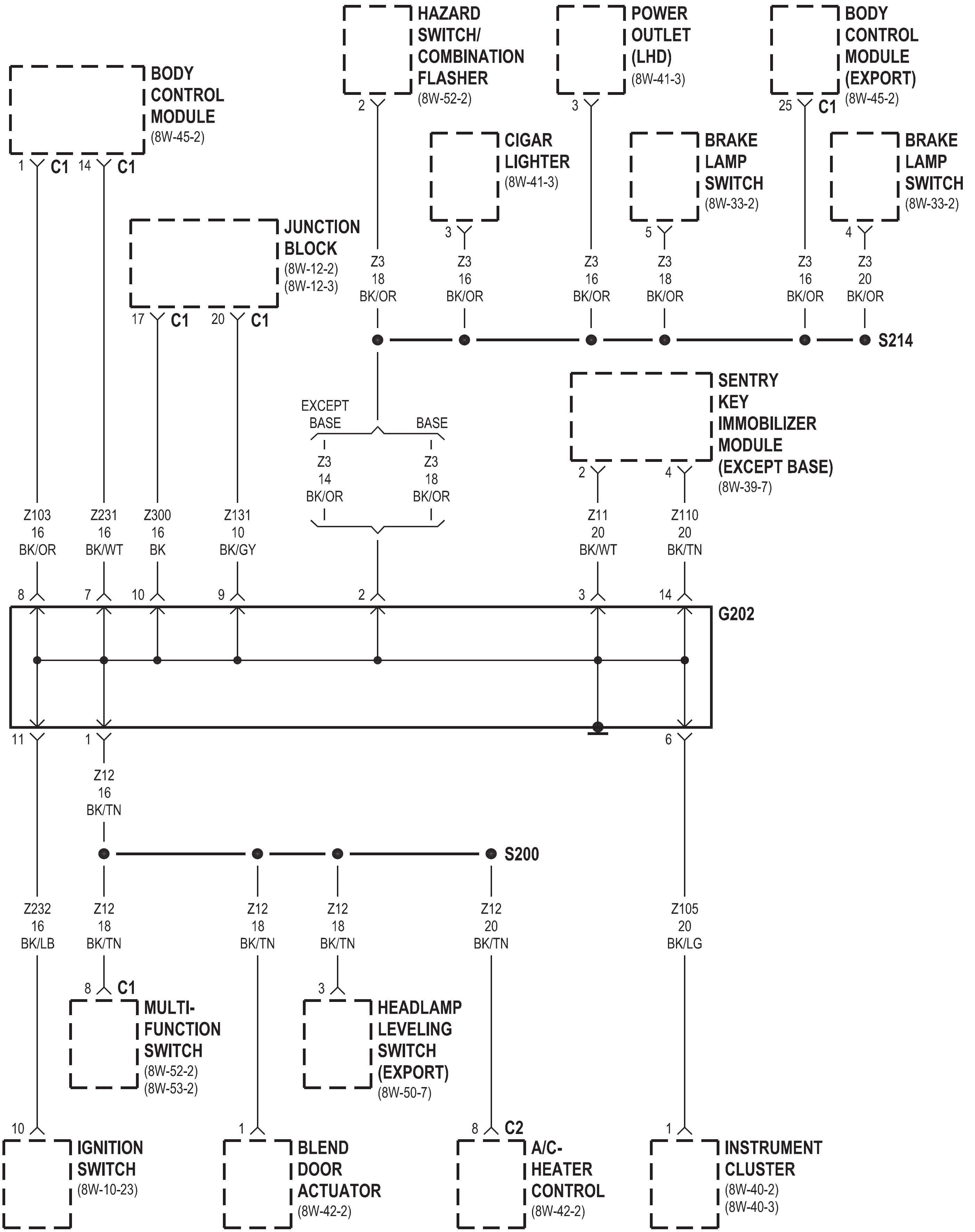

RIGHT HEADLAMP
(8W-50-4)
(8W-50-6)
▲ B
▲▲ 3
RED BRAKE WARNING INDICATOR SWITCH
(8W-40-3)
2
STARTER MOTOR RELAY
(8W-21-4)
△△ 85
BLOWER MOTOR RELAY
(8W-42-3)
85
TRANSMISSION CONTROL RELAY
(8W-31-2)
△ 85
H
FROM
S143
(8W-15-7)
Z142
18
BK/WT
5 C107
RIGHT LEVELING MOTOR (EXPORT)
(8W-50-6)
1
FUEL HEATER RELAY (DIESEL) (IN PDC)
(8W-30-32)
85
FROM
A/C LOW PRESSURE SWITCH (RHD DIESEL)
(8W-15-5)
K
S131
14 C106
S110
FROM
S109
(8W-15-5)
A
FROM
S111
(RHD GAS)
(8W-15-5)
J
Z141
14
BK
Z142
16
BK/WT
Z212
12
BK/OR
G111
2
RIGHT POSITION LAMP (EXPORT)
(8W-50-6)
1
SIREN (EXPORT)
(8W-49-3)
2
HOOD AJAR SWITCH (EXCEPT BASE)
(8W-45-7)
△ A/T
△△ M/T
▲ EXCEPT EXPORT
▲▲ EXPORT


POWER STEERING PRESSURE SWITCH (GAS)
(8W-30-23)
OXYGEN SENSOR 1/2 DOWNSTREAM (3.7L)
(8W-30-16)
A/C COMPRESSOR CLUTCH (GAS)
(8W-42-5)
OXYGEN SENSOR 2/2 DOWNSTREAM (3.7L)
(8W-30-17)
CABIN HEATER (DIESEL)
(8W-42-7)
A/C COMPRESSOR CLUTCH (DIESEL)
(8W-42-7)
FUEL HEATER (DIESEL)
(8W-30-32)
ENGINE COOLANT LEVEL SENSOR (DIESEL)
(8W-40-3)
2
Z246 18 BK/GY
Z186 18 BK/OR
2.4L
3.7L
3
C110
Z246 16 BK/GY
S169
S168
Z246 12 BK/GY
Z186 12 BK/OR
G101
G103

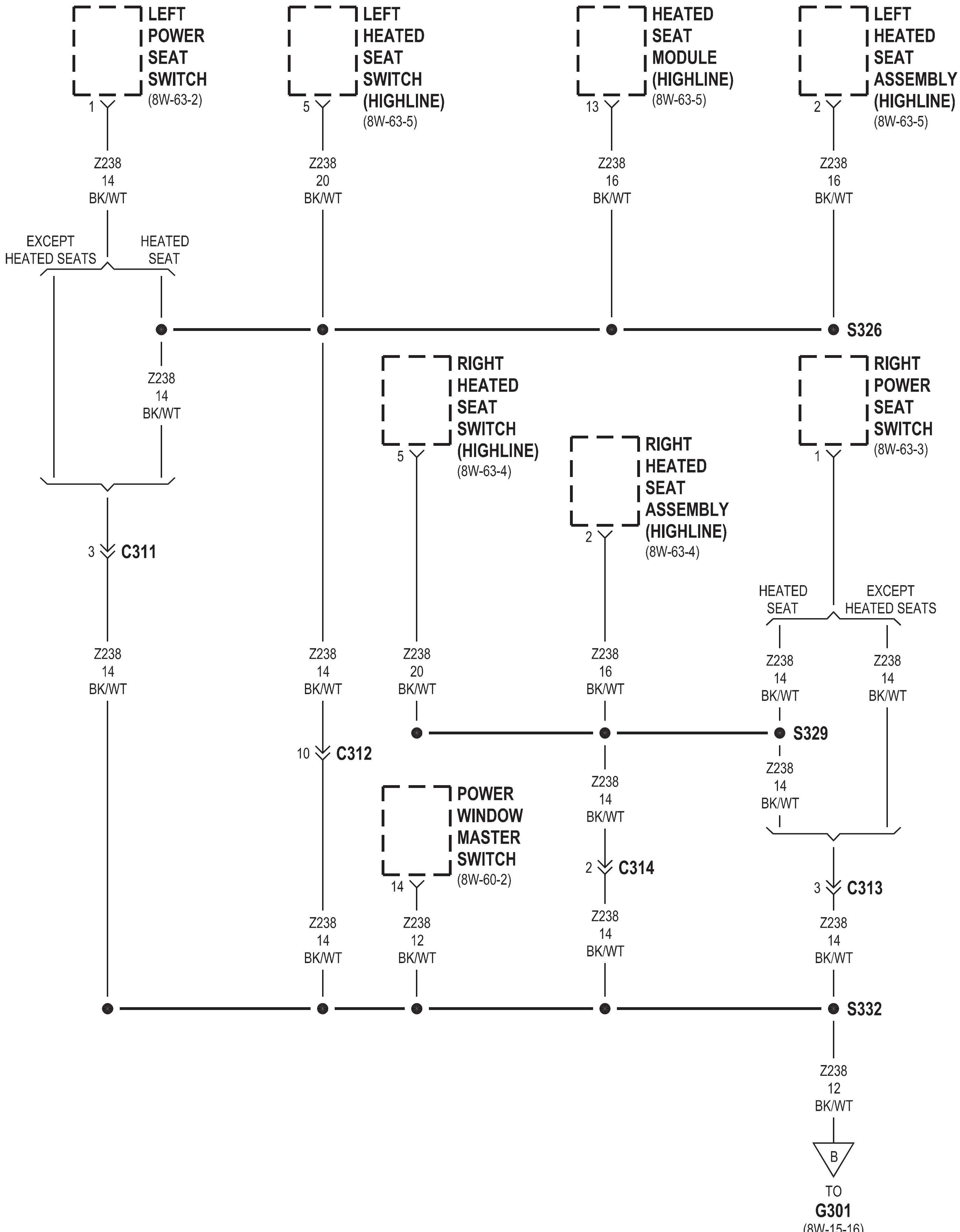

LEFT FRONT DOOR SPEAKER (PREMIUM)
(8W-47-7)
3
RIGHT FRONT DOOR SPEAKER (PREMIUM)
(8W-47-7)
3
Z9
16
BK
Z9
16
BK
RADIO
(8W-47-5)
(8W-47-7)
11
C1
22
C1
14
C300
14
C302
Z9
16
BK
Z9
16
BK
Z9
16
BK
Z9
16
BK
S319
AIRBAG CONTROL MODULE (ORC)
(8W-43-2)
16
C1
A/C-HEATER CONTROL (LHD)
(8W-42-4)
1
C1
Z9
16
BK
FROM
C203
(8W-15-11)
I
29
C201
Z6
18
BK/PK
Z8
12
BK/VT
Z9
16
BK
Z9
16
BK
G201
G200

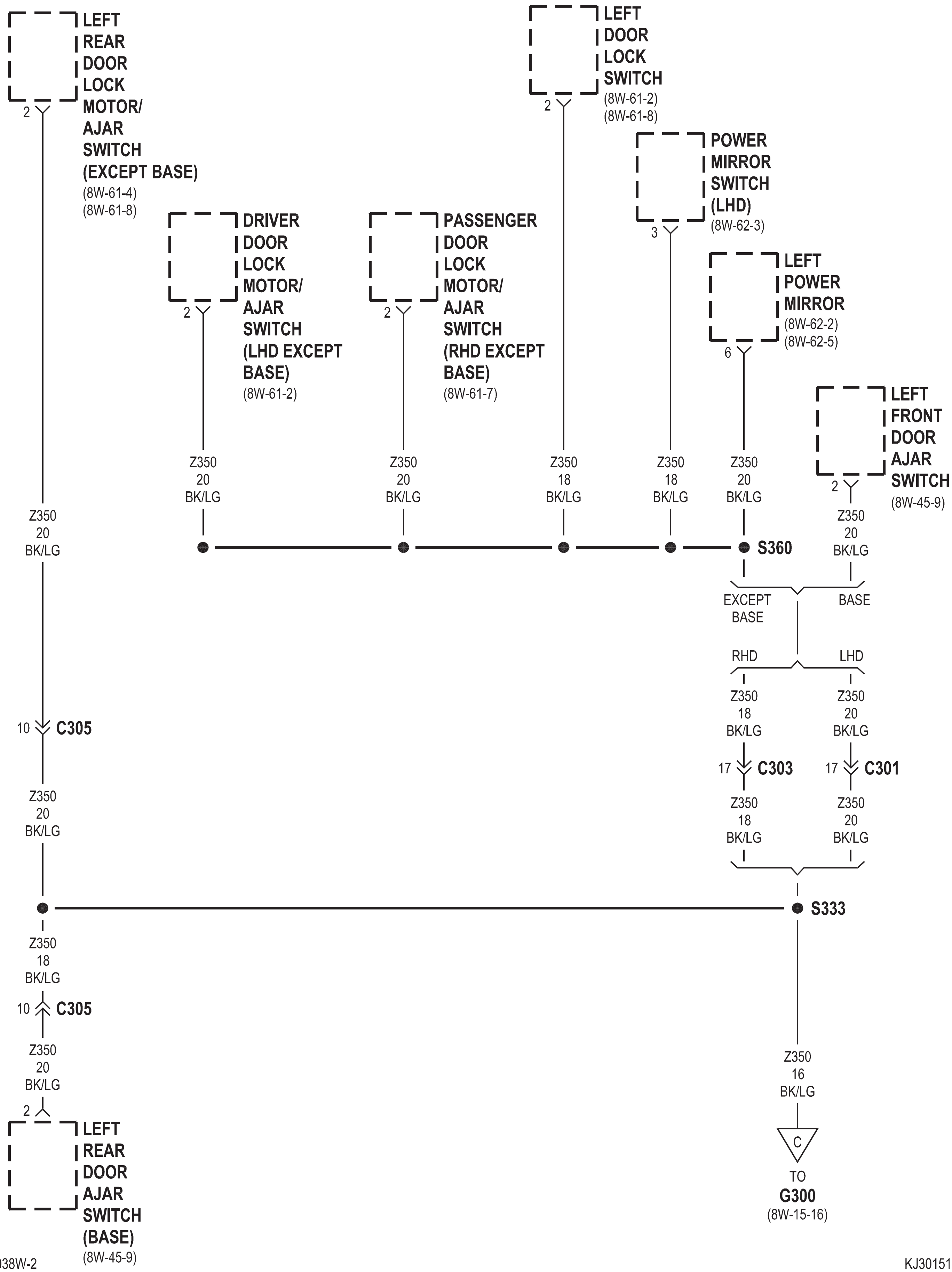


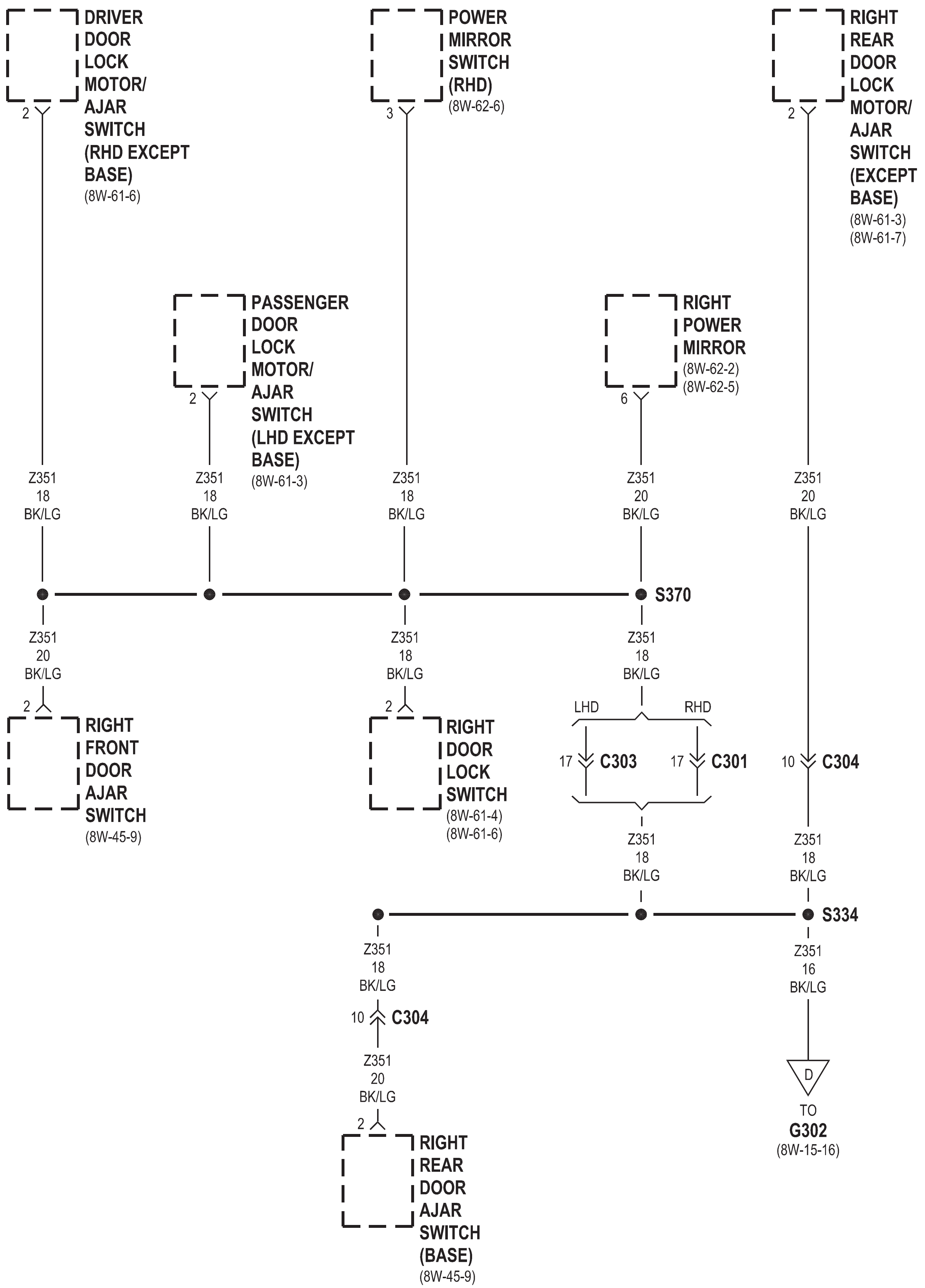
LIGHTBAR LAMP NO. 1 (8W-50-17)
LIGHTBAR LAMP NO. 2 (8W-50-17)
1
Z144 14 BK
S359
LIGHTBAR LAMP NO. 4 (8W-50-17)
EXPORT
EXCEPT EXPORT
S358
A/C-HEATER CONTROL (RHD) (8W-42-2) (8W-42-4)
C1
LIGHTBAR LAMP NO. 3 (8W-50-17)
C318
C203
RHD
LHD
Z8 12 BK/VT
G203
TO G200 (8W-15-10)

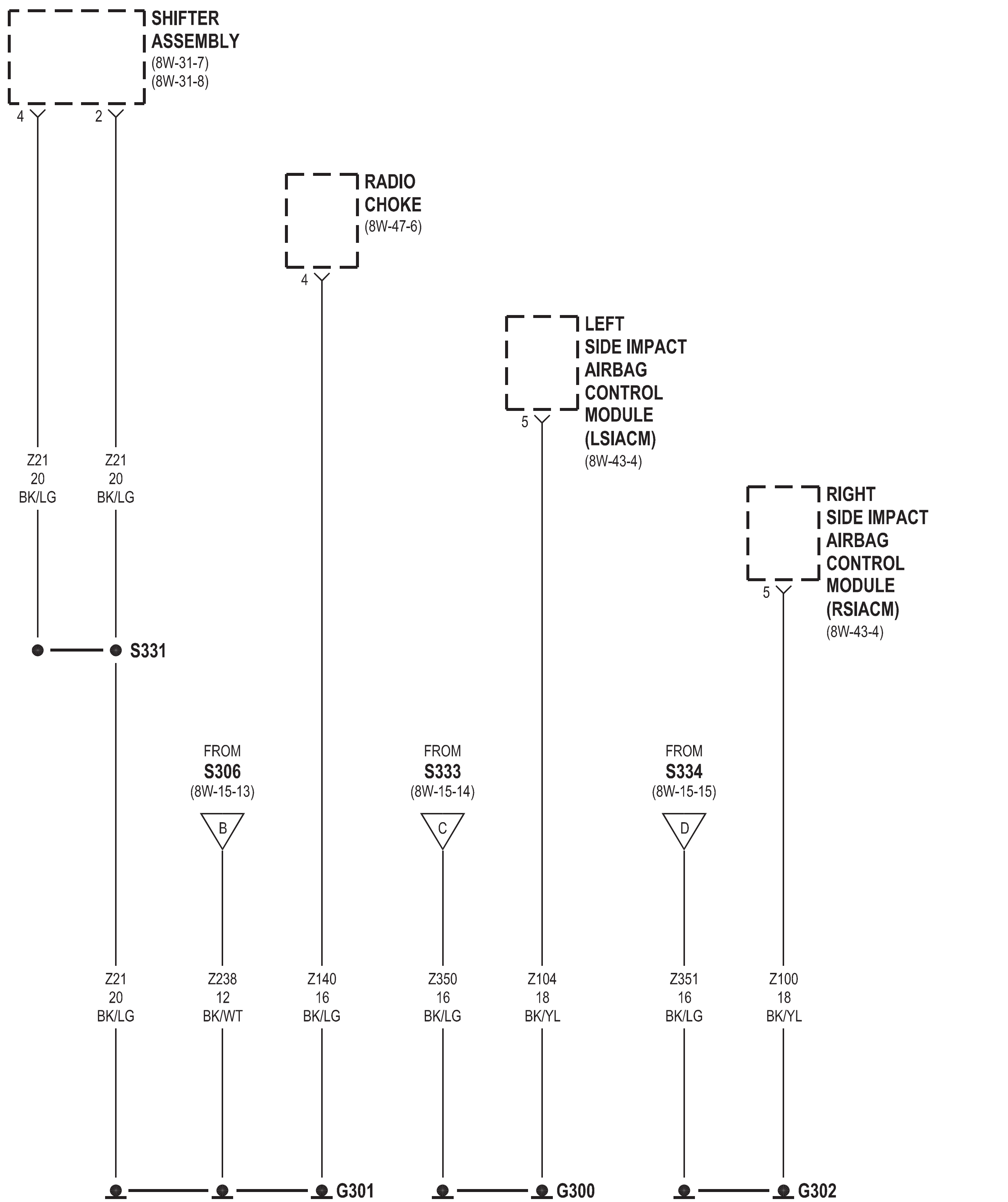


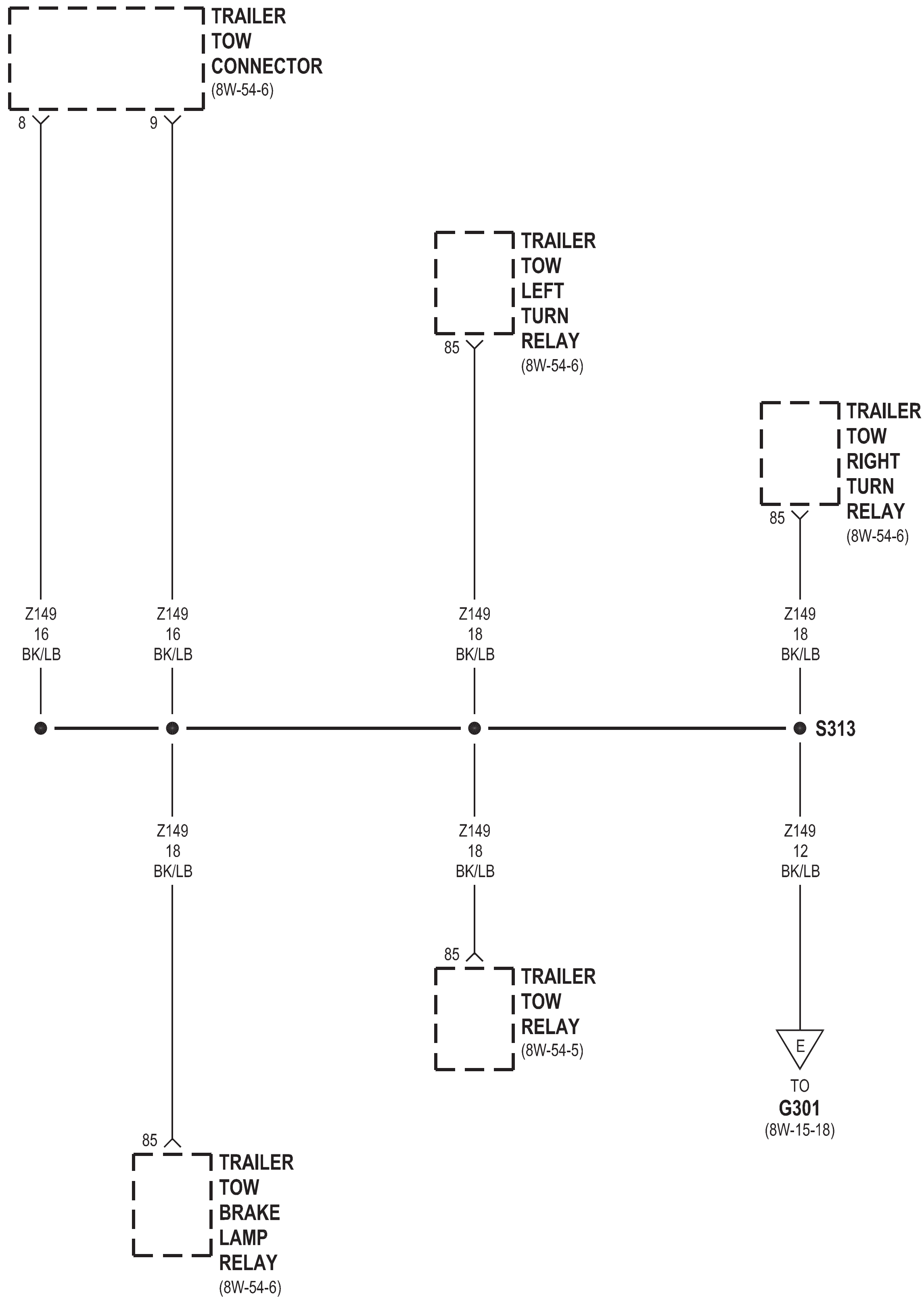
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
POWER OUTLET (LHD)
(8W-41-3)
BODY CONTROL MODULE (EXPORT)
(8W-45-2)
BODY CONTROL MODULE
(8W-45-2)
CIGAR LIGHTER
(8W-41-3)
BRAKE LAMP SWITCH
(8W-33-2)
BRAKE LAMP SWITCH
(8W-33-2)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
Z3 18 BK/OR
Z3 16 BK/OR
Z3 16 BK/OR
Z3 18 BK/OR
Z3 16 BK/OR
Z3 20 BK/OR
S214
SENTRY KEY IMMOBILIZER MODULE (EXCEPT BASE)
(8W-39-7)
EXCEPT BASE
BASE
Z3 14 BK/OR
Z3 18 BK/OR
Z103 16 BK/OR
Z231 16 BK/WT
Z300 16 BK
Z131 10 BK/GY
Z11 20 BK/WT
Z110 20 BK/TN
G202
Z12 16 BK/TN
S200
Z232 16 BK/LB
Z12 18 BK/TN
Z12 18 BK/TN
Z12 18 BK/TN
Z12 20 BK/TN
Z105 20 BK/LG
MULTI-FUNCTION SWITCH
(8W-52-2)
(8W-53-2)
HEADLAMP LEVELING SWITCH (EXPORT)
(8W-50-7)
IGNITION SWITCH
(8W-10-23)
BLEND DOOR ACTUATOR
(8W-42-2)
A/C-HEATER CONTROL
(8W-42-2)
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-3)

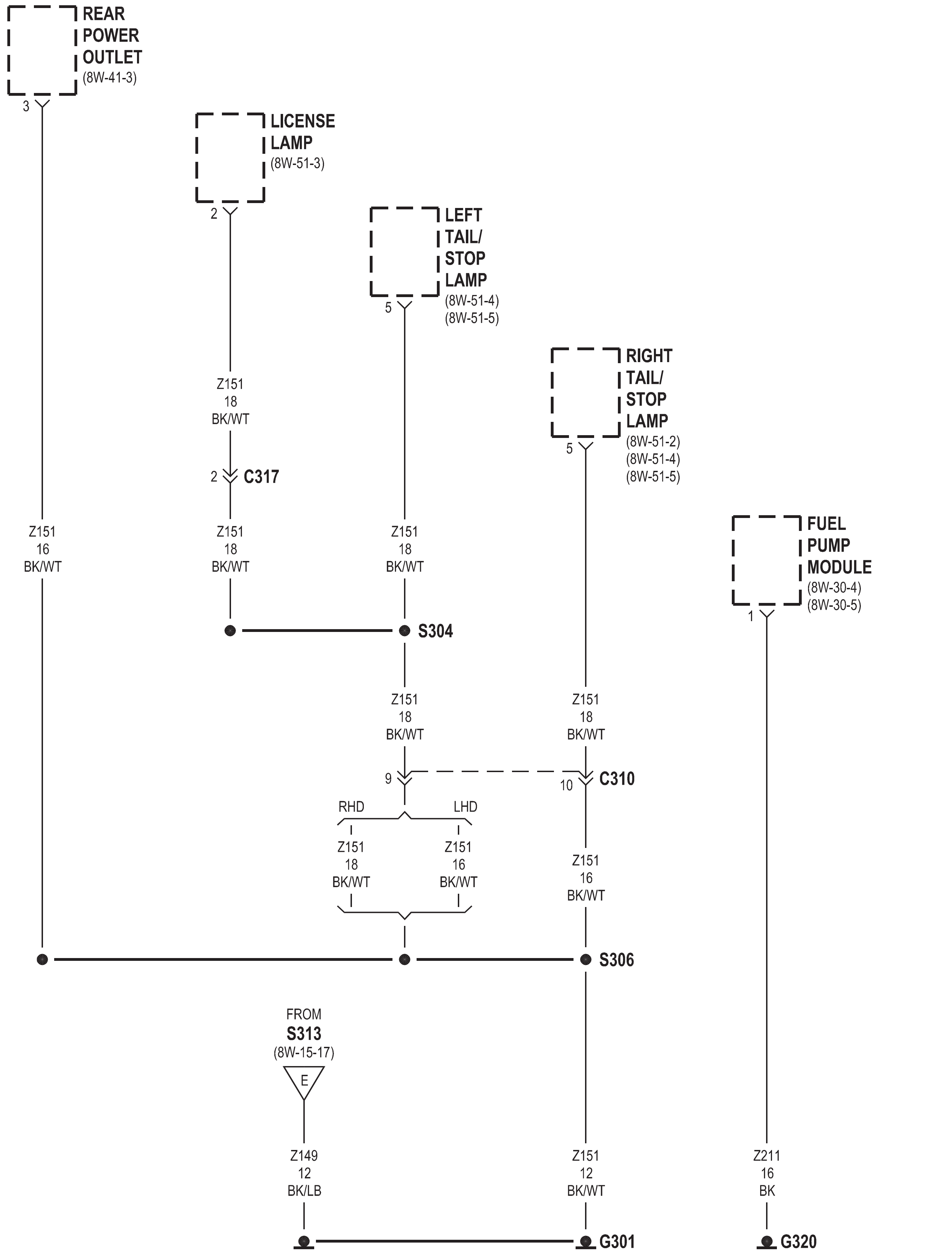

LEFT POWER SEAT SWITCH (8W-63-2)
LEFT HEATED SEAT SWITCH (HIGHLINE) (8W-63-5)
HEATED SEAT MODULE (HIGHLINE) (8W-63-5)
LEFT HEATED SEAT ASSEMBLY (HIGHLINE) (8W-63-5)
1
5
13
2
Z238 14 BK/WT
Z238 20 BK/WT
Z238 16 BK/WT
Z238 16 BK/WT
EXCEPT HEATED SEATS
HEATED SEAT
S326
Z238 14 BK/WT
RIGHT HEATED SEAT SWITCH (HIGHLINE) (8W-63-4)
RIGHT HEATED SEAT ASSEMBLY (HIGHLINE) (8W-63-4)
RIGHT POWER SEAT SWITCH (8W-63-3)
5
2
1
3 C311
HEATED SEAT
EXCEPT HEATED SEATS
Z238 14 BK/WT
Z238 14 BK/WT
Z238 20 BK/WT
Z238 16 BK/WT
Z238 14 BK/WT
Z238 14 BK/WT
S329
10 C312
POWER WINDOW MASTER SWITCH (8W-60-2)
14
Z238 14 BK/WT
Z238 14 BK/WT
2 C314
3 C313
Z238 14 BK/WT
Z238 12 BK/WT
Z238 14 BK/WT
Z238 14 BK/WT
S332
Z238 12 BK/WT
B
TO G301 (8W-15-16)

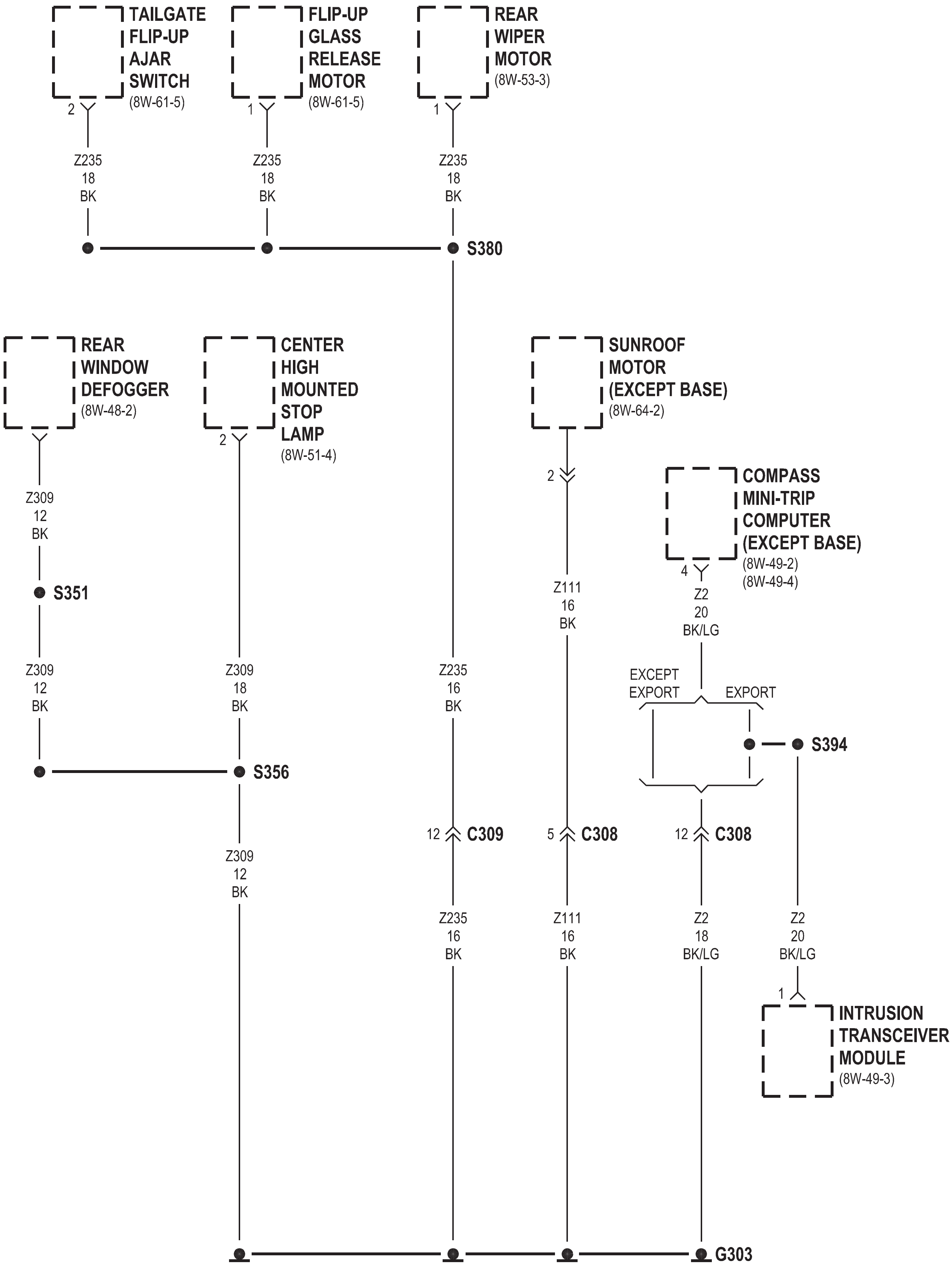

LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH (EXCEPT BASE)
(8W-61-4)
(8W-61-8)
2
LEFT DOOR LOCK SWITCH
(8W-61-2)
(8W-61-8)
2
POWER MIRROR SWITCH (LHD)
(8W-62-3)
3
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH (LHD EXCEPT BASE)
(8W-61-2)
2
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH (RHD EXCEPT BASE)
(8W-61-7)
2
LEFT POWER MIRROR
(8W-62-2)
(8W-62-5)
6
LEFT FRONT DOOR AJAR SWITCH
(8W-45-9)
2
Z350 20 BK/LG
Z350 20 BK/LG
Z350 20 BK/LG
Z350 18 BK/LG
Z350 18 BK/LG
Z350 20 BK/LG
Z350 20 BK/LG
S360
EXCEPT BASE
BASE
RHD
LHD
Z350 18 BK/LG
Z350 20 BK/LG
17 C303
17 C301
Z350 18 BK/LG
Z350 20 BK/LG
10 C305
Z350 20 BK/LG
S333
Z350 18 BK/LG
10 C305
Z350 20 BK/LG
2
LEFT REAR DOOR AJAR SWITCH (BASE)
(8W-45-9)
Z350 16 BK/LG
C
TO
G300
(8W-15-16)


DRIVER DOOR LOCK MOTOR/ AJAR SWITCH (RHD EXCEPT BASE)
(8W-61-6)
2
POWER MIRROR SWITCH (RHD)
(8W-62-6)
3
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH (EXCEPT BASE)
(8W-61-3)
(8W-61-7)
2
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH (LHD EXCEPT BASE)
(8W-61-3)
2
RIGHT POWER MIRROR
(8W-62-2)
(8W-62-5)
6
Z351 18 BK/LG
Z351 18 BK/LG
Z351 18 BK/LG
Z351 20 BK/LG
Z351 20 BK/LG
S370
Z351 20 BK/LG
Z351 18 BK/LG
Z351 18 BK/LG
2
RIGHT FRONT DOOR AJAR SWITCH
(8W-45-9)
2
RIGHT DOOR LOCK SWITCH
(8W-61-4)
(8W-61-6)
LHD
RHD
17 C303
17 C301
10 C304
Z351 18 BK/LG
Z351 18 BK/LG
S334
Z351 18 BK/LG
Z351 16 BK/LG
10 C304
Z351 20 BK/LG
D
TO
G302
(8W-15-16)
2
RIGHT REAR DOOR AJAR SWITCH (BASE)
(8W-45-9)

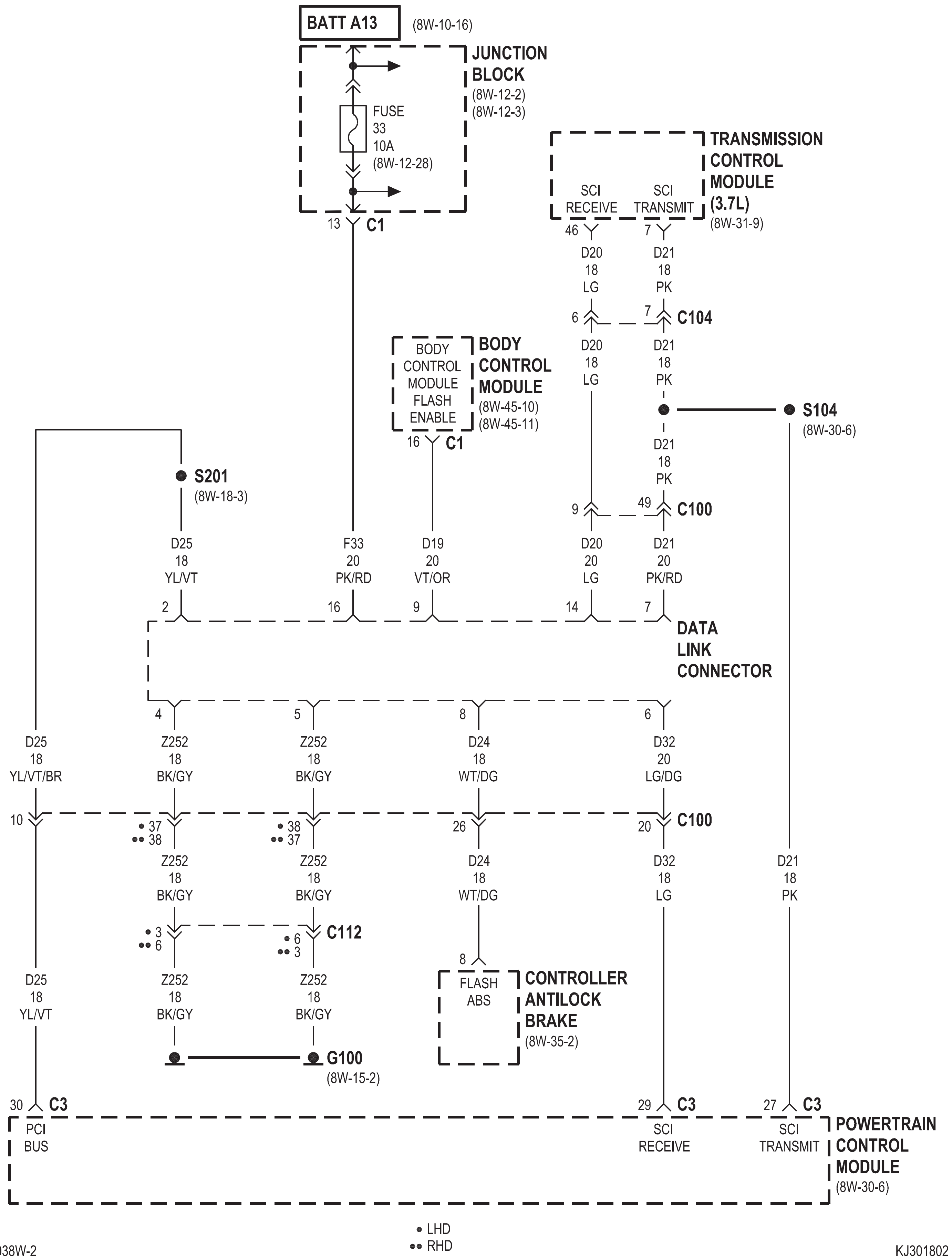

SHIFTER ASSEMBLY
(8W-31-7)
(8W-31-8)
4
2
RADIO CHOKE
(8W-47-6)
4
LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM)
(8W-43-4)
5
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE (RSIACM)
(8W-43-4)
5
Z21 20 BK/LG
Z21 20 BK/LG
S331
FROM S306 (8W-15-13)
B
FROM S333 (8W-15-14)
C
FROM S334 (8W-15-15)
D
Z21 20 BK/LG
Z238 12 BK/WT
Z140 16 BK/LG
Z350 16 BK/LG
Z104 18 BK/YL
Z351 16 BK/LG
Z100 18 BK/YL
G301
G300
G302

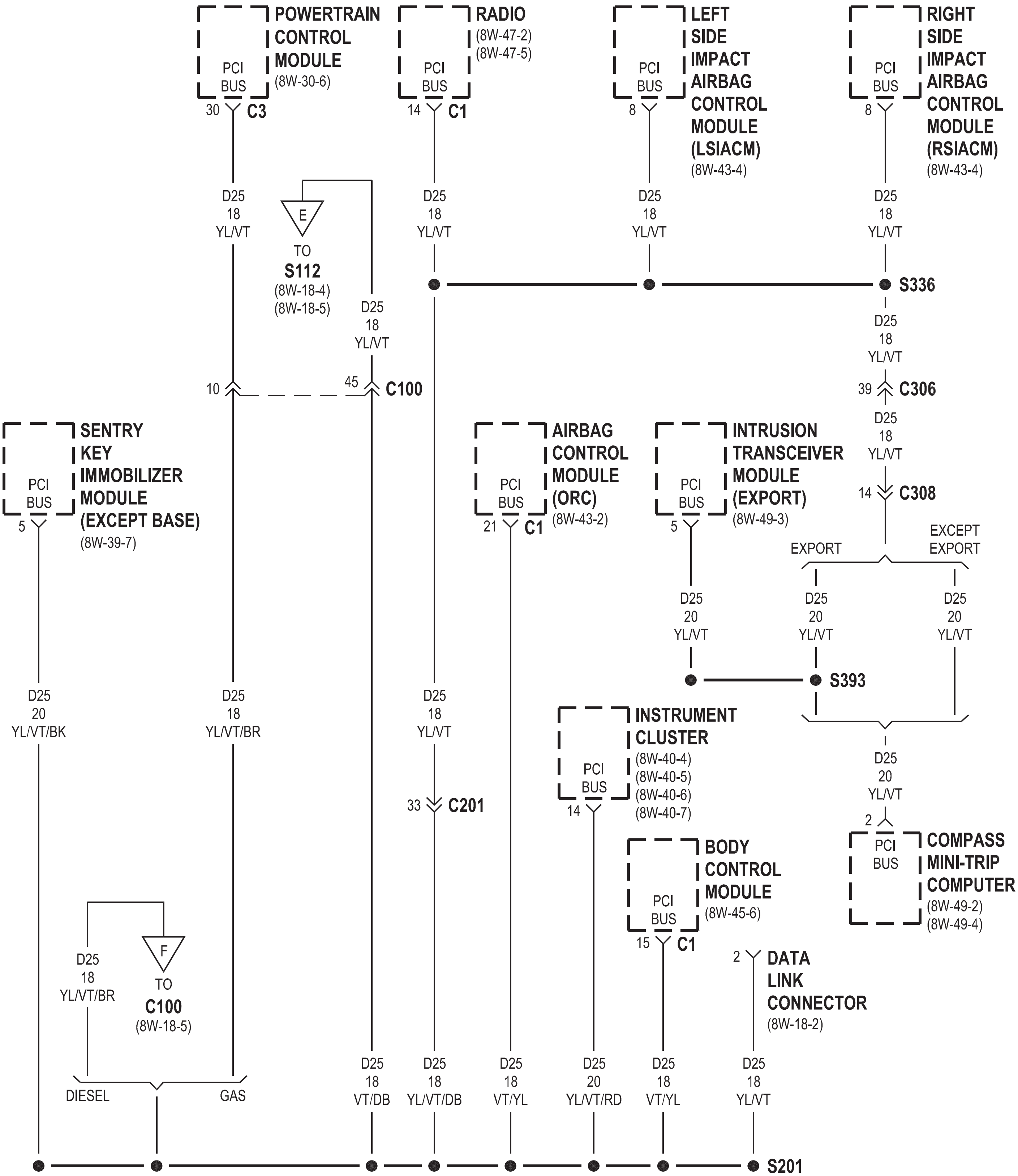

TRAILER TOW CONNECTOR
(8W-54-6)
8
9
TRAILER TOW LEFT TURN RELAY
(8W-54-6)
85
TRAILER TOW RIGHT TURN RELAY
(8W-54-6)
85
Z149 16 BK/LB
Z149 16 BK/LB
Z149 18 BK/LB
Z149 18 BK/LB
S313
Z149 18 BK/LB
Z149 18 BK/LB
Z149 12 BK/LB
85
TRAILER TOW RELAY
(8W-54-5)
E
TO G301
(8W-15-18)
85
TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)

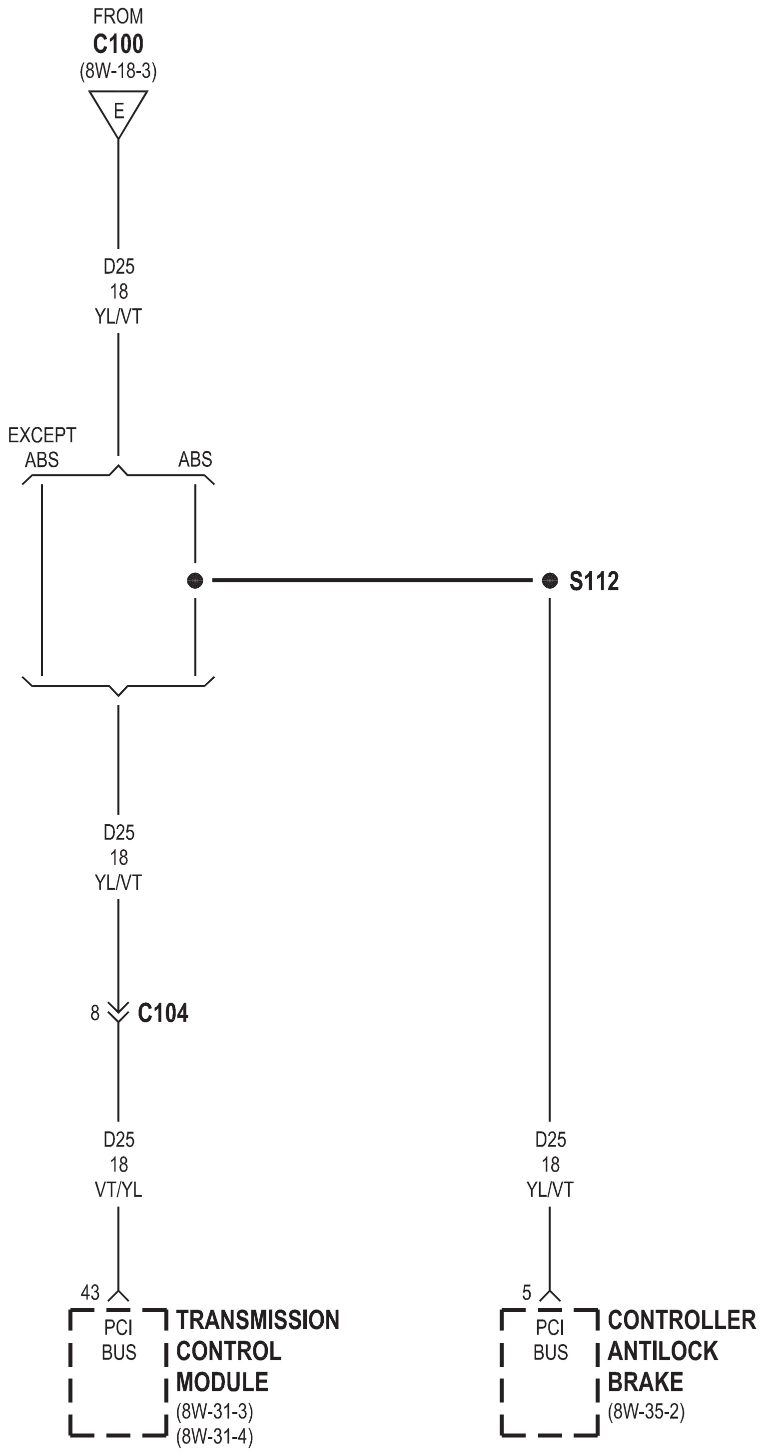

REAR POWER OUTLET
(8W-41-3)
3
LICENSE LAMP
(8W-51-3)
2
LEFT TAIL/ STOP LAMP
(8W-51-4)
(8W-51-5)
5
RIGHT TAIL/ STOP LAMP
(8W-51-2)
(8W-51-4)
(8W-51-5)
5
FUEL PUMP MODULE
(8W-30-4)
(8W-30-5)
1
Z151 18 BK/WT
2 C317
Z151 16 BK/WT
Z151 18 BK/WT
Z151 18 BK/WT
S304
Z151 18 BK/WT
Z151 18 BK/WT
9
10 C310
RHD
LHD
Z151 18 BK/WT
Z151 16 BK/WT
Z151 16 BK/WT
S306
FROM S313 (8W-15-17)
E
Z149 12 BK/LB
Z151 12 BK/WT
Z211 16 BK
G301
G320

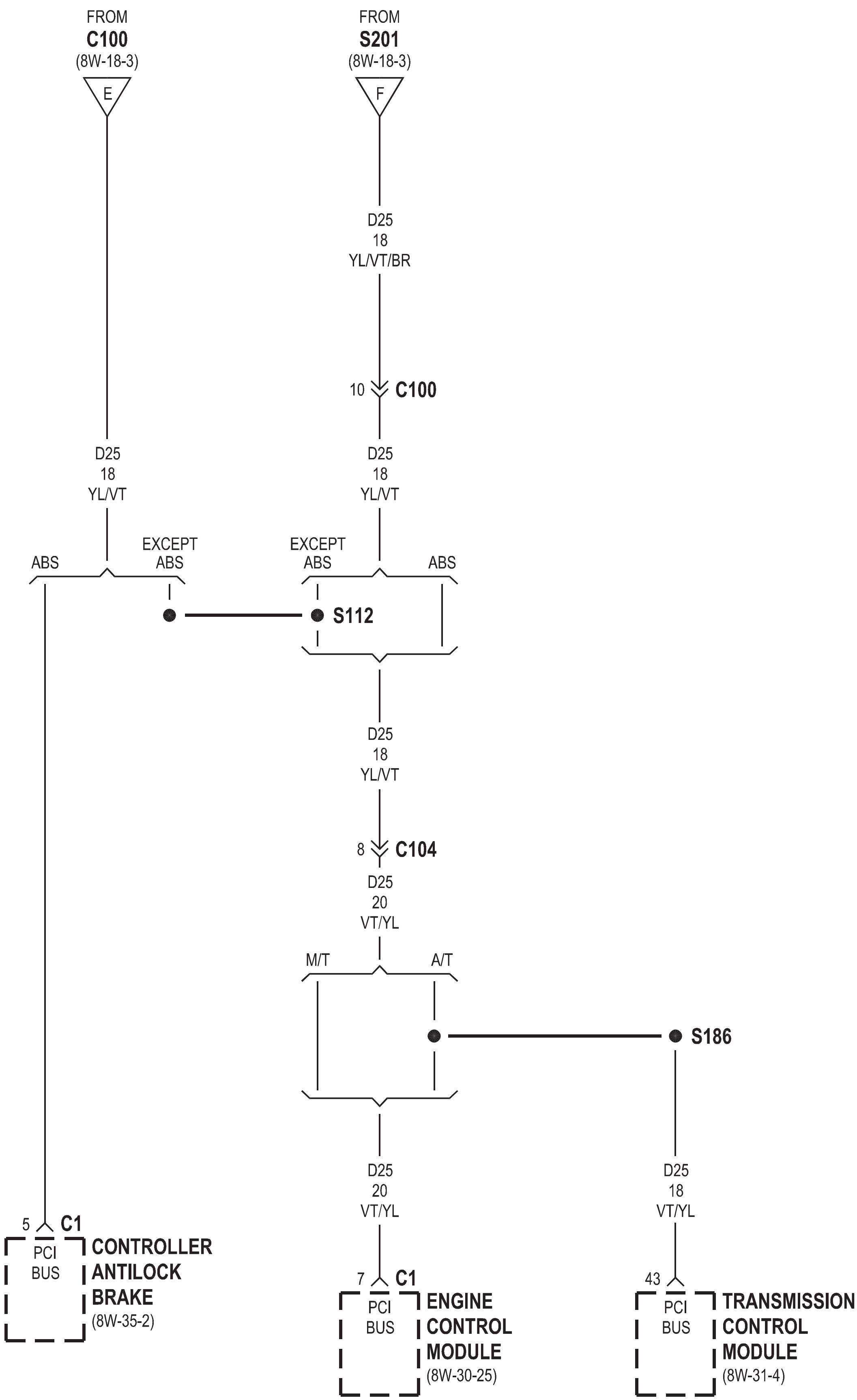

TAILGATE FLIP-UP AJAR SWITCH (8W-61-5)
FLIP-UP GLASS RELEASE MOTOR (8W-61-5)
REAR WIPER MOTOR (8W-53-3)
2
1
1
Z235 18 BK
Z235 18 BK
Z235 18 BK
S380
REAR WINDOW DEFOGGER (8W-48-2)
CENTER HIGH MOUNTED STOP LAMP (8W-51-4)
2
SUNROOF MOTOR (EXCEPT BASE) (8W-64-2)
2
COMPASS MINI-TRIP COMPUTER (EXCEPT BASE) (8W-49-2) (8W-49-4)
4
Z309 12 BK
S351
Z111 16 BK
Z2 20 BK/LG
Z309 12 BK
Z309 18 BK
Z235 16 BK
EXCEPT EXPORT
EXPORT
S394
S356
12 C309
5 C308
12 C308
Z309 12 BK
Z235 16 BK
Z111 16 BK
Z2 18 BK/LG
Z2 20 BK/LG
1
INTRUSION TRANSCEIVER MODULE (8W-49-3)
G303

8W-18 BUS COMMUNICATIONS

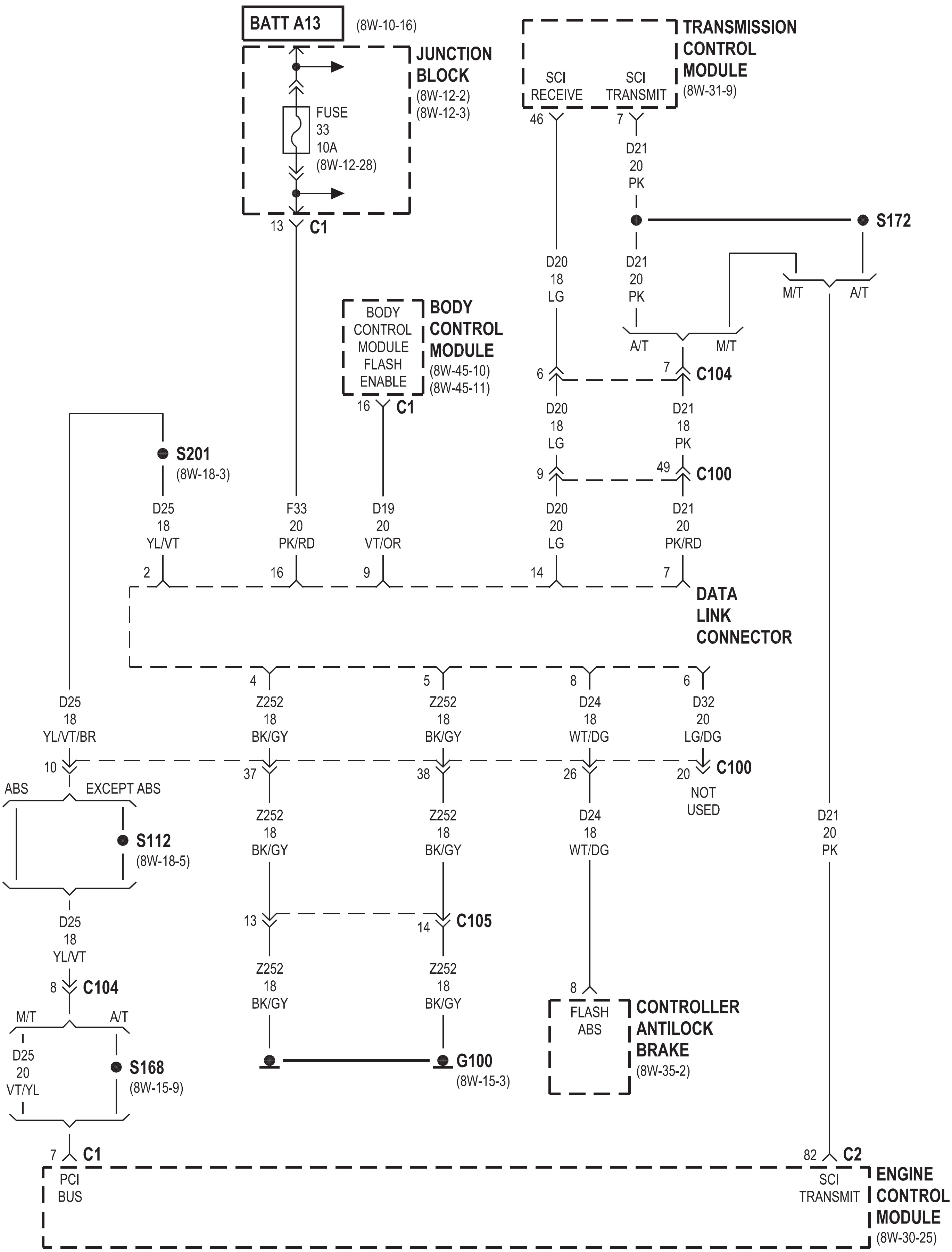

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
33
10A
(8W-12-28)
13 C1
TRANSMISSION CONTROL MODULE (3.7L)
(8W-31-9)
SCI RECEIVE
SCI TRANSMIT
46
7
D20 18 LG
D21 18 PK
6
7
C104
D20 18 LG
D21 18 PK
BODY CONTROL MODULE FLASH ENABLE
BODY CONTROL MODULE
(8W-45-10)
(8W-45-11)
16 C1
S104
(8W-30-6)
D21 18 PK
S201
(8W-18-3)
9
49
C100
D25 18 YL/VT
F33 20 PK/RD
D19 20 VT/OR
D20 20 LG
D21 20 PK/RD
2
16
9
14
7
DATA LINK CONNECTOR
4
5
8
6
D25 18 YL/VT/BR
Z252 18 BK/GY
Z252 18 BK/GY
D24 18 WT/DG
D32 20 LG/DG
10
• 37
•• 38
• 38
•• 37
26
20
C100
Z252 18 BK/GY
Z252 18 BK/GY
D24 18 WT/DG
D32 18 LG
D21 18 PK
• 3
•• 6
• 6
•• 3
C112
8
FLASH ABS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
D25 18 YL/VT
Z252 18 BK/GY
Z252 18 BK/GY
G100
(8W-15-2)
30 C3
29 C3
27 C3
PCI BUS
SCI RECEIVE
SCI TRANSMIT
POWERTRAIN CONTROL MODULE
(8W-30-6)
• LHD
•• RHD


POWERTRAIN CONTROL MODULE
(8W-30-6)
PCI BUS
30 C3
RADIO
(8W-47-2)
(8W-47-5)
PCI BUS
14 C1
LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM)
(8W-43-4)
PCI BUS
8
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE (RSIACM)
(8W-43-4)
PCI BUS
8
D25 18 YL/VT
E
TO S112
(8W-18-4)
(8W-18-5)
S336
10
45
C100
39 C306
14 C308
SENTRY KEY IMMOBILIZER MODULE (EXCEPT BASE)
(8W-39-7)
PCI BUS
5
AIRBAG CONTROL MODULE (ORC)
(8W-43-2)
PCI BUS
21 C1
INTRUSION TRANSCEIVER MODULE (EXPORT)
(8W-49-3)
PCI BUS
5
EXPORT
EXCEPT EXPORT
D25 20 YL/VT
S393
D25 20 YL/VT/BK
D25 18 YL/VT/BR
33 C201
INSTRUMENT CLUSTER
(8W-40-4)
(8W-40-5)
(8W-40-6)
(8W-40-7)
PCI BUS
14
2
COMPASS MINI-TRIP COMPUTER
(8W-49-2)
(8W-49-4)
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
2
DATA LINK CONNECTOR
(8W-18-2)
F
TO C100
(8W-18-5)
DIESEL
GAS
D25 18 VT/DB
D25 18 YL/VT/DB
D25 18 VT/YL
D25 20 YL/VT/RD
D25 18 YL/VT
S201


FROM
C100
(8W-18-3)
E
D25
18
YL/VT
EXCEPT
ABS
ABS
S112
D25
18
YL/VT
8
C104
D25
18
VT/YL
D25
18
YL/VT
43
PCI
BUS
TRANSMISSION
CONTROL
MODULE
(8W-31-3)
(8W-31-4)
5
PCI
BUS
CONTROLLER
ANTILOCK
BRAKE
(8W-35-2)

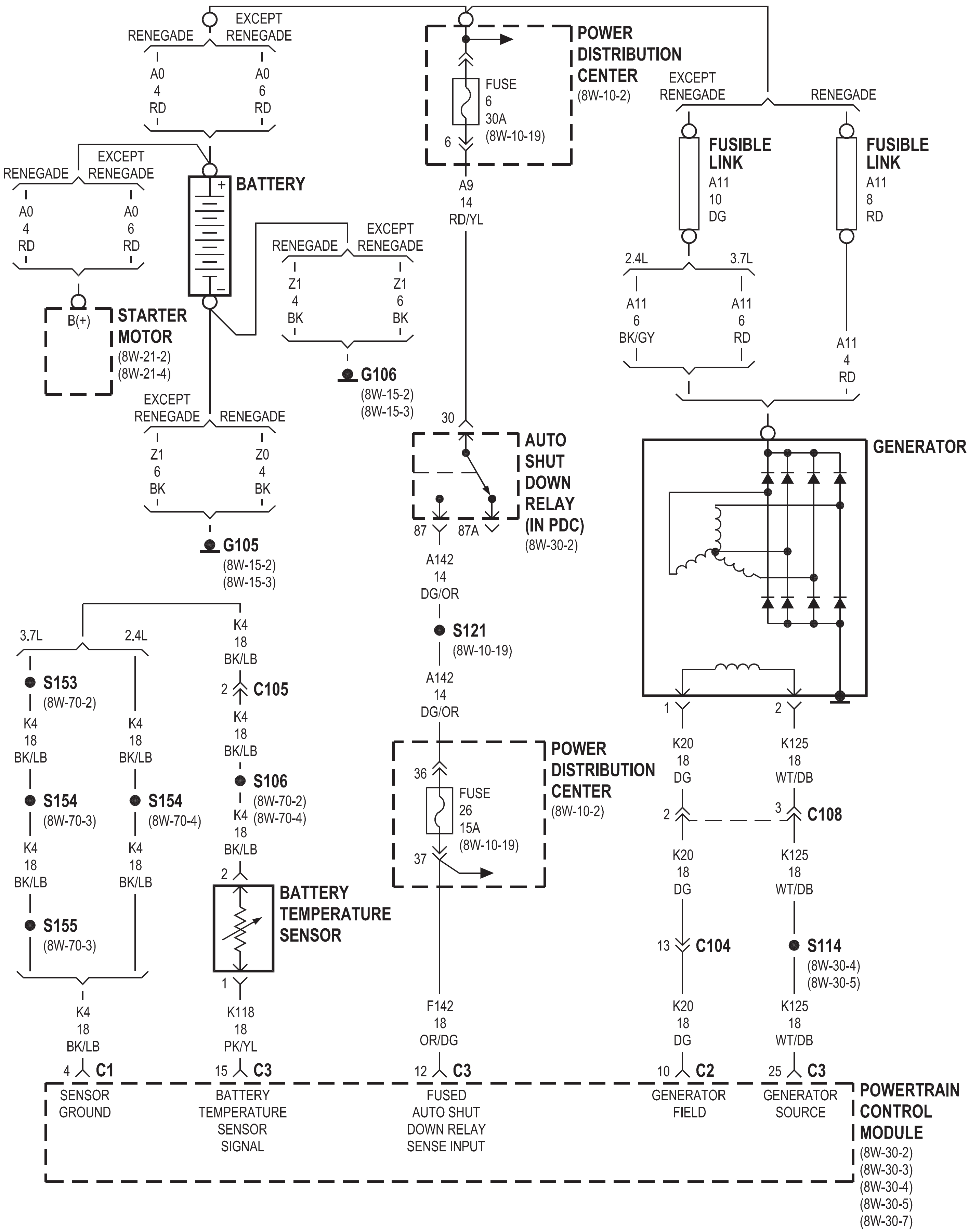

FROM
C100
(8W-18-3)
E
FROM
S201
(8W-18-3)
F
D25
18
YL/VT/BR
10
C100
D25
18
YL/VT
D25
18
YL/VT
ABS
EXCEPT ABS
EXCEPT ABS
ABS
S112
D25
18
YL/VT
8
C104
D25
20
VT/YL
M/T
A/T
S186
D25
20
VT/YL
D25
18
VT/YL
5
C1
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
7
C1
PCI BUS
ENGINE CONTROL MODULE
(8W-30-25)
43
PCI BUS
TRANSMISSION CONTROL MODULE
(8W-31-4)

DIESEL

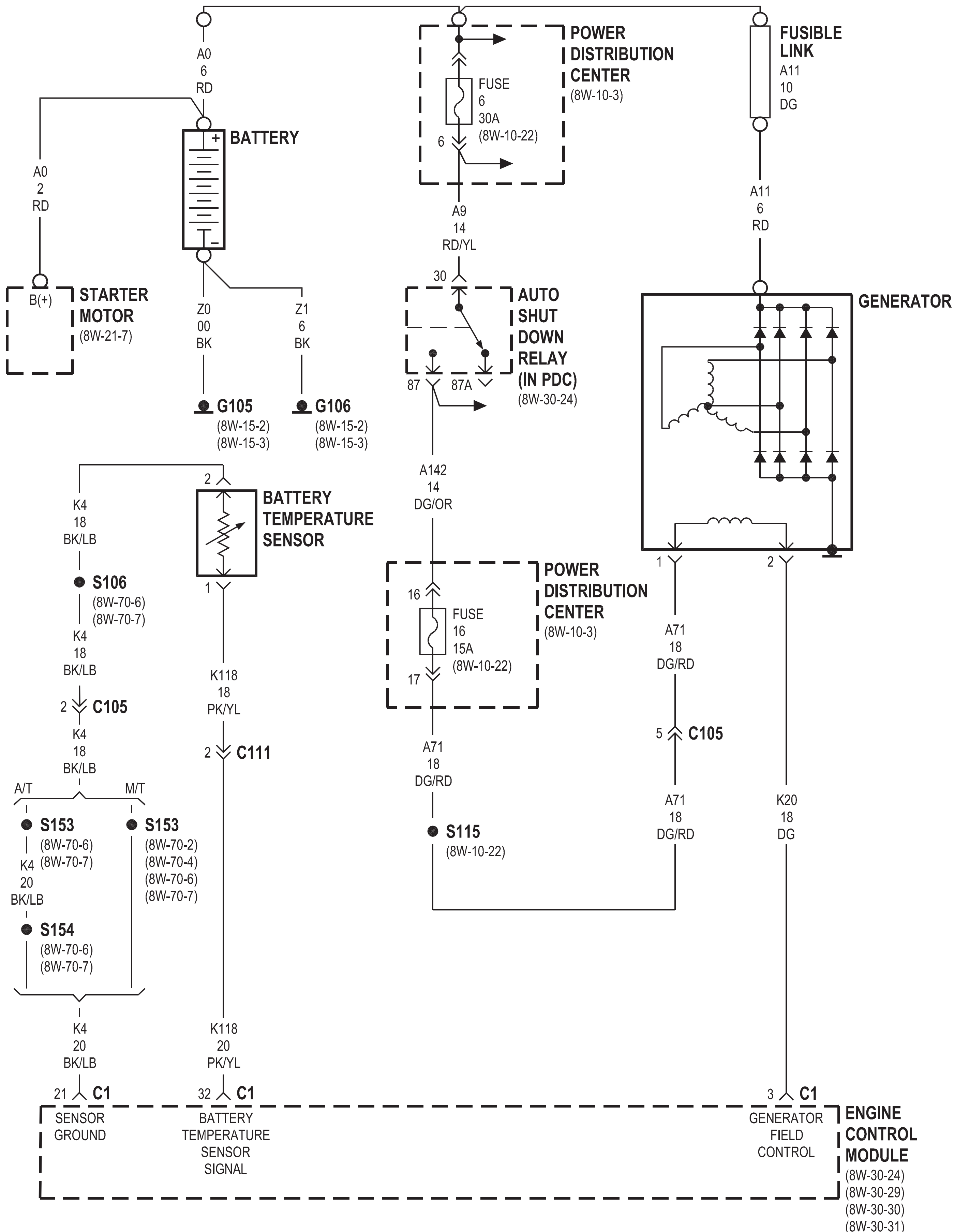

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 33 10A
(8W-12-28)
13 C1
TRANSMISSION CONTROL MODULE
(8W-31-9)
SCI RECEIVE
SCI TRANSMIT
46
7
D21 20 PK
S172
D20 18 LG
D21 20 PK
M/T
A/T
BODY CONTROL MODULE
(8W-45-10)
(8W-45-11)
BODY CONTROL MODULE FLASH ENABLE
16 C1
6
7 C104
D20 18 LG
D21 18 PK
9
49 C100
S201
(8W-18-3)
D25 18 YL/VT
F33 20 PK/RD
D19 20 VT/OR
D20 20 LG
D21 20 PK/RD
2
16
9
14
7
DATA LINK CONNECTOR
4
5
8
6
D25 18 YL/VT/BR
Z252 18 BK/GY
Z252 18 BK/GY
D24 18 WT/DG
D32 20 LG/DG
10
37
38
26
20 C100
NOT USED
ABS
EXCEPT ABS
S112
(8W-18-5)
Z252 18 BK/GY
Z252 18 BK/GY
D24 18 WT/DG
D21 20 PK
13
14 C105
D25 18 YL/VT
8 C104
Z252 18 BK/GY
Z252 18 BK/GY
8
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
FLASH ABS
M/T
A/T
D25 20 VT/YL
S168
(8W-15-9)
G100
(8W-15-3)
7 C1
82 C2
PCI BUS
SCI TRANSMIT
ENGINE CONTROL MODULE
(8W-30-25)

8W-20 CHARGING SYSTEM

GAS


RENEGADE
EXCEPT RENEGADE
A0 4 RD
A0 6 RD
BATTERY
STARTER MOTOR
B(+)
(8W-21-2)
(8W-21-4)
Z1 4 BK
Z1 6 BK
G106
(8W-15-2)
(8W-15-3)
Z1 6 BK
Z0 4 BK
G105
(8W-15-2)
(8W-15-3)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A (8W-10-19)
A9 14 RD/YL
FUSIBLE LINK
A11 10 DG
A11 8 RD
2.4L
3.7L
A11 6 BK/GY
A11 6 RD
A11 4 RD
GENERATOR
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-2)
30
87
87A
A142 14 DG/OR
S121
(8W-10-19)
FUSE 26 15A (8W-10-19)
36
37
F142 18 OR/DG
K20 18 DG
K125 18 WT/DB
C108
C104
S114
(8W-30-4)
(8W-30-5)
K4 18 BK/LB
C105
S106
(8W-70-2)
(8W-70-4)
S153
(8W-70-2)
S154
(8W-70-3)
(8W-70-4)
S155
(8W-70-3)
BATTERY TEMPERATURE SENSOR
K118 18 PK/YL
4 C1
15 C3
12 C3
10 C2
25 C3
SENSOR GROUND
BATTERY TEMPERATURE SENSOR SIGNAL
FUSED AUTO SHUT DOWN RELAY SENSE INPUT
GENERATOR FIELD
GENERATOR SOURCE
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-3)
(8W-30-4)
(8W-30-5)
(8W-30-7)

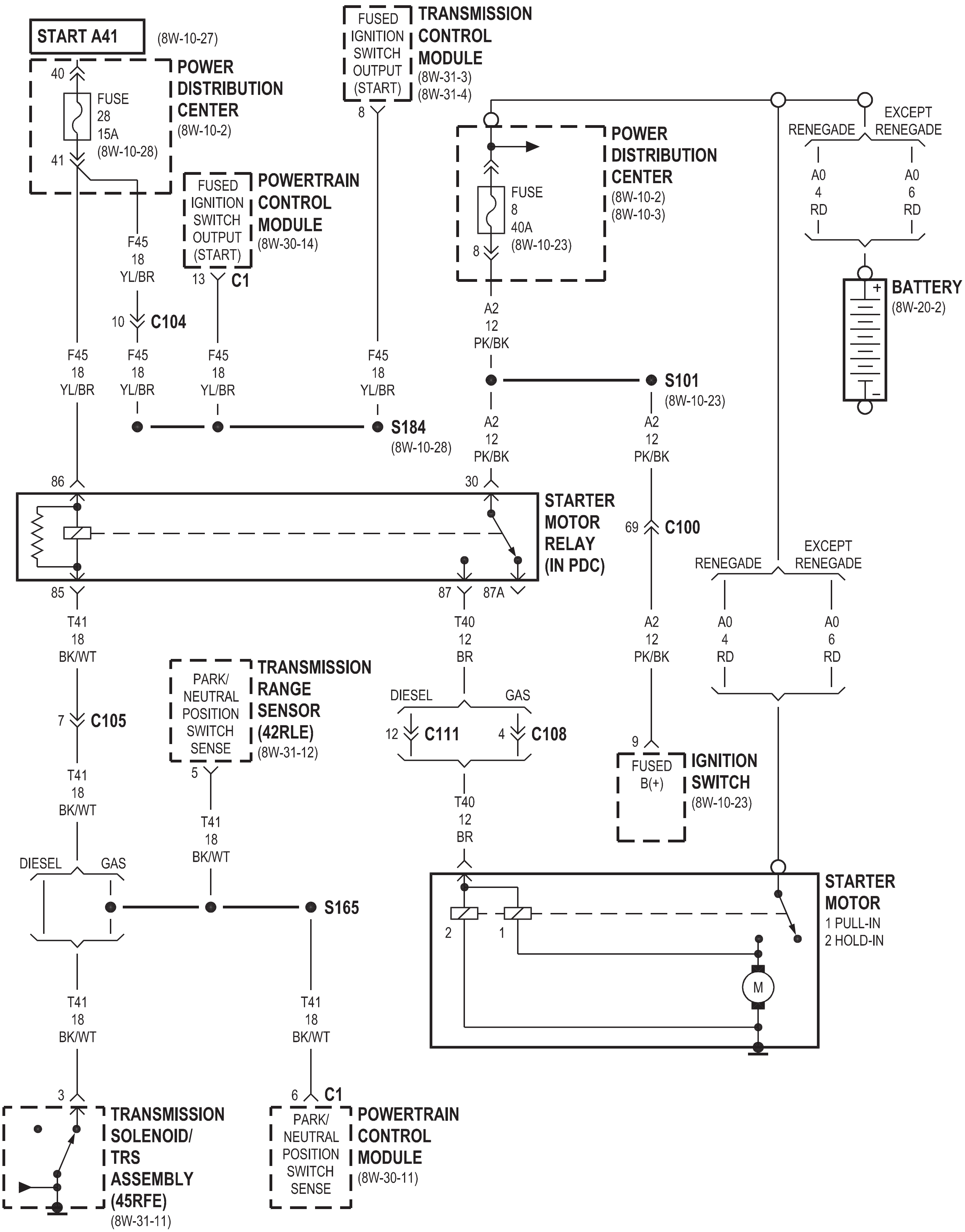
DIESEL

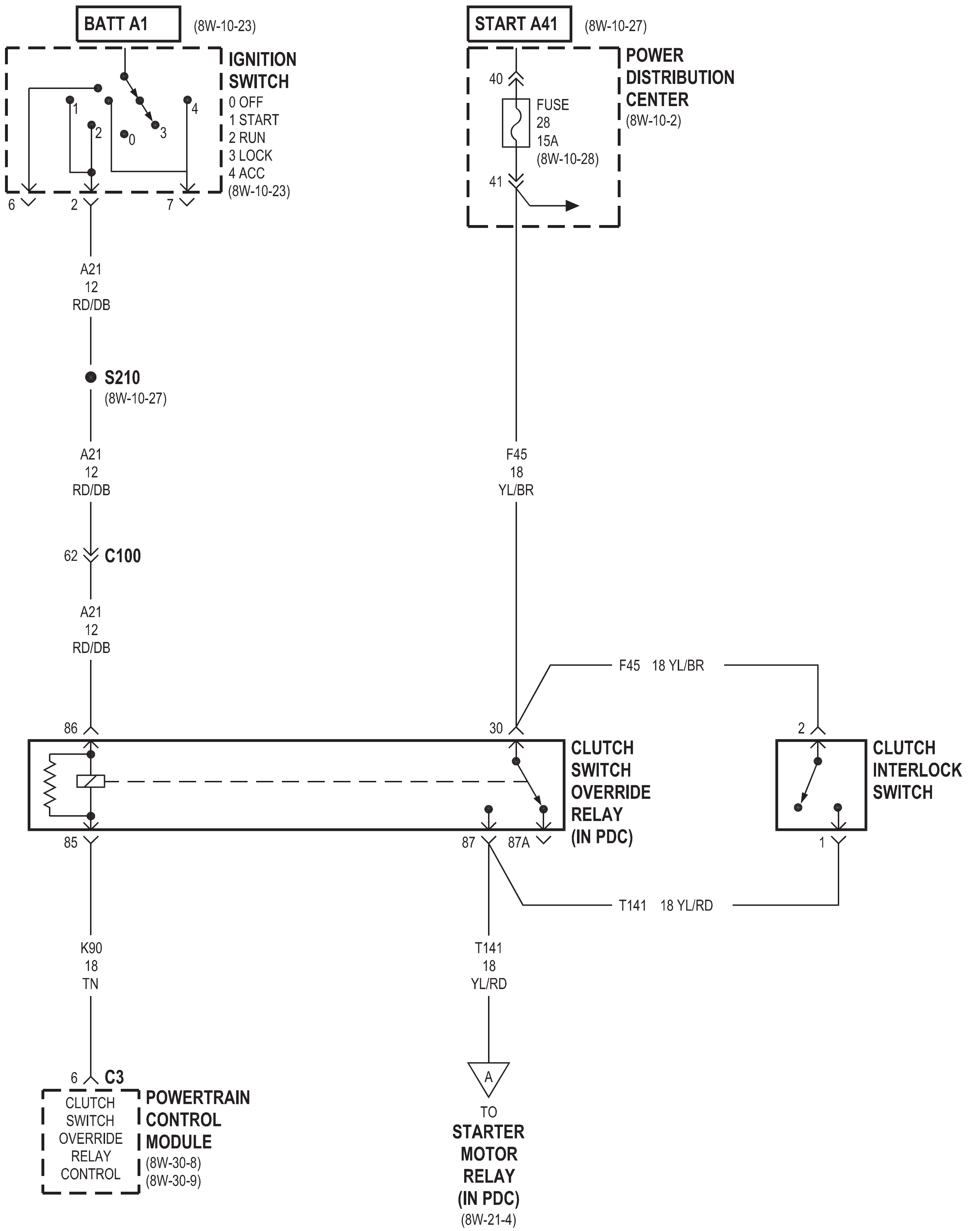


A0
6
RD
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE
6
30A
(8W-10-22)
6
FUSIBLE LINK
A11
10
DG
BATTERY
A0
2
RD
A9
14
RD/YL
A11
6
RD
30
STARTER MOTOR
(8W-21-7)
B(+)
Z0
00
BK
Z1
6
BK
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-24)
87
87A
GENERATOR
G105
(8W-15-2)
(8W-15-3)
G106
(8W-15-2)
(8W-15-3)
A142
14
DG/OR
2
BATTERY TEMPERATURE SENSOR
1
K4
18
BK/LB
S106
(8W-70-6)
(8W-70-7)
K4
18
BK/LB
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE
16
15A
(8W-10-22)
17
1
2
A71
18
DG/RD
K118
18
PK/YL
2
C105
K4
18
BK/LB
2
C111
A71
18
DG/RD
5
C105
A/T
M/T
S153
(8W-70-6)
(8W-70-7)
S153
(8W-70-2)
(8W-70-4)
(8W-70-6)
(8W-70-7)
K4
20
BK/LB
S115
(8W-10-22)
A71
18
DG/RD
K20
18
DG
S154
(8W-70-6)
(8W-70-7)
K4
20
BK/LB
K118
20
PK/YL
21
C1
32
C1
3
C1
SENSOR GROUND
BATTERY TEMPERATURE SENSOR SIGNAL
GENERATOR FIELD CONTROL
ENGINE CONTROL MODULE
(8W-30-24)
(8W-30-29)
(8W-30-30)
(8W-30-31)

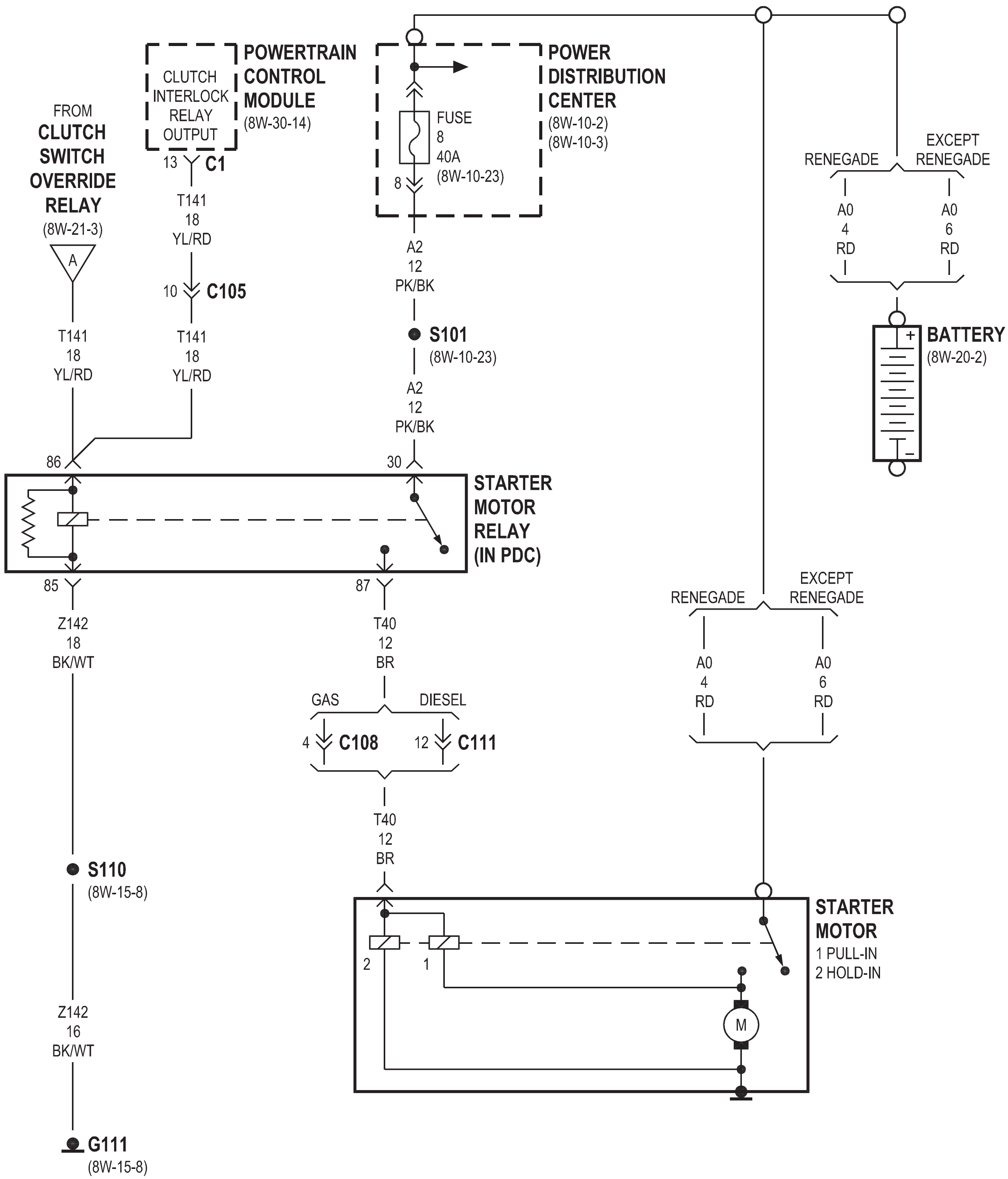
8W-21 STARTING SYSTEM

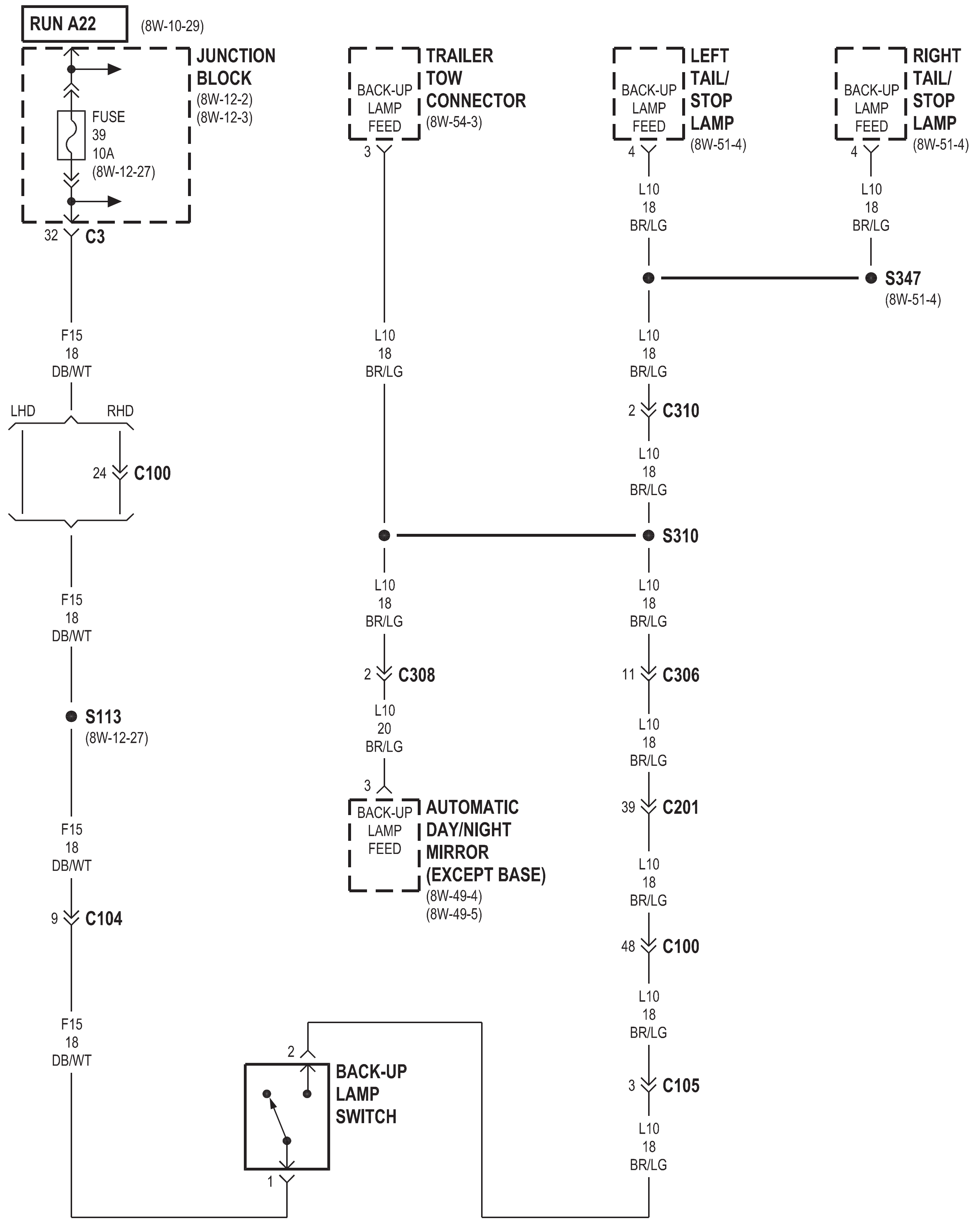
A/T

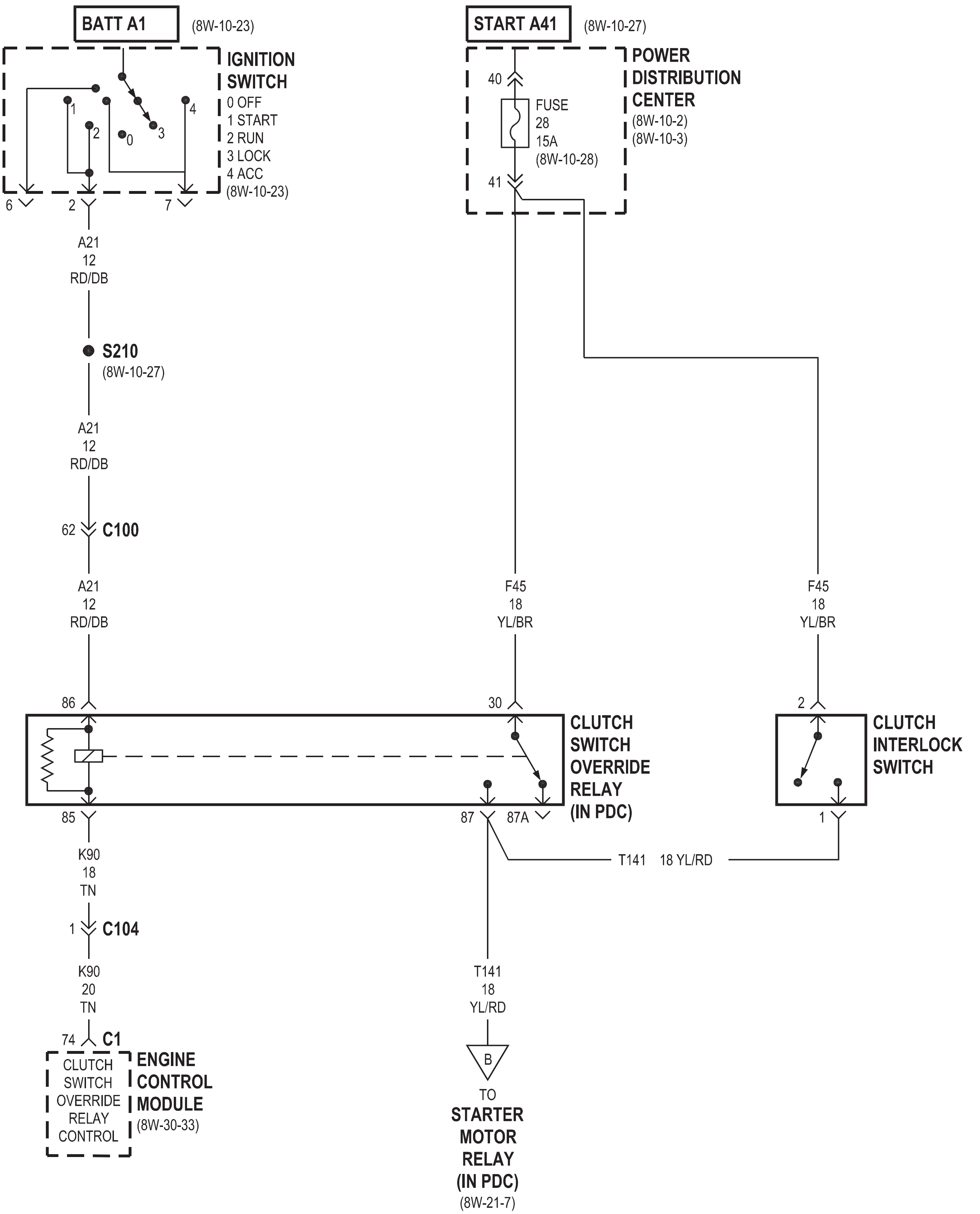

START A41
(8W-10-27)
40
FUSE
28
15A
(8W-10-28)
41
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSED IGNITION SWITCH OUTPUT (START)
TRANSMISSION CONTROL MODULE
(8W-31-3)
(8W-31-4)
8
FUSED IGNITION SWITCH OUTPUT (START)
POWERTRAIN CONTROL MODULE
(8W-30-14)
13 C1
F45
18
YL/BR
10 C104
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
8
40A
(8W-10-23)
8
A2
12
PK/BK
S101
(8W-10-23)
S184
(8W-10-28)
RENEGADE
EXCEPT RENEGADE
A0
4
RD
A0
6
RD
BATTERY
(8W-20-2)
86
30
STARTER MOTOR RELAY (IN PDC)
85
87
87A
69 C100
T41
18
BK/WT
T40
12
BR
7 C105
PARK/ NEUTRAL POSITION SWITCH SENSE
TRANSMISSION RANGE SENSOR (42RLE)
(8W-31-12)
5
DIESEL
GAS
12 C111
4 C108
9
FUSED B(+)
IGNITION SWITCH
(8W-10-23)
S165
STARTER MOTOR
1 PULL-IN
2 HOLD-IN
2
1
M
3
TRANSMISSION SOLENOID/ TRS ASSEMBLY (45RFE)
(8W-31-11)
6 C1
PARK/ NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-11)

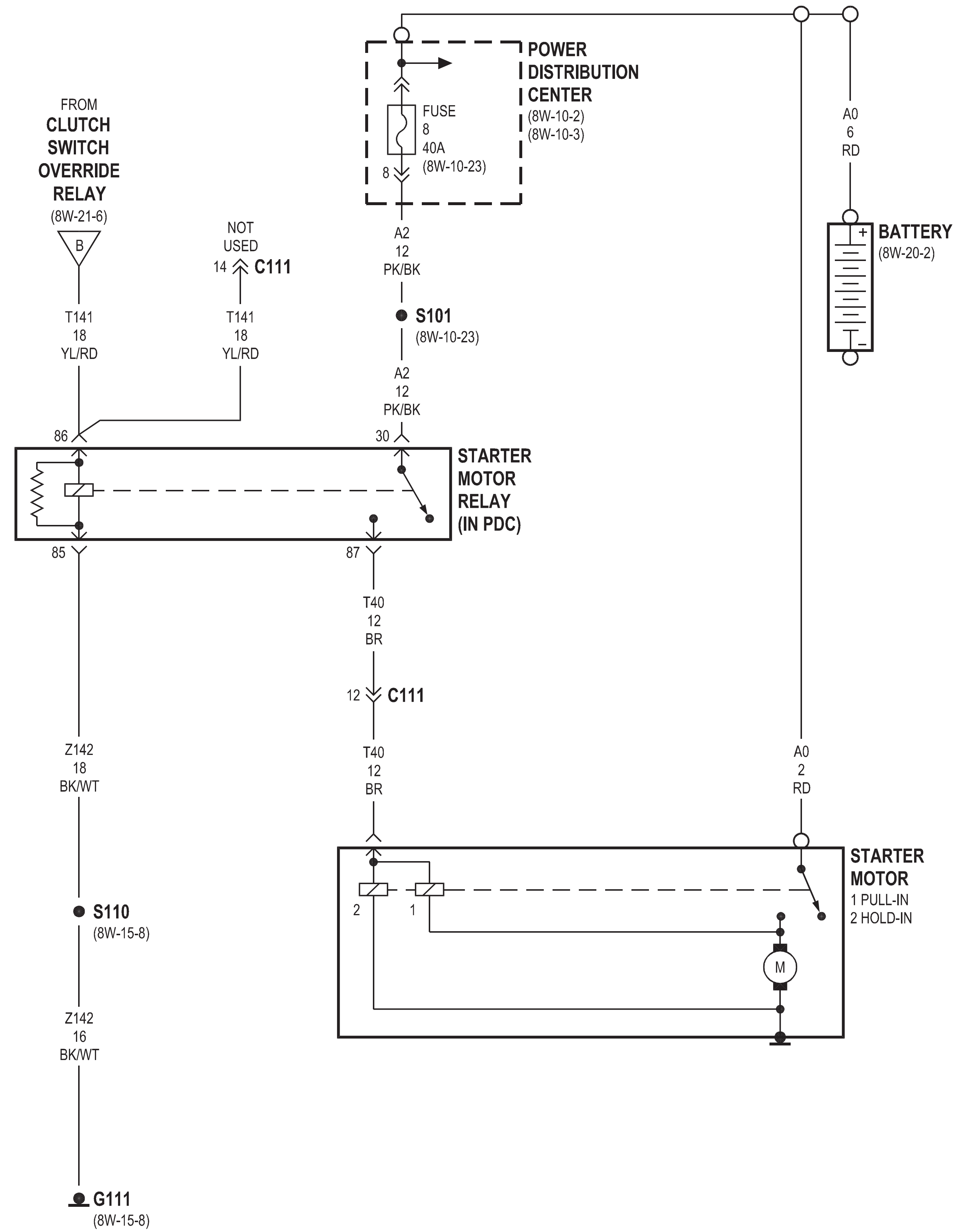


BATT A1
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
START A41
(8W-10-27)
POWER DISTRIBUTION CENTER
(8W-10-2)
40
FUSE
28
15A
(8W-10-28)
41
6
2
7
A21
12
RD/DB
S210
(8W-10-27)
A21
12
RD/DB
F45
18
YL/BR
62
C100
A21
12
RD/DB
F45 18 YL/BR
86
30
2
CLUTCH SWITCH OVERRIDE RELAY (IN PDC)
CLUTCH INTERLOCK SWITCH
85
87
87A
1
T141 18 YL/RD
K90
18
TN
T141
18
YL/RD
6
C3
CLUTCH SWITCH OVERRIDE RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-8)
(8W-30-9)
A
TO STARTER MOTOR RELAY (IN PDC)
(8W-21-4)


POWERTRAIN CONTROL MODULE
(8W-30-14)
CLUTCH INTERLOCK RELAY OUTPUT
13 C1
T141 18 YL/RD
10 C105
T141 18 YL/RD
FROM CLUTCH SWITCH OVERRIDE RELAY
(8W-21-3)
A
T141 18 YL/RD
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 8 40A
(8W-10-23)
8
A2 12 PK/BK
S101
(8W-10-23)
A2 12 PK/BK
RENEGADE
EXCEPT RENEGADE
A0 4 RD
A0 6 RD
BATTERY
(8W-20-2)
86
30
STARTER MOTOR RELAY (IN PDC)
85
87
Z142 18 BK/WT
T40 12 BR
GAS
DIESEL
4 C108
12 C111
T40 12 BR
RENEGADE
EXCEPT RENEGADE
A0 4 RD
A0 6 RD
S110
(8W-15-8)
STARTER MOTOR
1 PULL-IN
2 HOLD-IN
2
1
M
Z142 16 BK/WT
G111
(8W-15-8)

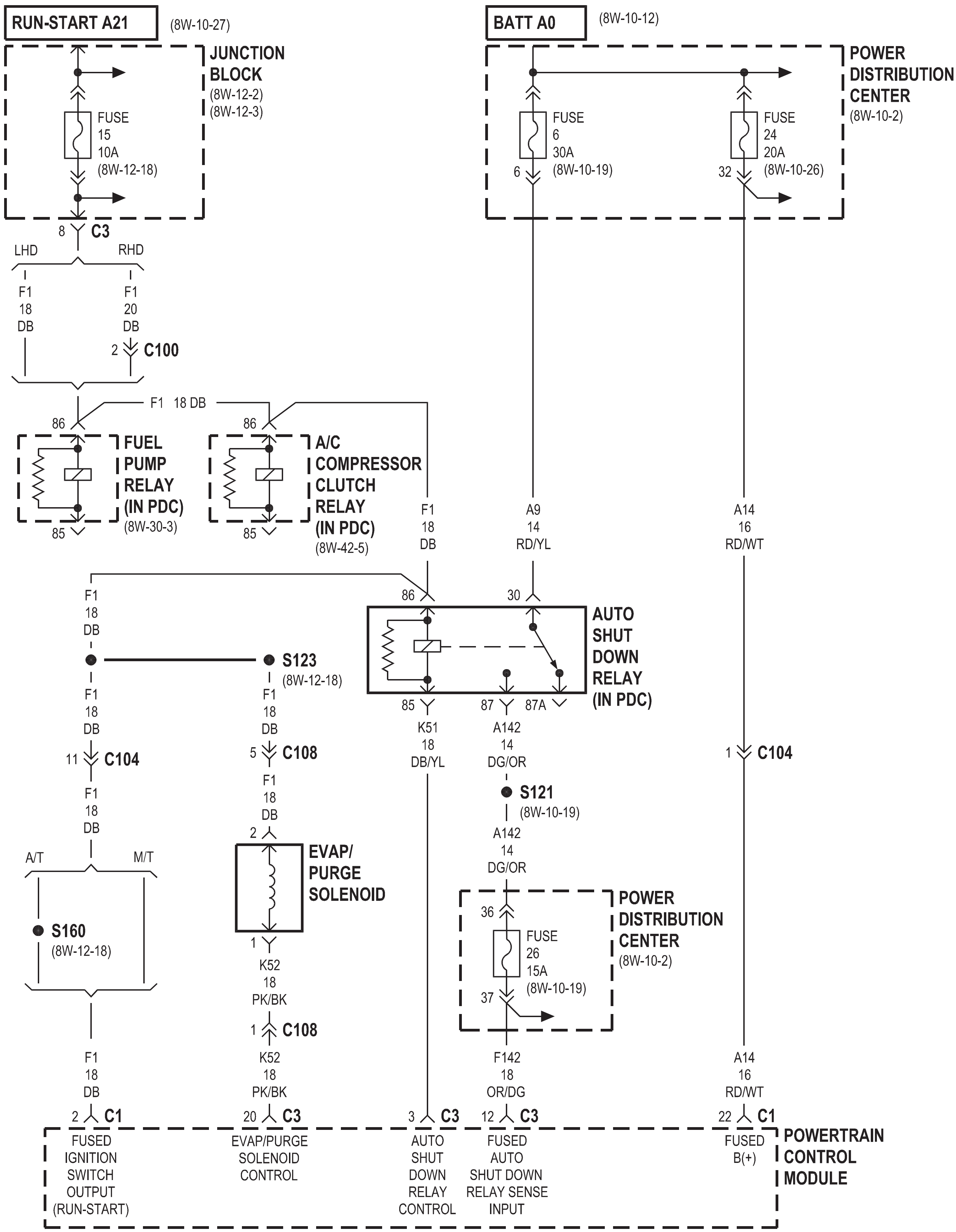

RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 39 10A (8W-12-27)
32 C3
F15 18 DB/WT
LHD
RHD
24 C100
S113
(8W-12-27)
9 C104
TRAILER TOW CONNECTOR
(8W-54-3)
BACK-UP LAMP FEED
3
L10 18 BR/LG
2 C308
L10 20 BR/LG
AUTOMATIC DAY/NIGHT MIRROR (EXCEPT BASE)
(8W-49-4)
(8W-49-5)
LEFT TAIL/ STOP LAMP
(8W-51-4)
RIGHT TAIL/ STOP LAMP
(8W-51-4)
4
S347
(8W-51-4)
2 C310
S310
11 C306
39 C201
48 C100
3 C105
BACK-UP LAMP SWITCH
2
1

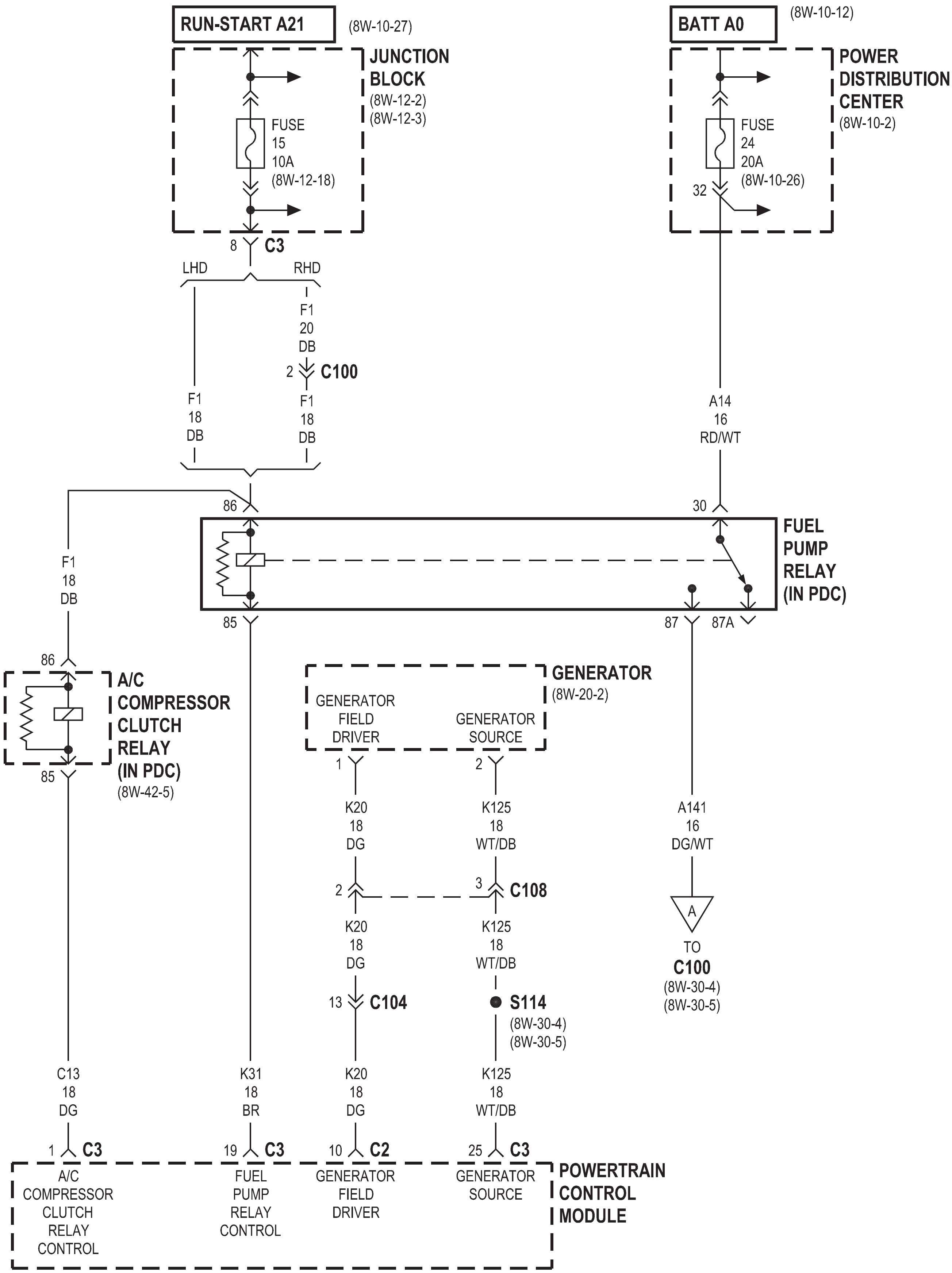

BATT A1
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
6
2
7
A21
12
RD/DB
S210
(8W-10-27)
A21
12
RD/DB
62
C100
A21
12
RD/DB
START A41
(8W-10-27)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
40
FUSE
28
15A
(8W-10-28)
41
F45
18
YL/BR
F45
18
YL/BR
86
30
CLUTCH SWITCH OVERRIDE RELAY (IN PDC)
2
CLUTCH INTERLOCK SWITCH
85
87
87A
1
T141 18 YL/RD
K90
18
TN
1
C104
K90
20
TN
74
C1
CLUTCH SWITCH OVERRIDE RELAY CONTROL
ENGINE CONTROL MODULE
(8W-30-33)
T141
18
YL/RD
B
TO
STARTER MOTOR RELAY (IN PDC)
(8W-21-7)

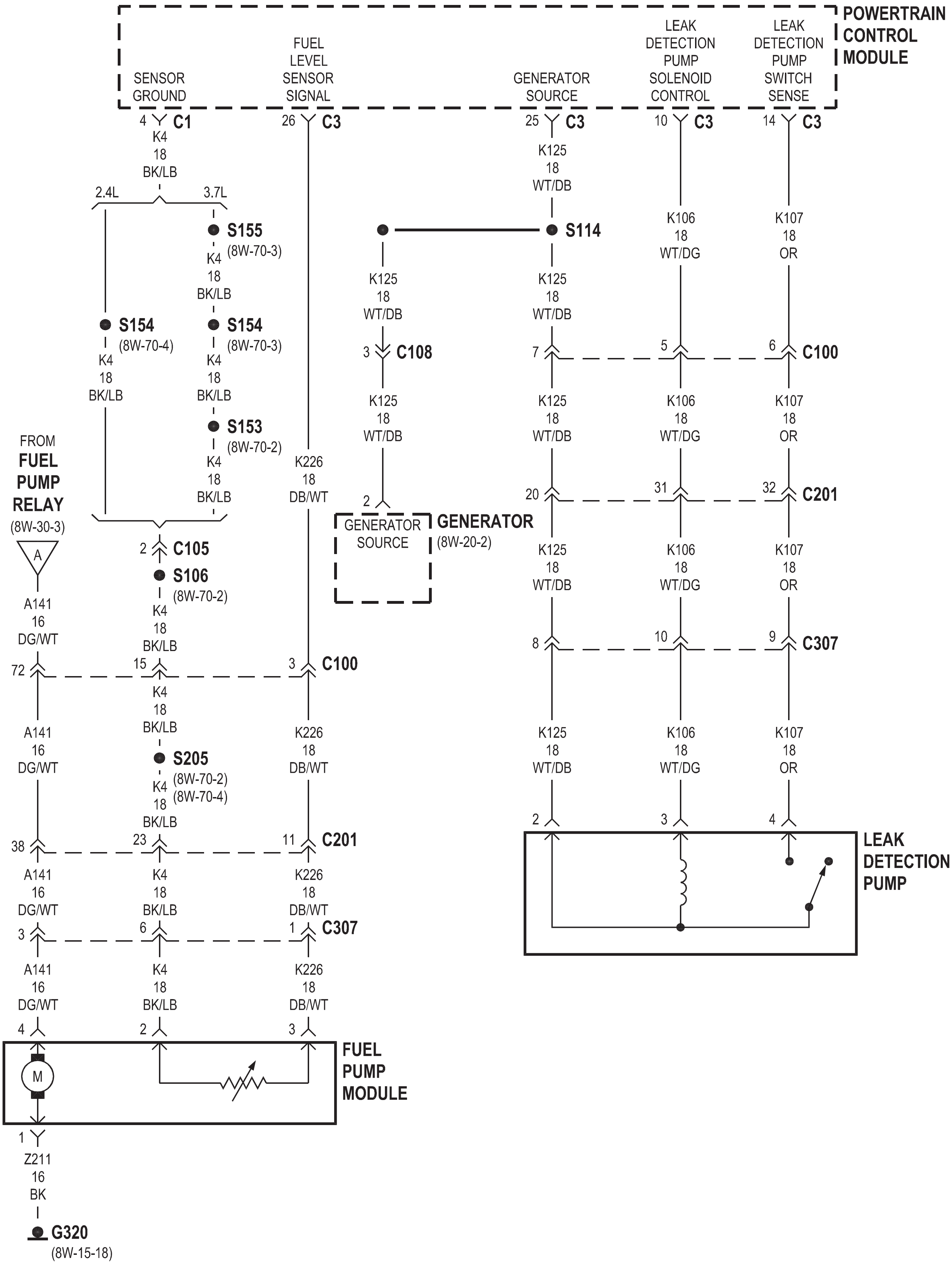

POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
8
40A
(8W-10-23)
8
A0
6
RD
BATTERY
(8W-20-2)
FROM
CLUTCH
SWITCH
OVERRIDE
RELAY
(8W-21-6)
B
NOT
USED
14
C111
A2
12
PK/BK
S101
(8W-10-23)
T141
18
YL/RD
T141
18
YL/RD
A2
12
PK/BK
86
30
STARTER
MOTOR
RELAY
(IN PDC)
85
87
T40
12
BR
12
C111
Z142
18
BK/WT
T40
12
BR
A0
2
RD
STARTER
MOTOR
1 PULL-IN
2 HOLD-IN
2
1
M
S110
(8W-15-8)
Z142
16
BK/WT
G111
(8W-15-8)

8W-30 FUEL/IGNITION SYSTEM

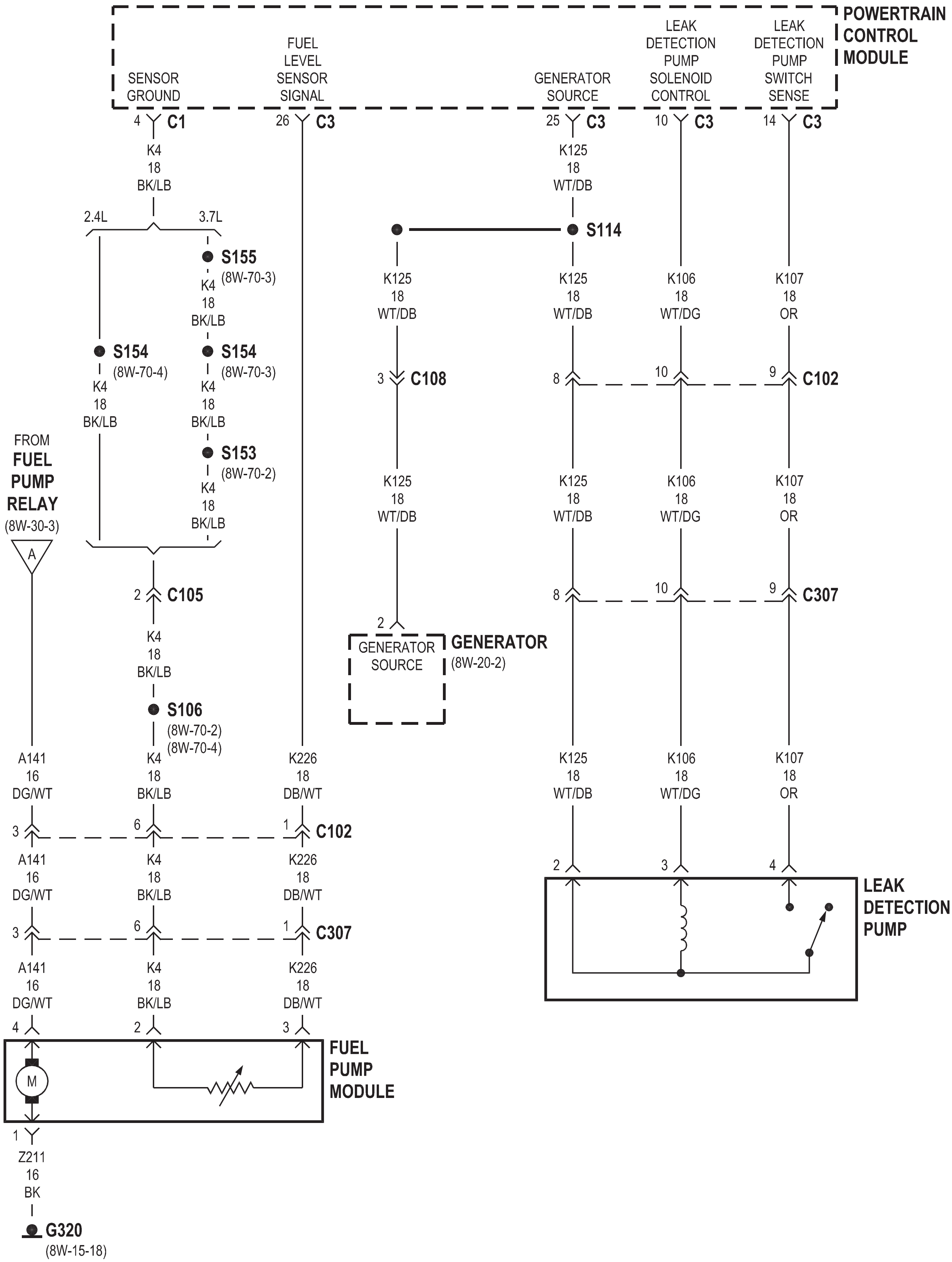
GAS

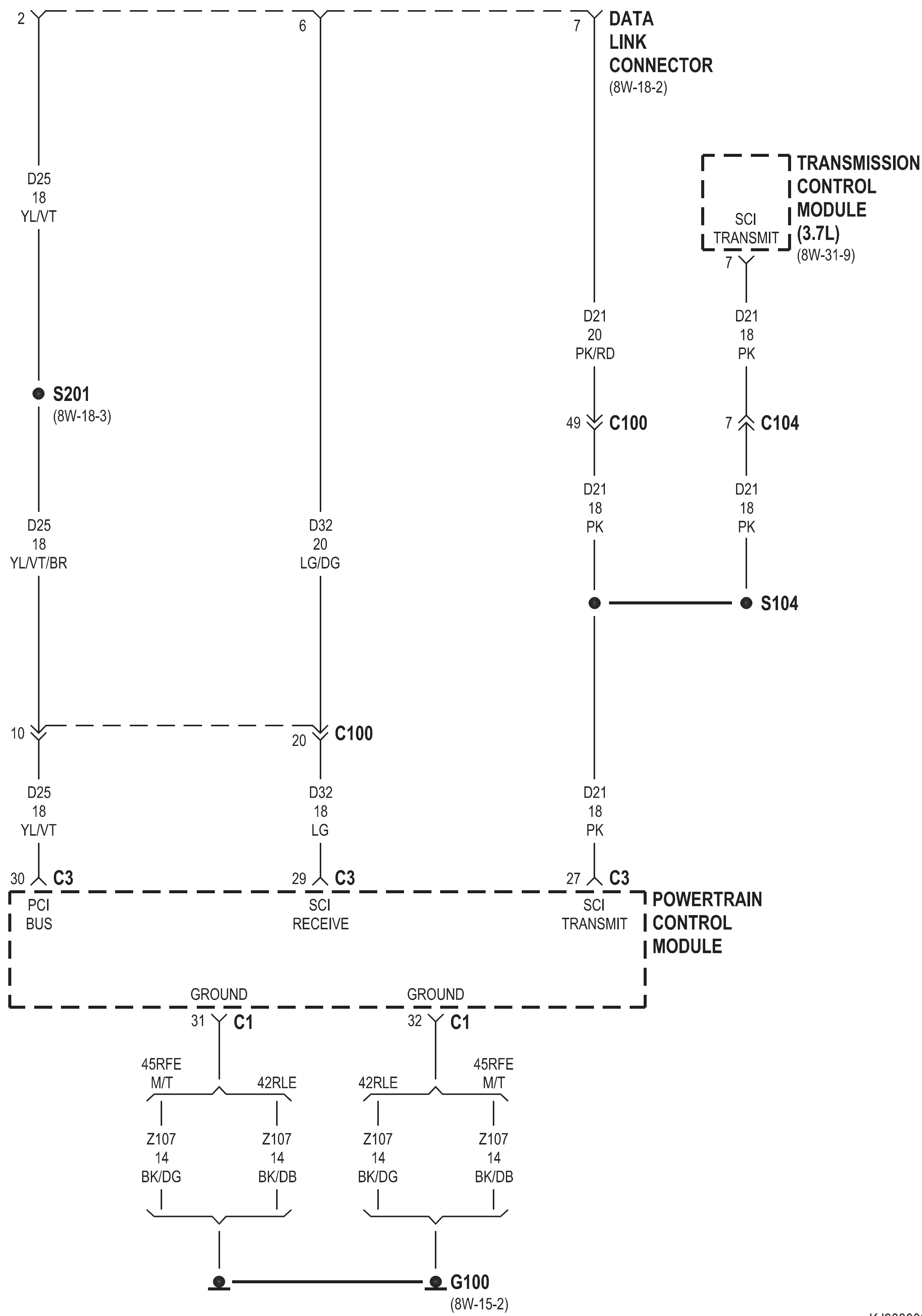

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 15 10A (8W-12-18)
8 C3
LHD
RHD
F1 18 DB
F1 20 DB
2 C100
F1 18 DB
86
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
85
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-5)
85
F1 18 DB
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A (8W-10-19)
6
FUSE 24 20A (8W-10-26)
32
A9 14 RD/YL
A14 16 RD/WT
86
30
AUTO SHUT DOWN RELAY (IN PDC)
85
87
87A
K51 18 DB/YL
A142 14 DG/OR
S121
(8W-10-19)
A142 14 DG/OR
POWER DISTRIBUTION CENTER
(8W-10-2)
36
FUSE 26 15A (8W-10-19)
37
F142 18 OR/DG
1 C104
A14 16 RD/WT
F1 18 DB
S123
(8W-12-18)
F1 18 DB
F1 18 DB
11 C104
F1 18 DB
A/T
M/T
S160
(8W-12-18)
F1 18 DB
5 C108
F1 18 DB
2
EVAP/ PURGE SOLENOID
1
K52 18 PK/BK
1 C108
K52 18 PK/BK
2 C1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
20 C3
EVAP/PURGE SOLENOID CONTROL
3 C3
AUTO SHUT DOWN RELAY CONTROL
12 C3
FUSED AUTO SHUT DOWN RELAY SENSE INPUT
22 C1
FUSED B(+)
POWERTRAIN CONTROL MODULE

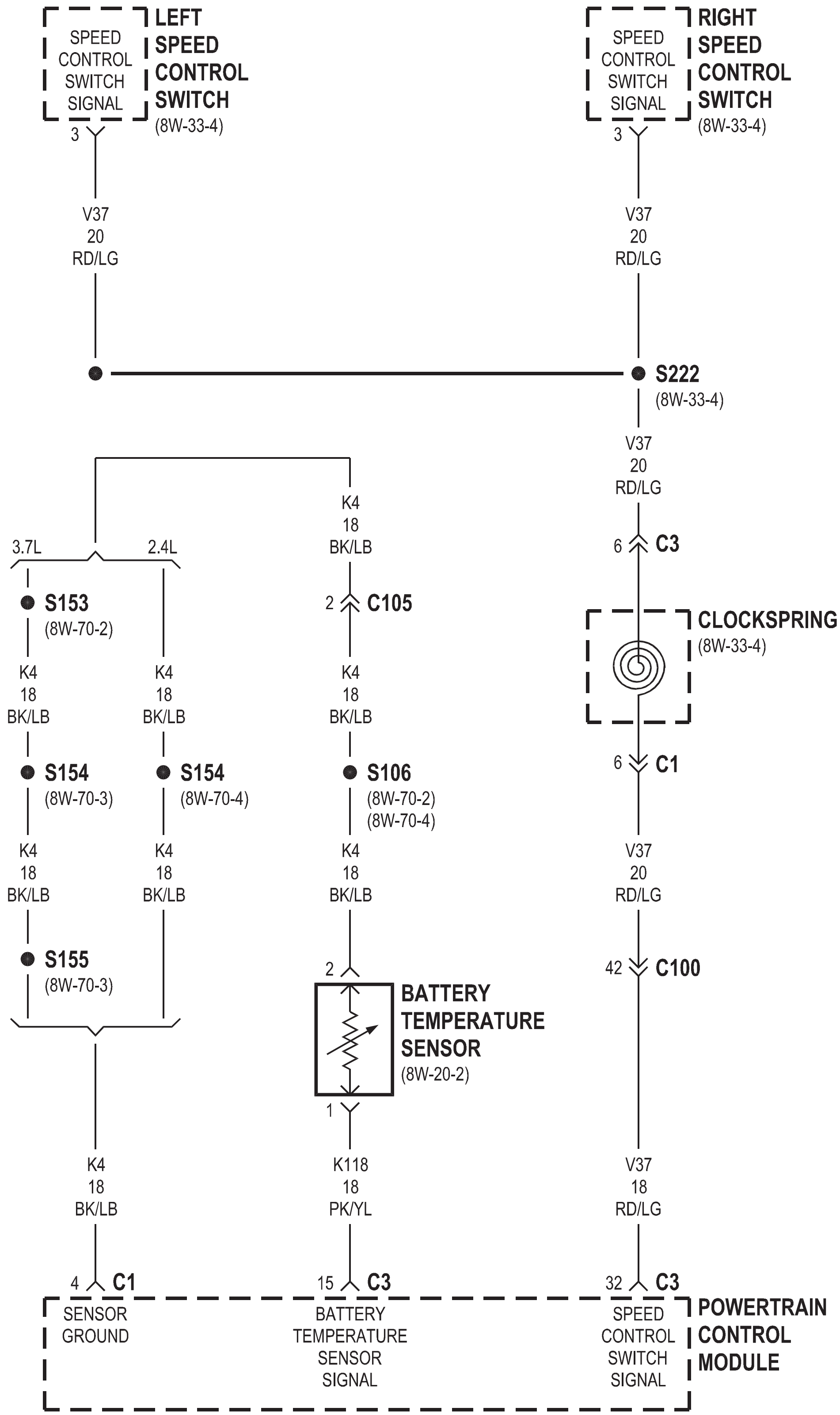

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
(8W-12-18)
8
C3
LHD
RHD
F1
20
DB
2
C100
F1
18
DB
F1
18
DB
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
24
20A
(8W-10-26)
32
A14
16
RD/WT
86
30
FUEL PUMP RELAY (IN PDC)
85
87
87A
F1
18
DB
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-5)
85
GENERATOR
(8W-20-2)
GENERATOR FIELD DRIVER
GENERATOR SOURCE
1
2
K20
18
DG
K125
18
WT/DB
2
3
C108
K20
18
DG
K125
18
WT/DB
13
C104
S114
(8W-30-4)
(8W-30-5)
A141
16
DG/WT
A
TO
C100
(8W-30-4)
(8W-30-5)
C13
18
DG
K31
18
BR
K20
18
DG
K125
18
WT/DB
1
C3
19
C3
10
C2
25
C3
A/C COMPRESSOR CLUTCH RELAY CONTROL
FUEL PUMP RELAY CONTROL
GENERATOR FIELD DRIVER
GENERATOR SOURCE
POWERTRAIN CONTROL MODULE


POWERTRAIN CONTROL MODULE
SENSOR GROUND
FUEL LEVEL SENSOR SIGNAL
GENERATOR SOURCE
LEAK DETECTION PUMP SOLENOID CONTROL
LEAK DETECTION PUMP SWITCH SENSE
4 C1
26 C3
25 C3
10 C3
14 C3
K4 18 BK/LB
2.4L
3.7L
S155 (8W-70-3)
S154 (8W-70-4)
S154 (8W-70-3)
S153 (8W-70-2)
FROM FUEL PUMP RELAY (8W-30-3)
A
2 C105
S106 (8W-70-2)
A141 16 DG/WT
72
15
3 C100
K226 18 DB/WT
S205 (8W-70-2) (8W-70-4)
38
23
11 C201
3
6
1 C307
4
2
3
M
FUEL PUMP MODULE
1
Z211 16 BK
G320 (8W-15-18)
K125 18 WT/DB
S114
3 C108
2
GENERATOR SOURCE
GENERATOR (8W-20-2)
K106 18 WT/DG
K107 18 OR
7
5
6 C100
20
31
32 C201
8
10
9 C307
2
3
4
LEAK DETECTION PUMP

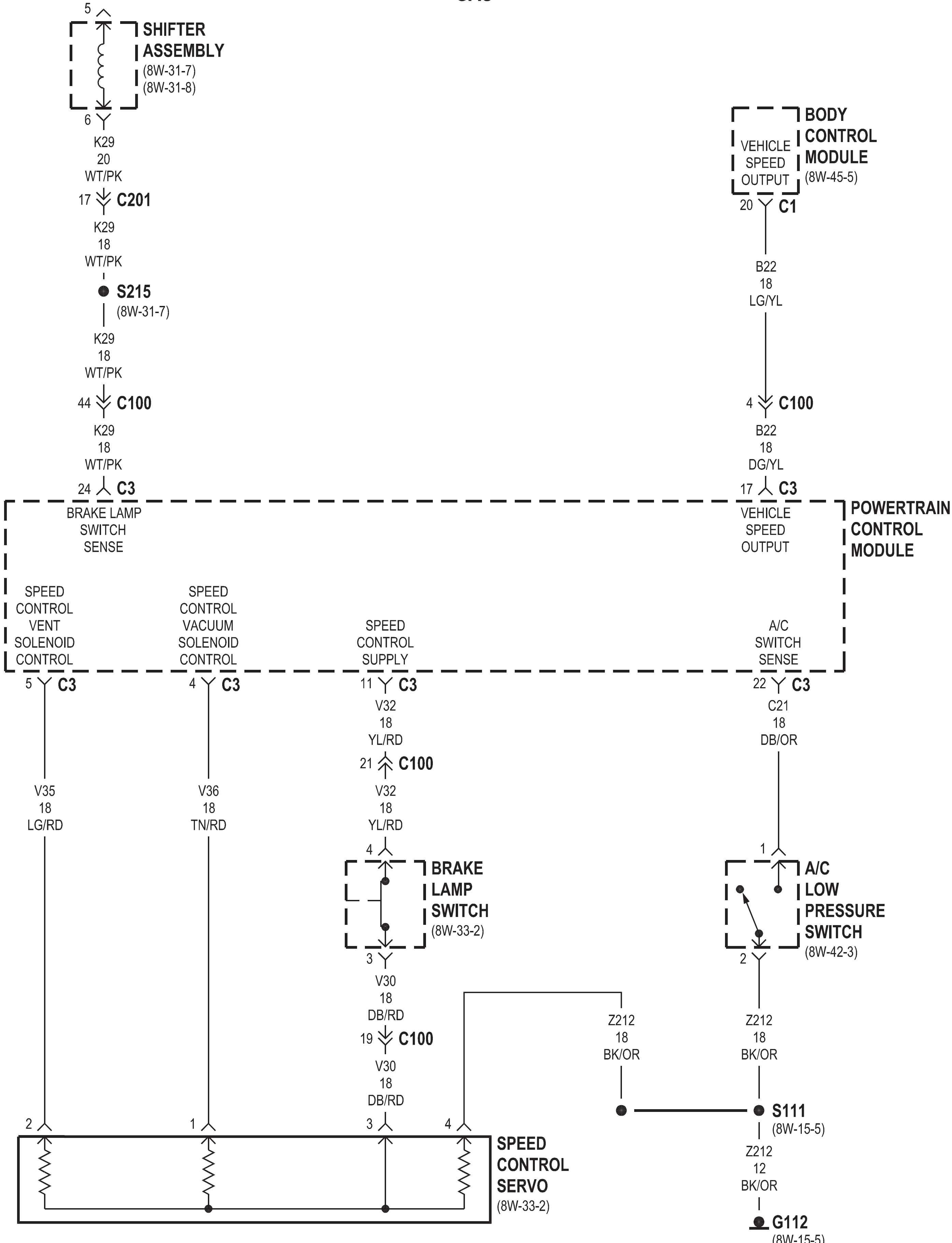
RHD

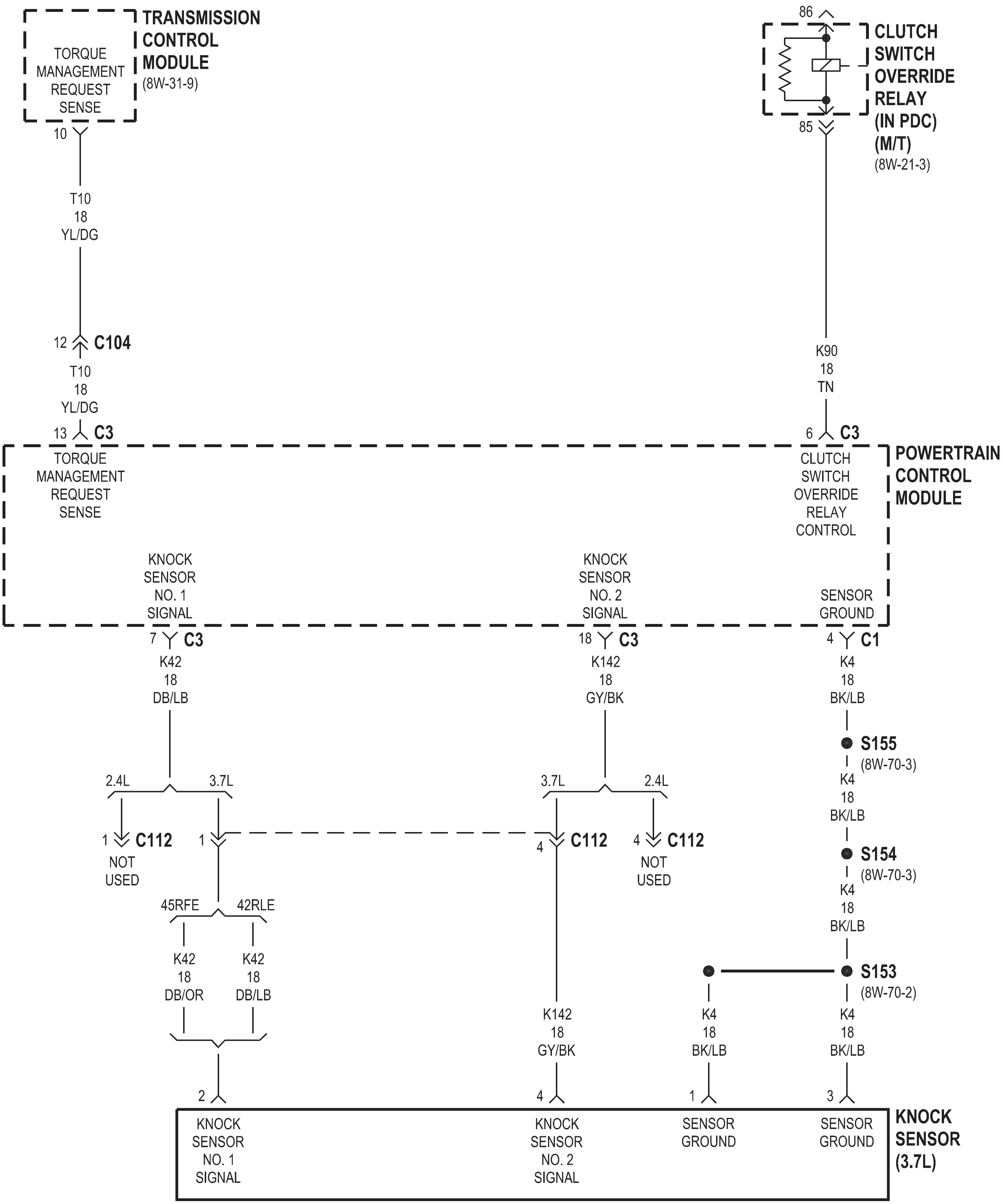

POWERTRAIN CONTROL MODULE
SENSOR GROUND
FUEL LEVEL SENSOR SIGNAL
GENERATOR SOURCE
LEAK DETECTION PUMP SOLENOID CONTROL
LEAK DETECTION PUMP SWITCH SENSE
C1
C3
K4 18 BK/LB
K125 18 WT/DB
K106 18 WT/DG
K107 18 OR
K226 18 DB/WT
A141 16 DG/WT
2.4L
3.7L
S114
S155 (8W-70-3)
S154 (8W-70-4)
S154 (8W-70-3)
S153 (8W-70-2)
C108
C102
C307
C105
S106 (8W-70-2) (8W-70-4)
FROM FUEL PUMP RELAY (8W-30-3)
A
GENERATOR SOURCE
GENERATOR (8W-20-2)
LEAK DETECTION PUMP
FUEL PUMP MODULE
M
Z211 16 BK
G320 (8W-15-18)

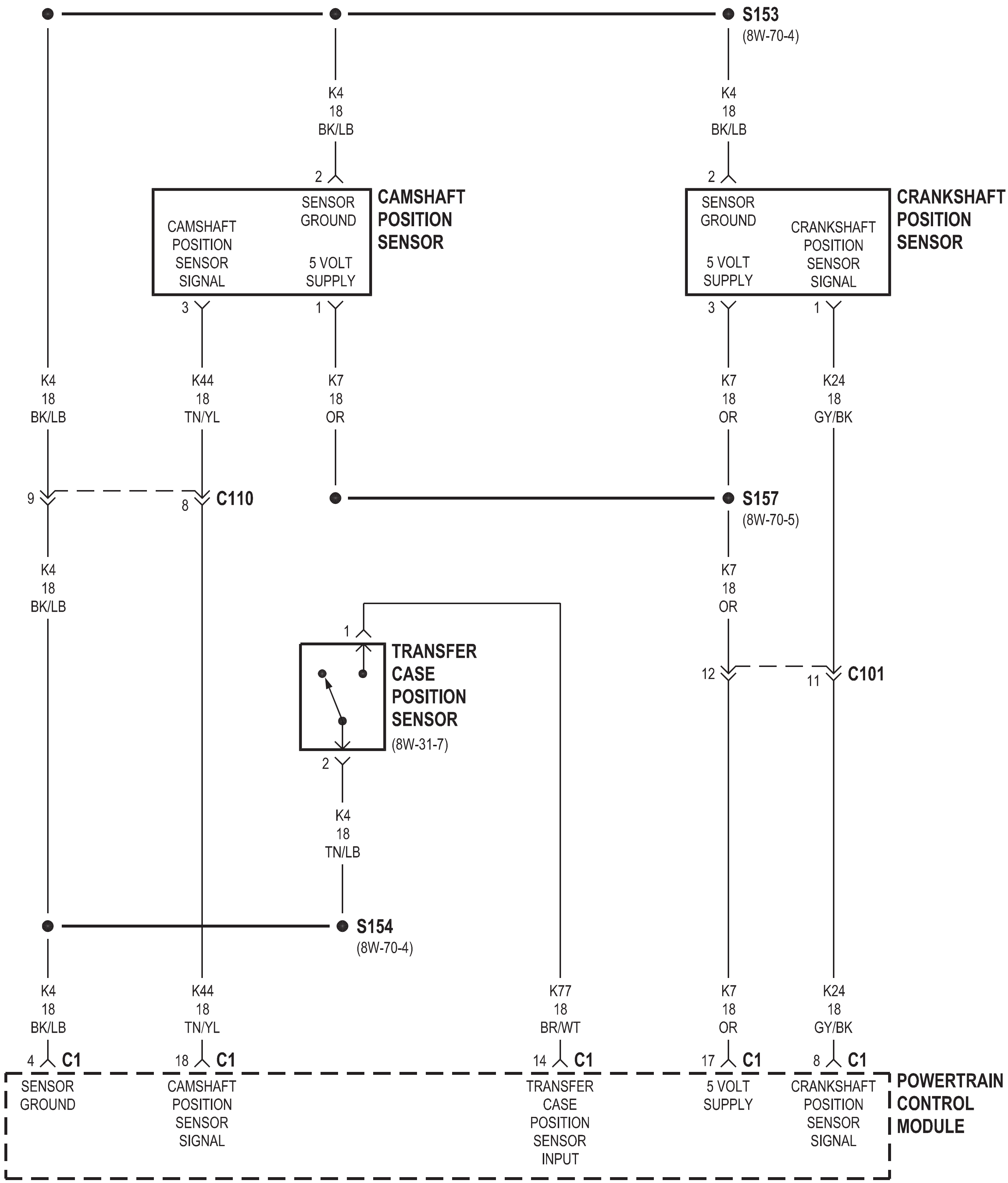

2
6
7
DATA LINK CONNECTOR
(8W-18-2)
TRANSMISSION CONTROL MODULE (3.7L)
(8W-31-9)
SCI TRANSMIT
7
D25
18
YL/VT
D21
20
PK/RD
D21
18
PK
S201
(8W-18-3)
49
C100
7
C104
D21
18
PK
D21
18
PK
D25
18
YL/VT/BR
D32
20
LG/DG
S104
10
20
C100
D25
18
YL/VT
D32
18
LG
D21
18
PK
30
C3
29
C3
27
C3
PCI BUS
SCI RECEIVE
SCI TRANSMIT
POWERTRAIN CONTROL MODULE
GROUND
GROUND
31
C1
32
C1
45RFE M/T
42RLE
42RLE
45RFE M/T
Z107
14
BK/DG
Z107
14
BK/DB
Z107
14
BK/DG
Z107
14
BK/DB
G100
(8W-15-2)

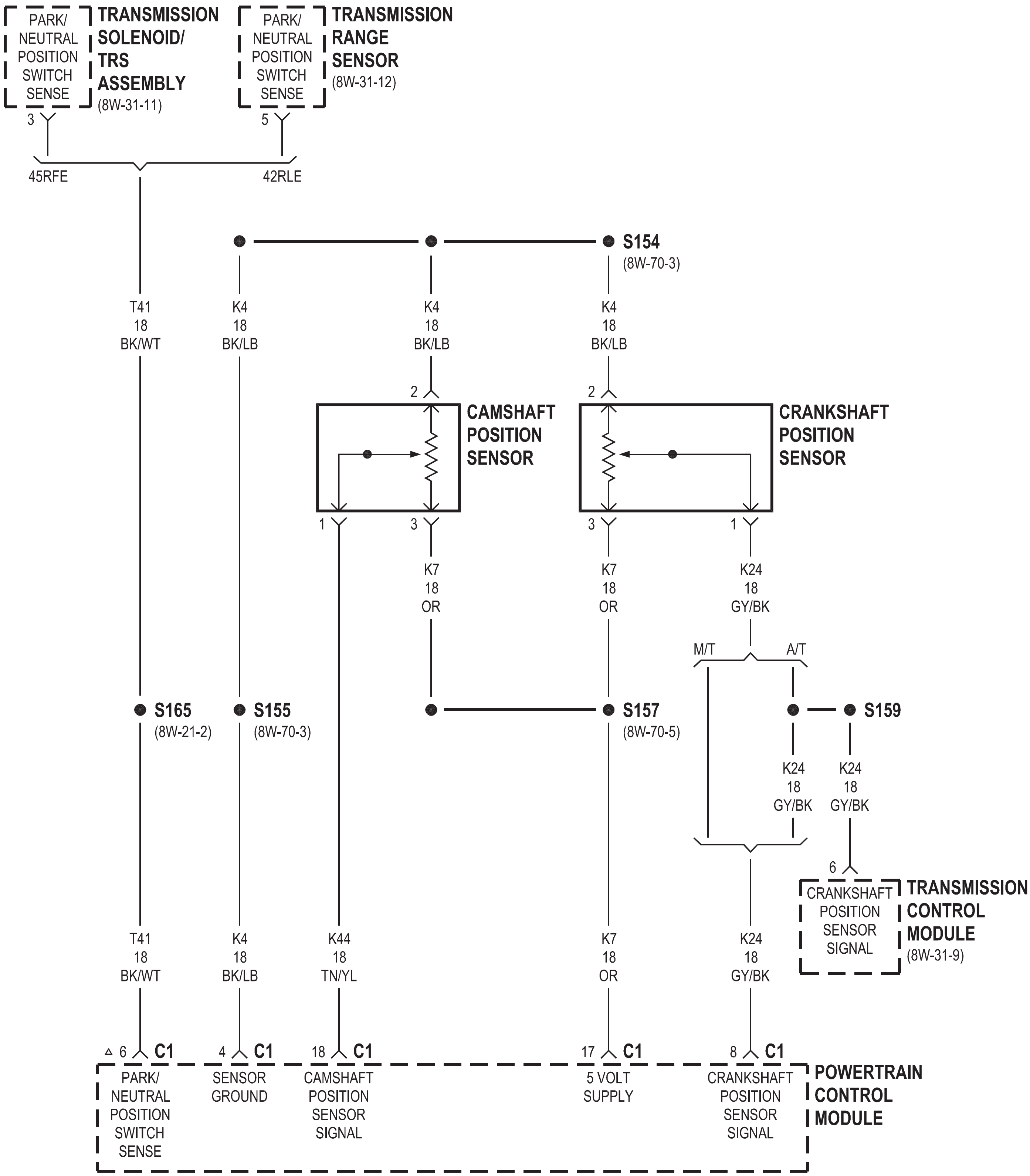


SPEED CONTROL SWITCH SIGNAL
LEFT SPEED CONTROL SWITCH
(8W-33-4)
3
V37
20
RD/LG
SPEED CONTROL SWITCH SIGNAL
RIGHT SPEED CONTROL SWITCH
(8W-33-4)
3
V37
20
RD/LG
S222
(8W-33-4)
V37
20
RD/LG
6
C3
CLOCKSPRING
(8W-33-4)
6
C1
V37
20
RD/LG
42
C100
V37
18
RD/LG
K4
18
BK/LB
3.7L
2.4L
S153
(8W-70-2)
2
C105
K4
18
BK/LB
S154
(8W-70-3)
S154
(8W-70-4)
S106
(8W-70-2)
(8W-70-4)
S155
(8W-70-3)
2
BATTERY TEMPERATURE SENSOR
(8W-20-2)
1
K118
18
PK/YL
4
C1
15
C3
32
C3
SENSOR GROUND
BATTERY TEMPERATURE SENSOR SIGNAL
SPEED CONTROL SWITCH SIGNAL
POWERTRAIN CONTROL MODULE

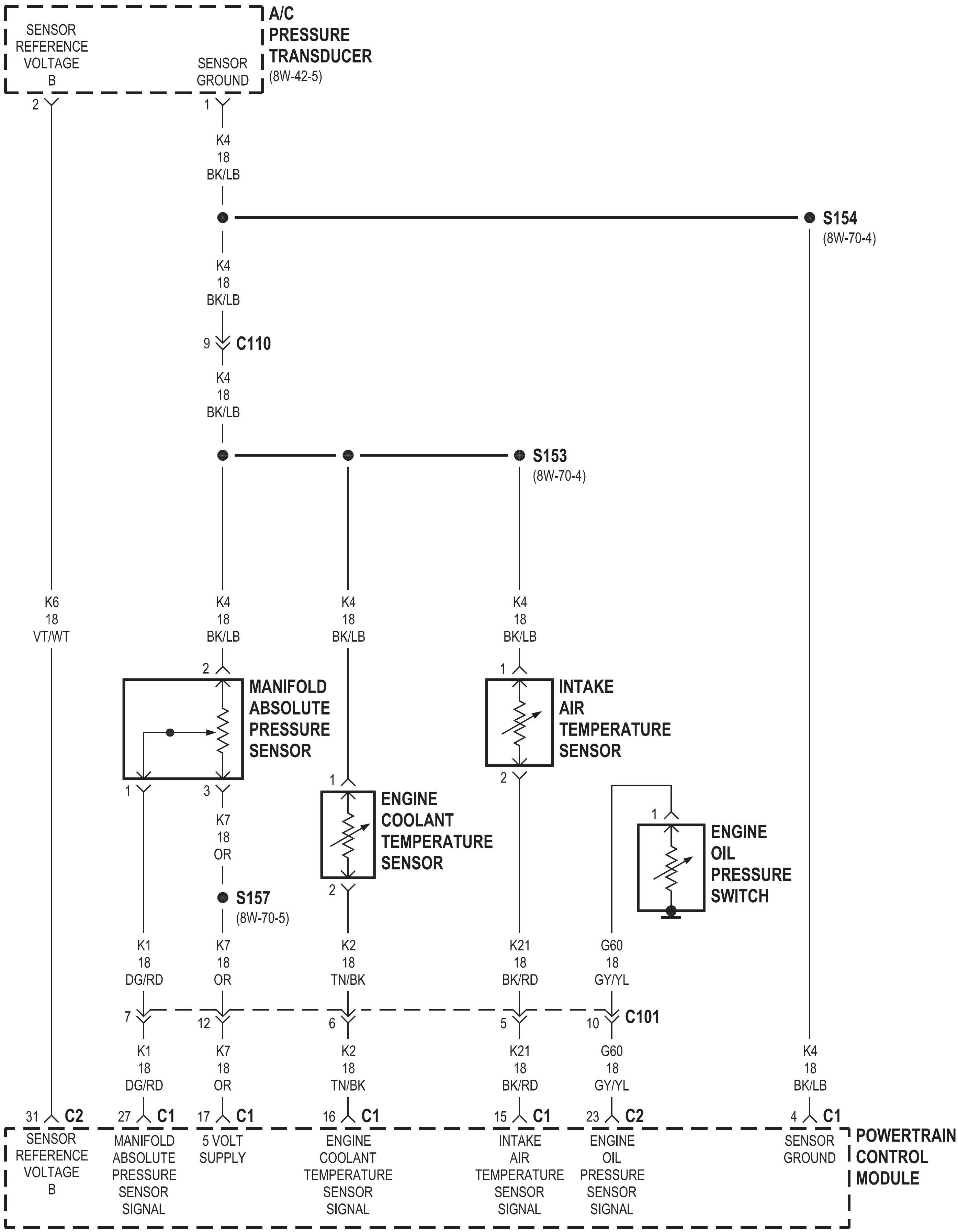

5
SHIFTER ASSEMBLY
(8W-31-7)
(8W-31-8)
6
K29
20
WT/PK
17 C201
K29
18
WT/PK
S215
(8W-31-7)
K29
18
WT/PK
44 C100
K29
18
WT/PK
24 C3
BRAKE LAMP SWITCH SENSE
BODY CONTROL MODULE
(8W-45-5)
VEHICLE SPEED OUTPUT
20 C1
B22
18
LG/YL
4 C100
B22
18
DG/YL
17 C3
VEHICLE SPEED OUTPUT
POWERTRAIN CONTROL MODULE
SPEED CONTROL VENT SOLENOID CONTROL
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL SUPPLY
A/C SWITCH SENSE
5 C3
4 C3
11 C3
22 C3
V32
18
YL/RD
21 C100
V32
18
YL/RD
C21
18
DB/OR
V35
18
LG/RD
V36
18
TN/RD
4
BRAKE LAMP SWITCH
(8W-33-2)
3
V30
18
DB/RD
19 C100
V30
18
DB/RD
1
A/C LOW PRESSURE SWITCH
(8W-42-3)
2
Z212
18
BK/OR
Z212
18
BK/OR
S111
(8W-15-5)
Z212
12
BK/OR
G112
(8W-15-5)
2
1
3
4
SPEED CONTROL SERVO
(8W-33-2)

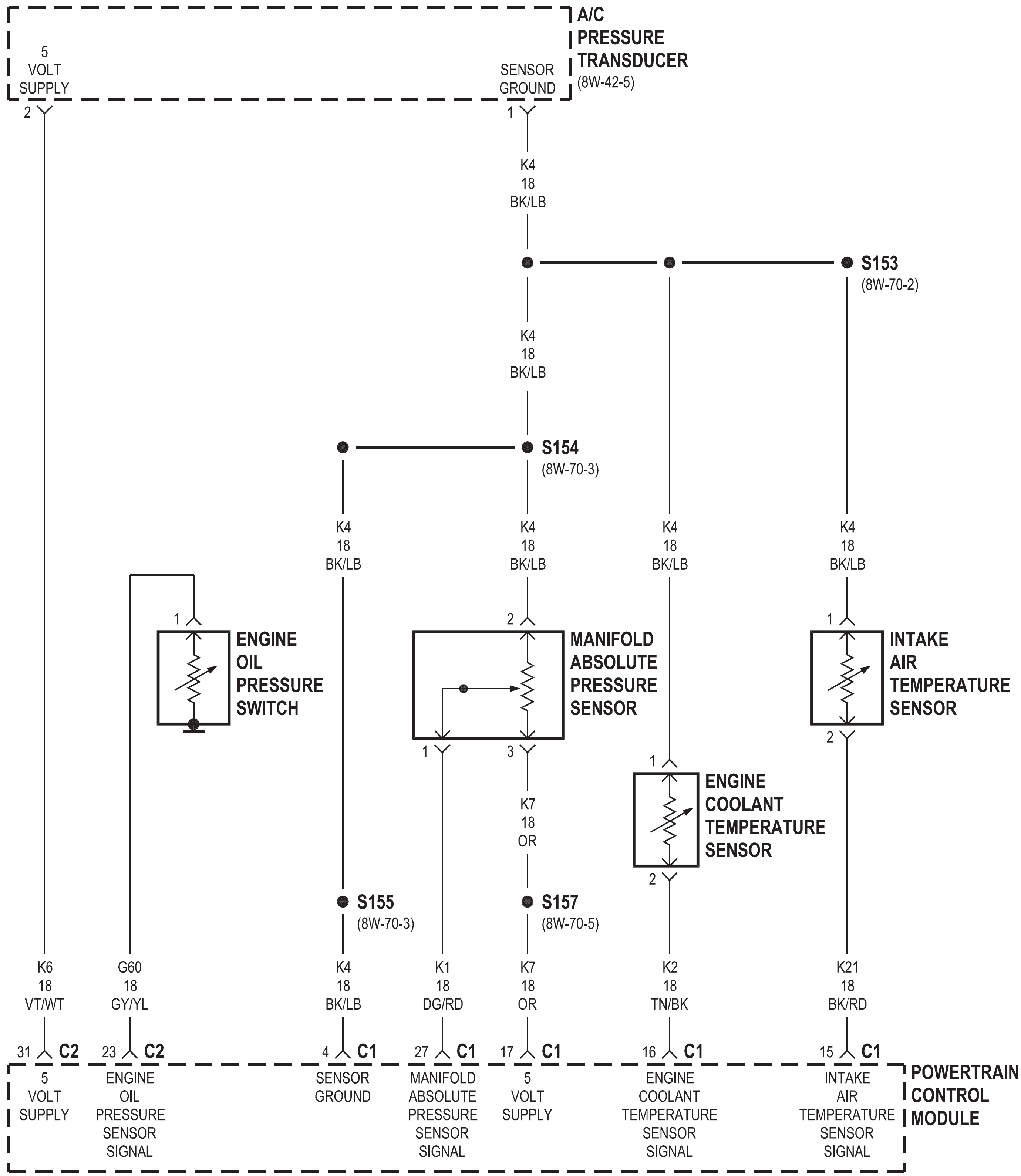

TRANSMISSION CONTROL MODULE
(8W-31-9)
TORQUE MANAGEMENT REQUEST SENSE
10
T10 18 YL/DG
12 C104
T10 18 YL/DG
13 C3
CLUTCH SWITCH OVERRIDE RELAY (IN PDC) (M/T)
(8W-21-3)
86
85
K90 18 TN
6 C3
POWERTRAIN CONTROL MODULE
TORQUE MANAGEMENT REQUEST SENSE
CLUTCH SWITCH OVERRIDE RELAY CONTROL
KNOCK SENSOR NO. 1 SIGNAL
KNOCK SENSOR NO. 2 SIGNAL
SENSOR GROUND
7 C3
K42 18 DB/LB
18 C3
K142 18 GY/BK
4 C1
K4 18 BK/LB
S155
(8W-70-3)
K4 18 BK/LB
S154
(8W-70-3)
K4 18 BK/LB
S153
(8W-70-2)
2.4L
3.7L
1 C112
NOT USED
1
45RFE
42RLE
K42 18 DB/OR
K42 18 DB/LB
3.7L
2.4L
4 C112
4 C112
NOT USED
K142 18 GY/BK
K4 18 BK/LB
K4 18 BK/LB
2
4
1
3
KNOCK SENSOR NO. 1 SIGNAL
KNOCK SENSOR NO. 2 SIGNAL
SENSOR GROUND
SENSOR GROUND
KNOCK SENSOR (3.7L)


S153
(8W-70-4)
K4
18
BK/LB
K4
18
BK/LB
2
SENSOR
GROUND
CAMSHAFT
POSITION
SENSOR
SIGNAL
5 VOLT
SUPPLY
3
1
CAMSHAFT
POSITION
SENSOR
2
SENSOR
GROUND
5 VOLT
SUPPLY
CRANKSHAFT
POSITION
SENSOR
SIGNAL
3
1
CRANKSHAFT
POSITION
SENSOR
K4
18
BK/LB
K44
18
TN/YL
K7
18
OR
K7
18
OR
K24
18
GY/BK
9
8
C110
S157
(8W-70-5)
K4
18
BK/LB
K7
18
OR
1
TRANSFER
CASE
POSITION
SENSOR
(8W-31-7)
12
11
C101
2
K4
18
TN/LB
S154
(8W-70-4)
K4
18
BK/LB
K44
18
TN/YL
K77
18
BR/WT
K7
18
OR
K24
18
GY/BK
4 C1
18 C1
14 C1
17 C1
8 C1
SENSOR
GROUND
CAMSHAFT
POSITION
SENSOR
SIGNAL
TRANSFER
CASE
POSITION
SENSOR
INPUT
5 VOLT
SUPPLY
CRANKSHAFT
POSITION
SENSOR
SIGNAL
POWERTRAIN
CONTROL
MODULE

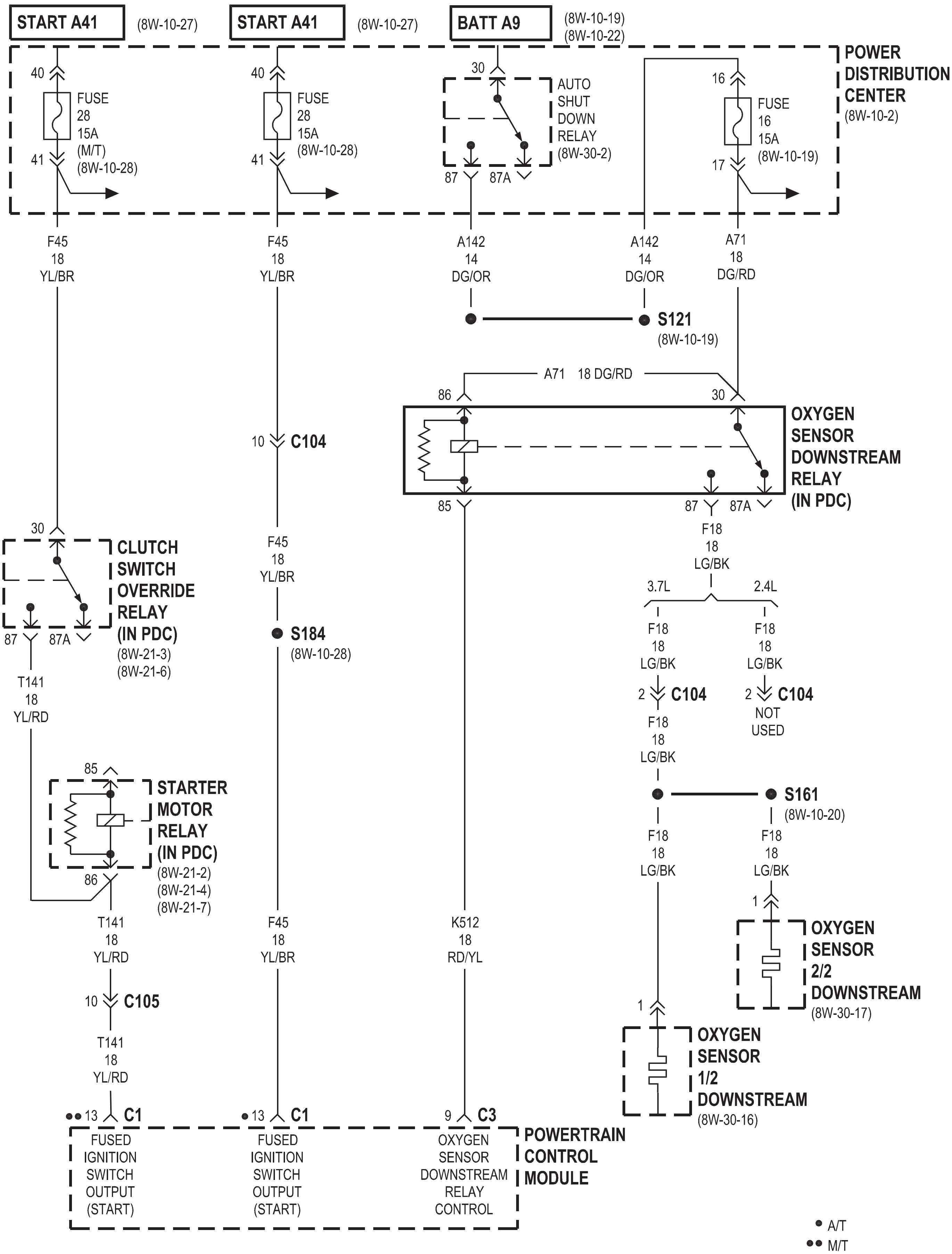

PARK/
NEUTRAL
POSITION
SWITCH
SENSE
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-11)
3
PARK/
NEUTRAL
POSITION
SWITCH
SENSE
TRANSMISSION RANGE SENSOR
(8W-31-12)
5
45RFE
42RLE
S154
(8W-70-3)
T41
18
BK/WT
K4
18
BK/LB
K4
18
BK/LB
K4
18
BK/LB
2
CAMSHAFT POSITION SENSOR
2
CRANKSHAFT POSITION SENSOR
1
3
3
1
K7
18
OR
K7
18
OR
K24
18
GY/BK
M/T
A/T
S165
(8W-21-2)
S155
(8W-70-3)
S157
(8W-70-5)
S159
K24
18
GY/BK
K24
18
GY/BK
6
CRANKSHAFT
POSITION
SENSOR
SIGNAL
TRANSMISSION CONTROL MODULE
(8W-31-9)
T41
18
BK/WT
K4
18
BK/LB
K44
18
TN/YL
K7
18
OR
K24
18
GY/BK
6 C1
4 C1
18 C1
17 C1
8 C1
PARK/
NEUTRAL
POSITION
SWITCH
SENSE
SENSOR
GROUND
CAMSHAFT
POSITION
SENSOR
SIGNAL
5 VOLT
SUPPLY
CRANKSHAFT
POSITION
SENSOR
SIGNAL
POWERTRAIN CONTROL MODULE

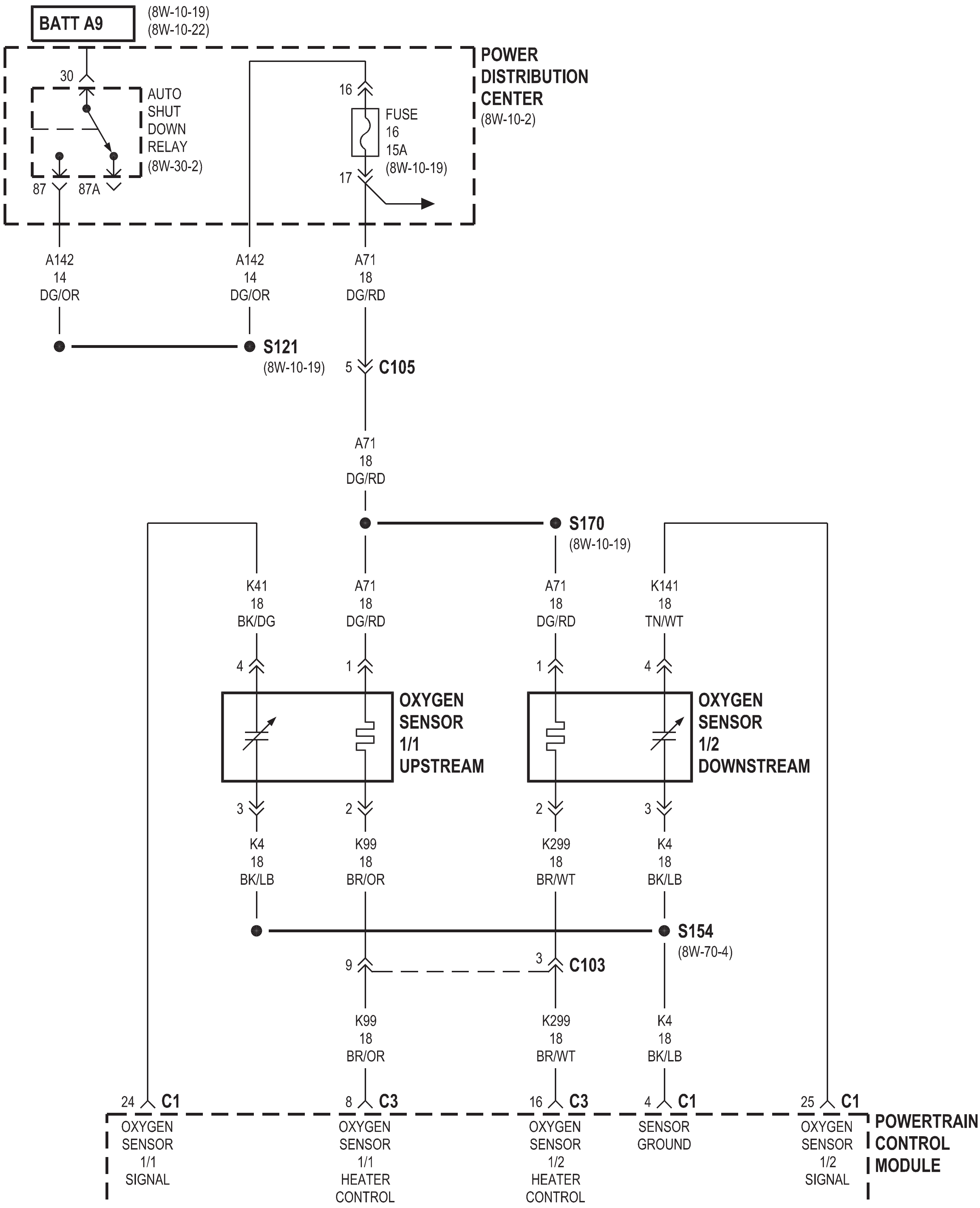
△ A/T

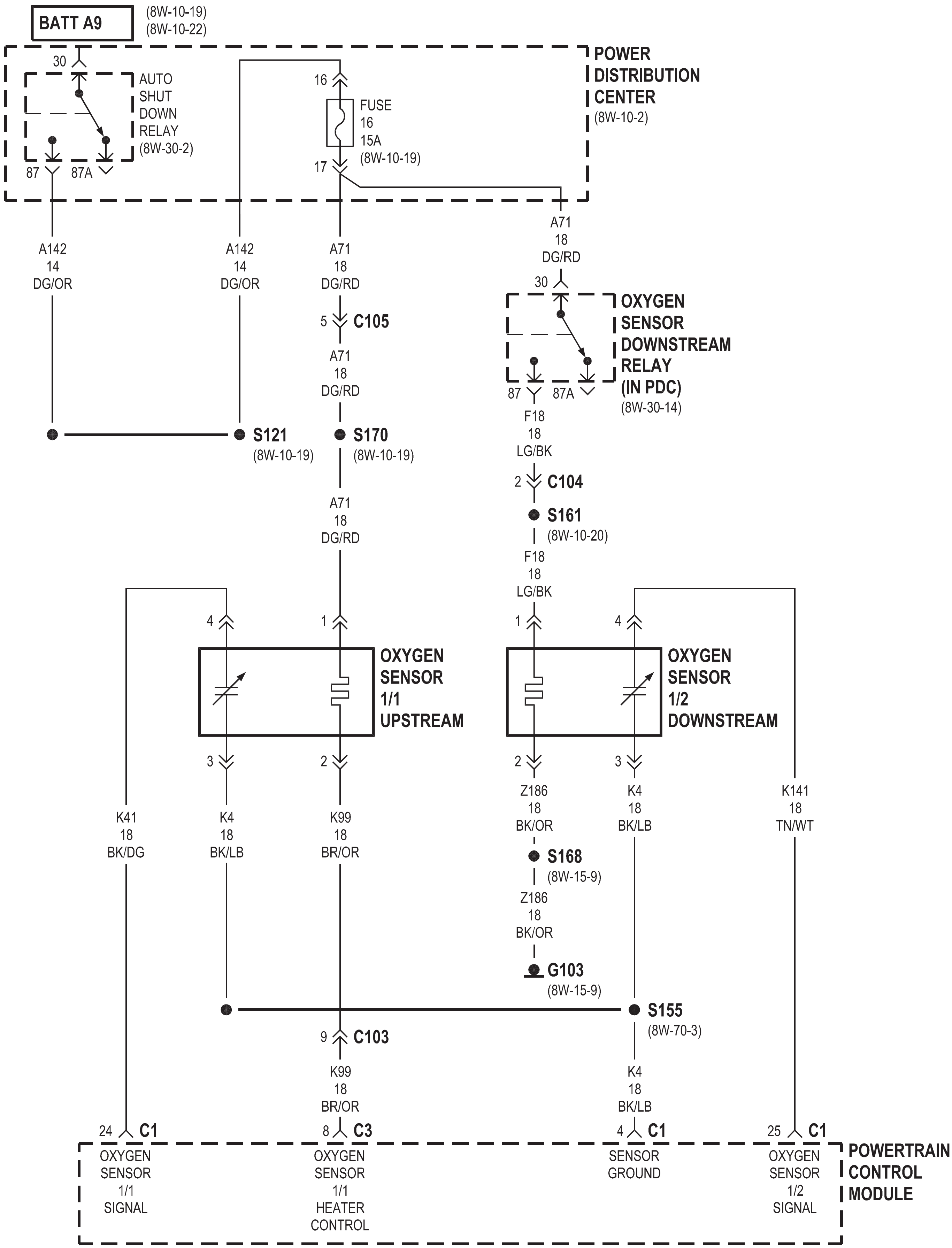

A/C PRESSURE TRANSDUCER
(8W-42-5)
SENSOR REFERENCE VOLTAGE B
SENSOR GROUND
K4 18 BK/LB
S154
(8W-70-4)
C110
S153
(8W-70-4)
K6 18 VT/WT
MANIFOLD ABSOLUTE PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
ENGINE OIL PRESSURE SWITCH
K7 18 OR
S157
(8W-70-5)
K1 18 DG/RD
K2 18 TN/BK
K21 18 BK/RD
G60 18 GY/YL
C101
C2
C1
POWERTRAIN CONTROL MODULE
SENSOR REFERENCE VOLTAGE B
MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
5 VOLT SUPPLY
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
INTAKE AIR TEMPERATURE SENSOR SIGNAL
ENGINE OIL PRESSURE SENSOR SIGNAL
SENSOR GROUND

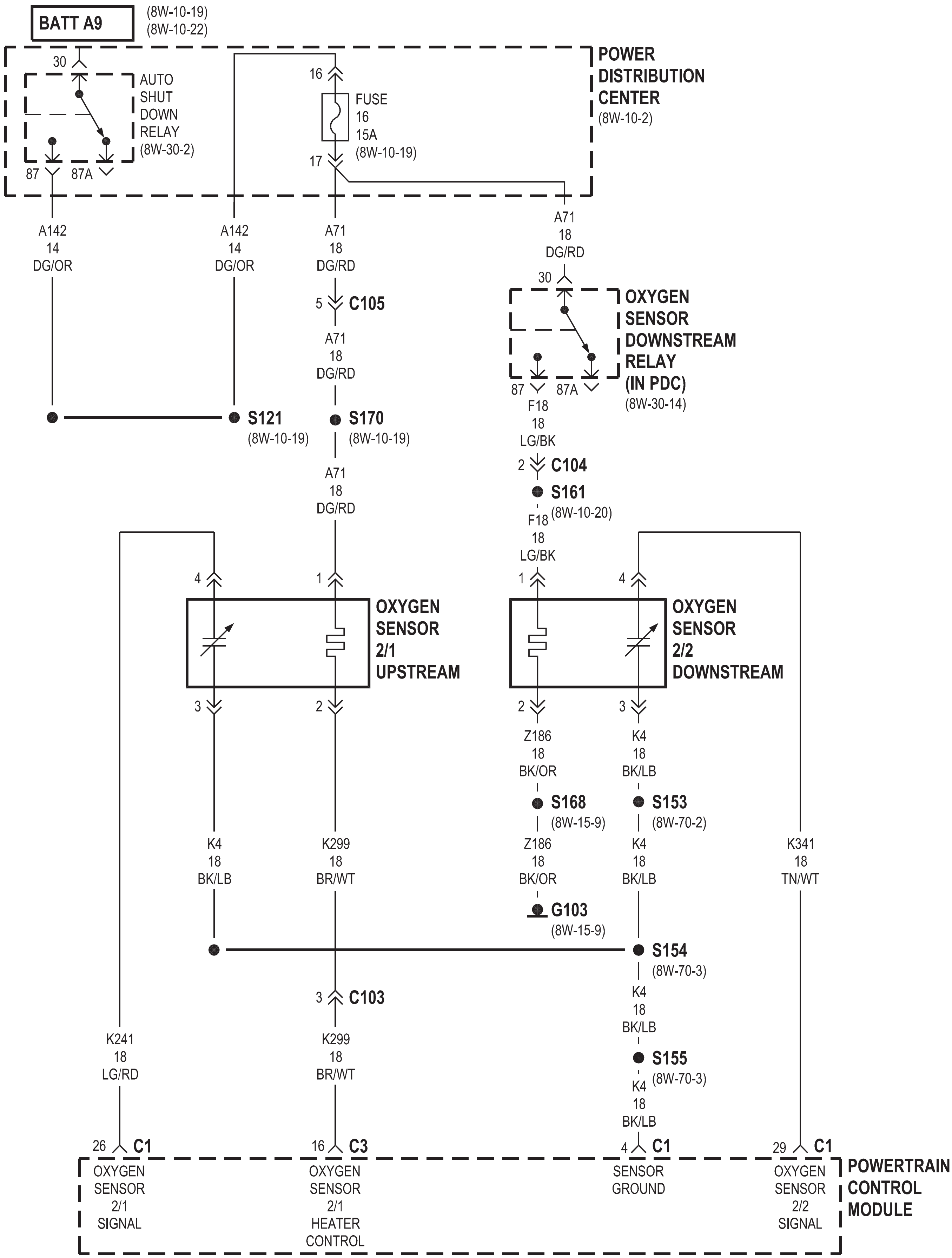

A/C
PRESSURE
TRANSDUCER
(8W-42-5)
5
VOLT
SUPPLY
SENSOR
GROUND
2
1
K4
18
BK/LB
S153
(8W-70-2)
K4
18
BK/LB
S154
(8W-70-3)
K4
18
BK/LB
K4
18
BK/LB
K4
18
BK/LB
K4
18
BK/LB
1
ENGINE
OIL
PRESSURE
SWITCH
2
MANIFOLD
ABSOLUTE
PRESSURE
SENSOR
1
3
1
INTAKE
AIR
TEMPERATURE
SENSOR
2
K7
18
OR
1
ENGINE
COOLANT
TEMPERATURE
SENSOR
2
S155
(8W-70-3)
S157
(8W-70-5)
K6
18
VT/WT
G60
18
GY/YL
K4
18
BK/LB
K1
18
DG/RD
K7
18
OR
K2
18
TN/BK
K21
18
BK/RD
31 C2
23 C2
4 C1
27 C1
17 C1
16 C1
15 C1
5
VOLT
SUPPLY
ENGINE
OIL
PRESSURE
SENSOR
SIGNAL
SENSOR
GROUND
MANIFOLD
ABSOLUTE
PRESSURE
SENSOR
SIGNAL
5
VOLT
SUPPLY
ENGINE
COOLANT
TEMPERATURE
SENSOR
SIGNAL
INTAKE
AIR
TEMPERATURE
SENSOR
SIGNAL
POWERTRAIN
CONTROL
MODULE

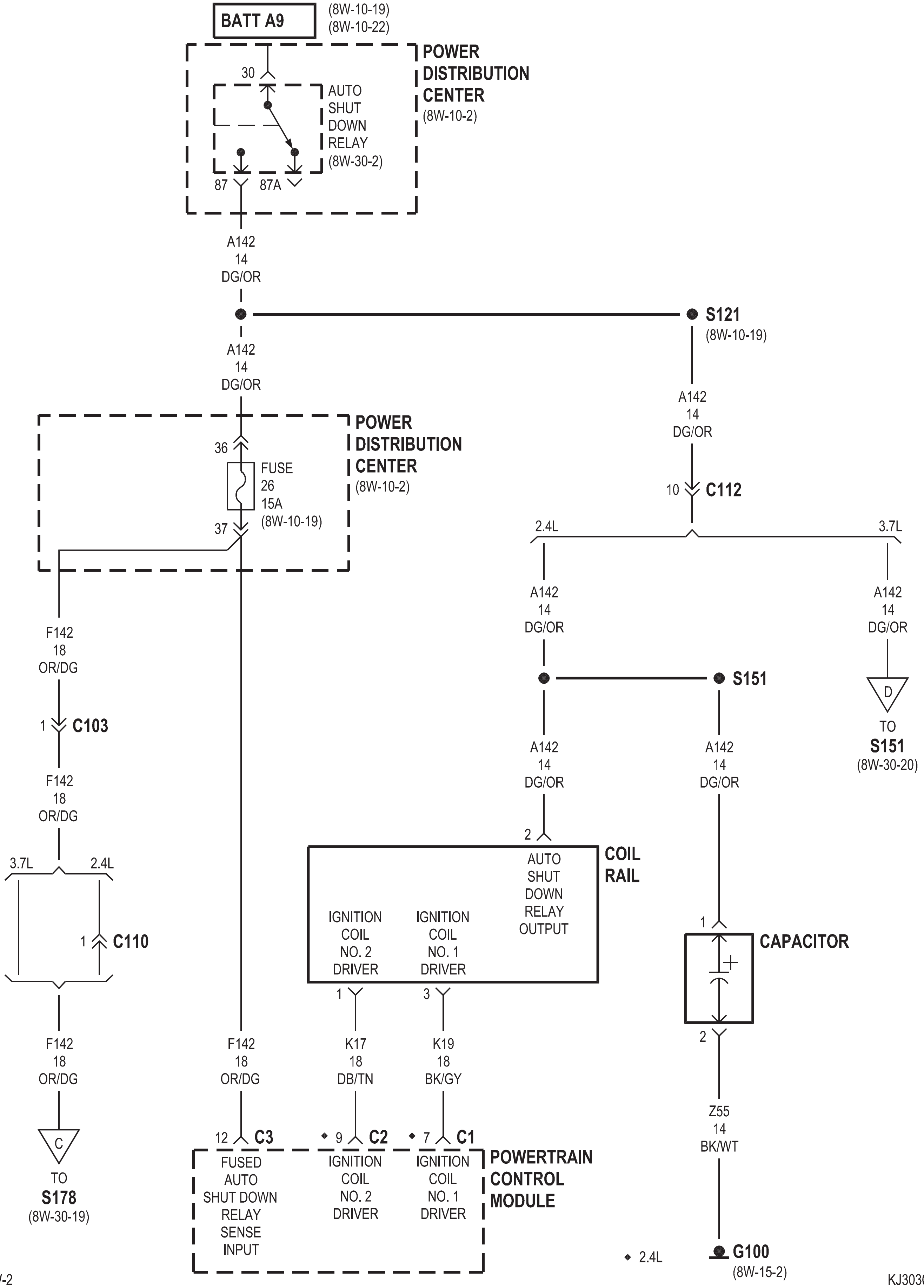
GAS

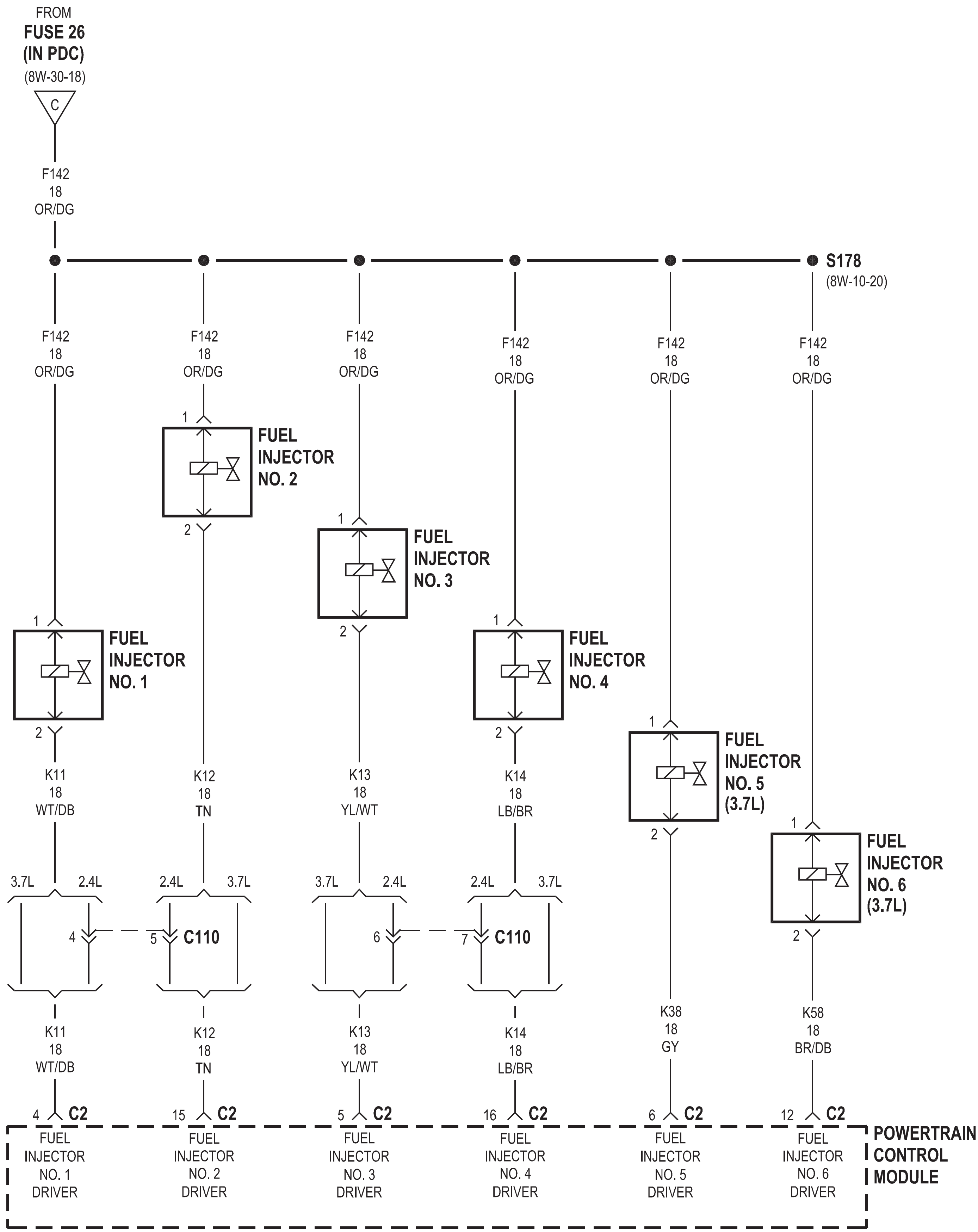

START A41
(8W-10-27)
START A41
(8W-10-27)
BATT A9
(8W-10-19)
(8W-10-22)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
40
FUSE
28
15A
(M/T)
(8W-10-28)
41
40
FUSE
28
15A
(8W-10-28)
41
30
AUTO
SHUT
DOWN
RELAY
(8W-30-2)
87
87A
16
FUSE
16
15A
(8W-10-19)
17
F45
18
YL/BR
F45
18
YL/BR
A142
14
DG/OR
A142
14
DG/OR
A71
18
DG/RD
S121
(8W-10-19)
A71 18 DG/RD
86
30
OXYGEN
SENSOR
DOWNSTREAM
RELAY
(IN PDC)
85
87
87A
10
C104
F45
18
YL/BR
S184
(8W-10-28)
30
CLUTCH
SWITCH
OVERRIDE
RELAY
(IN PDC)
(8W-21-3)
(8W-21-6)
87
87A
T141
18
YL/RD
F18
18
LG/BK
3.7L
2.4L
F18
18
LG/BK
F18
18
LG/BK
2
C104
2
C104
NOT
USED
F18
18
LG/BK
S161
(8W-10-20)
F18
18
LG/BK
F18
18
LG/BK
85
STARTER
MOTOR
RELAY
(IN PDC)
(8W-21-2)
(8W-21-4)
(8W-21-7)
86
T141
18
YL/RD
F45
18
YL/BR
K512
18
RD/YL
1
OXYGEN
SENSOR
2/2
DOWNSTREAM
(8W-30-17)
10
C105
T141
18
YL/RD
1
OXYGEN
SENSOR
1/2
DOWNSTREAM
(8W-30-16)
●● 13
C1
● 13
C1
9
C3
FUSED
IGNITION
SWITCH
OUTPUT
(START)
FUSED
IGNITION
SWITCH
OUTPUT
(START)
OXYGEN
SENSOR
DOWNSTREAM
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
● A/T
●● M/T

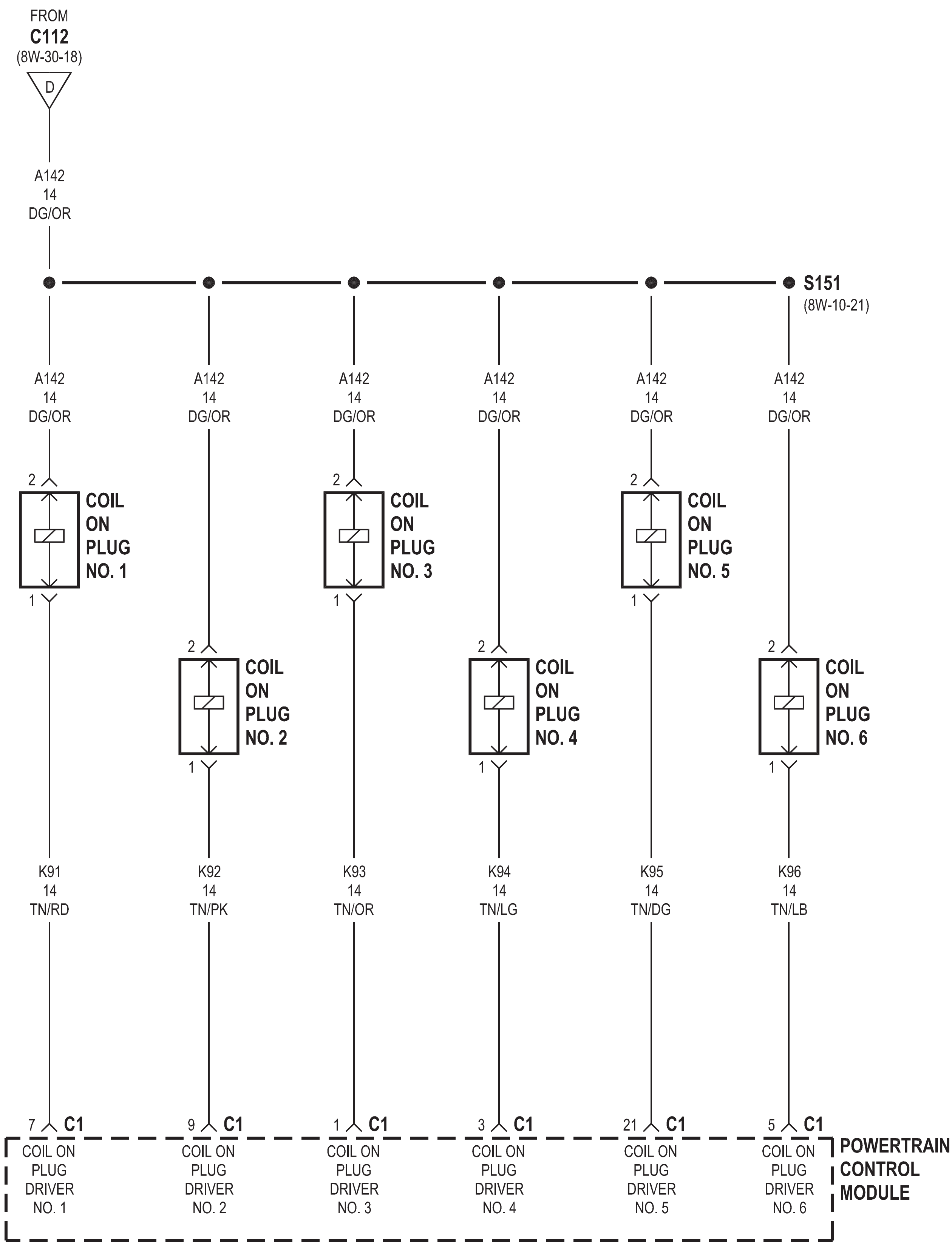

BATT A9
(8W-10-19)
(8W-10-22)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-2)
87
87A
16
FUSE 16 15A
(8W-10-19)
17
A142 14 DG/OR
A142 14 DG/OR
A71 18 DG/RD
S121
(8W-10-19)
5
C105
A71 18 DG/RD
S170
(8W-10-19)
K41 18 BK/DG
A71 18 DG/RD
A71 18 DG/RD
K141 18 TN/WT
4
1
1
4
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
3
2
2
3
K4 18 BK/LB
K99 18 BR/OR
K299 18 BR/WT
K4 18 BK/LB
S154
(8W-70-4)
9
3
C103
K99 18 BR/OR
K299 18 BR/WT
K4 18 BK/LB
24 C1
8 C3
16 C3
4 C1
25 C1
OXYGEN SENSOR 1/1 SIGNAL
OXYGEN SENSOR 1/1 HEATER CONTROL
OXYGEN SENSOR 1/2 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 1/2 SIGNAL
POWERTRAIN CONTROL MODULE

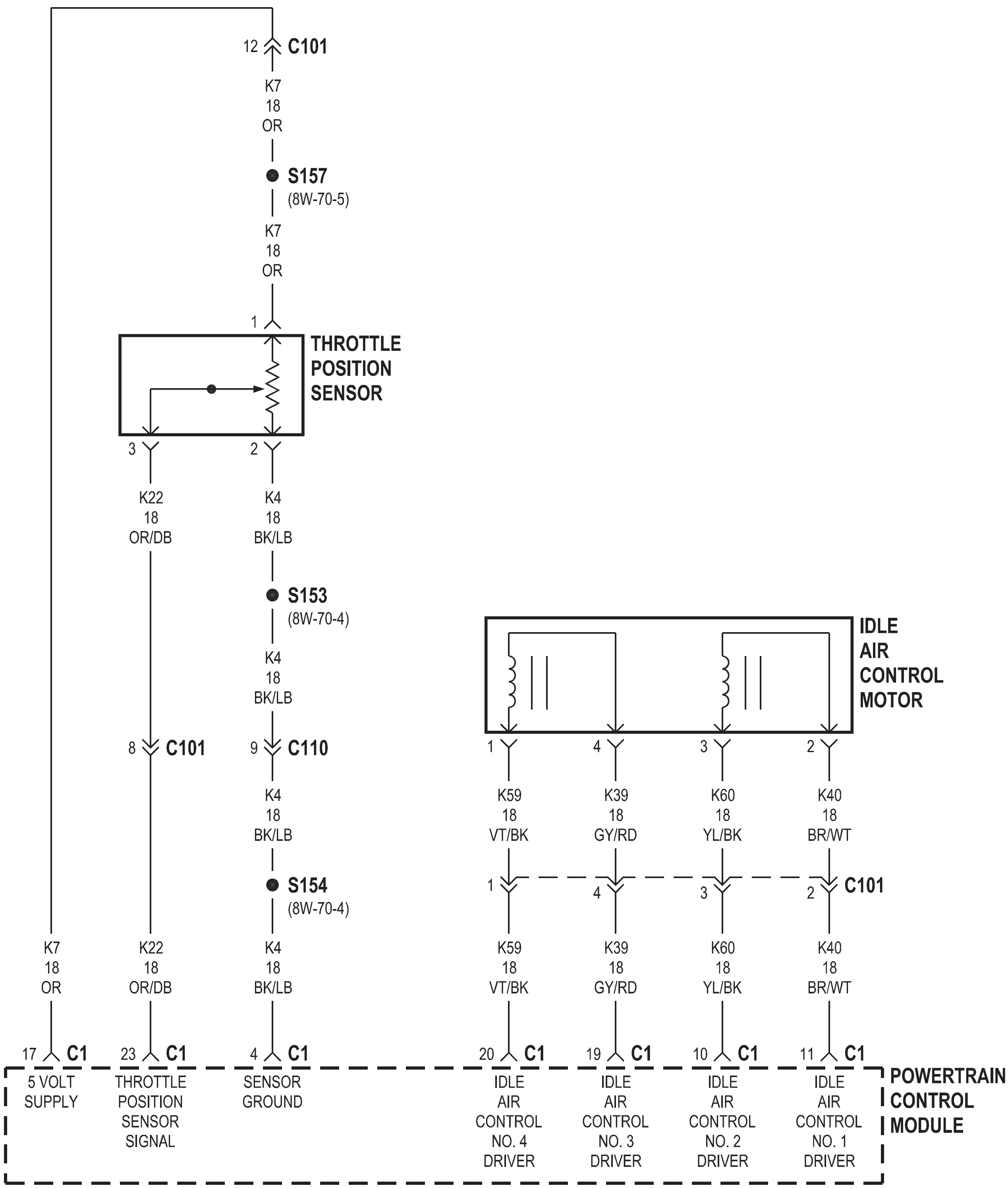

BATT A9
(8W-10-19)
(8W-10-22)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-2)
87
87A
16
FUSE 16 15A
(8W-10-19)
17
A142 14 DG/OR
A142 14 DG/OR
A71 18 DG/RD
5 C105
A71 18 DG/RD
S121
(8W-10-19)
S170
(8W-10-19)
A71 18 DG/RD
A71 18 DG/RD
30
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-14)
87
87A
F18 18 LG/BK
2 C104
S161
(8W-10-20)
F18 18 LG/BK
4
1
1
4
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
3
2
2
3
K41 18 BK/DG
K4 18 BK/LB
K99 18 BR/OR
Z186 18 BK/OR
K4 18 BK/LB
K141 18 TN/WT
S168
(8W-15-9)
Z186 18 BK/OR
G103
(8W-15-9)
S155
(8W-70-3)
9 C103
K99 18 BR/OR
K4 18 BK/LB
24 C1
8 C3
4 C1
25 C1
OXYGEN SENSOR 1/1 SIGNAL
OXYGEN SENSOR 1/1 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 1/2 SIGNAL
POWERTRAIN CONTROL MODULE

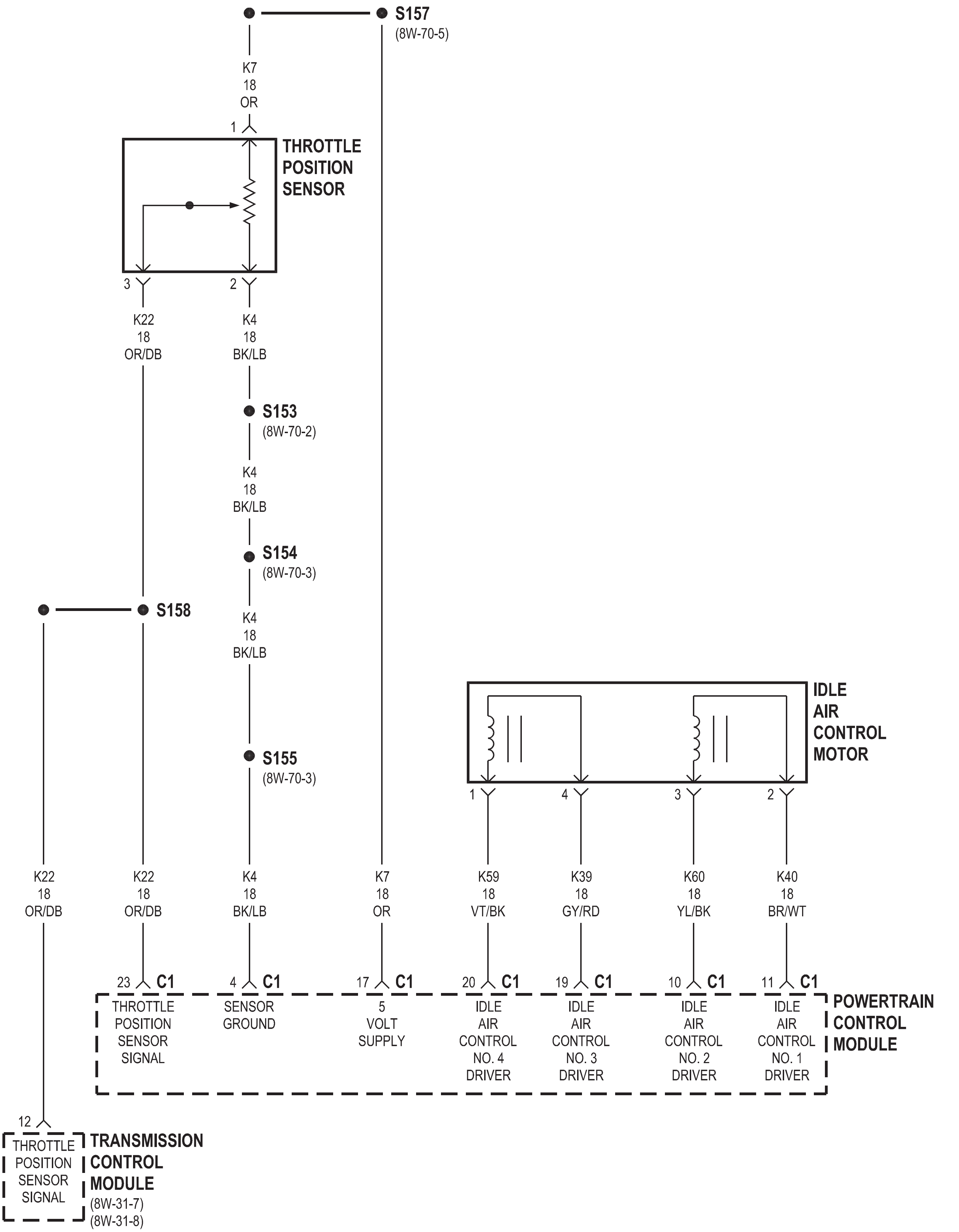

BATT A9
(8W-10-19)
(8W-10-22)
30
16
AUTO SHUT DOWN RELAY (8W-30-2)
FUSE 16 15A (8W-10-19)
17
87
87A
POWER DISTRIBUTION CENTER
(8W-10-2)
A142 14 DG/OR
A142 14 DG/OR
A71 18 DG/RD
A71 18 DG/RD
30
5
C105
A71 18 DG/RD
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-14)
87
87A
F18 18 LG/BK
S121
(8W-10-19)
S170
(8W-10-19)
2
C104
S161
(8W-10-20)
A71 18 DG/RD
F18 18 LG/BK
4
1
1
4
OXYGEN SENSOR 2/1 UPSTREAM
OXYGEN SENSOR 2/2 DOWNSTREAM
3
2
2
3
Z186 18 BK/OR
K4 18 BK/LB
S168
(8W-15-9)
S153
(8W-70-2)
K4 18 BK/LB
K299 18 BR/WT
Z186 18 BK/OR
K4 18 BK/LB
K341 18 TN/WT
G103
(8W-15-9)
S154
(8W-70-3)
3
C103
K4 18 BK/LB
K241 18 LG/RD
K299 18 BR/WT
S155
(8W-70-3)
K4 18 BK/LB
26
C1
16
C3
4
C1
29
C1
OXYGEN SENSOR 2/1 SIGNAL
OXYGEN SENSOR 2/1 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 2/2 SIGNAL
POWERTRAIN CONTROL MODULE


BATT A9
(8W-10-19)
(8W-10-22)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-2)
87
87A
A142
14
DG/OR
S121
(8W-10-19)
36
FUSE
26
15A
(8W-10-19)
37
10
C112
2.4L
3.7L
F142
18
OR/DG
1
C103
S151
D
TO
S151
(8W-30-20)
2
COIL RAIL
AUTO SHUT DOWN RELAY OUTPUT
IGNITION COIL NO. 2 DRIVER
IGNITION COIL NO. 1 DRIVER
C110
CAPACITOR
K17
18
DB/TN
K19
18
BK/GY
Z55
14
BK/WT
C
TO
S178
(8W-30-19)
12
C3
9
C2
7
C1
POWERTRAIN CONTROL MODULE
FUSED AUTO SHUT DOWN RELAY SENSE INPUT
◆ 2.4L
G100
(8W-15-2)

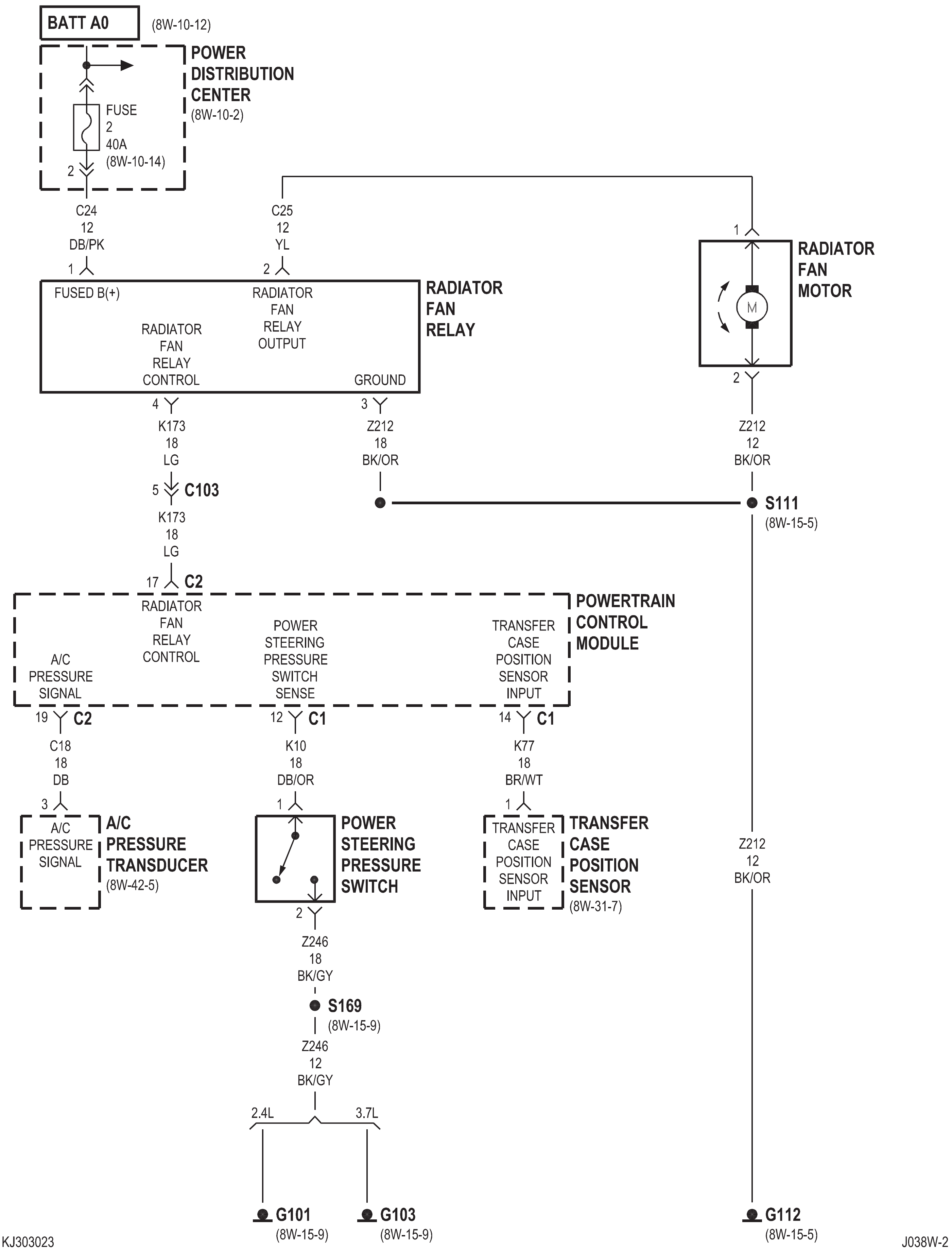

FROM
FUSE 26
(IN PDC)
(8W-30-18)
C
F142
18
OR/DG
S178
(8W-10-20)
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
FUEL INJECTOR NO. 5 (3.7L)
FUEL INJECTOR NO. 6 (3.7L)
K11 18 WT/DB
K12 18 TN
K13 18 YL/WT
K14 18 LB/BR
K38 18 GY
K58 18 BR/DB
3.7L
2.4L
C110
C2
POWERTRAIN CONTROL MODULE
FUEL INJECTOR NO. 1 DRIVER
FUEL INJECTOR NO. 2 DRIVER
FUEL INJECTOR NO. 3 DRIVER
FUEL INJECTOR NO. 4 DRIVER
FUEL INJECTOR NO. 5 DRIVER
FUEL INJECTOR NO. 6 DRIVER

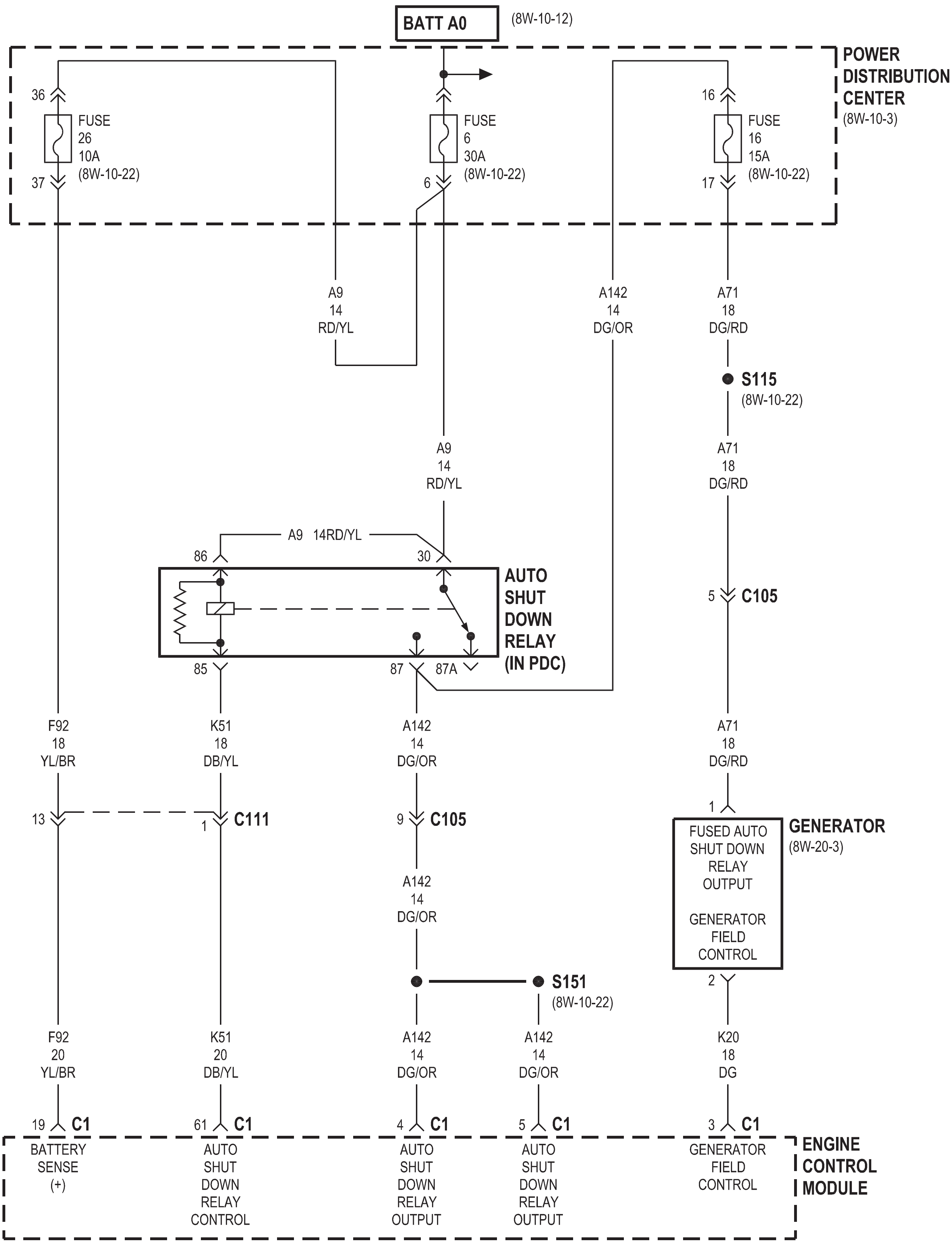

FROM
C112
(8W-30-18)
D
A142
14
DG/OR
S151
(8W-10-21)
A142 14 DG/OR
COIL ON PLUG NO. 1
COIL ON PLUG NO. 2
COIL ON PLUG NO. 3
COIL ON PLUG NO. 4
COIL ON PLUG NO. 5
COIL ON PLUG NO. 6
K91 14 TN/RD
K92 14 TN/PK
K93 14 TN/OR
K94 14 TN/LG
K95 14 TN/DG
K96 14 TN/LB
7 C1
9 C1
1 C1
3 C1
21 C1
5 C1
COIL ON PLUG DRIVER NO. 1
COIL ON PLUG DRIVER NO. 2
COIL ON PLUG DRIVER NO. 3
COIL ON PLUG DRIVER NO. 4
COIL ON PLUG DRIVER NO. 5
COIL ON PLUG DRIVER NO. 6
POWERTRAIN CONTROL MODULE


12 C101
K7
18
OR
S157
(8W-70-5)
K7
18
OR
1
THROTTLE
POSITION
SENSOR
3
2
K22
18
OR/DB
K4
18
BK/LB
S153
(8W-70-4)
K4
18
BK/LB
8 C101
9 C110
K4
18
BK/LB
S154
(8W-70-4)
IDLE
AIR
CONTROL
MOTOR
1
4
3
2
K59
18
VT/BK
K39
18
GY/RD
K60
18
YL/BK
K40
18
BR/WT
1
4
3
2 C101
K59
18
VT/BK
K39
18
GY/RD
K60
18
YL/BK
K40
18
BR/WT
K7
18
OR
K22
18
OR/DB
K4
18
BK/LB
17 C1
23 C1
4 C1
20 C1
19 C1
10 C1
11 C1
5 VOLT SUPPLY
THROTTLE POSITION SENSOR SIGNAL
SENSOR GROUND
IDLE AIR CONTROL NO. 4 DRIVER
IDLE AIR CONTROL NO. 3 DRIVER
IDLE AIR CONTROL NO. 2 DRIVER
IDLE AIR CONTROL NO. 1 DRIVER
POWERTRAIN
CONTROL
MODULE

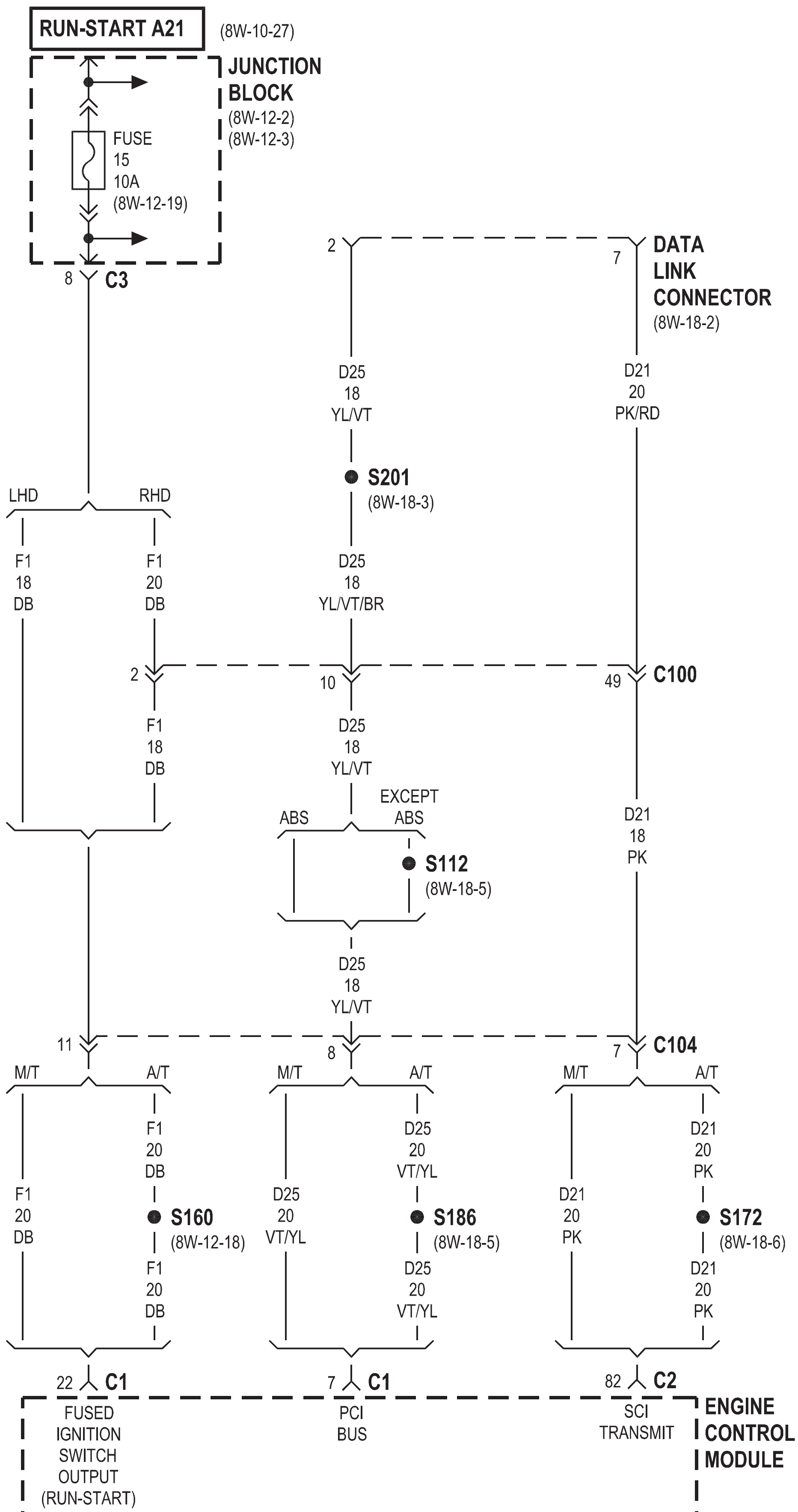

S157
(8W-70-5)
K7
18
OR
1
THROTTLE
POSITION
SENSOR
3
2
K22
18
OR/DB
K4
18
BK/LB
S153
(8W-70-2)
K4
18
BK/LB
S154
(8W-70-3)
S158
K4
18
BK/LB
S155
(8W-70-3)
IDLE
AIR
CONTROL
MOTOR
1
4
3
2
K22
18
OR/DB
K22
18
OR/DB
K4
18
BK/LB
K7
18
OR
K59
18
VT/BK
K39
18
GY/RD
K60
18
YL/BK
K40
18
BR/WT
23 C1
4 C1
17 C1
20 C1
19 C1
10 C1
11 C1
THROTTLE POSITION SENSOR SIGNAL
SENSOR GROUND
5 VOLT SUPPLY
IDLE AIR CONTROL NO. 4 DRIVER
IDLE AIR CONTROL NO. 3 DRIVER
IDLE AIR CONTROL NO. 2 DRIVER
IDLE AIR CONTROL NO. 1 DRIVER
POWERTRAIN
CONTROL
MODULE
12
THROTTLE POSITION SENSOR SIGNAL
TRANSMISSION
CONTROL
MODULE
(8W-31-7)
(8W-31-8)

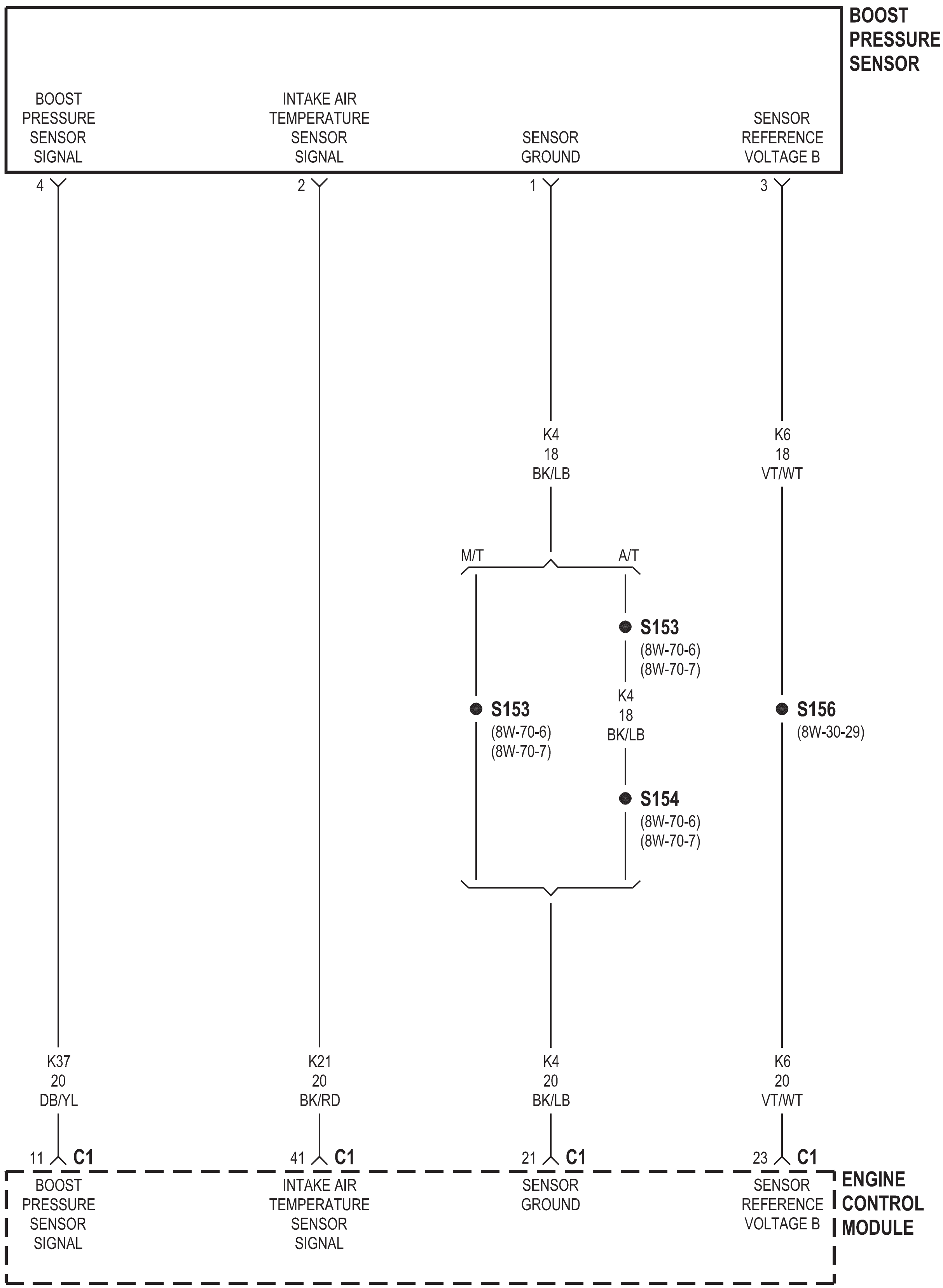
8W-30 FUEL/IGNITION SYSTEM
GAS

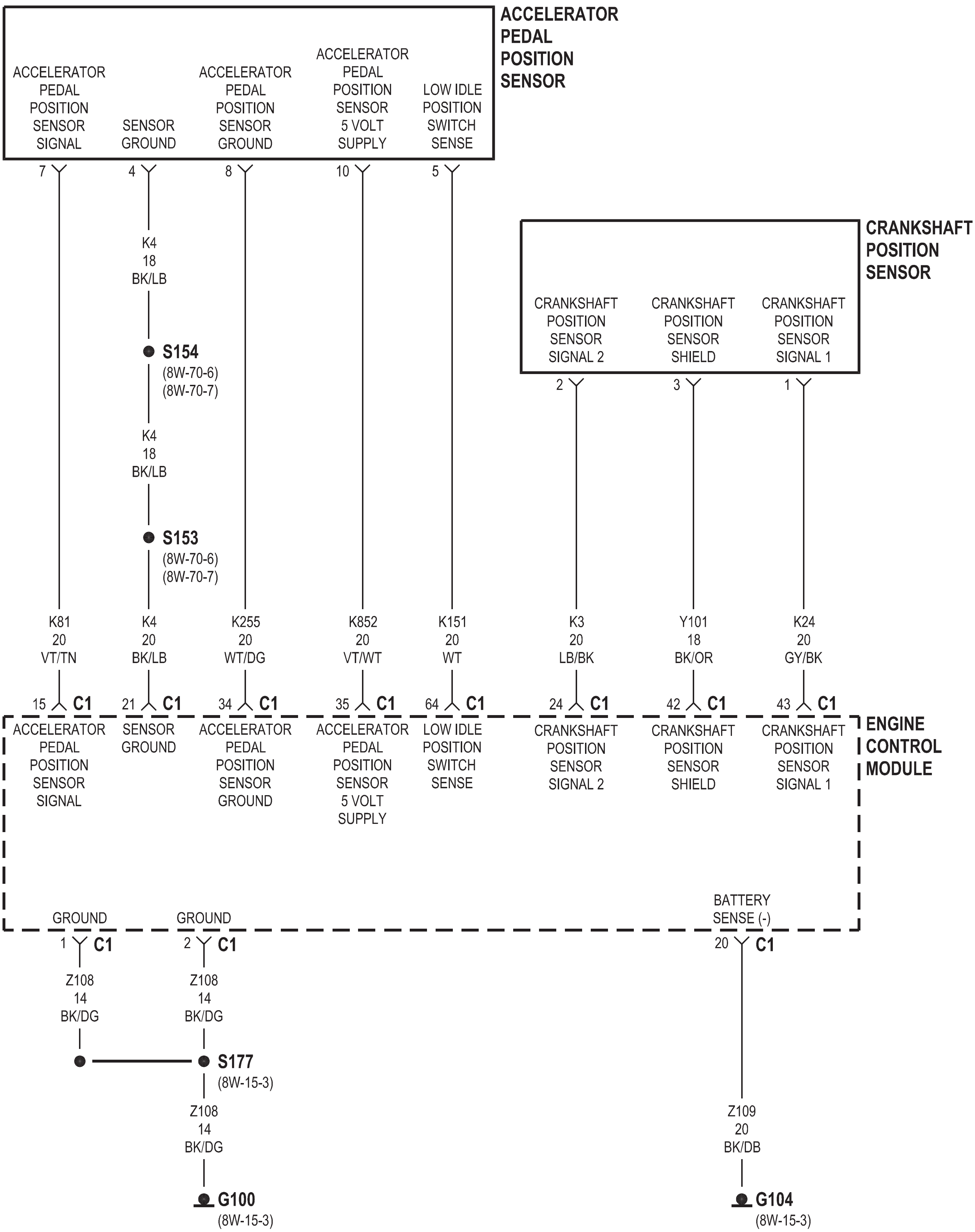


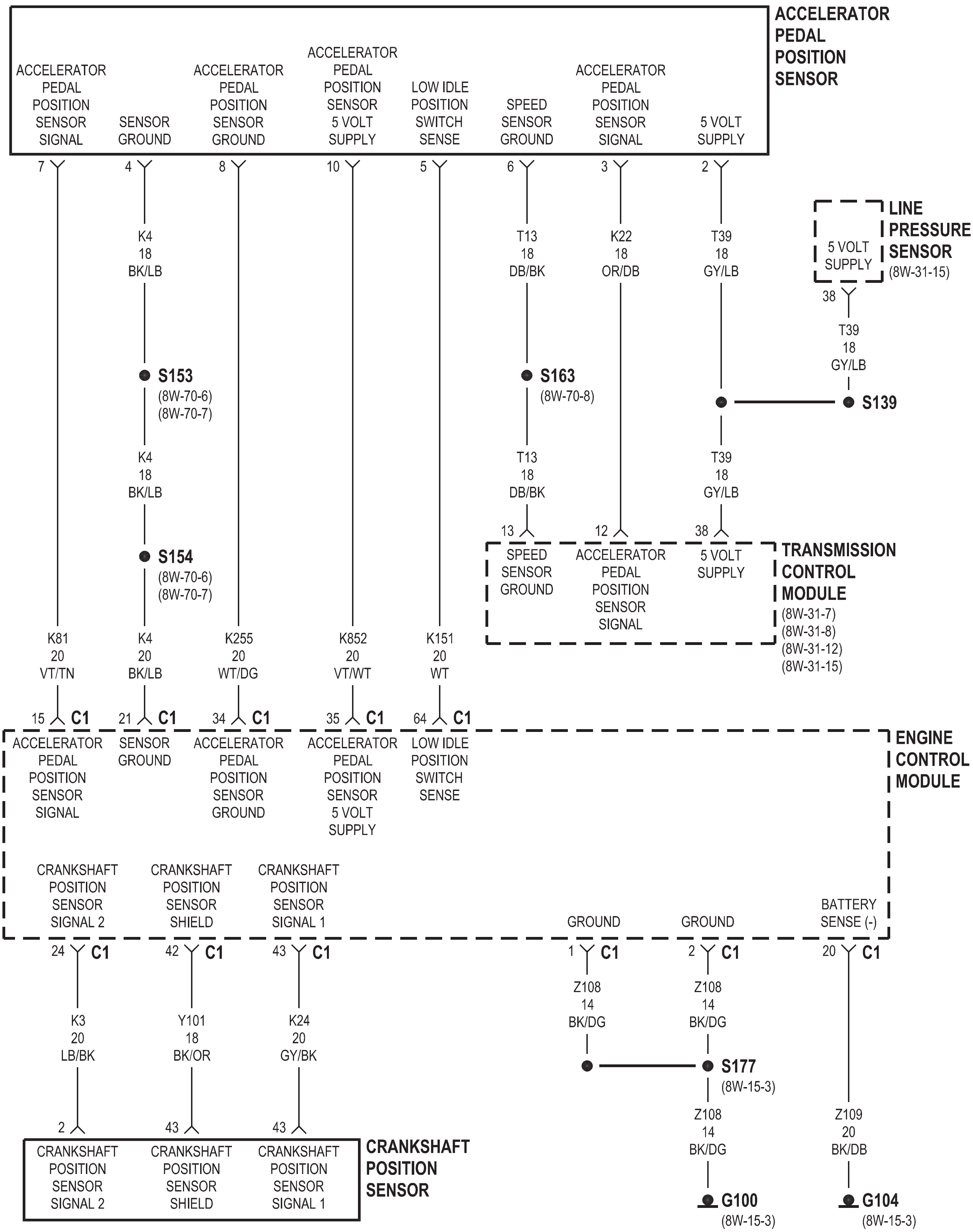


BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
36
FUSE
26
10A
(8W-10-22)
37
FUSE
6
30A
(8W-10-22)
6
16
FUSE
16
15A
(8W-10-22)
17
A9
14
RD/YL
A142
14
DG/OR
A71
18
DG/RD
S115
(8W-10-22)
A9
14
RD/YL
A71
18
DG/RD
A9 14RD/YL
86
30
AUTO SHUT DOWN RELAY (IN PDC)
85
87
87A
5
C105
F92
18
YL/BR
K51
18
DB/YL
A142
14
DG/OR
A71
18
DG/RD
13
1
C111
9
C105
1
GENERATOR
(8W-20-3)
FUSED AUTO SHUT DOWN RELAY OUTPUT
GENERATOR FIELD CONTROL
2
A142
14
DG/OR
S151
(8W-10-22)
F92
20
YL/BR
K51
20
DB/YL
A142
14
DG/OR
A142
14
DG/OR
K20
18
DG
19
C1
61
C1
4
C1
5
C1
3
C1
ENGINE CONTROL MODULE
BATTERY SENSE (+)
AUTO SHUT DOWN RELAY CONTROL
AUTO SHUT DOWN RELAY OUTPUT
AUTO SHUT DOWN RELAY OUTPUT
GENERATOR FIELD CONTROL


RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 15 10A (8W-12-19)
C3
DATA LINK CONNECTOR
(8W-18-2)
D25 18 YL/VT
D21 20 PK/RD
S201
(8W-18-3)
LHD
RHD
F1 18 DB
F1 20 DB
D25 18 YL/VT/BR
C100
F1 18 DB
D25 18 YL/VT
ABS
EXCEPT ABS
S112
(8W-18-5)
D21 18 PK
D25 18 YL/VT
C104
M/T
A/T
F1 20 DB
S160
(8W-12-18)
D25 20 VT/YL
S186
(8W-18-5)
D21 20 PK
S172
(8W-18-6)
C1
C2
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
SCI TRANSMIT
ENGINE CONTROL MODULE


BOOST PRESSURE SENSOR
BOOST PRESSURE SENSOR SIGNAL
INTAKE AIR TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
SENSOR REFERENCE VOLTAGE B
4
2
1
3
K4 18 BK/LB
K6 18 VT/WT
M/T
A/T
S153 (8W-70-6) (8W-70-7)
K4 18 BK/LB
S154 (8W-70-6) (8W-70-7)
S153 (8W-70-6) (8W-70-7)
S156 (8W-30-29)
K37 20 DB/YL
K21 20 BK/RD
K4 20 BK/LB
K6 20 VT/WT
11 C1
41 C1
21 C1
23 C1
BOOST PRESSURE SENSOR SIGNAL
INTAKE AIR TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
SENSOR REFERENCE VOLTAGE B
ENGINE CONTROL MODULE


ACCELERATOR PEDAL POSITION SENSOR
ACCELERATOR PEDAL POSITION SENSOR SIGNAL
SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
LOW IDLE POSITION SWITCH SENSE
7
4
8
10
5
K4 18 BK/LB
S154 (8W-70-6) (8W-70-7)
K4 18 BK/LB
S153 (8W-70-6) (8W-70-7)
K81 20 VT/TN
K4 20 BK/LB
K255 20 WT/DG
K852 20 VT/WT
K151 20 WT
CRANKSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR SIGNAL 2
CRANKSHAFT POSITION SENSOR SHIELD
CRANKSHAFT POSITION SENSOR SIGNAL 1
2
3
1
K3 20 LB/BK
Y101 18 BK/OR
K24 20 GY/BK
15 C1
21 C1
34 C1
35 C1
64 C1
24 C1
42 C1
43 C1
ENGINE CONTROL MODULE
ACCELERATOR PEDAL POSITION SENSOR SIGNAL
SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
LOW IDLE POSITION SWITCH SENSE
CRANKSHAFT POSITION SENSOR SIGNAL 2
CRANKSHAFT POSITION SENSOR SHIELD
CRANKSHAFT POSITION SENSOR SIGNAL 1
GROUND
GROUND
BATTERY SENSE (-)
1 C1
2 C1
20 C1
Z108 14 BK/DG
Z108 14 BK/DG
S177 (8W-15-3)
Z108 14 BK/DG
G100 (8W-15-3)
Z109 20 BK/DB
G104 (8W-15-3)



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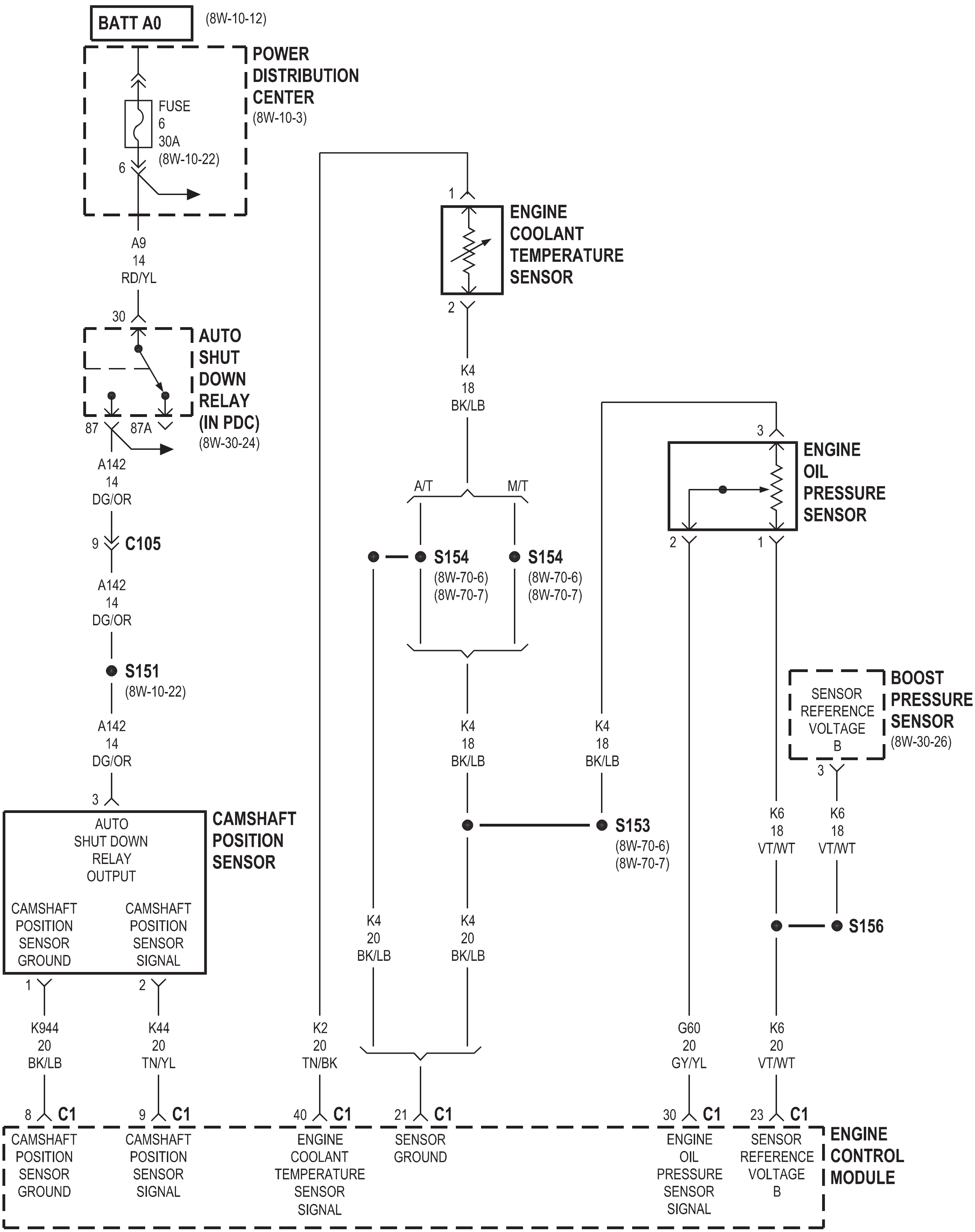
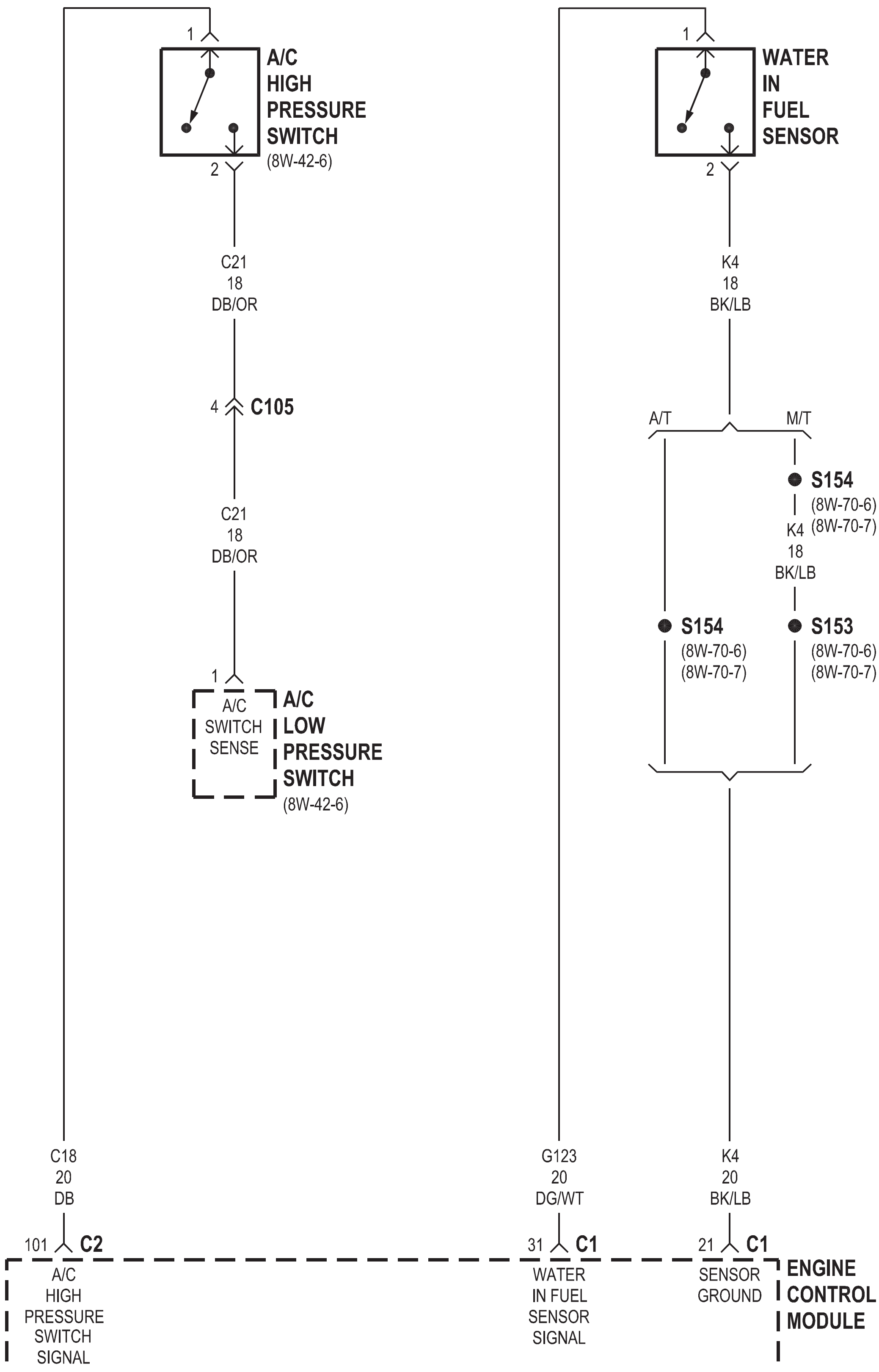
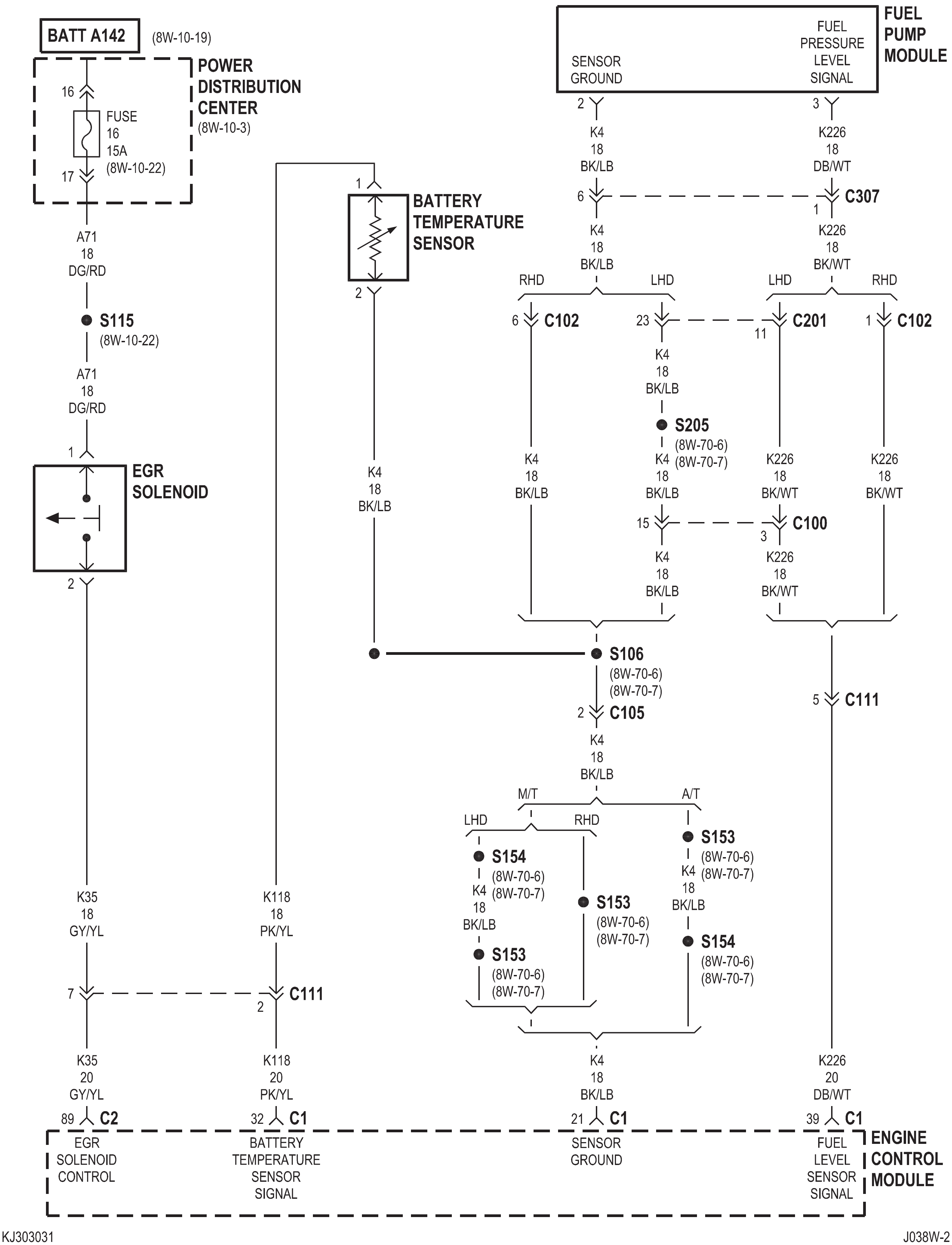
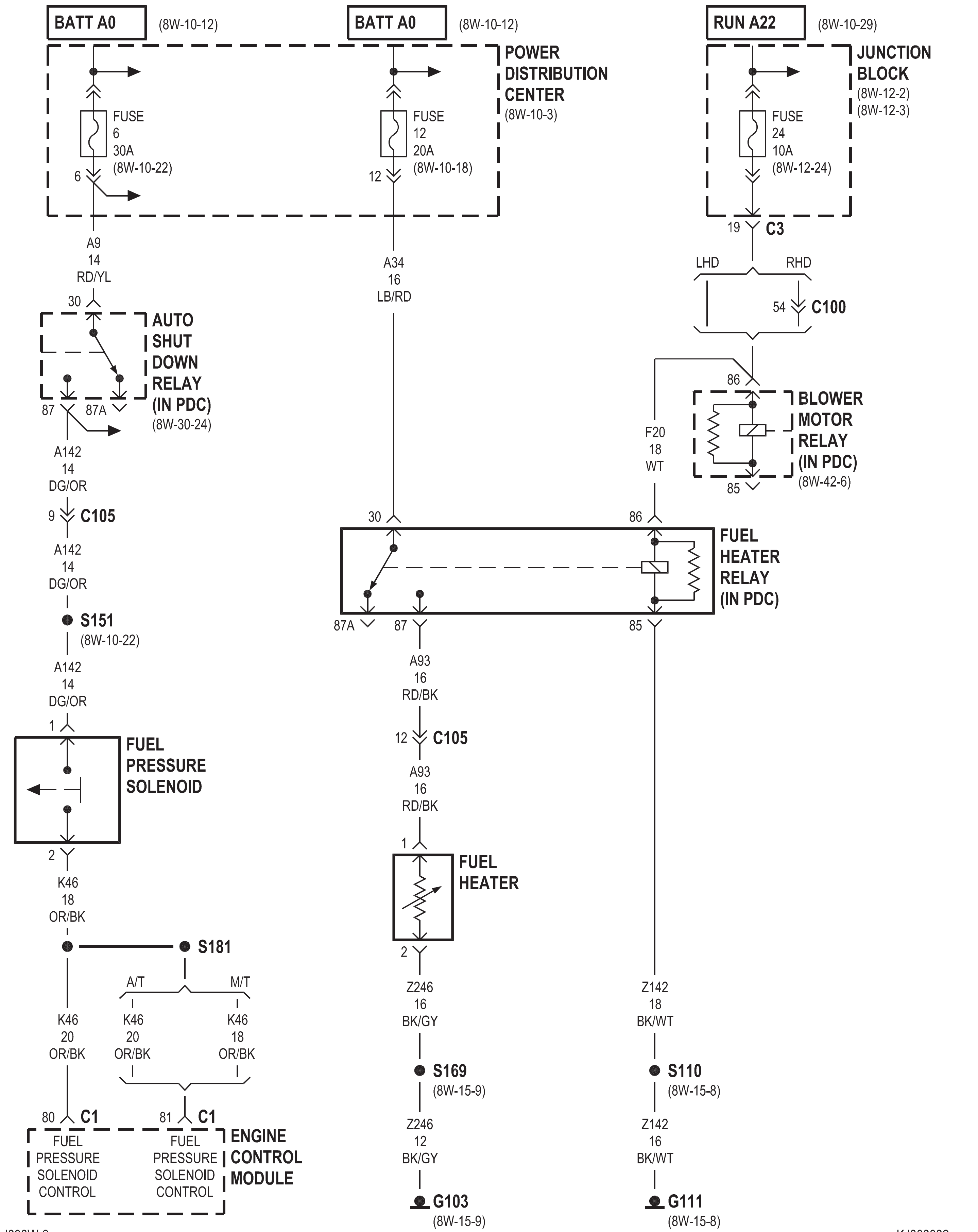
KJ303028

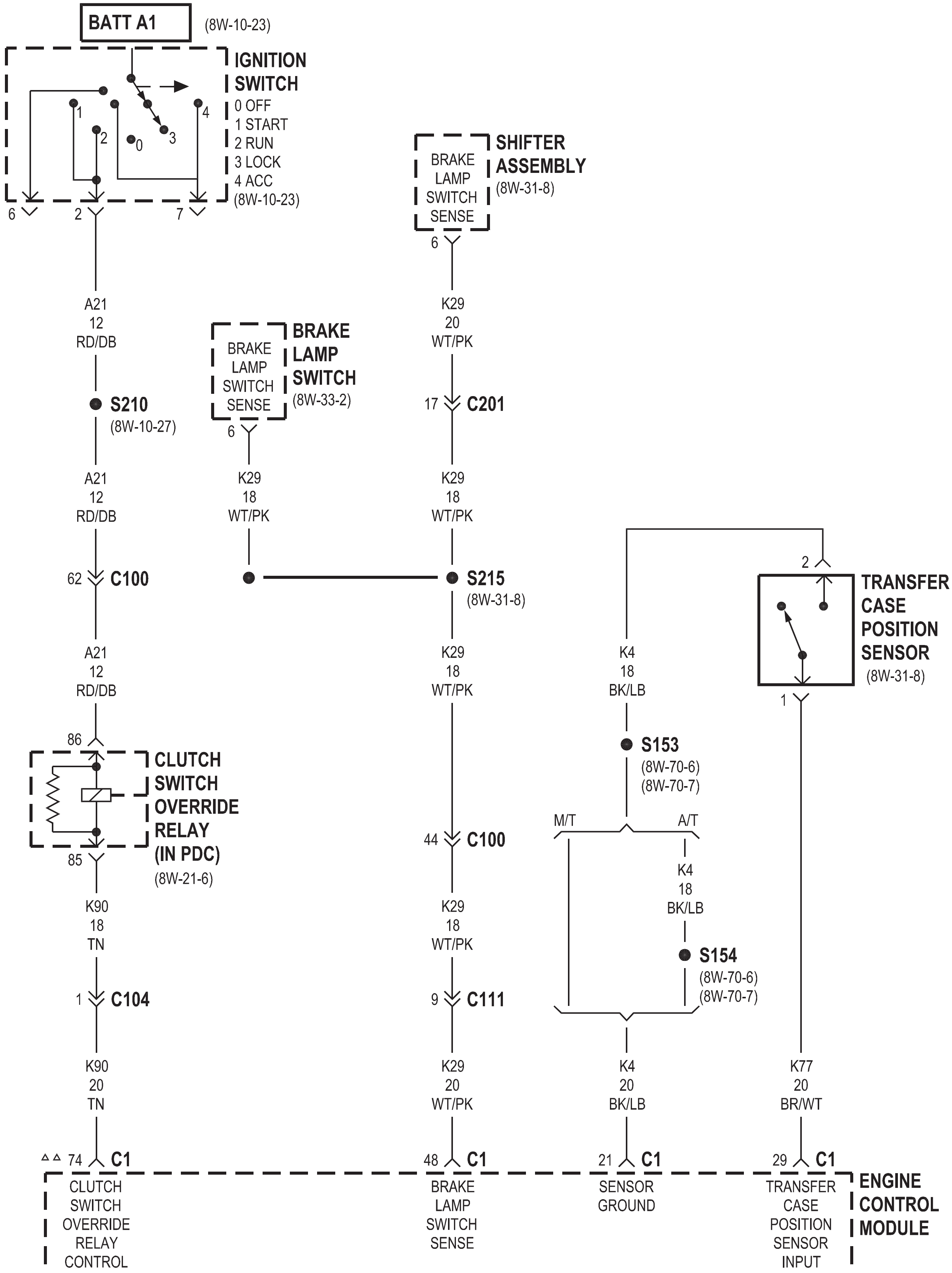


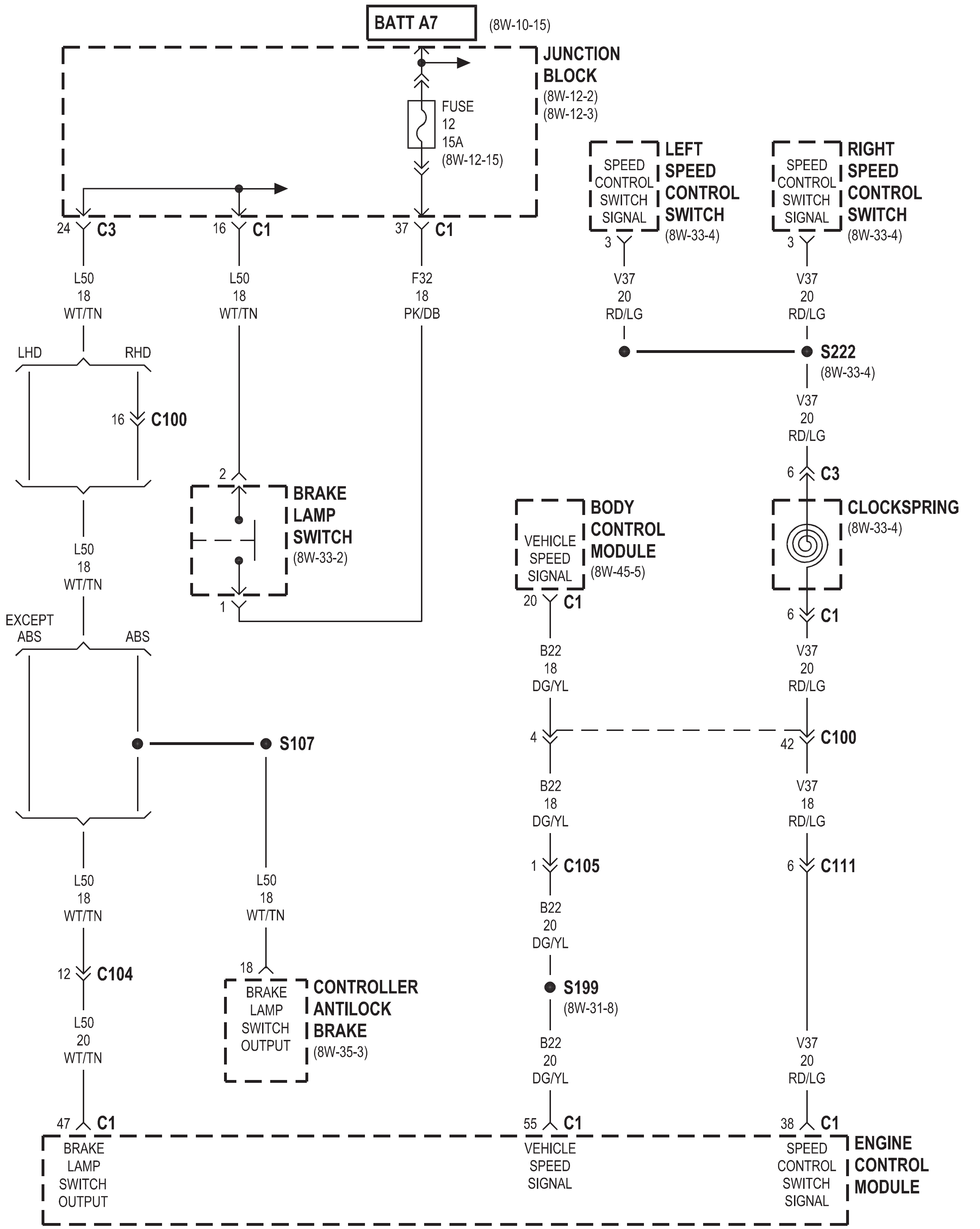
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 6 30A
(8W-10-22)
6
A9 14 RD/YL
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-24)
87
87A
A142 14 DG/OR
9
C105
A142 14 DG/OR
S151
(8W-10-22)
A142 14 DG/OR
3
CAMSHAFT POSITION SENSOR
AUTO SHUT DOWN RELAY OUTPUT
CAMSHAFT POSITION SENSOR GROUND
CAMSHAFT POSITION SENSOR SIGNAL
1
2
K944 20 BK/LB
K44 20 TN/YL
1
ENGINE COOLANT TEMPERATURE SENSOR
2
K4 18 BK/LB
A/T
M/T
S154
(8W-70-6)
(8W-70-7)
S154
(8W-70-6)
(8W-70-7)
K4 18 BK/LB
K4 18 BK/LB
S153
(8W-70-6)
(8W-70-7)
K4 20 BK/LB
K4 20 BK/LB
K2 20 TN/BK
3
ENGINE OIL PRESSURE SENSOR
2
1
BOOST PRESSURE SENSOR
(8W-30-26)
SENSOR REFERENCE VOLTAGE B
3
K6 18 VT/WT
K6 18 VT/WT
S156
G60 20 GY/YL
K6 20 VT/WT
8 C1
9 C1
40 C1
21 C1
30 C1
23 C1
ENGINE CONTROL MODULE
CAMSHAFT POSITION SENSOR GROUND
CAMSHAFT POSITION SENSOR SIGNAL
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
ENGINE OIL PRESSURE SENSOR SIGNAL
SENSOR REFERENCE VOLTAGE B

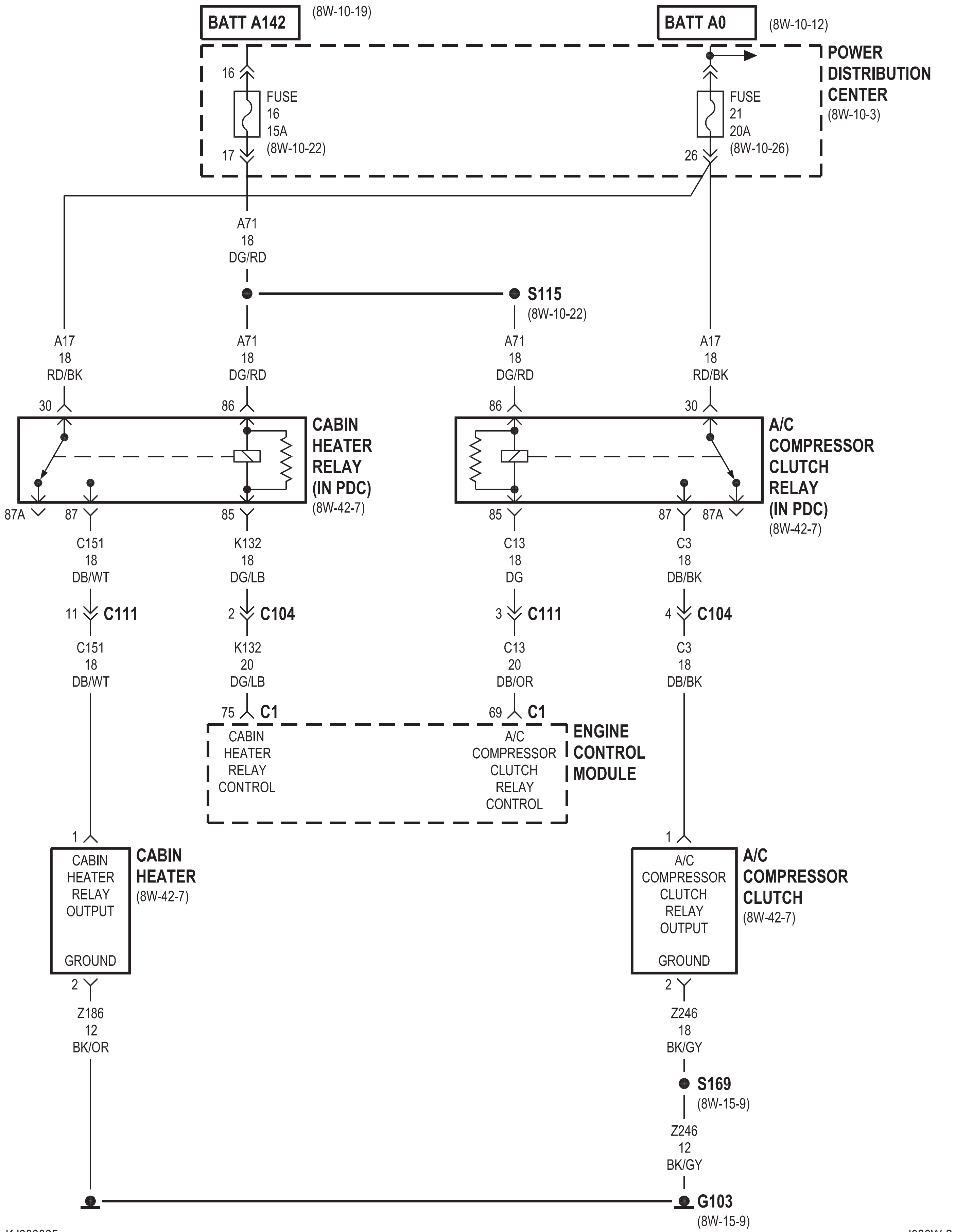

1
A/C
HIGH
PRESSURE
SWITCH
(8W-42-6)
2
C21
18
DB/OR
4 C105
C21
18
DB/OR
1
A/C
SWITCH
SENSE
A/C
LOW
PRESSURE
SWITCH
(8W-42-6)
1
WATER
IN
FUEL
SENSOR
2
K4
18
BK/LB
A/T
M/T
S154
(8W-70-6)
(8W-70-7)
K4
18
BK/LB
S154
(8W-70-6)
(8W-70-7)
S153
(8W-70-6)
(8W-70-7)
C18
20
DB
G123
20
DG/WT
K4
20
BK/LB
101 C2
31 C1
21 C1
A/C
HIGH
PRESSURE
SWITCH
SIGNAL
WATER
IN FUEL
SENSOR
SIGNAL
SENSOR
GROUND
ENGINE
CONTROL
MODULE


BATT A142
(8W-10-19)
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE
16
15A
(8W-10-22)
17
A71
18
DG/RD
S115
(8W-10-22)
A71
18
DG/RD
1
EGR SOLENOID
2
K35
18
GY/YL
7
C111
2
K35
20
GY/YL
89
C2
K118
18
PK/YL
K118
20
PK/YL
32
C1
1
BATTERY TEMPERATURE SENSOR
2
K4
18
BK/LB
FUEL PUMP MODULE
SENSOR GROUND
FUEL PRESSURE LEVEL SIGNAL
2
3
K4
18
BK/LB
K226
18
DB/WT
6
C307
1
K226
18
BK/WT
RHD
LHD
6
C102
23
C201
11
1
K4
18
BK/LB
S205
(8W-70-6)
(8W-70-7)
K226
18
BK/WT
15
C100
3
S106
(8W-70-6)
(8W-70-7)
2
C105
M/T
A/T
S154
S153
(8W-70-6)
(8W-70-7)
5
K226
20
DB/WT
21
39
ENGINE CONTROL MODULE
EGR SOLENOID CONTROL
BATTERY TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
FUEL LEVEL SENSOR SIGNAL
KJ303031
J038W-2


BATT A0
(8W-10-12)
BATT A0
(8W-10-12)
RUN A22
(8W-10-29)
POWER DISTRIBUTION CENTER
(8W-10-3)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 6 30A
(8W-10-22)
FUSE 12 20A
(8W-10-18)
FUSE 24 10A
(8W-12-24)
6
12
19
C3
A9 14 RD/YL
A34 16 LB/RD
LHD
RHD
54
C100
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-24)
87
87A
86
BLOWER MOTOR RELAY (IN PDC)
(8W-42-6)
85
F20 18 WT
A142 14 DG/OR
9
C105
A142 14 DG/OR
S151
(8W-10-22)
A142 14 DG/OR
30
86
FUEL HEATER RELAY (IN PDC)
87A
87
85
A93 16 RD/BK
12
C105
A93 16 RD/BK
1
FUEL PRESSURE SOLENOID
2
1
FUEL HEATER
2
K46 18 OR/BK
S181
A/T
M/T
K46 20 OR/BK
K46 20 OR/BK
K46 18 OR/BK
Z246 16 BK/GY
Z142 18 BK/WT
S169
(8W-15-9)
S110
(8W-15-8)
Z246 12 BK/GY
Z142 16 BK/WT
80
C1
81
C1
FUEL PRESSURE SOLENOID CONTROL
FUEL PRESSURE SOLENOID CONTROL
ENGINE CONTROL MODULE
G103
(8W-15-9)
G111
(8W-15-8)


BATT A1
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
SHIFTER ASSEMBLY
(8W-31-8)
BRAKE LAMP SWITCH SENSE
A21 12 RD/DB
S210
(8W-10-27)
BRAKE LAMP SWITCH
(8W-33-2)
K29 20 WT/PK
C201
K29 18 WT/PK
C100
S215
(8W-31-8)
TRANSFER CASE POSITION SENSOR
(8W-31-8)
K4 18 BK/LB
S153
(8W-70-6)
(8W-70-7)
CLUTCH SWITCH OVERRIDE RELAY (IN PDC)
(8W-21-6)
M/T
A/T
S154
K90 18 TN
C104
C111
K90 20 TN
K4 20 BK/LB
K77 20 BR/WT
C1
CLUTCH SWITCH OVERRIDE RELAY CONTROL
BRAKE LAMP SWITCH SENSE
SENSOR GROUND
TRANSFER CASE POSITION SENSOR INPUT
ENGINE CONTROL MODULE
△△ M/T


BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 15A
(8W-12-15)
24 C3
16 C1
37 C1
L50 18 WT/TN
L50 18 WT/TN
F32 18 PK/DB
LHD
RHD
16 C100
2
BRAKE LAMP SWITCH
(8W-33-2)
1
L50 18 WT/TN
EXCEPT ABS
ABS
S107
L50 18 WT/TN
L50 18 WT/TN
12 C104
L50 20 WT/TN
18
BRAKE LAMP SWITCH OUTPUT
CONTROLLER ANTILOCK BRAKE
(8W-35-3)
SPEED CONTROL SWITCH SIGNAL
LEFT SPEED CONTROL SWITCH
(8W-33-4)
3
SPEED CONTROL SWITCH SIGNAL
RIGHT SPEED CONTROL SWITCH
(8W-33-4)
3
V37 20 RD/LG
V37 20 RD/LG
S222
(8W-33-4)
V37 20 RD/LG
6 C3
CLOCKSPRING
(8W-33-4)
6 C1
V37 20 RD/LG
VEHICLE SPEED SIGNAL
BODY CONTROL MODULE
(8W-45-5)
20 C1
B22 18 DG/YL
4
42 C100
B22 18 DG/YL
V37 18 RD/LG
1 C105
6 C111
B22 20 DG/YL
S199
(8W-31-8)
B22 20 DG/YL
V37 20 RD/LG
47 C1
55 C1
38 C1
BRAKE LAMP SWITCH OUTPUT
VEHICLE SPEED SIGNAL
SPEED CONTROL SWITCH SIGNAL
ENGINE CONTROL MODULE



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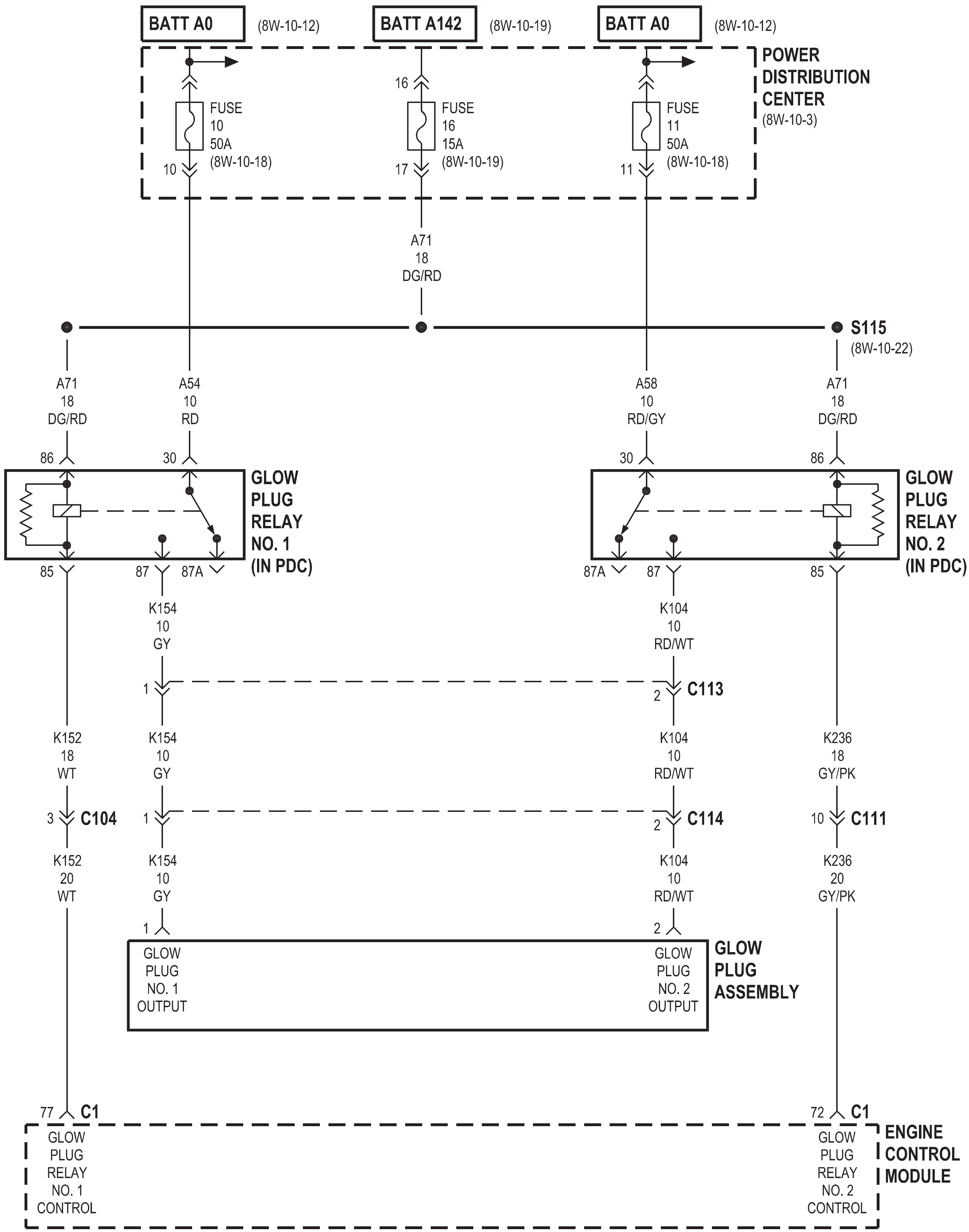
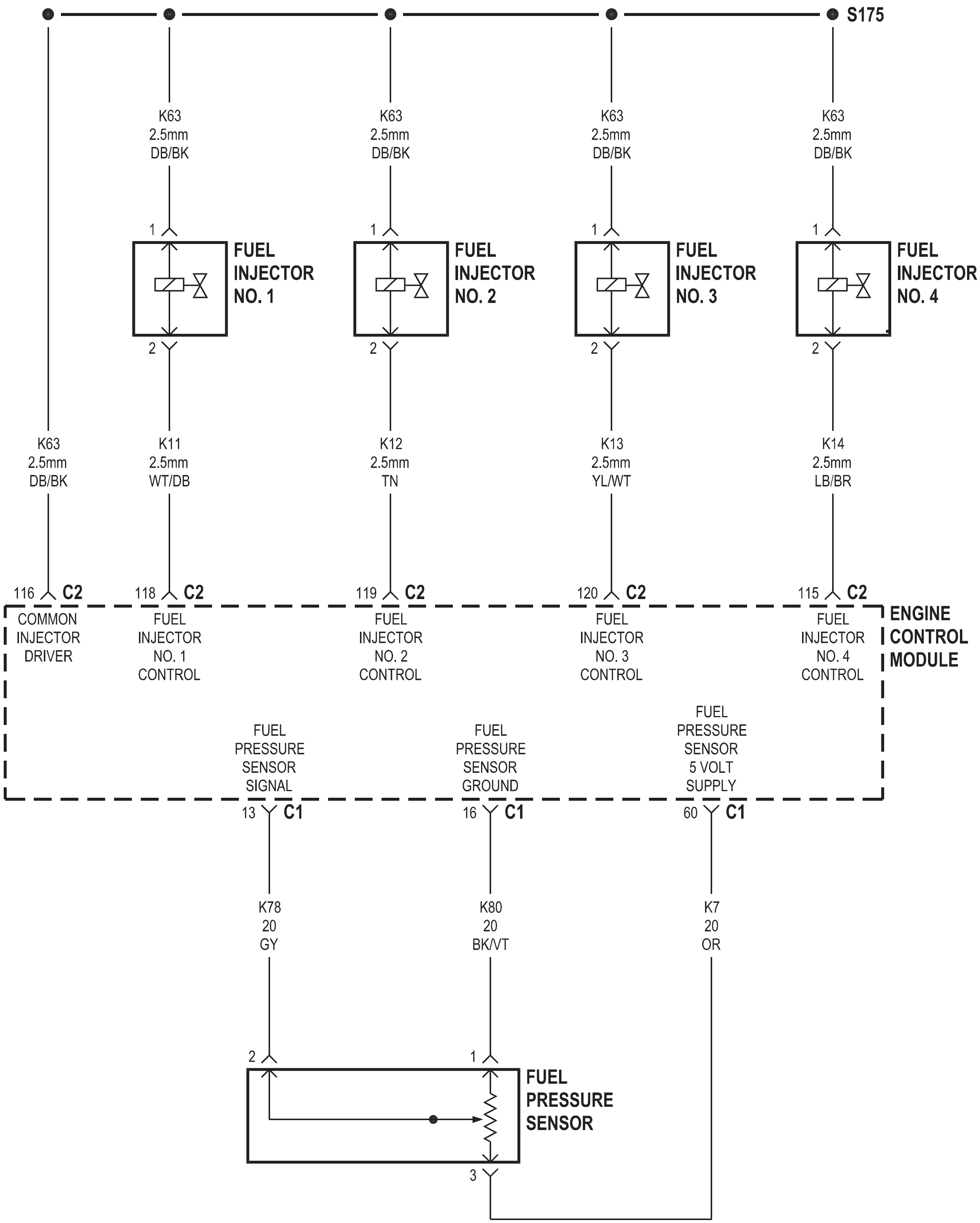
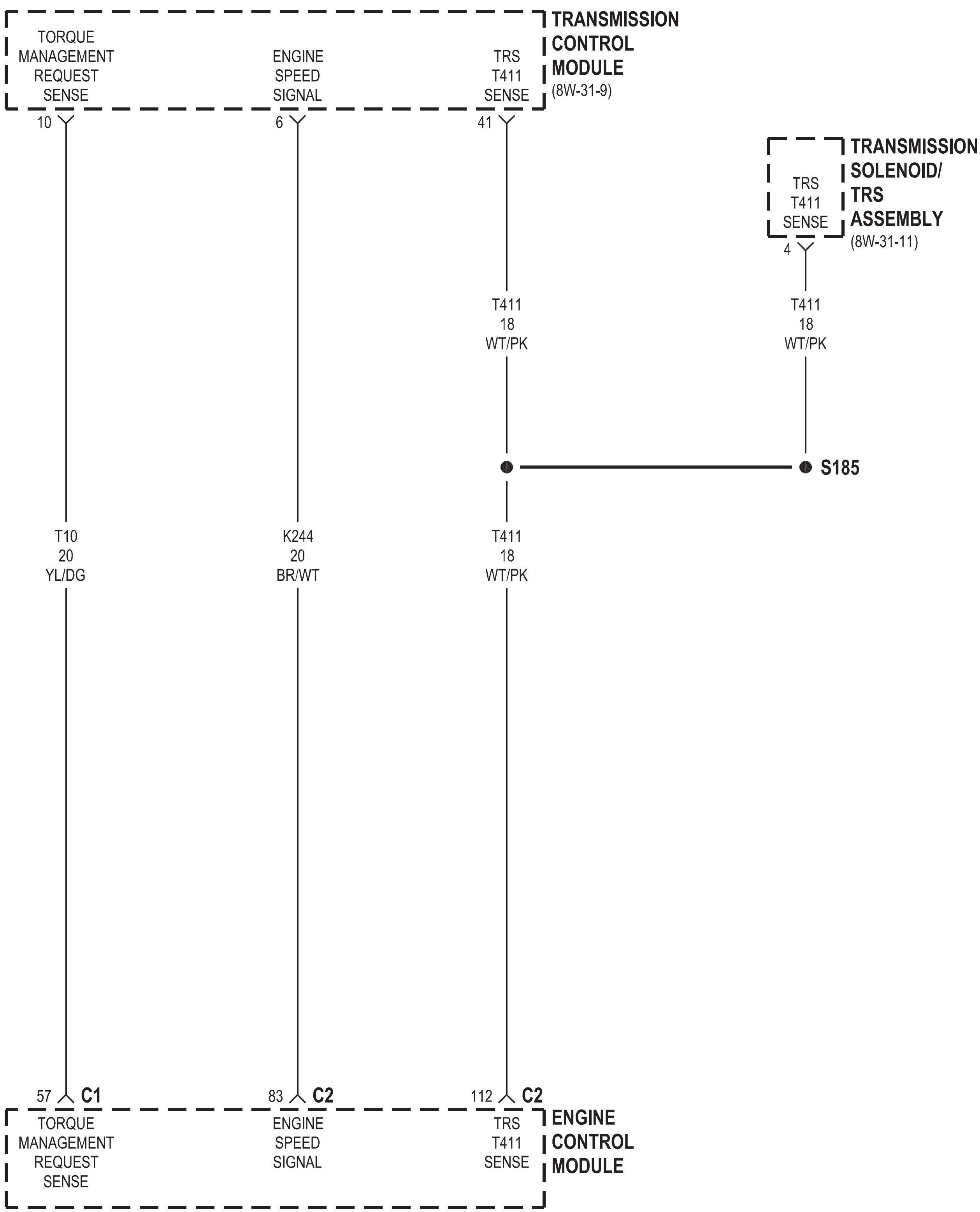
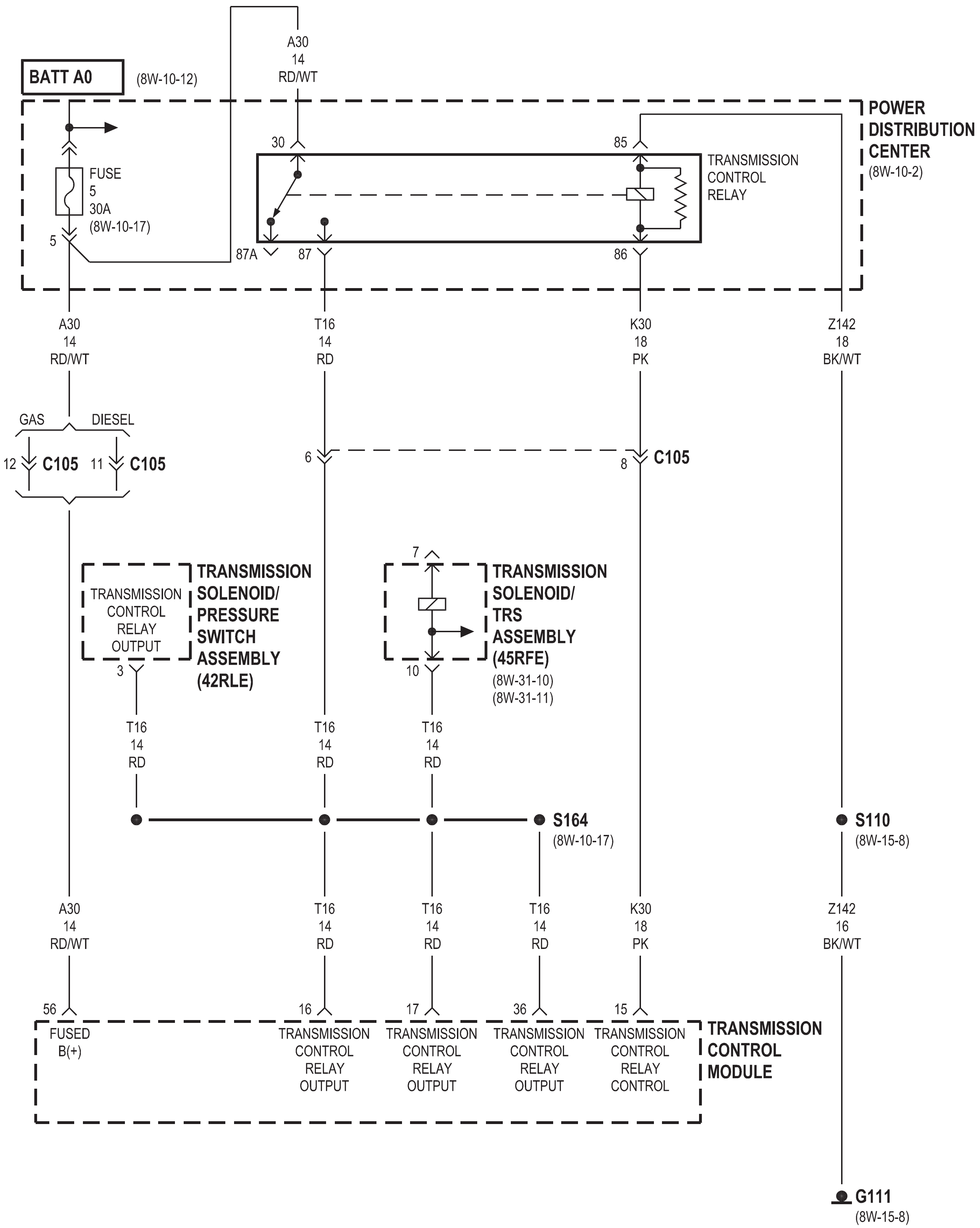
DIESEL


BATT A0
(8W-10-12)
BATT A142
(8W-10-19)
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE 10 50A (8W-10-18)
10
FUSE 16 15A (8W-10-19)
17
FUSE 11 50A (8W-10-18)
11
A71 18 DG/RD
S115
(8W-10-22)
A71 18 DG/RD
A54 10 RD
A58 10 RD/GY
A71 18 DG/RD
86
30
30
86
GLOW PLUG RELAY NO. 1 (IN PDC)
GLOW PLUG RELAY NO. 2 (IN PDC)
85
87
87A
87A
87
85
K154 10 GY
K104 10 RD/WT
1
C113
2
K152 18 WT
K154 10 GY
K104 10 RD/WT
K236 18 GY/PK
3
C104
1
2
C114
10
C111
K152 20 WT
K154 10 GY
K104 10 RD/WT
K236 20 GY/PK
1
2
GLOW PLUG NO. 1 OUTPUT
GLOW PLUG NO. 2 OUTPUT
GLOW PLUG ASSEMBLY
77
C1
72
C1
GLOW PLUG RELAY NO. 1 CONTROL
GLOW PLUG RELAY NO. 2 CONTROL
ENGINE CONTROL MODULE

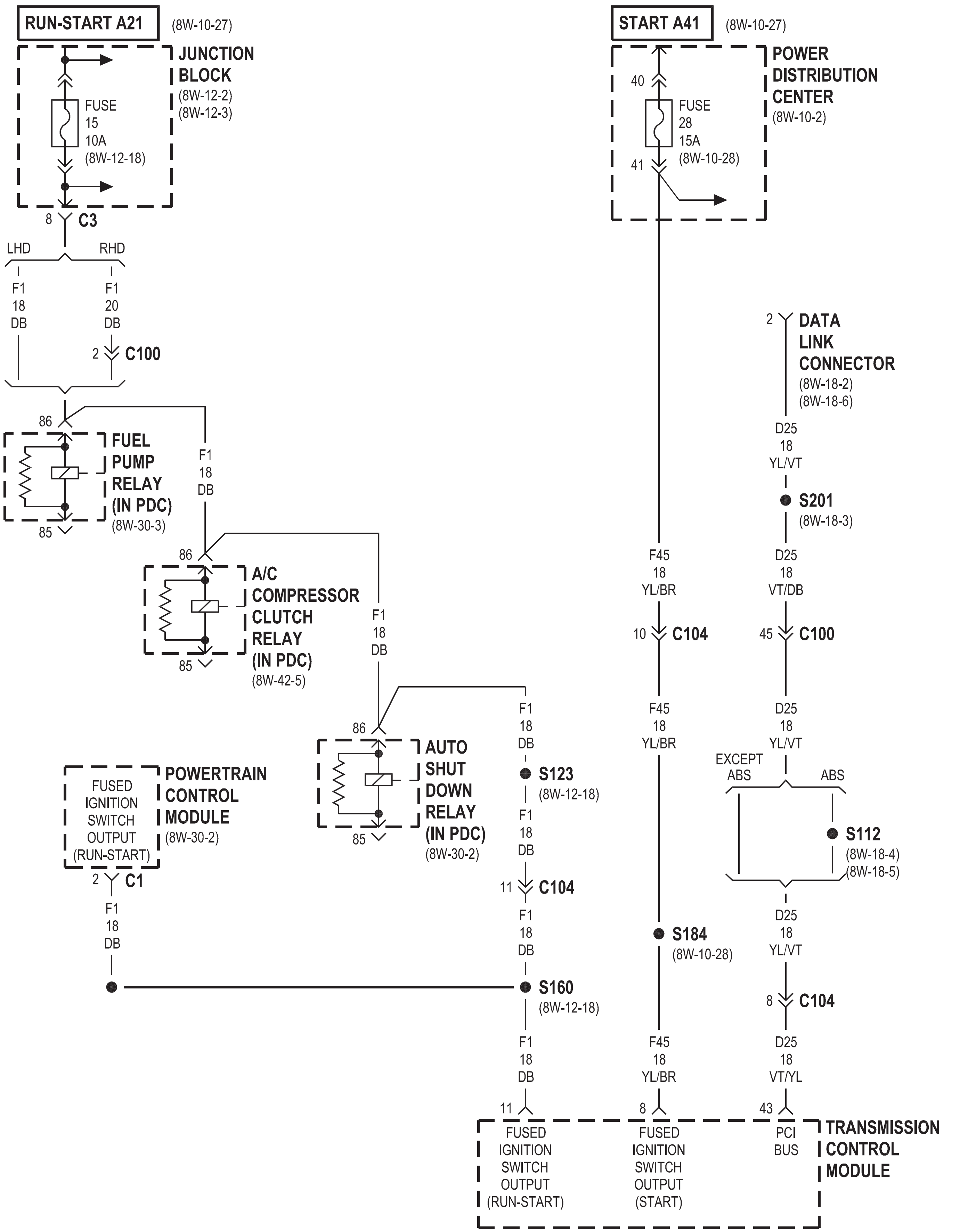

S175
K63
2.5mm
DB/BK
K63
2.5mm
DB/BK
K63
2.5mm
DB/BK
K63
2.5mm
DB/BK
1
2
FUEL INJECTOR NO. 1
1
2
FUEL INJECTOR NO. 2
1
2
FUEL INJECTOR NO. 3
1
2
FUEL INJECTOR NO. 4
K63
2.5mm
DB/BK
K11
2.5mm
WT/DB
K12
2.5mm
TN
K13
2.5mm
YL/WT
K14
2.5mm
LB/BR
116 C2
118 C2
119 C2
120 C2
115 C2
COMMON INJECTOR DRIVER
FUEL INJECTOR NO. 1 CONTROL
FUEL INJECTOR NO. 2 CONTROL
FUEL INJECTOR NO. 3 CONTROL
FUEL INJECTOR NO. 4 CONTROL
ENGINE CONTROL MODULE
FUEL PRESSURE SENSOR SIGNAL
FUEL PRESSURE SENSOR GROUND
FUEL PRESSURE SENSOR 5 VOLT SUPPLY
13 C1
16 C1
60 C1
K78
20
GY
K80
20
BK/VT
K7
20
OR
2
1
3
FUEL PRESSURE SENSOR

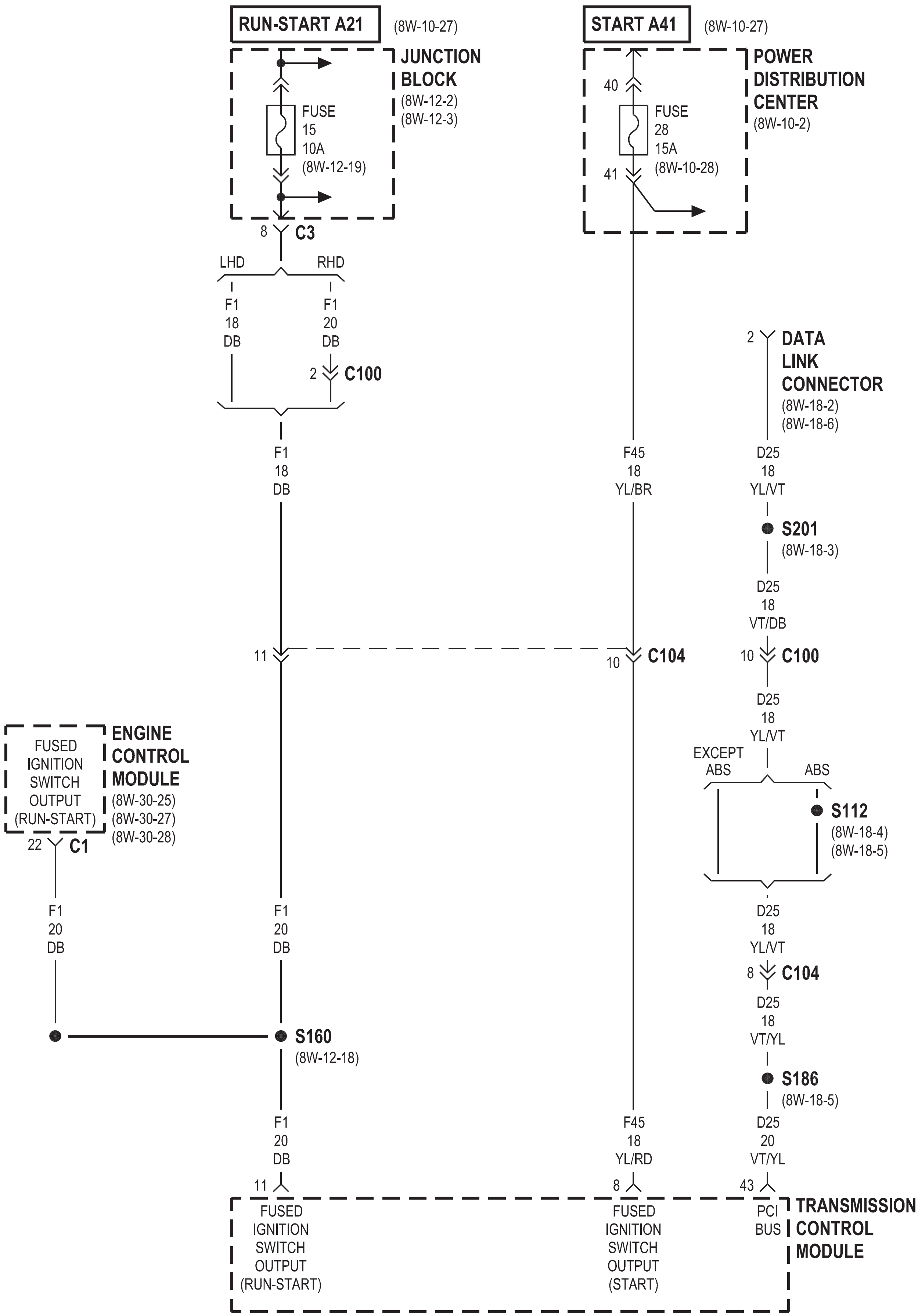

TRANSMISSION CONTROL MODULE
(8W-31-9)
TORQUE MANAGEMENT REQUEST SENSE
ENGINE SPEED SIGNAL
TRS T411 SENSE
10
6
41
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-11)
TRS T411 SENSE
4
T411
18
WT/PK
T411
18
WT/PK
S185
T10
20
YL/DG
K244
20
BR/WT
T411
18
WT/PK
57 C1
83 C2
112 C2
TORQUE MANAGEMENT REQUEST SENSE
ENGINE SPEED SIGNAL
TRS T411 SENSE
ENGINE CONTROL MODULE

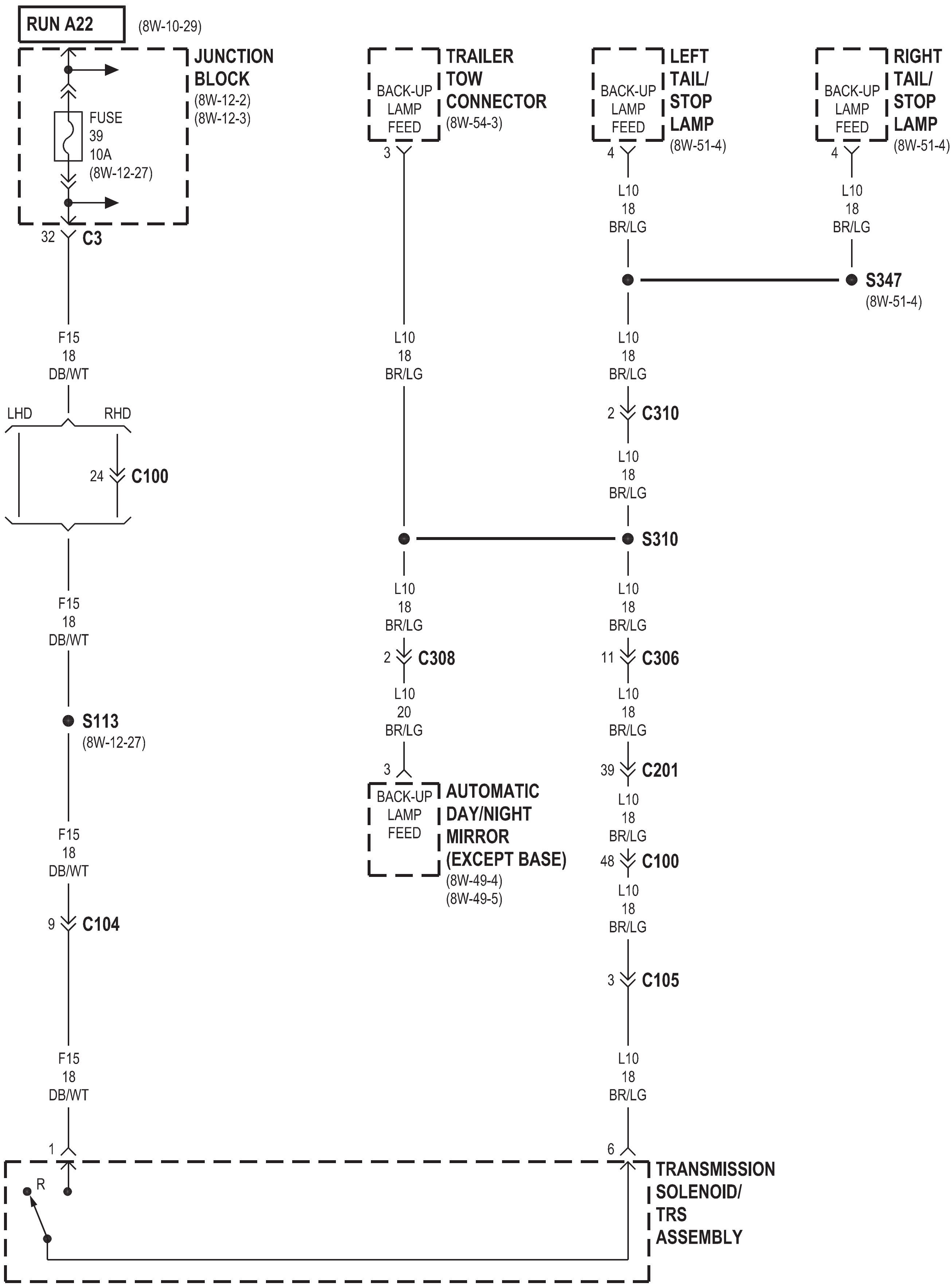
8W-31 TRANSMISSION CONTROL SYSTEM



BATT A0
(8W-10-12)
A30
14
RD/WT
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
5
30A
(8W-10-17)
5
30
85
87A
87
86
TRANSMISSION
CONTROL
RELAY
A30
14
RD/WT
T16
14
RD
K30
18
PK
Z142
18
BK/WT
GAS
DIESEL
12
C105
11
C105
6
8
C105
TRANSMISSION
CONTROL
RELAY
OUTPUT
3
TRANSMISSION
SOLENOID/
PRESSURE
SWITCH
ASSEMBLY
(42RLE)
7
10
TRANSMISSION
SOLENOID/
TRS
ASSEMBLY
(45RFE)
(8W-31-10)
(8W-31-11)
T16
14
RD
T16
14
RD
T16
14
RD
S164
(8W-10-17)
S110
(8W-15-8)
A30
14
RD/WT
T16
14
RD
T16
14
RD
T16
14
RD
K30
18
PK
Z142
16
BK/WT
56
16
17
36
15
FUSED
B(+)
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
CONTROL
TRANSMISSION
CONTROL
MODULE
G111
(8W-15-8)

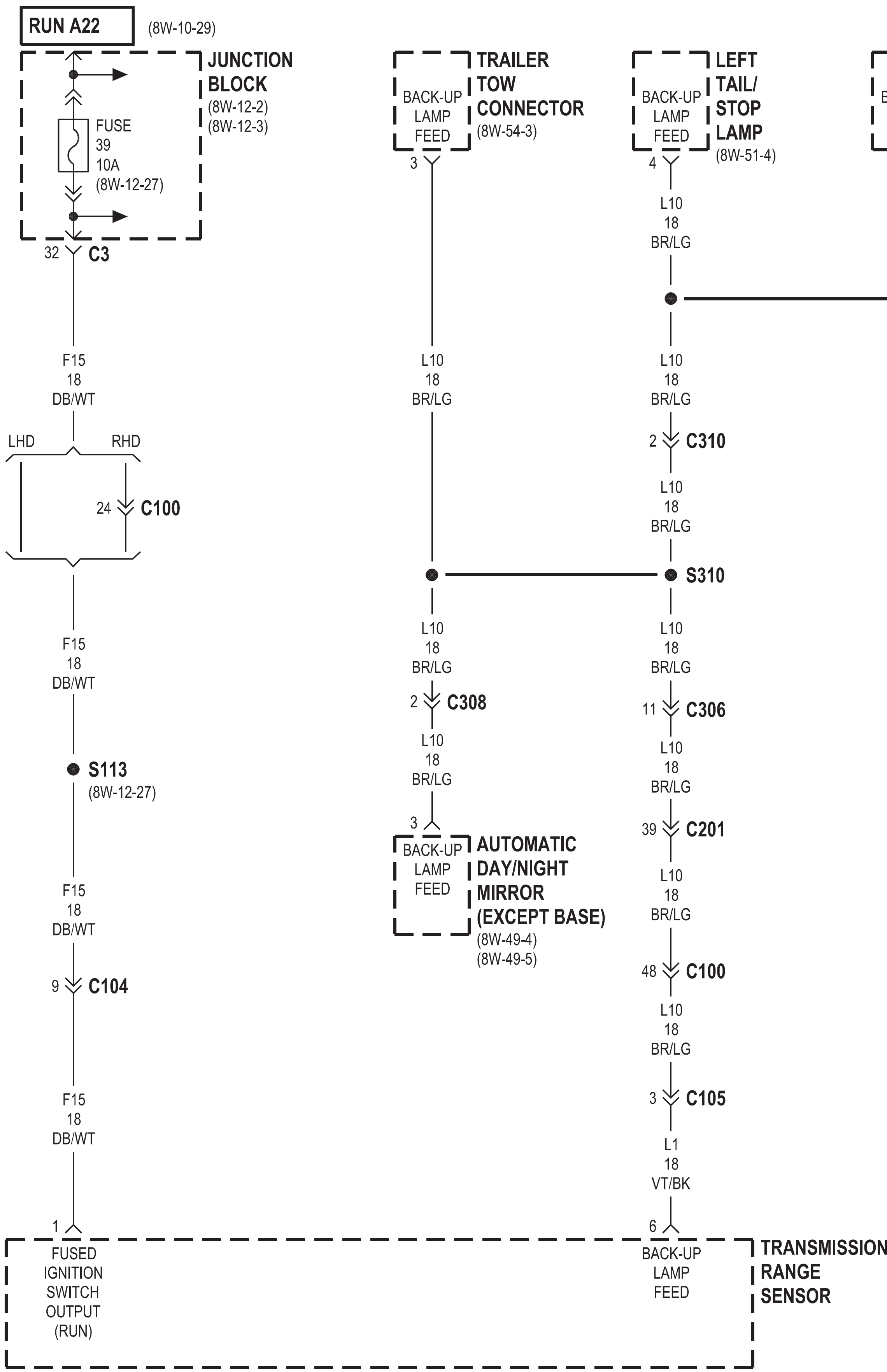

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 15 10A (8W-12-18)
8 C3
LHD
RHD
F1 18 DB
F1 20 DB
2 C100
86
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
85
F1 18 DB
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-5)
85
F1 18 DB
86
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-2)
85
F1 18 DB
S123
(8W-12-18)
F1 18 DB
11 C104
F1 18 DB
S160
(8W-12-18)
F1 18 DB
POWERTRAIN CONTROL MODULE
(8W-30-2)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
2 C1
F1 18 DB
START A41
(8W-10-27)
POWER DISTRIBUTION CENTER
(8W-10-2)
40
FUSE 28 15A (8W-10-28)
41
2 DATA LINK CONNECTOR
(8W-18-2)
(8W-18-6)
D25 18 YL/VT
S201
(8W-18-3)
D25 18 VT/DB
F45 18 YL/BR
10 C104
45 C100
F45 18 YL/BR
D25 18 YL/VT
EXCEPT ABS
ABS
S112
(8W-18-4)
(8W-18-5)
D25 18 YL/VT
S184
(8W-10-28)
8 C104
F45 18 YL/BR
D25 18 VT/YL
11
8
43
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED IGNITION SWITCH OUTPUT (START)
PCI BUS
TRANSMISSION CONTROL MODULE

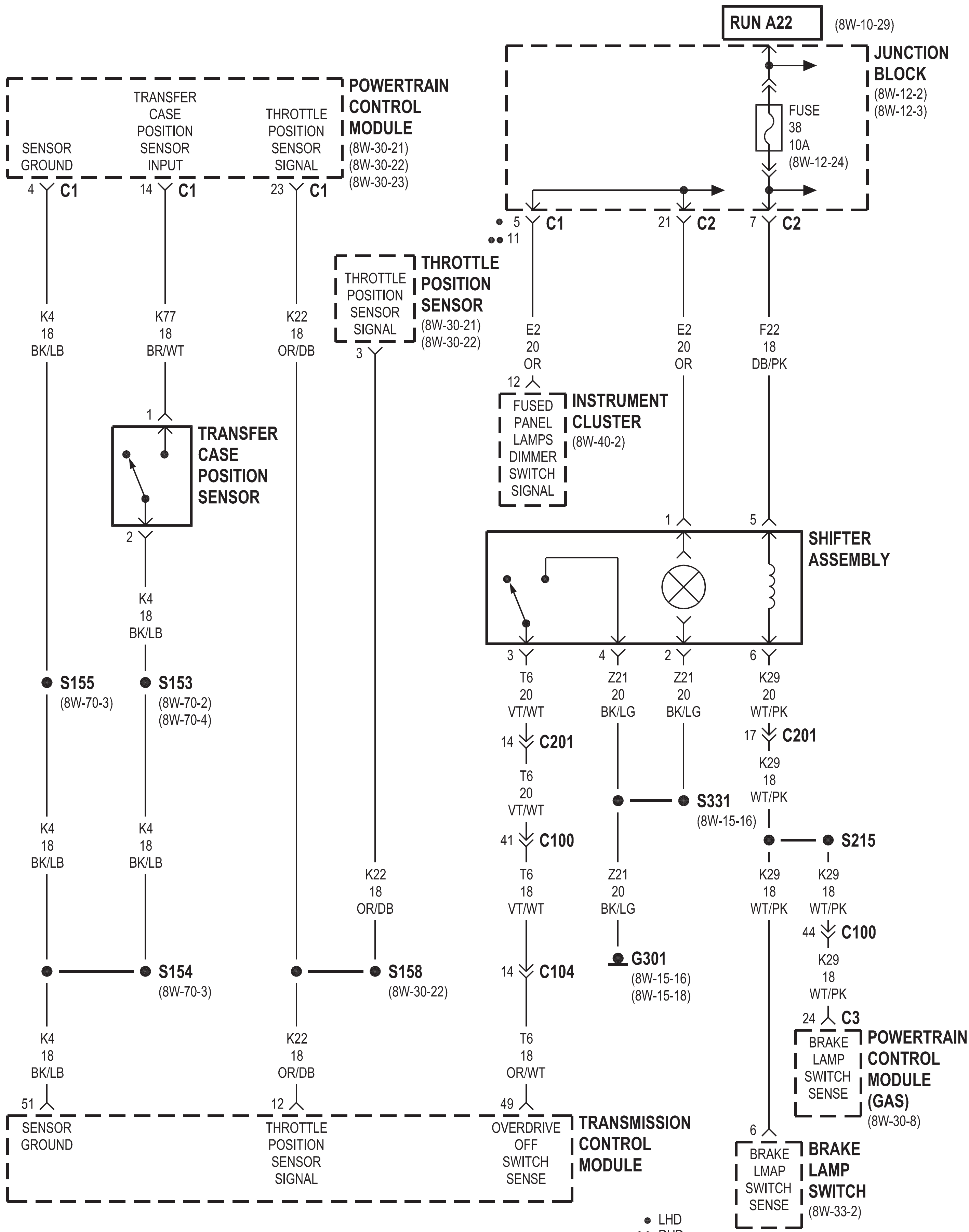

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
(8W-12-19)
8 C3
LHD
RHD
F1 18 DB
F1 20 DB
2 C100
F1 18 DB
START A41
(8W-10-27)
POWER DISTRIBUTION CENTER
(8W-10-2)
40
FUSE
28
15A
(8W-10-28)
41
F45 18 YL/BR
2 DATA LINK CONNECTOR
(8W-18-2)
(8W-18-6)
D25 18 YL/VT
S201
(8W-18-3)
D25 18 VT/DB
11
10 C104
10 C100
D25 18 YL/VT
EXCEPT ABS
ABS
S112
(8W-18-4)
(8W-18-5)
D25 18 YL/VT
8 C104
D25 18 VT/YL
S186
(8W-18-5)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
ENGINE CONTROL MODULE
(8W-30-25)
(8W-30-27)
(8W-30-28)
22 C1
F1 20 DB
F1 20 DB
S160
(8W-12-18)
F1 20 DB
F45 18 YL/RD
D25 20 VT/YL
11
8
43
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED IGNITION SWITCH OUTPUT (START)
PCI BUS
TRANSMISSION CONTROL MODULE



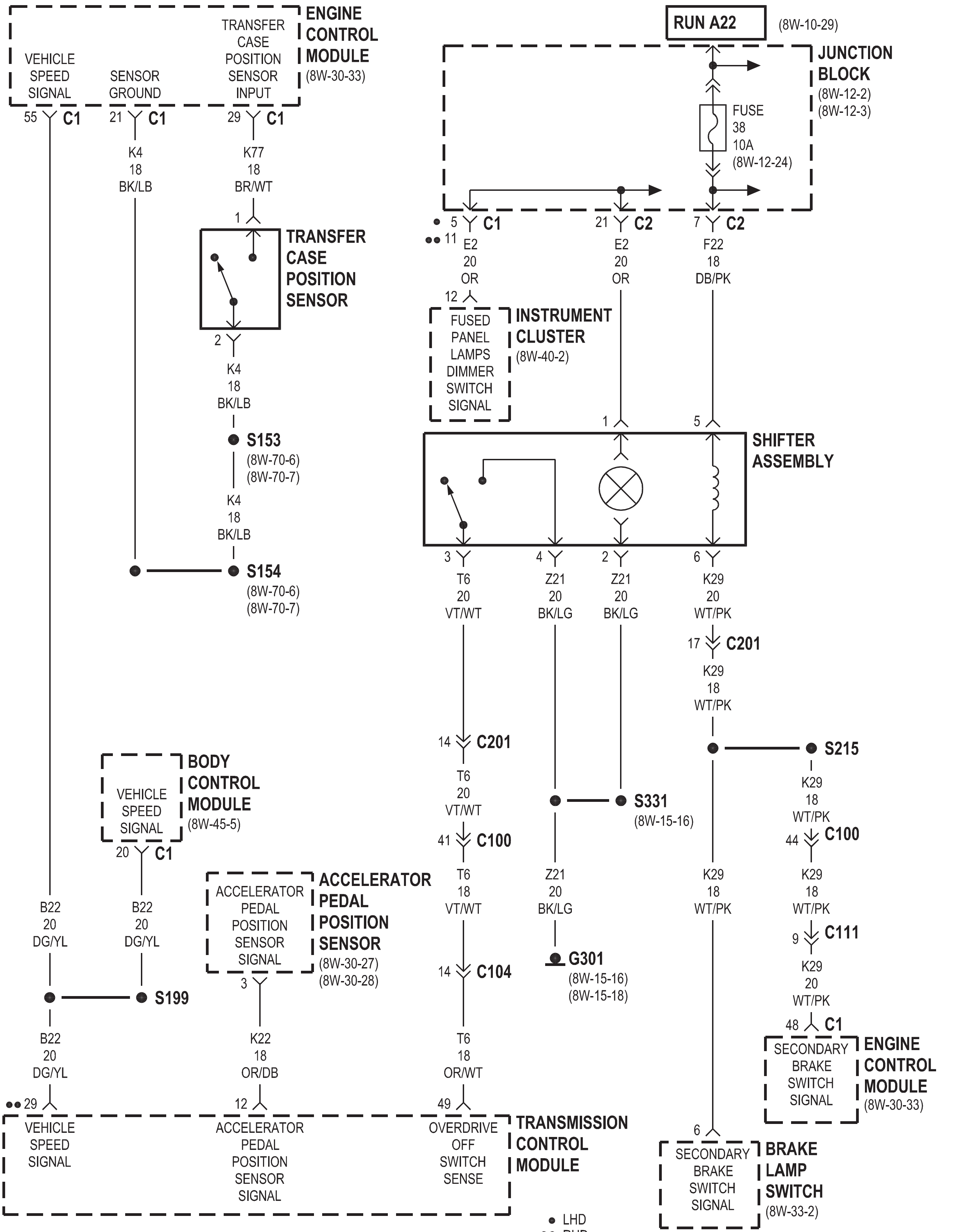
RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
39
10A
(8W-12-27)
32
C3
F15
18
DB/WT
LHD
RHD
24
C100
F15
18
DB/WT
S113
(8W-12-27)
F15
18
DB/WT
9
C104
F15
18
DB/WT
1
R
TRAILER TOW CONNECTOR
BACK-UP LAMP FEED
(8W-54-3)
3
L10
18
BR/LG
L10
18
BR/LG
2
C308
L10
20
BR/LG
3
BACK-UP LAMP FEED
AUTOMATIC DAY/NIGHT MIRROR (EXCEPT BASE)
(8W-49-4)
(8W-49-5)
LEFT TAIL/ STOP LAMP
BACK-UP LAMP FEED
(8W-51-4)
4
L10
18
BR/LG
RIGHT TAIL/ STOP LAMP
BACK-UP LAMP FEED
(8W-51-4)
4
L10
18
BR/LG
S347
(8W-51-4)
L10
18
BR/LG
2
C310
L10
18
BR/LG
S310
L10
18
BR/LG
11
C306
L10
18
BR/LG
39
C201
L10
18
BR/LG
48
C100
L10
18
BR/LG
3
C105
L10
18
BR/LG
6
TRANSMISSION SOLENOID/ TRS ASSEMBLY

42RLE

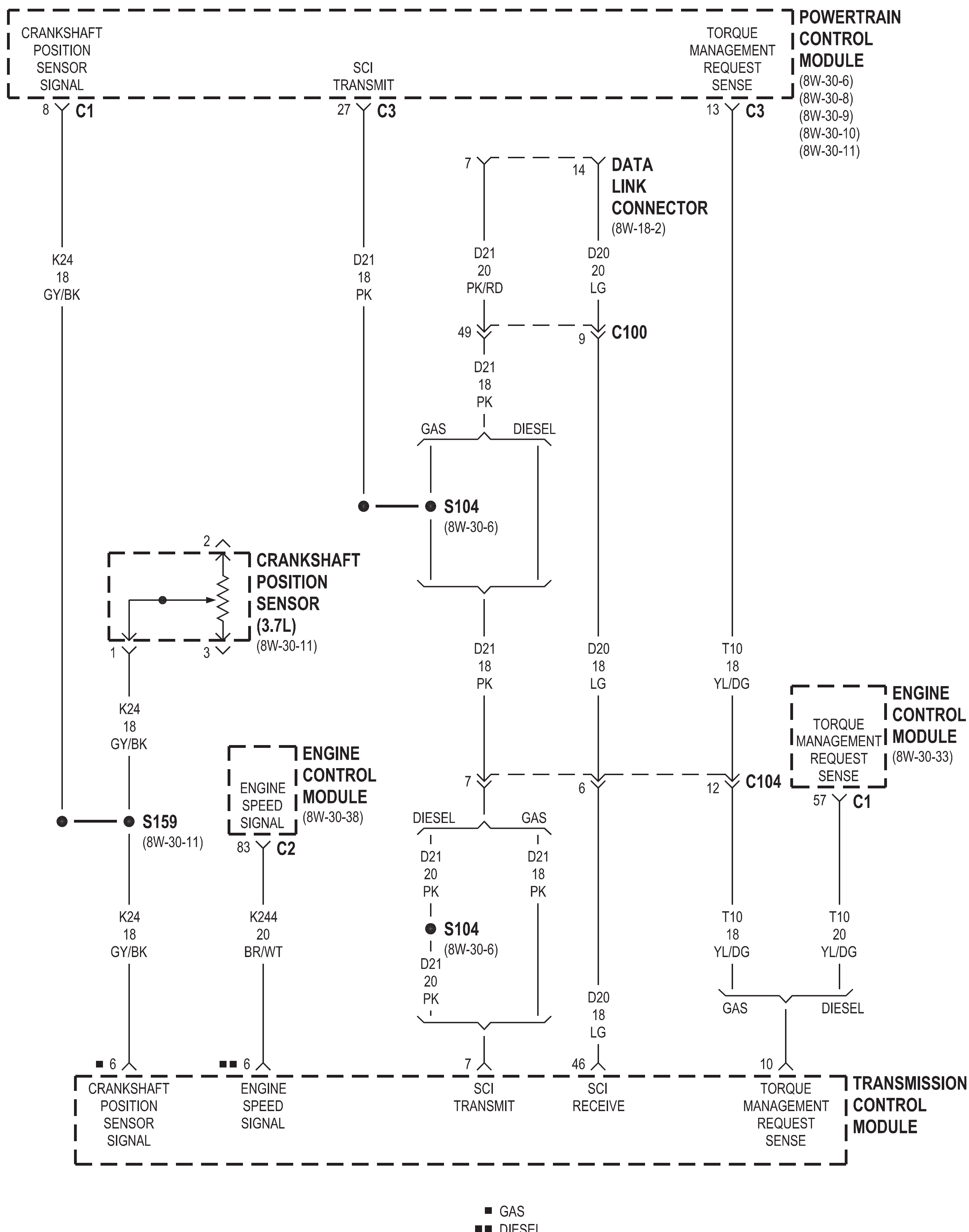

RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 39 10A (8W-12-27)
32 C3
F15 18 DB/WT
LHD
RHD
24 C100
F15 18 DB/WT
S113
(8W-12-27)
F15 18 DB/WT
9 C104
F15 18 DB/WT
TRAILER TOW CONNECTOR
(8W-54-3)
BACK-UP LAMP FEED
3
L10 18 BR/LG
LEFT TAIL/ STOP LAMP
(8W-51-4)
BACK-UP LAMP FEED
4
L10 18 BR/LG
RIGHT TAIL/ STOP LAMP
(8W-51-4)
BACK-UP LAMP FEED
4
L10 18 BR/LG
S347
(8W-51-4)
L10 18 BR/LG
2 C310
L10 18 BR/LG
S310
L10 18 BR/LG
2 C308
L10 18 BR/LG
3
BACK-UP LAMP FEED
AUTOMATIC DAY/NIGHT MIRROR (EXCEPT BASE)
(8W-49-4)
(8W-49-5)
L10 18 BR/LG
11 C306
L10 18 BR/LG
39 C201
L10 18 BR/LG
48 C100
L10 18 BR/LG
3 C105
L1 18 VT/BK
1
6
FUSED IGNITION SWITCH OUTPUT (RUN)
BACK-UP LAMP FEED
TRANSMISSION RANGE SENSOR


RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 38 10A (8W-12-24)
POWERTRAIN CONTROL MODULE
(8W-30-21)
(8W-30-22)
(8W-30-23)
SENSOR GROUND
TRANSFER CASE POSITION SENSOR INPUT
THROTTLE POSITION SENSOR SIGNAL
4 C1
14 C1
23 C1
5 C1
11
21 C2
7 C2
THROTTLE POSITION SENSOR
THROTTLE POSITION SENSOR SIGNAL
(8W-30-21)
(8W-30-22)
3
K4 18 BK/LB
K77 18 BR/WT
K22 18 OR/DB
E2 20 OR
E2 20 OR
F22 18 DB/PK
12
INSTRUMENT CLUSTER
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
(8W-40-2)
1
TRANSFER CASE POSITION SENSOR
2
K4 18 BK/LB
1
5
SHIFTER ASSEMBLY
3
4
2
6
T6 20 VT/WT
Z21 20 BK/LG
Z21 20 BK/LG
K29 20 WT/PK
S155
(8W-70-3)
S153
(8W-70-2)
(8W-70-4)
14 C201
17 C201
T6 20 VT/WT
K29 18 WT/PK
S331
(8W-15-16)
41 C100
S215
K4 18 BK/LB
K4 18 BK/LB
K22 18 OR/DB
T6 18 VT/WT
Z21 20 BK/LG
K29 18 WT/PK
K29 18 WT/PK
44 C100
G301
(8W-15-16)
(8W-15-18)
K29 18 WT/PK
S154
(8W-70-3)
S158
(8W-30-22)
14 C104
24 C3
POWERTRAIN CONTROL MODULE (GAS)
BRAKE LAMP SWITCH SENSE
(8W-30-8)
K4 18 BK/LB
K22 18 OR/DB
T6 18 OR/WT
51
12
49
TRANSMISSION CONTROL MODULE
SENSOR GROUND
THROTTLE POSITION SENSOR SIGNAL
OVERDRIVE OFF SWITCH SENSE
6
BRAKE LAMP SWITCH
BRAKE LMAP SWITCH SENSE
(8W-33-2)
LHD
RHD

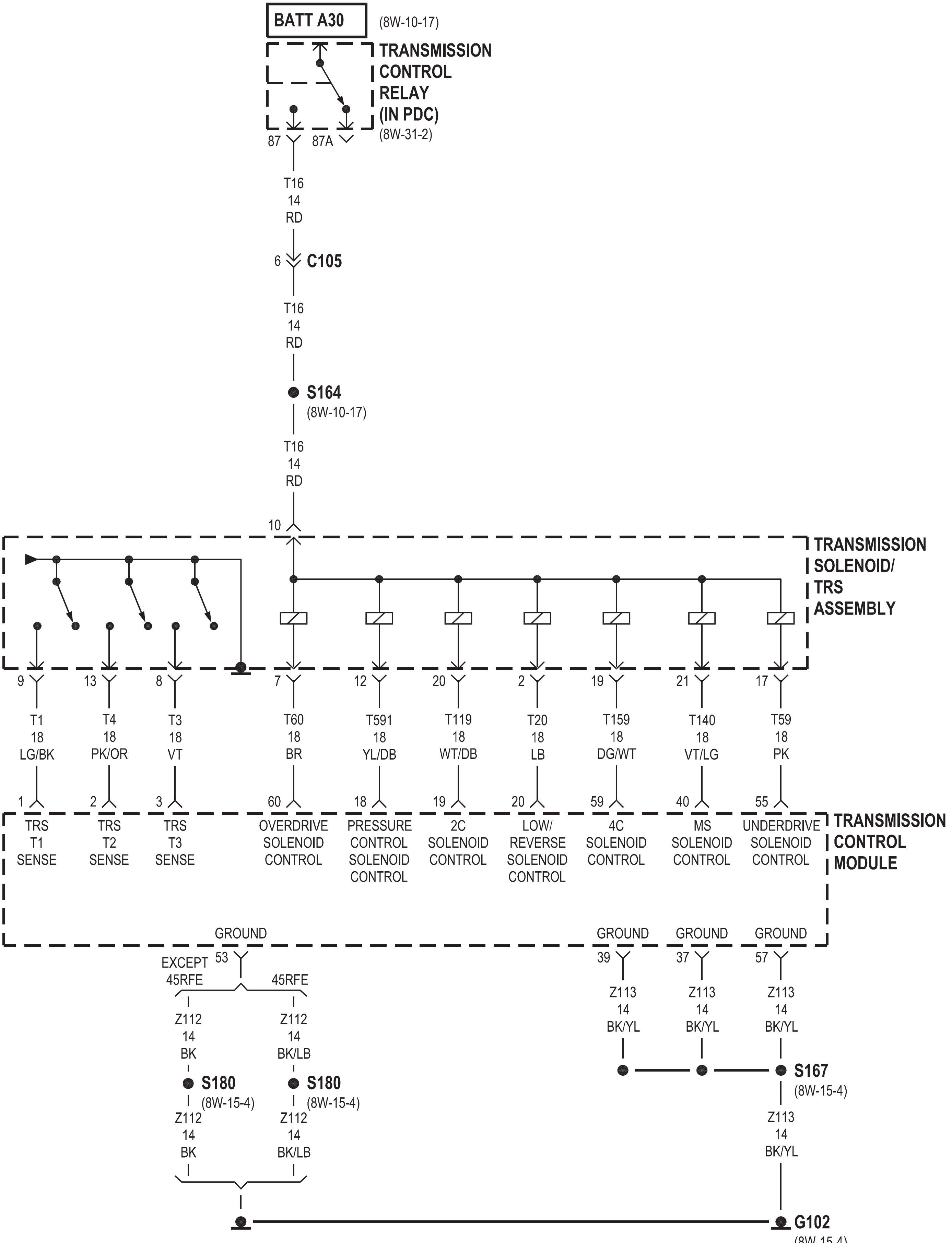
DIESEL

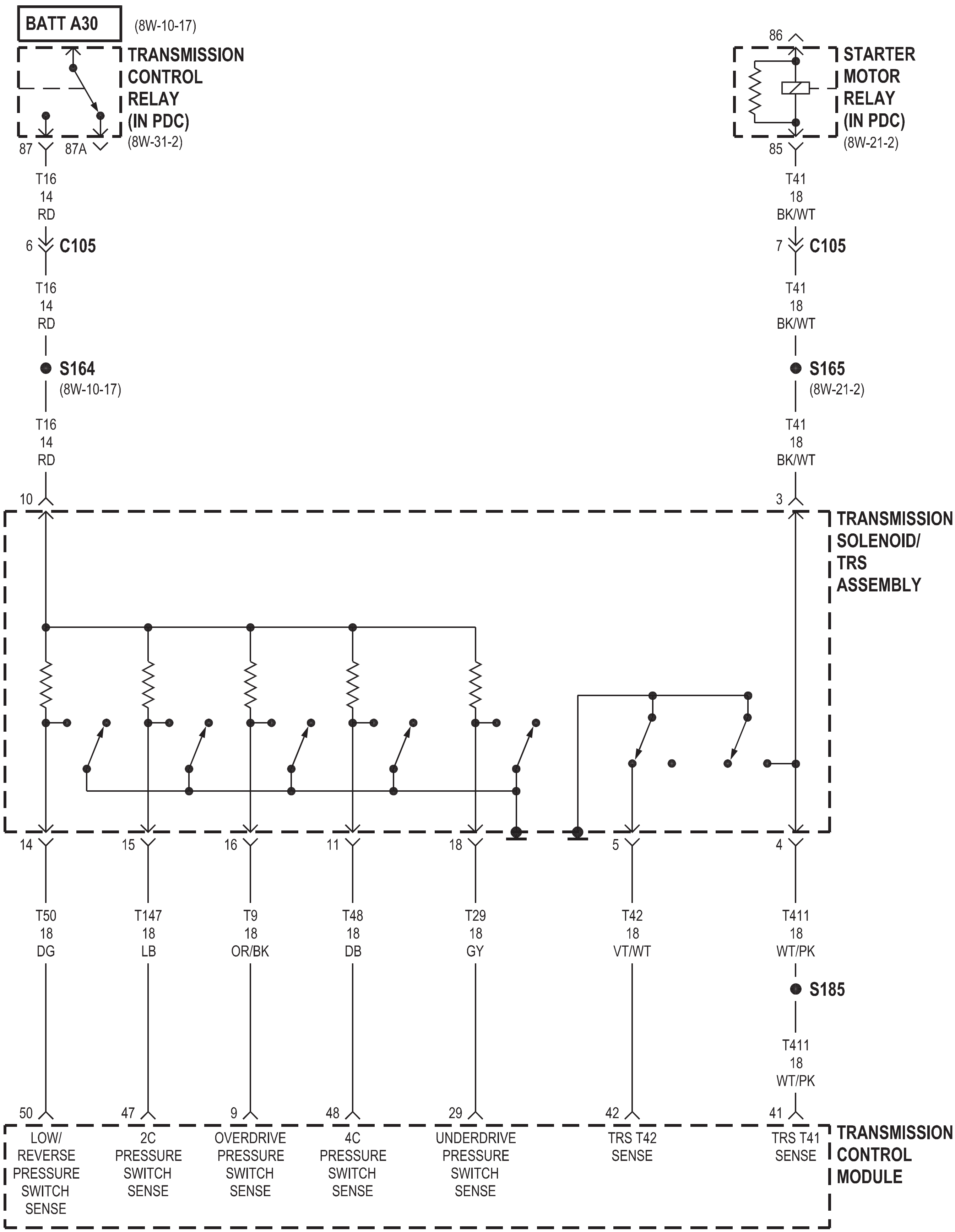


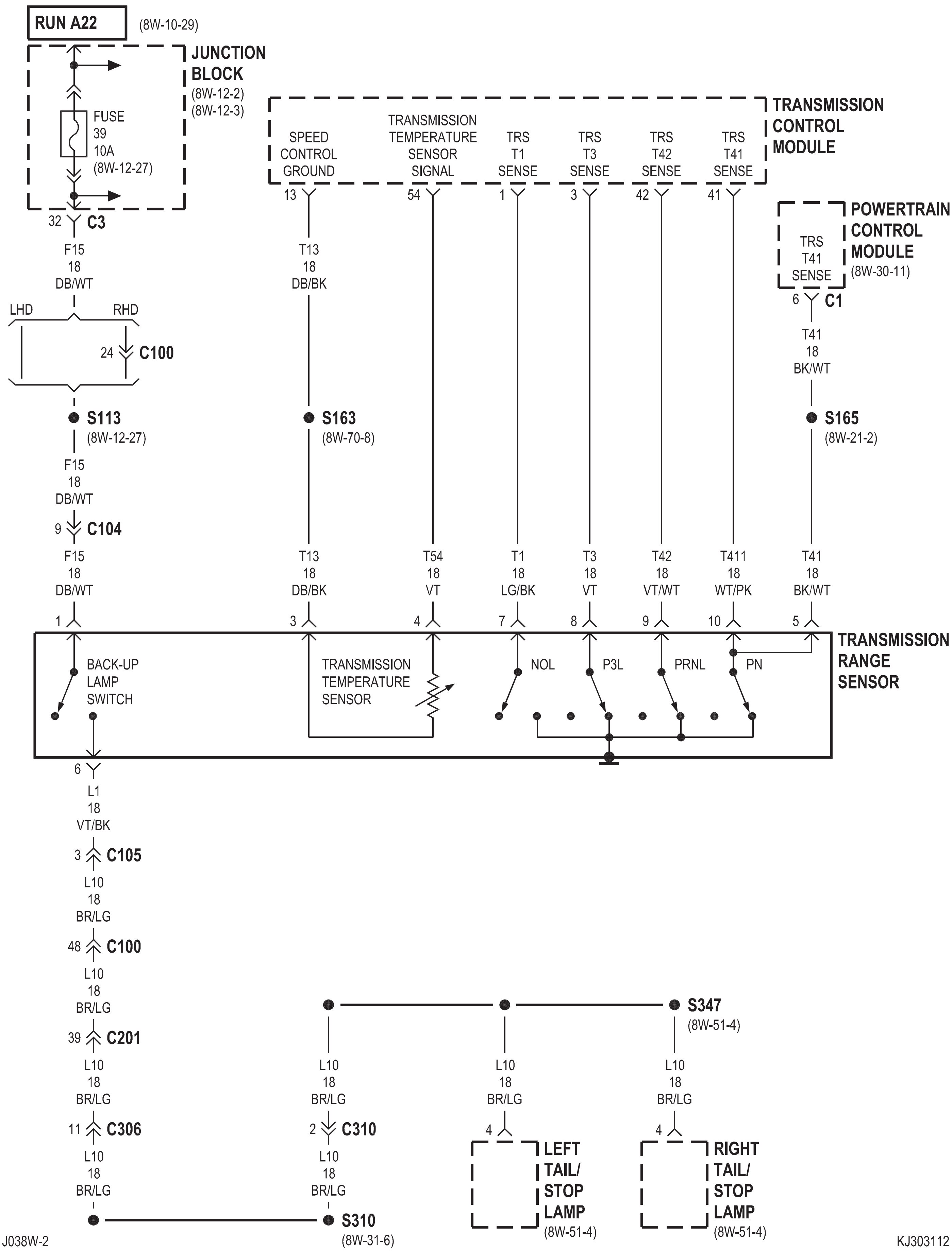
J038W-2 KJ303108

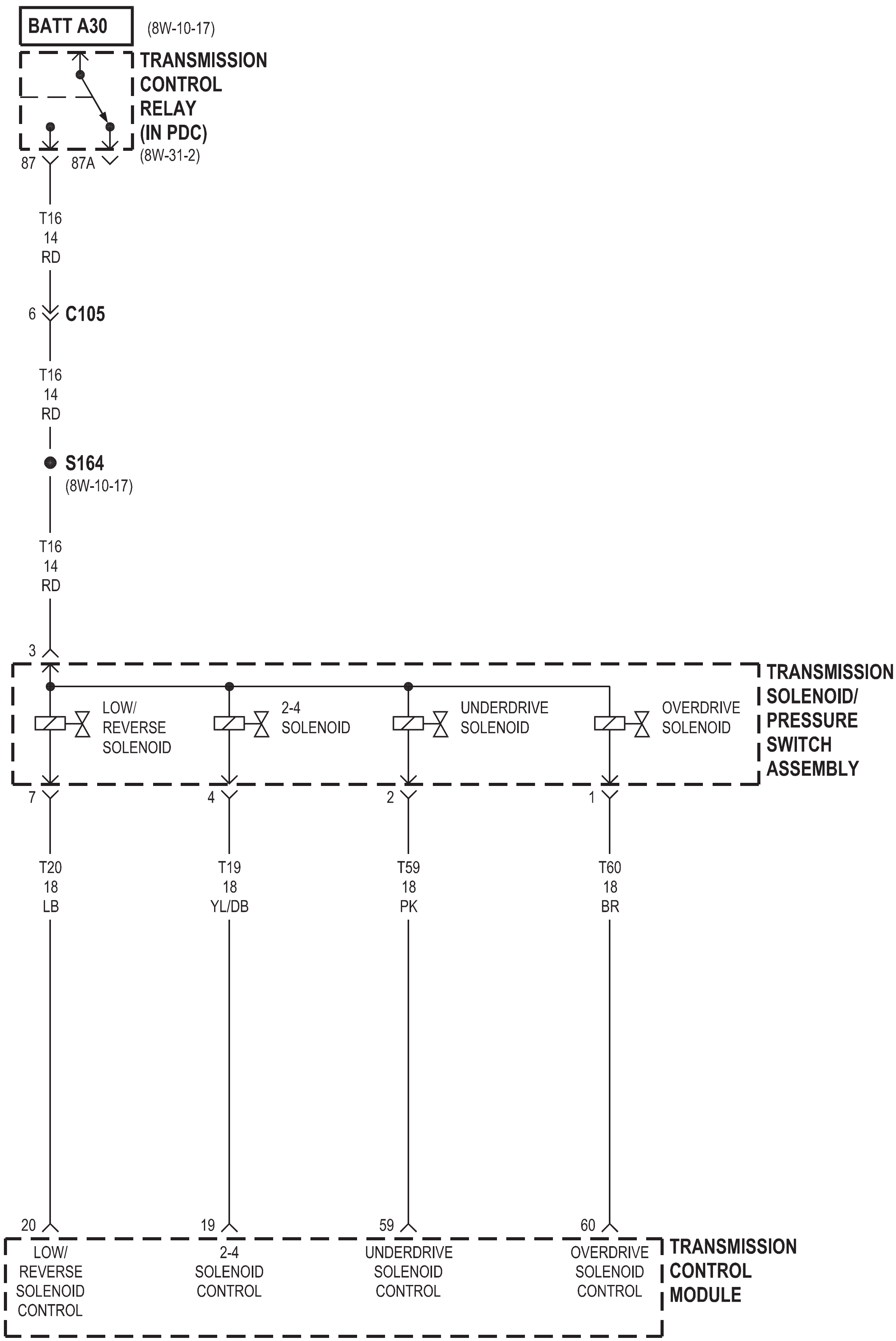

POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-8)
(8W-30-9)
(8W-30-10)
(8W-30-11)
CRANKSHAFT POSITION SENSOR SIGNAL
8 C1
SCI TRANSMIT
27 C3
TORQUE MANAGEMENT REQUEST SENSE
13 C3
7
14
DATA LINK CONNECTOR
(8W-18-2)
K24 18 GY/BK
D21 18 PK
D21 20 PK/RD
D20 20 LG
49
9
C100
D21 18 PK
GAS
DIESEL
S104
(8W-30-6)
2
CRANKSHAFT POSITION SENSOR (3.7L)
(8W-30-11)
1
3
D21 18 PK
D20 18 LG
T10 18 YL/DG
ENGINE CONTROL MODULE
(8W-30-33)
TORQUE MANAGEMENT REQUEST SENSE
57 C1
K24 18 GY/BK
ENGINE CONTROL MODULE
(8W-30-38)
ENGINE SPEED SIGNAL
83 C2
7
6
12
C104
S159
(8W-30-11)
DIESEL
GAS
D21 20 PK
D21 18 PK
S104
(8W-30-6)
D21 20 PK
K24 18 GY/BK
K244 20 BR/WT
T10 18 YL/DG
T10 20 YL/DG
GAS
DIESEL
D20 18 LG
■ 6
■■ 6
7
46
10
CRANKSHAFT POSITION SENSOR SIGNAL
ENGINE SPEED SIGNAL
SCI TRANSMIT
SCI RECEIVE
TORQUE MANAGEMENT REQUEST SENSE
TRANSMISSION CONTROL MODULE
■ GAS
■■ DIESEL

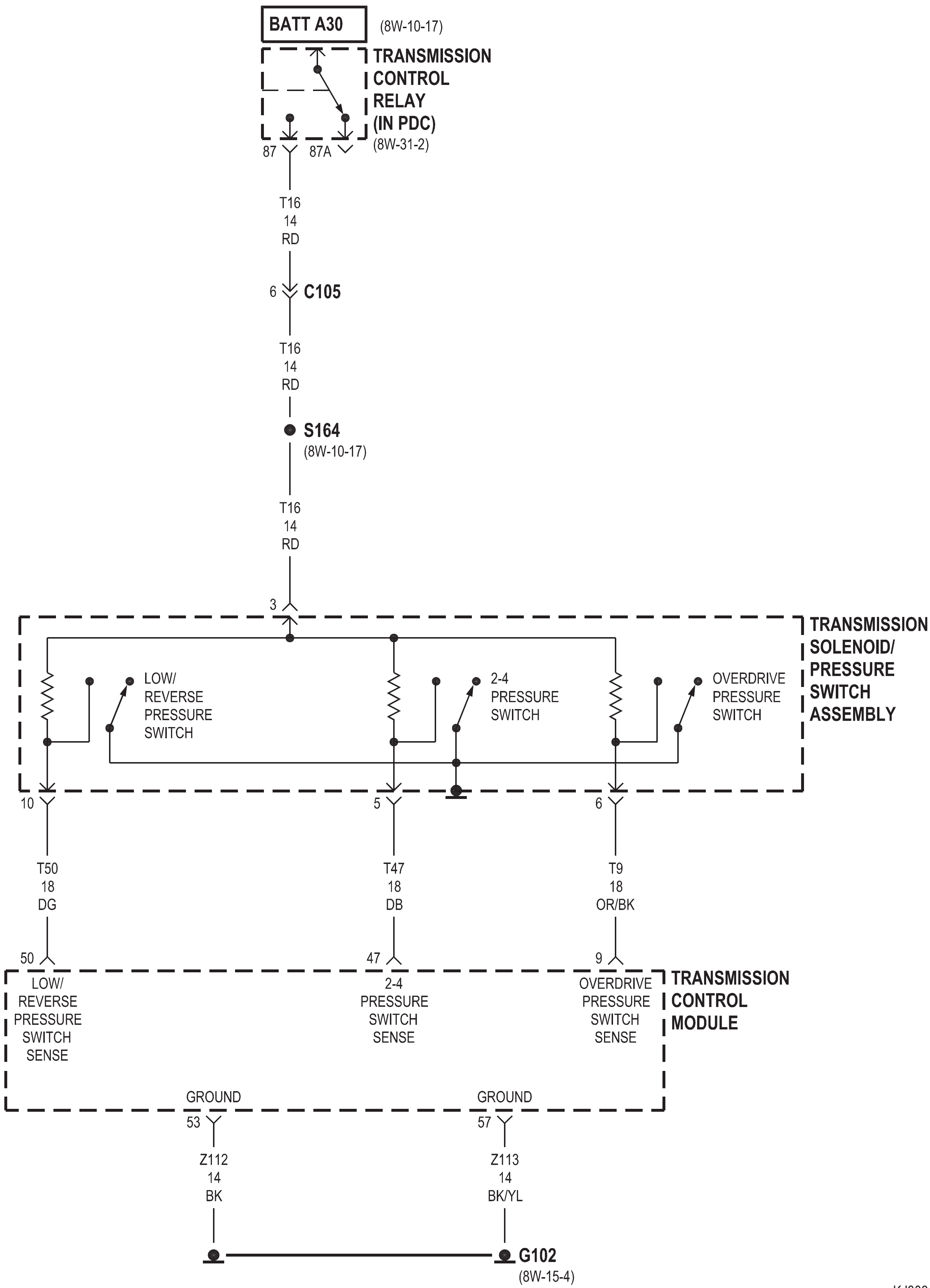
45RFE/DIESEL



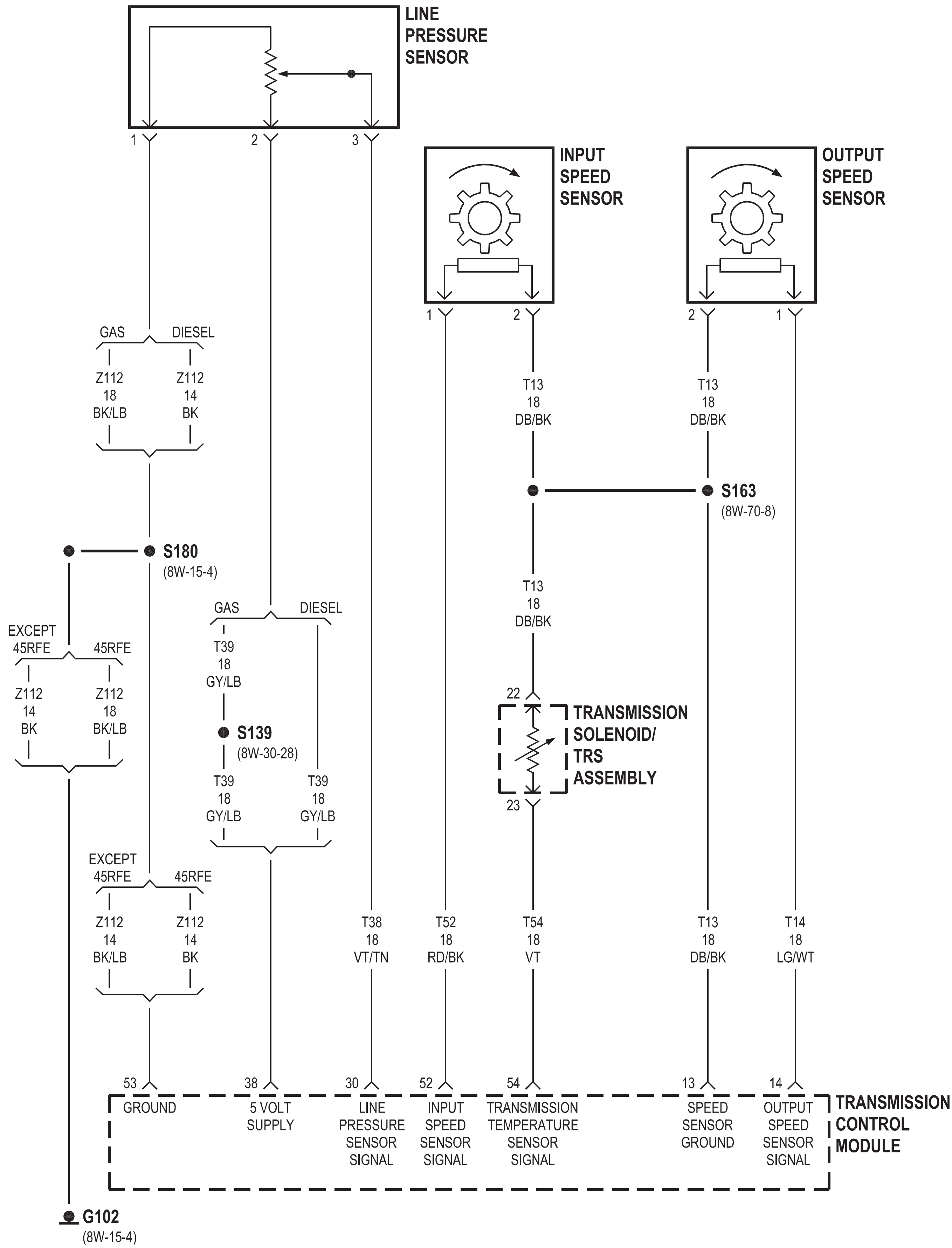

BATT A30
(8W-10-17)
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
87
87A
T16 14 RD
6 C105
T16 14 RD
S164
(8W-10-17)
T16 14 RD
10
86
STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
85
T41 18 BK/WT
7 C105
T41 18 BK/WT
S165
(8W-21-2)
T41 18 BK/WT
3
TRANSMISSION SOLENOID/ TRS ASSEMBLY
14
15
16
11
18
5
4
T50 18 DG
T147 18 LB
T9 18 OR/BK
T48 18 DB
T29 18 GY
T42 18 VT/WT
T411 18 WT/PK
S185
T411 18 WT/PK
50
47
9
48
29
42
41
LOW/ REVERSE PRESSURE SWITCH SENSE
2C PRESSURE SWITCH SENSE
OVERDRIVE PRESSURE SWITCH SENSE
4C PRESSURE SWITCH SENSE
UNDERDRIVE PRESSURE SWITCH SENSE
TRS T42 SENSE
TRS T41 SENSE
TRANSMISSION CONTROL MODULE


RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
39
10A
(8W-12-27)
32 C3
F15
18
DB/WT
LHD
RHD
24 C100
S113
(8W-12-27)
F15
18
DB/WT
9 C104
F15
18
DB/WT
TRANSMISSION CONTROL MODULE
SPEED CONTROL GROUND
TRANSMISSION TEMPERATURE SENSOR SIGNAL
TRS T1 SENSE
TRS T3 SENSE
TRS T42 SENSE
TRS T41 SENSE
13
54
1
3
42
41
T13
18
DB/BK
S163
(8W-70-8)
POWERTRAIN CONTROL MODULE
(8W-30-11)
TRS T41 SENSE
6 C1
T41
18
BK/WT
S165
(8W-21-2)
T13
18
DB/BK
T54
18
VT
T1
18
LG/BK
T3
18
VT
T42
18
VT/WT
T411
18
WT/PK
T41
18
BK/WT
1
3
4
7
8
9
10
5
TRANSMISSION RANGE SENSOR
BACK-UP LAMP SWITCH
TRANSMISSION TEMPERATURE SENSOR
NOL
P3L
PRNL
PN
6
L1
18
VT/BK
3 C105
L10
18
BR/LG
48 C100
L10
18
BR/LG
39 C201
L10
18
BR/LG
11 C306
L10
18
BR/LG
S347
(8W-51-4)
L10
18
BR/LG
2 C310
L10
18
BR/LG
S310
(8W-31-6)
L10
18
BR/LG
4
LEFT TAIL/ STOP LAMP
(8W-51-4)
L10
18
BR/LG
4
RIGHT TAIL/ STOP LAMP
(8W-51-4)

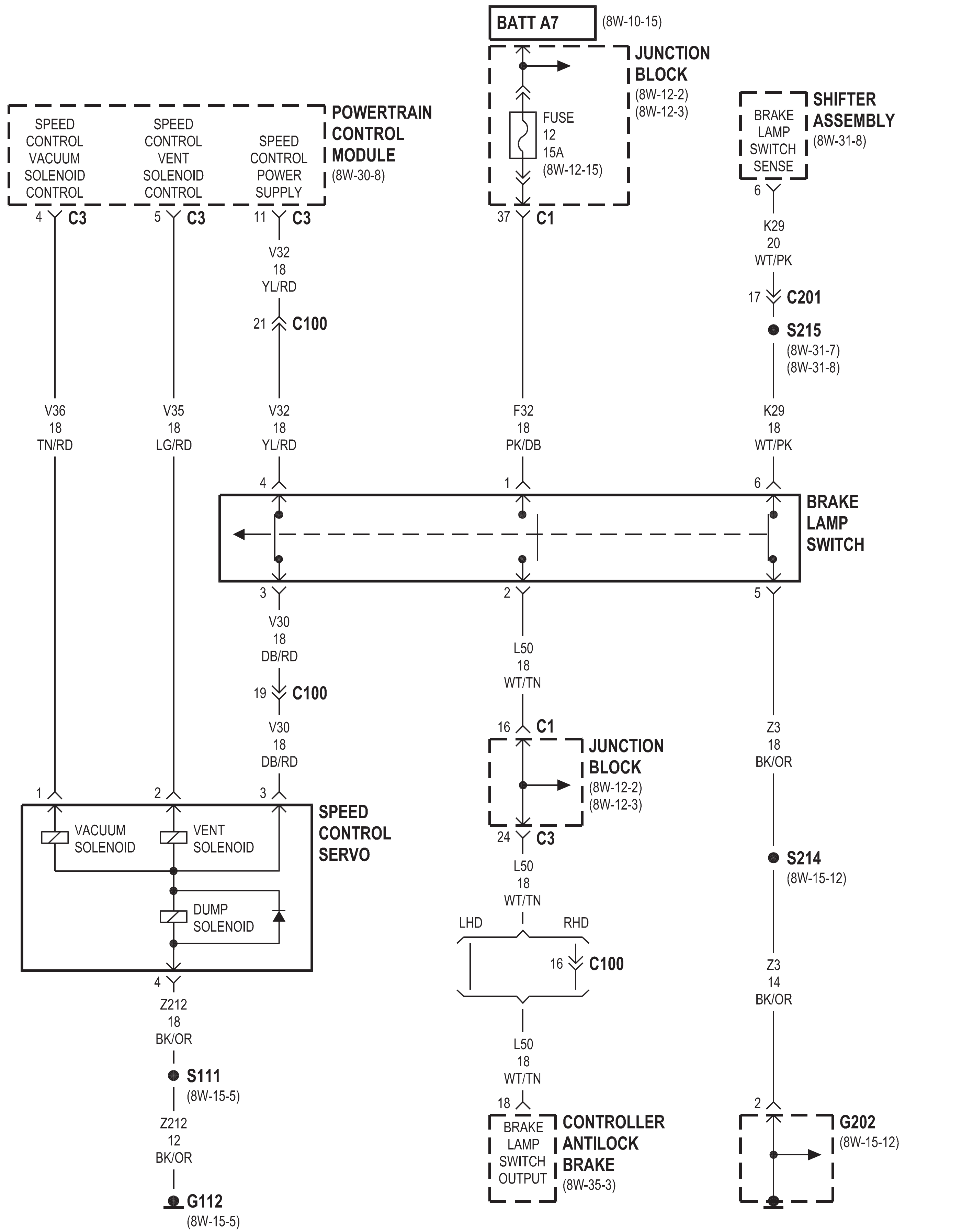

BATT A30
(8W-10-17)
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
87
87A
T16
14
RD
6
C105
T16
14
RD
S164
(8W-10-17)
T16
14
RD
3
LOW/ REVERSE SOLENOID
2-4 SOLENOID
UNDERDRIVE SOLENOID
OVERDRIVE SOLENOID
TRANSMISSION SOLENOID/ PRESSURE SWITCH ASSEMBLY
7
4
2
1
T20
18
LB
T19
18
YL/DB
T59
18
PK
T60
18
BR
20
19
59
60
LOW/ REVERSE SOLENOID CONTROL
2-4 SOLENOID CONTROL
UNDERDRIVE SOLENOID CONTROL
OVERDRIVE SOLENOID CONTROL
TRANSMISSION CONTROL MODULE


BATT A30
(8W-10-17)
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
87
87A
T16
14
RD
6
C105
T16
14
RD
S164
(8W-10-17)
T16
14
RD
3
LOW/ REVERSE PRESSURE SWITCH
2-4 PRESSURE SWITCH
OVERDRIVE PRESSURE SWITCH
TRANSMISSION SOLENOID/ PRESSURE SWITCH ASSEMBLY
10
5
6
T50
18
DG
T47
18
DB
T9
18
OR/BK
50
47
9
LOW/ REVERSE PRESSURE SWITCH SENSE
2-4 PRESSURE SWITCH SENSE
OVERDRIVE PRESSURE SWITCH SENSE
TRANSMISSION CONTROL MODULE
GROUND
GROUND
53
57
Z112
14
BK
Z113
14
BK/YL
G102
(8W-15-4)

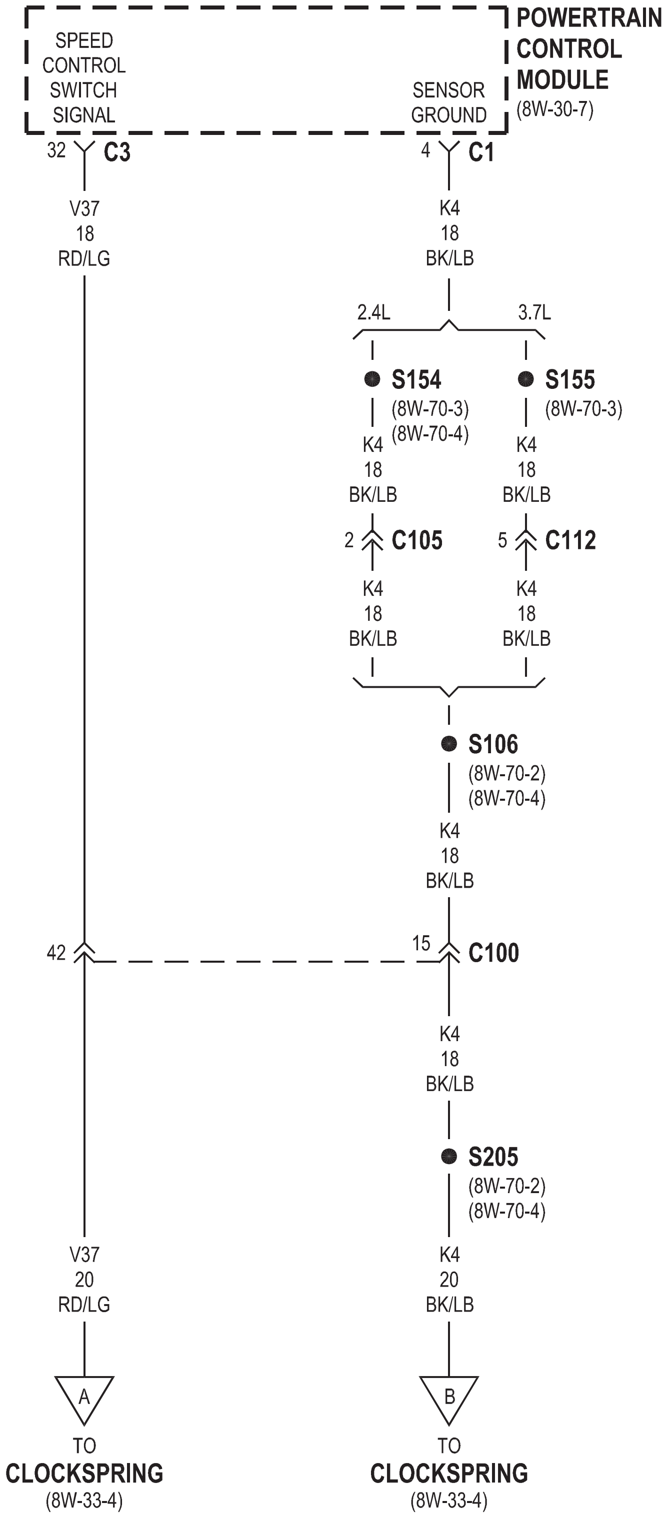
45RFE/DIESEL

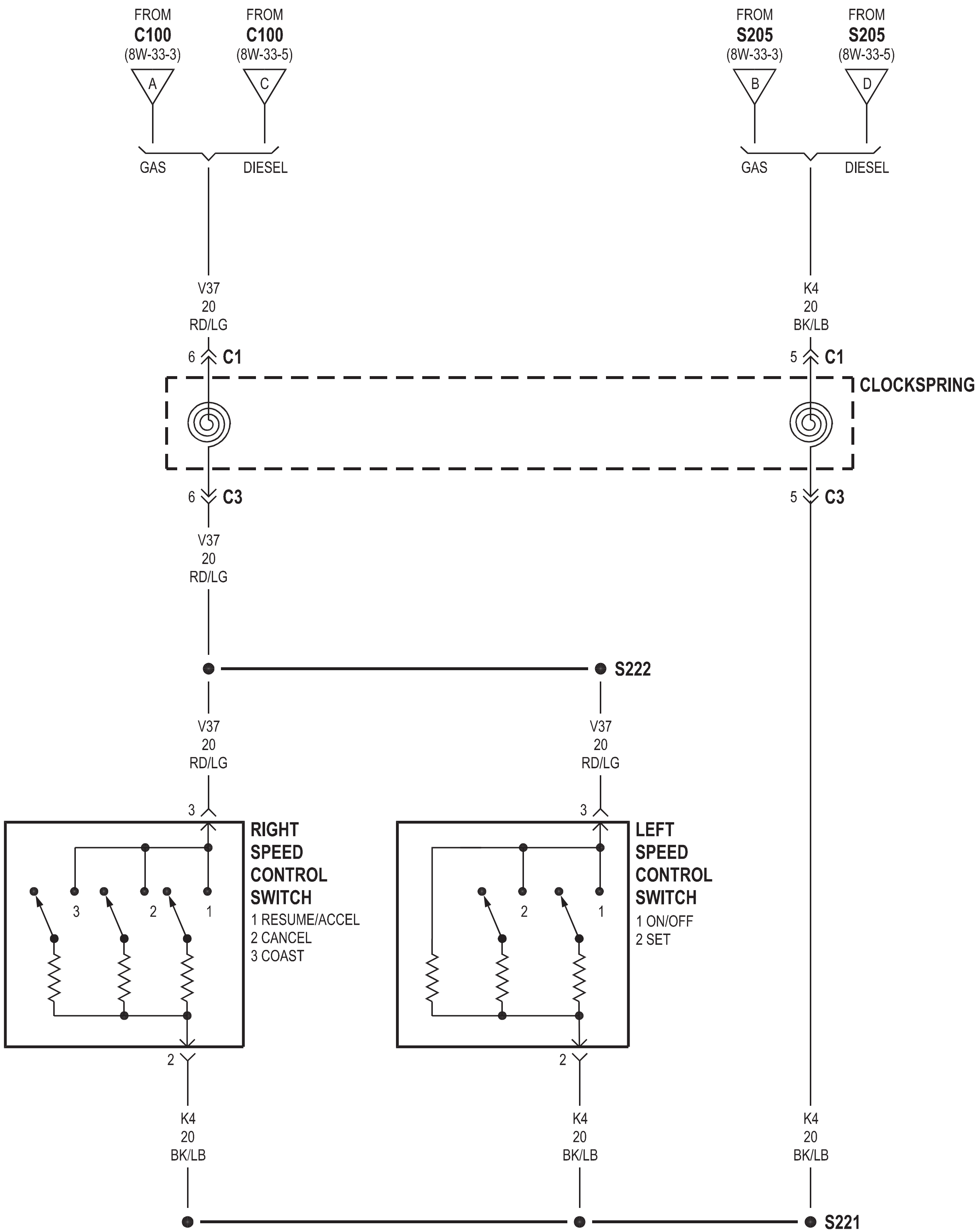


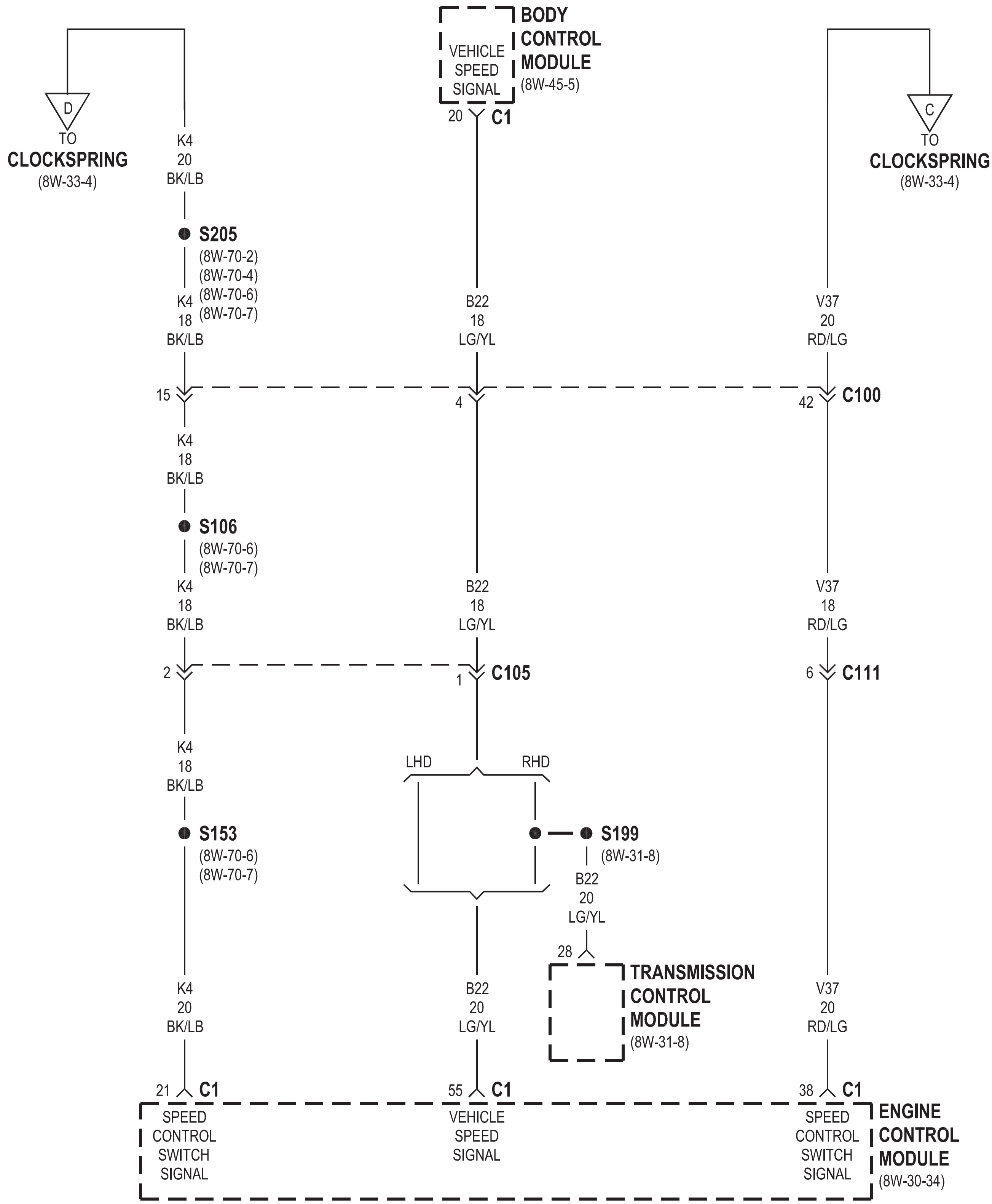
8W-33 VEHICLE SPEED CONTROL



BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 15A (8W-12-15)
37 C1
F32 18 PK/DB
POWERTRAIN CONTROL MODULE
(8W-30-8)
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL VENT SOLENOID CONTROL
SPEED CONTROL POWER SUPPLY
4 C3
5 C3
11 C3
V32 18 YL/RD
21 C100
V36 18 TN/RD
V35 18 LG/RD
V32 18 YL/RD
SHIFTER ASSEMBLY
(8W-31-8)
BRAKE LAMP SWITCH SENSE
6
K29 20 WT/PK
17 C201
S215
(8W-31-7)
(8W-31-8)
K29 18 WT/PK
BRAKE LAMP SWITCH
4
1
6
3
2
5
V30 18 DB/RD
19 C100
V30 18 DB/RD
L50 18 WT/TN
16 C1
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
24 C3
L50 18 WT/TN
LHD
RHD
16 C100
L50 18 WT/TN
18
CONTROLLER ANTILOCK BRAKE
(8W-35-3)
BRAKE LAMP SWITCH OUTPUT
Z3 18 BK/OR
S214
(8W-15-12)
Z3 14 BK/OR
2
G202
(8W-15-12)
1
2
3
SPEED CONTROL SERVO
VACUUM SOLENOID
VENT SOLENOID
DUMP SOLENOID
4
Z212 18 BK/OR
S111
(8W-15-5)
Z212 12 BK/OR
G112
(8W-15-5)

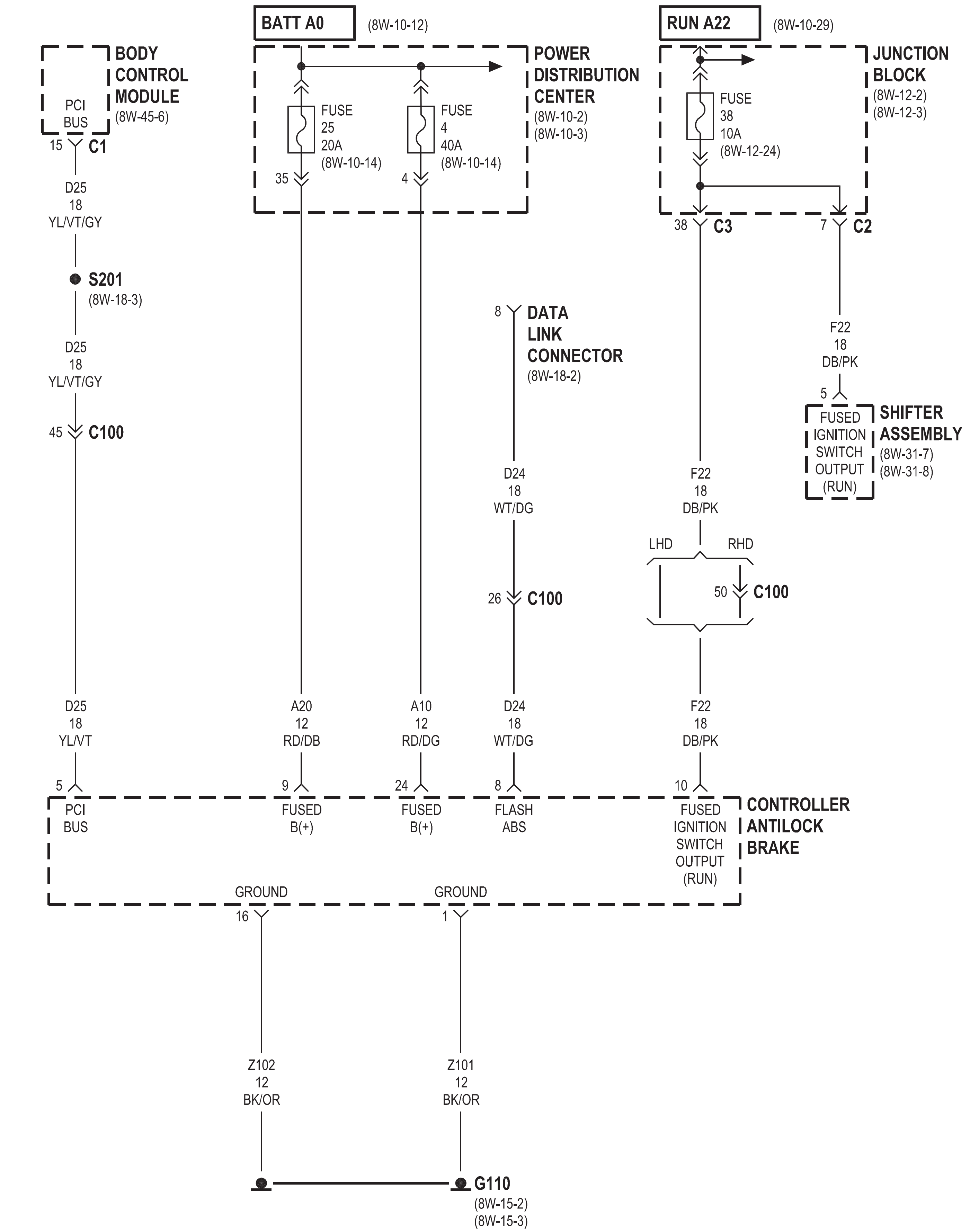

POWERTRAIN
CONTROL
MODULE
(8W-30-7)
SPEED
CONTROL
SWITCH
SIGNAL
SENSOR
GROUND
32
C3
4
C1
V37
18
RD/LG
K4
18
BK/LB
2.4L
3.7L
S154
(8W-70-3)
(8W-70-4)
S155
(8W-70-3)
K4
18
BK/LB
2
C105
5
C112
S106
(8W-70-2)
(8W-70-4)
42
15
C100
S205
(8W-70-2)
(8W-70-4)
V37
20
RD/LG
K4
20
BK/LB
A
B
TO
CLOCKSPRING
(8W-33-4)
TO
CLOCKSPRING
(8W-33-4)


FROM
C100
(8W-33-3)
A
FROM
C100
(8W-33-5)
C
FROM
S205
(8W-33-3)
B
FROM
S205
(8W-33-5)
D
GAS
DIESEL
GAS
DIESEL
V37
20
RD/LG
K4
20
BK/LB
6 C1
5 C1
CLOCKSPRING
6 C3
5 C3
V37
20
RD/LG
S222
V37
20
RD/LG
V37
20
RD/LG
3
3
RIGHT
SPEED
CONTROL
SWITCH
1 RESUME/ACCEL
2 CANCEL
3 COAST
LEFT
SPEED
CONTROL
SWITCH
1 ON/OFF
2 SET
3 2 1
2 1
2
2
K4
20
BK/LB
K4
20
BK/LB
K4
20
BK/LB
S221

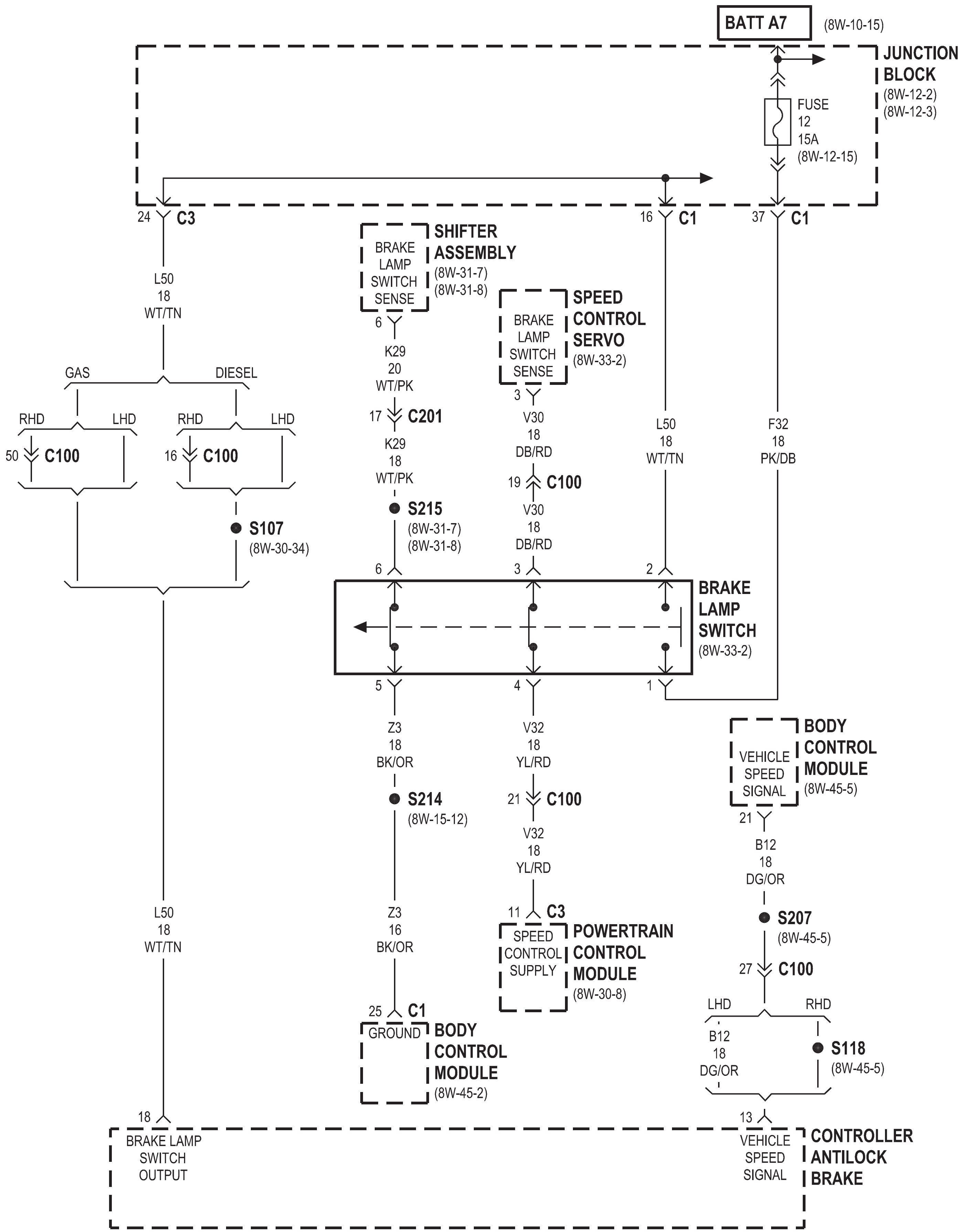


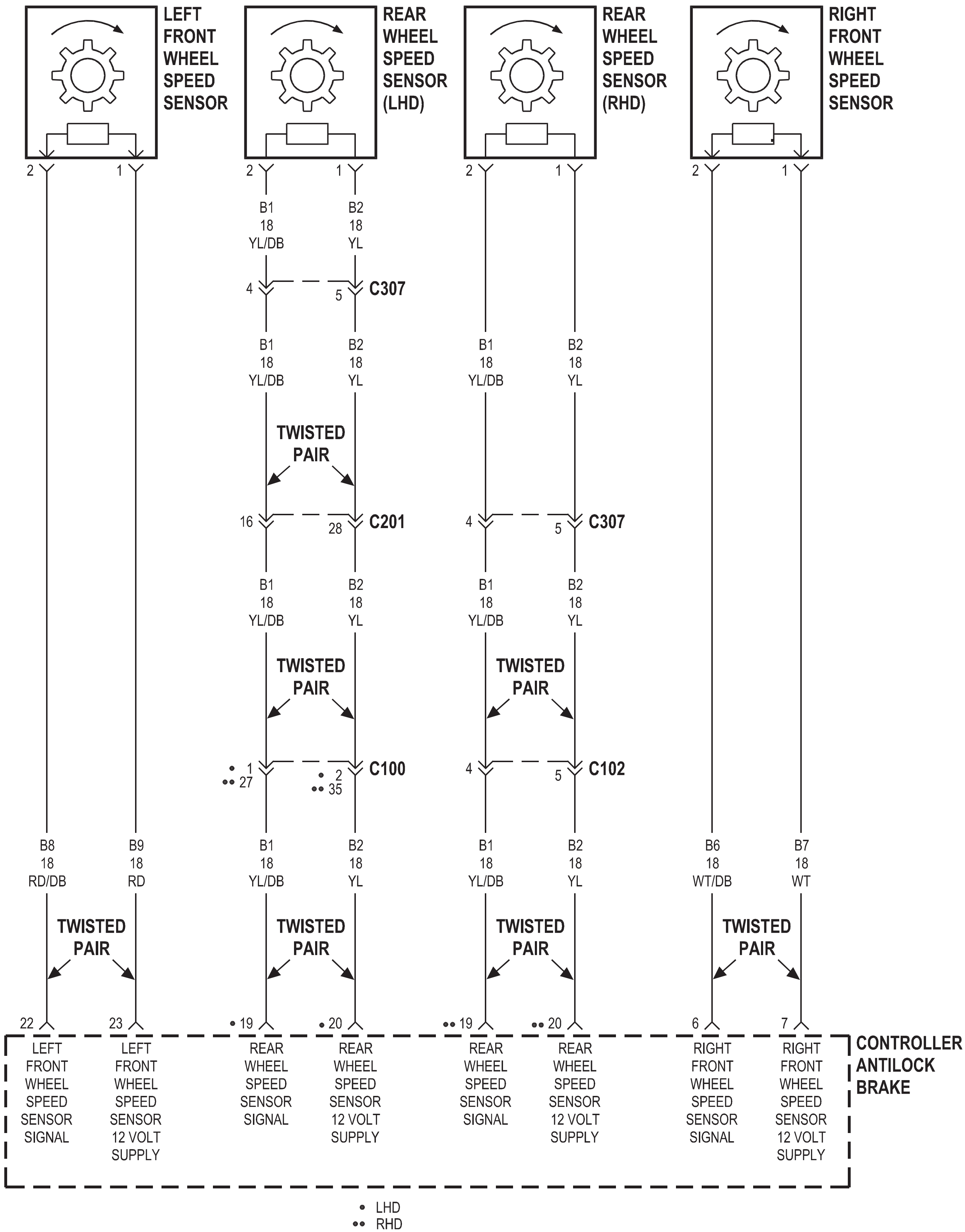
BODY CONTROL MODULE
VEHICLE SPEED SIGNAL
(8W-45-5)
20 C1
D
TO CLOCKSPRING
(8W-33-4)
C
TO CLOCKSPRING
(8W-33-4)
K4 20 BK/LB
S205
(8W-70-2)
(8W-70-4)
(8W-70-6)
(8W-70-7)
K4 18 BK/LB
B22 18 LG/YL
V37 20 RD/LG
15
4
42
C100
K4 18 BK/LB
S106
(8W-70-6)
(8W-70-7)
K4 18 BK/LB
B22 18 LG/YL
V37 18 RD/LG
2
1
C105
6
C111
K4 18 BK/LB
LHD
RHD
S153
(8W-70-6)
(8W-70-7)
S199
(8W-31-8)
B22 20 LG/YL
28
TRANSMISSION CONTROL MODULE
(8W-31-8)
K4 20 BK/LB
B22 20 LG/YL
V37 20 RD/LG
21 C1
55 C1
38 C1
SPEED CONTROL SWITCH SIGNAL
VEHICLE SPEED SIGNAL
SPEED CONTROL SWITCH SIGNAL
ENGINE CONTROL MODULE
(8W-30-34)

8W-35 ANTILOCK BRAKES



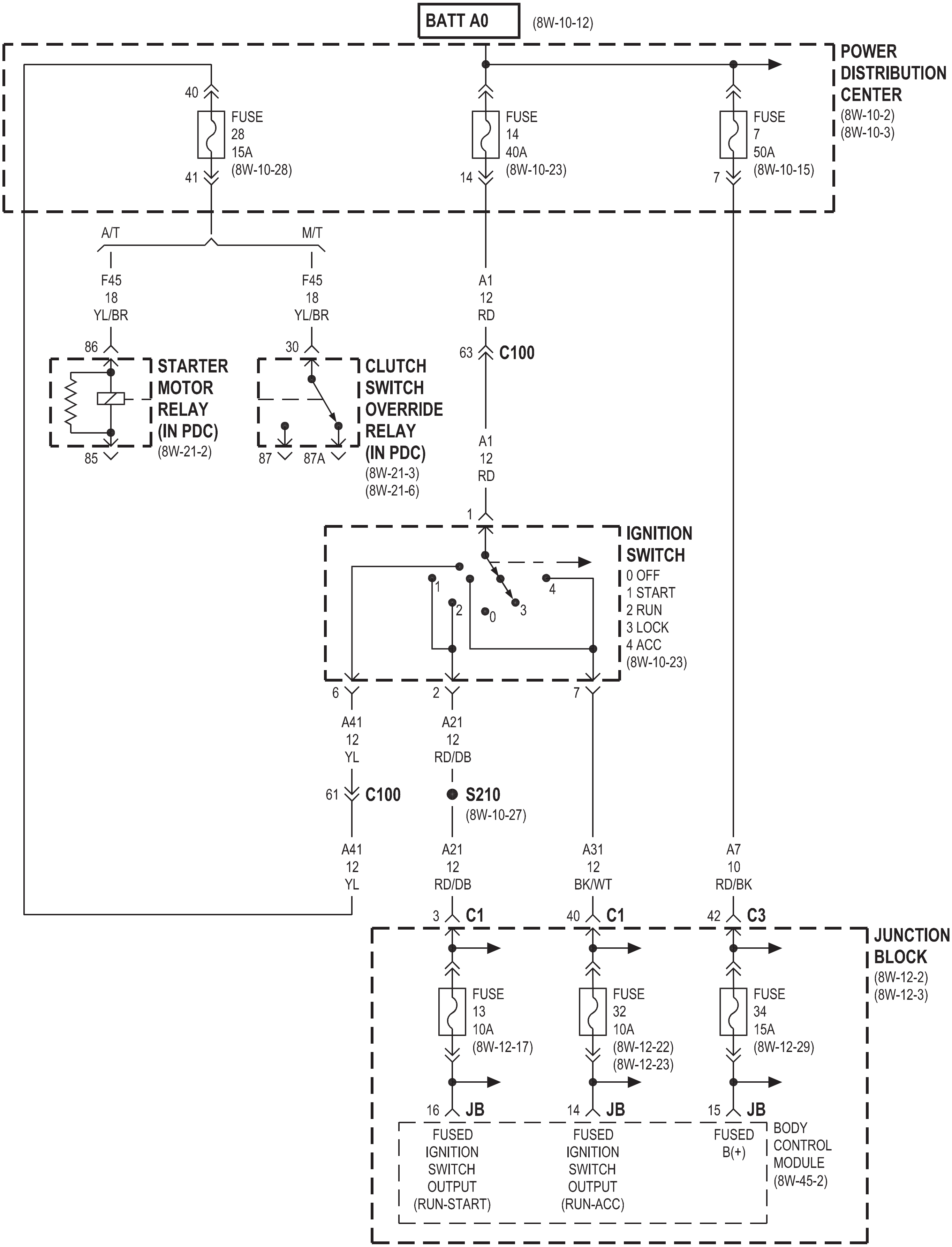
BATT A0
(8W-10-12)
RUN A22
(8W-10-29)
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15
C1
D25
18
YL/VT/GY
S201
(8W-18-3)
D25
18
YL/VT/GY
45
C100
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
25
20A
(8W-10-14)
FUSE
4
40A
(8W-10-14)
35
4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
38
10A
(8W-12-24)
38
C3
7
C2
F22
18
DB/PK
5
SHIFTER ASSEMBLY
(8W-31-7)
(8W-31-8)
FUSED IGNITION SWITCH OUTPUT (RUN)
8
DATA LINK CONNECTOR
(8W-18-2)
D24
18
WT/DG
26
C100
F22
18
DB/PK
LHD
RHD
50
C100
D25
18
YL/VT
A20
12
RD/DB
A10
12
RD/DG
D24
18
WT/DG
F22
18
DB/PK
5
9
24
8
10
PCI BUS
FUSED B(+)
FUSED B(+)
FLASH ABS
FUSED IGNITION SWITCH OUTPUT (RUN)
CONTROLLER ANTILOCK BRAKE
GROUND
GROUND
16
1
Z102
12
BK/OR
Z101
12
BK/OR
G110
(8W-15-2)
(8W-15-3)

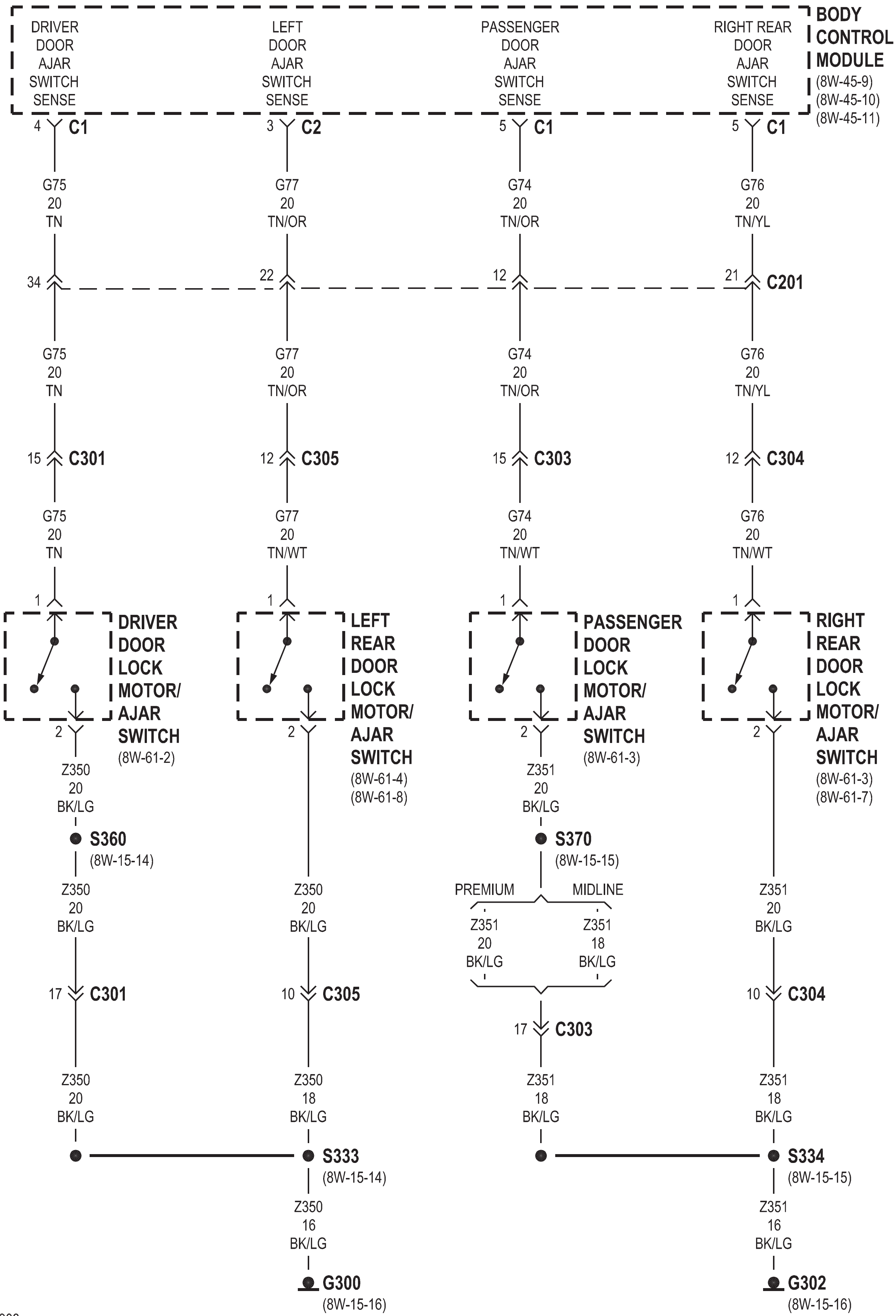

BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
12
15A
(8W-12-15)
24 C3
16 C1
37 C1
SHIFTER ASSEMBLY
BRAKE LAMP SWITCH SENSE
(8W-31-7)
(8W-31-8)
6
L50
18
WT/TN
K29
20
WT/PK
SPEED CONTROL SERVO
BRAKE LAMP SWITCH SENSE
(8W-33-2)
3
GAS
DIESEL
RHD
LHD
RHD
LHD
17 C201
50 C100
16 C100
K29
18
WT/PK
V30
18
DB/RD
L50
18
WT/TN
F32
18
PK/DB
19 C100
S215
(8W-31-7)
(8W-31-8)
S107
(8W-30-34)
V30
18
DB/RD
6
3
2
BRAKE LAMP SWITCH
(8W-33-2)
5
4
1
Z3
18
BK/OR
V32
18
YL/RD
BODY CONTROL MODULE
VEHICLE SPEED SIGNAL
(8W-45-5)
S214
(8W-15-12)
21 C100
21
V32
18
YL/RD
B12
18
DG/OR
L50
18
WT/TN
Z3
16
BK/OR
11 C3
POWERTRAIN CONTROL MODULE
SPEED CONTROL SUPPLY
(8W-30-8)
S207
(8W-45-5)
27 C100
LHD
RHD
25 C1
GROUND
BODY CONTROL MODULE
(8W-45-2)
B12
18
DG/OR
S118
(8W-45-5)
18
13
BRAKE LAMP SWITCH OUTPUT
VEHICLE SPEED SIGNAL
CONTROLLER ANTILOCK BRAKE



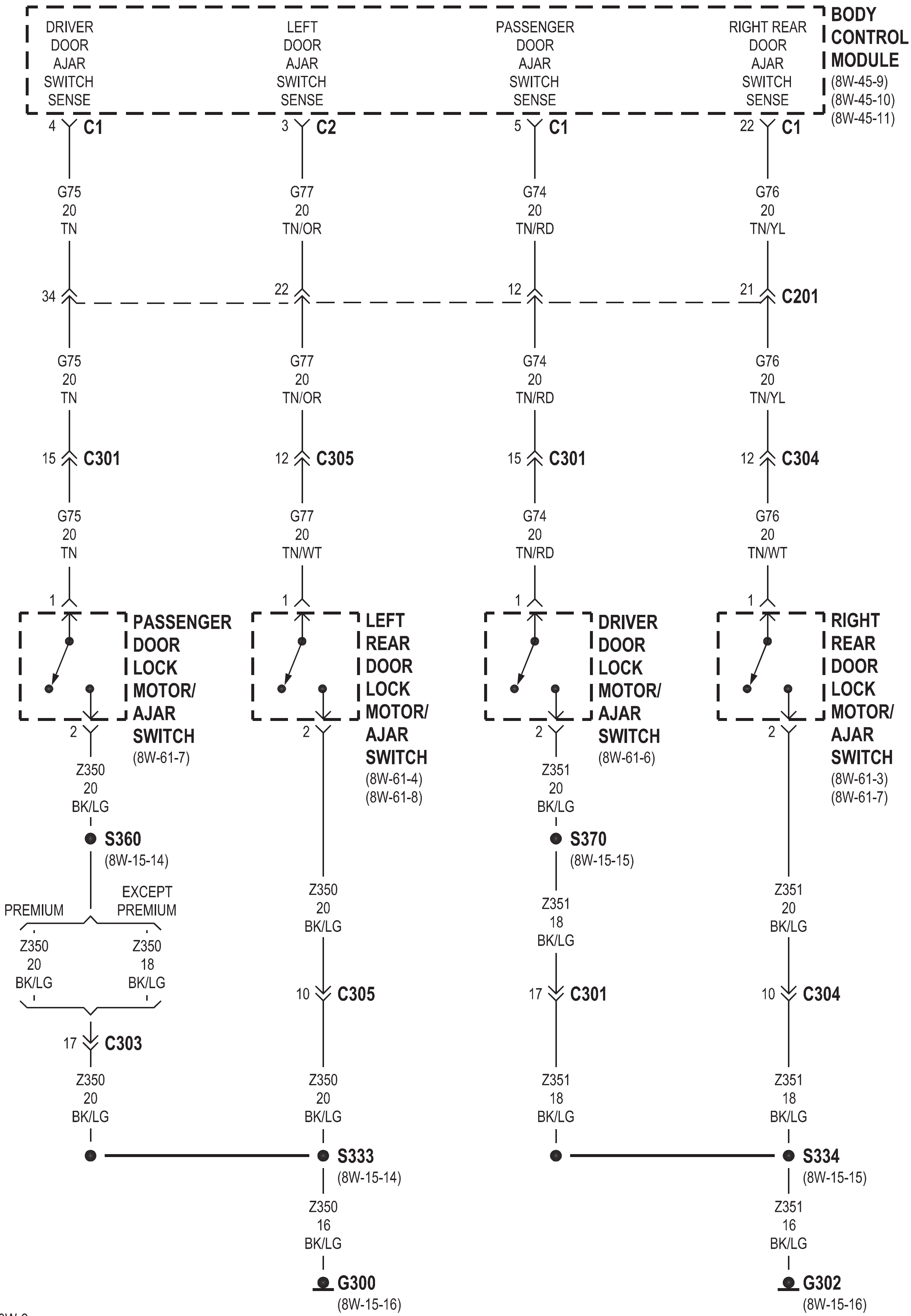
LEFT FRONT WHEEL SPEED SENSOR
REAR WHEEL SPEED SENSOR (LHD)
REAR WHEEL SPEED SENSOR (RHD)
RIGHT FRONT WHEEL SPEED SENSOR
2
1
B1 18 YL/DB
B2 18 YL
4
5
C307
TWISTED PAIR
16
28
C201
C100
C102
1
27
2
35
B8 18 RD/DB
B9 18 RD
B6 18 WT/DB
B7 18 WT
22
23
19
20
6
7
LEFT FRONT WHEEL SPEED SENSOR SIGNAL
LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
REAR WHEEL SPEED SENSOR SIGNAL
REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
CONTROLLER ANTILOCK BRAKE
• LHD
•• RHD

8W-39 VEHICLE THEFT SECURITY SYSTEM

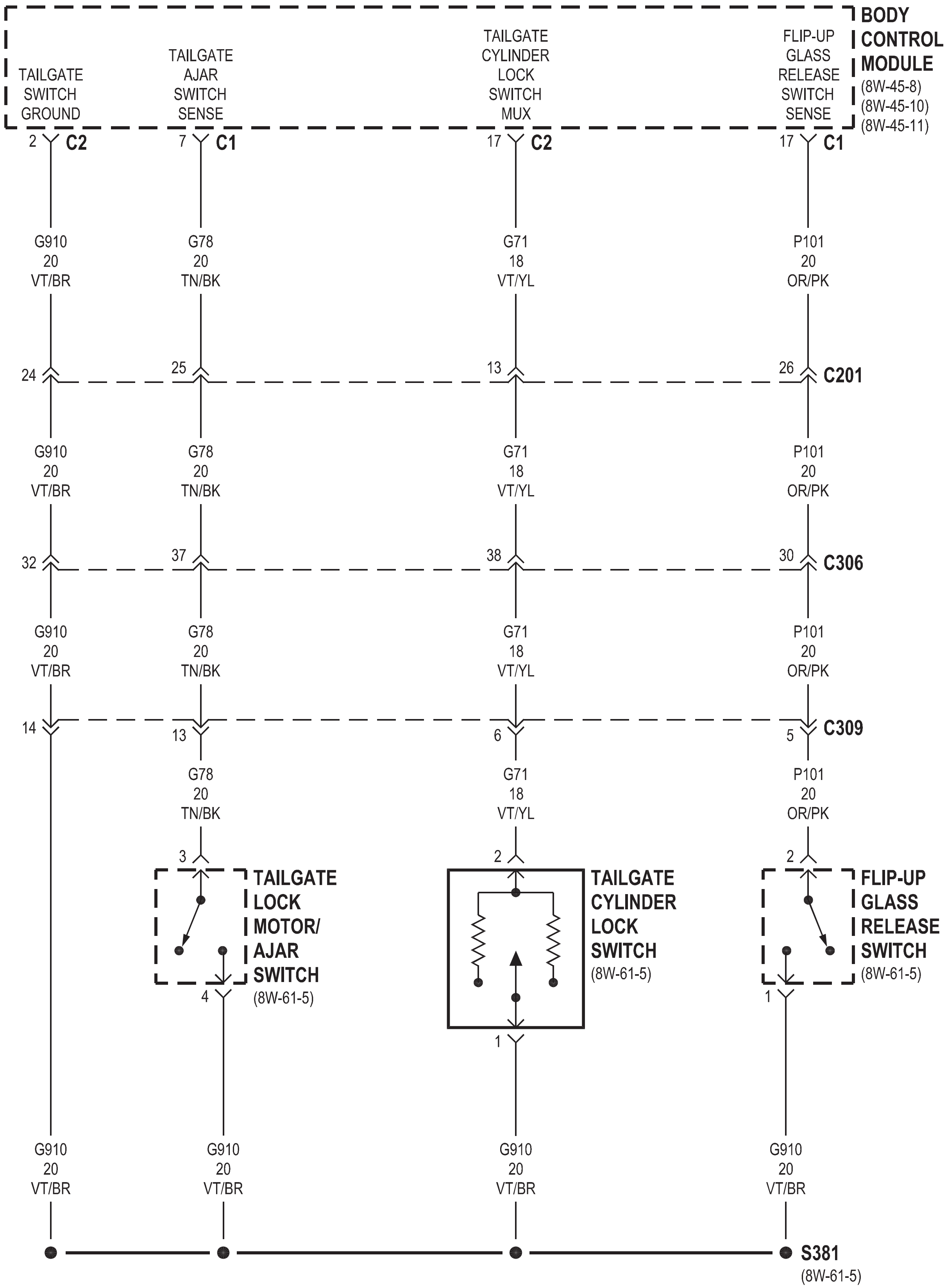

BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
40
FUSE
28
15A
(8W-10-28)
41
FUSE
14
40A
(8W-10-23)
14
FUSE
7
50A
(8W-10-15)
7
A/T
M/T
F45
18
YL/BR
F45
18
YL/BR
A1
12
RD
86
STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
85
30
CLUTCH SWITCH OVERRIDE RELAY (IN PDC)
(8W-21-3)
(8W-21-6)
87
87A
63
C100
A1
12
RD
1
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
1
2
0
3
4
6
2
7
A41
12
YL
A21
12
RD/DB
61
C100
S210
(8W-10-27)
A41
12
YL
A21
12
RD/DB
A31
12
BK/WT
A7
10
RD/BK
3
C1
40
C1
42
C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
13
10A
(8W-12-17)
FUSE
32
10A
(8W-12-22)
(8W-12-23)
FUSE
34
15A
(8W-12-29)
16
JB
14
JB
15
JB
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
FUSED B(+)
BODY CONTROL MODULE
(8W-45-2)

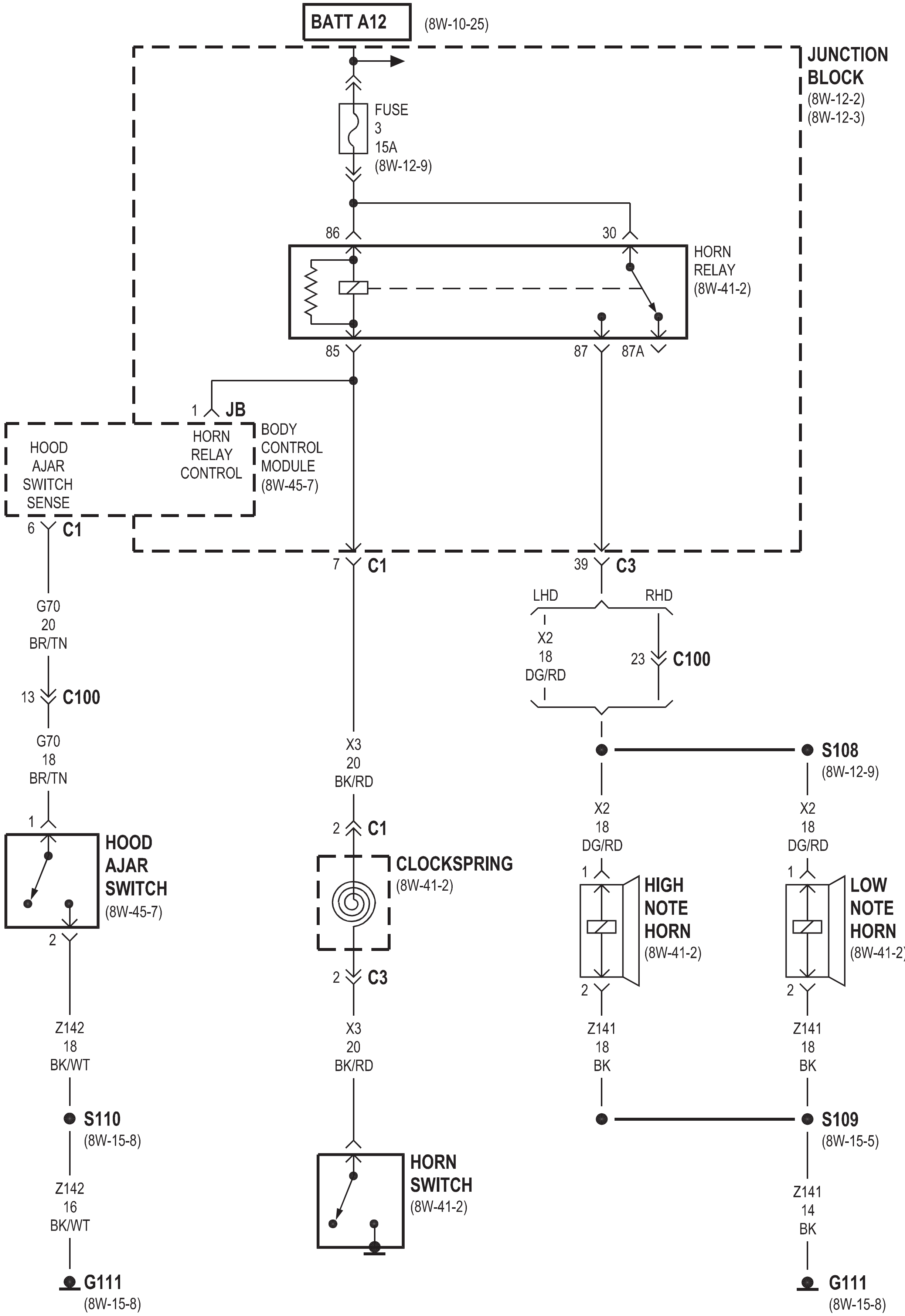

BODY CONTROL MODULE
(8W-45-9)
(8W-45-10)
(8W-45-11)
DRIVER DOOR AJAR SWITCH SENSE
LEFT DOOR AJAR SWITCH SENSE
PASSENGER DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
4 C1
3 C2
5 C1
5 C1
G75 20 TN
G77 20 TN/OR
G74 20 TN/OR
G76 20 TN/YL
34
22
12
21 C201
G75 20 TN
G77 20 TN/OR
G74 20 TN/OR
G76 20 TN/YL
15 C301
12 C305
15 C303
12 C304
G75 20 TN
G77 20 TN/WT
G74 20 TN/WT
G76 20 TN/WT
1
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-2)
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-4)
(8W-61-8)
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-3)
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-3)
(8W-61-7)
2
Z350 20 BK/LG
S360
(8W-15-14)
Z350 20 BK/LG
Z351 20 BK/LG
S370
(8W-15-15)
PREMIUM
MIDLINE
Z351 20 BK/LG
Z351 18 BK/LG
Z350 20 BK/LG
Z350 20 BK/LG
Z351 20 BK/LG
17 C301
10 C305
17 C303
10 C304
Z350 20 BK/LG
Z350 18 BK/LG
Z351 18 BK/LG
Z351 18 BK/LG
S333
(8W-15-14)
S334
(8W-15-15)
Z350 16 BK/LG
Z351 16 BK/LG
G300
(8W-15-16)
G302
(8W-15-16)

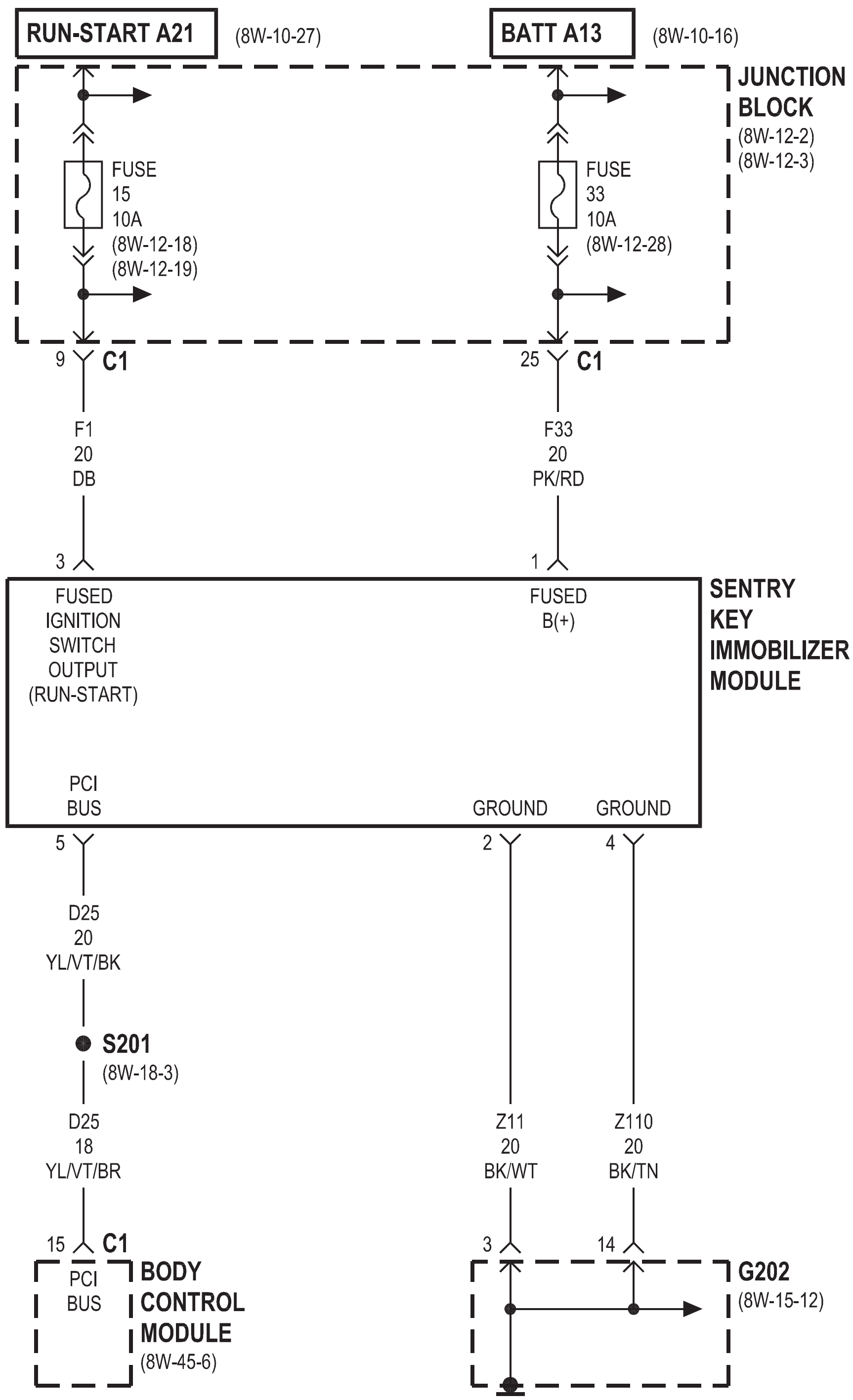
RHD

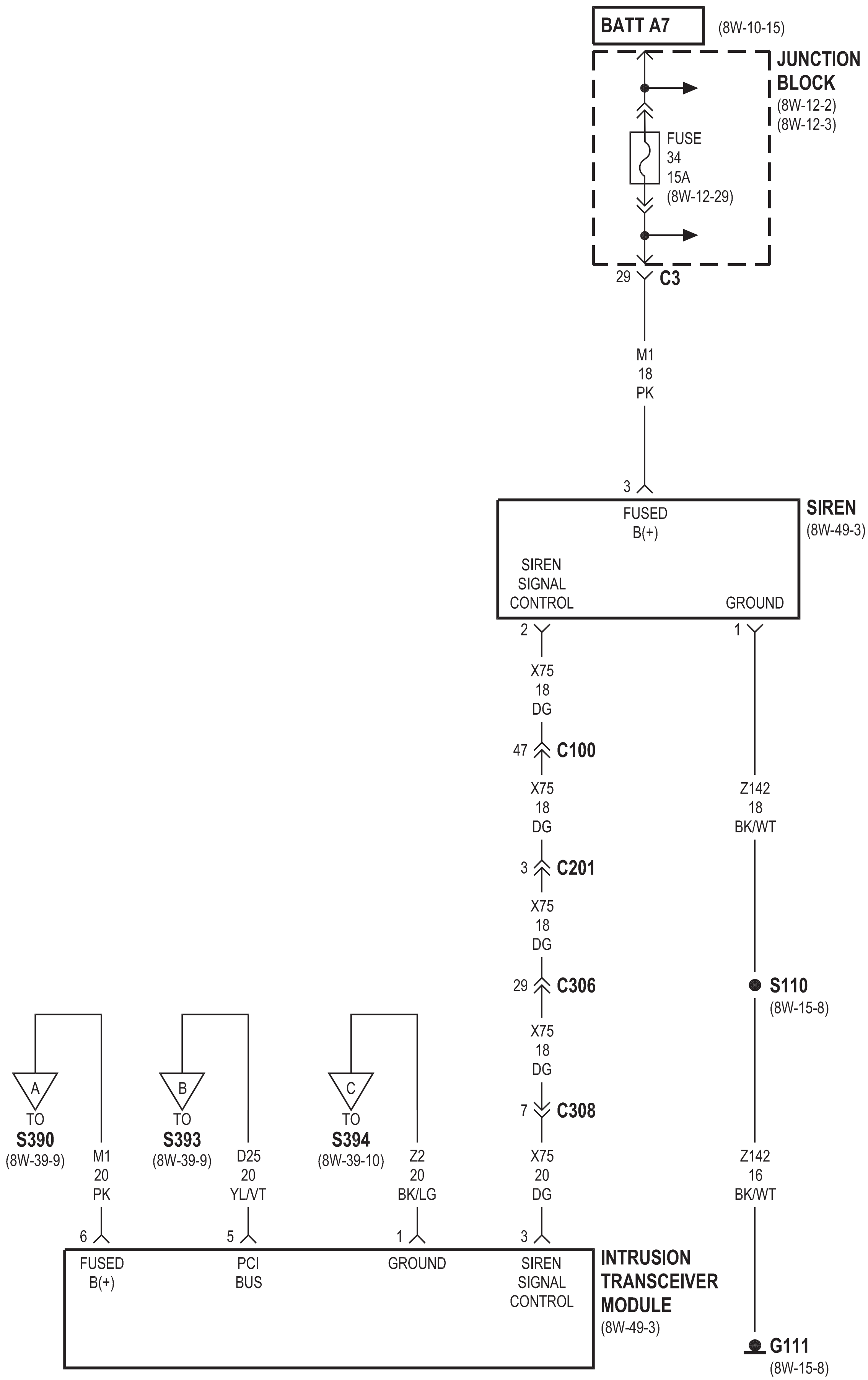


J038W-2 KJ303904

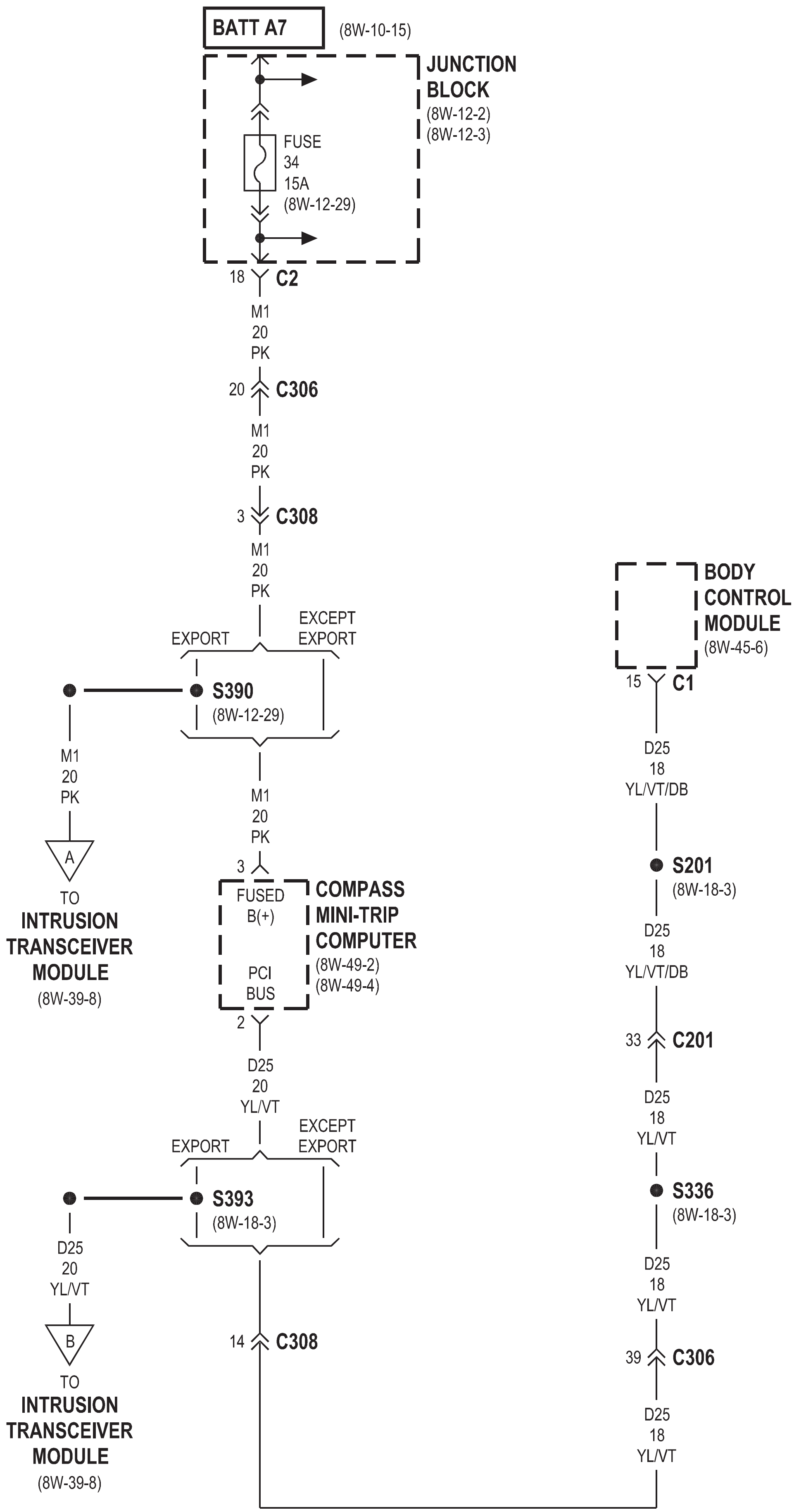

BODY CONTROL MODULE
(8W-45-8)
(8W-45-10)
(8W-45-11)
TAILGATE SWITCH GROUND
TAILGATE AJAR SWITCH SENSE
TAILGATE CYLINDER LOCK SWITCH MUX
FLIP-UP GLASS RELEASE SWITCH SENSE
2 C2
7 C1
17 C2
17 C1
G910 20 VT/BR
G78 20 TN/BK
G71 18 VT/YL
P101 20 OR/PK
24 25 13 26 C201
32 37 38 30 C306
14 13 6 5 C309
3
2
2
TAILGATE LOCK MOTOR/ AJAR SWITCH
(8W-61-5)
4
TAILGATE CYLINDER LOCK SWITCH
(8W-61-5)
1
FLIP-UP GLASS RELEASE SWITCH
(8W-61-5)
1
S381
(8W-61-5)

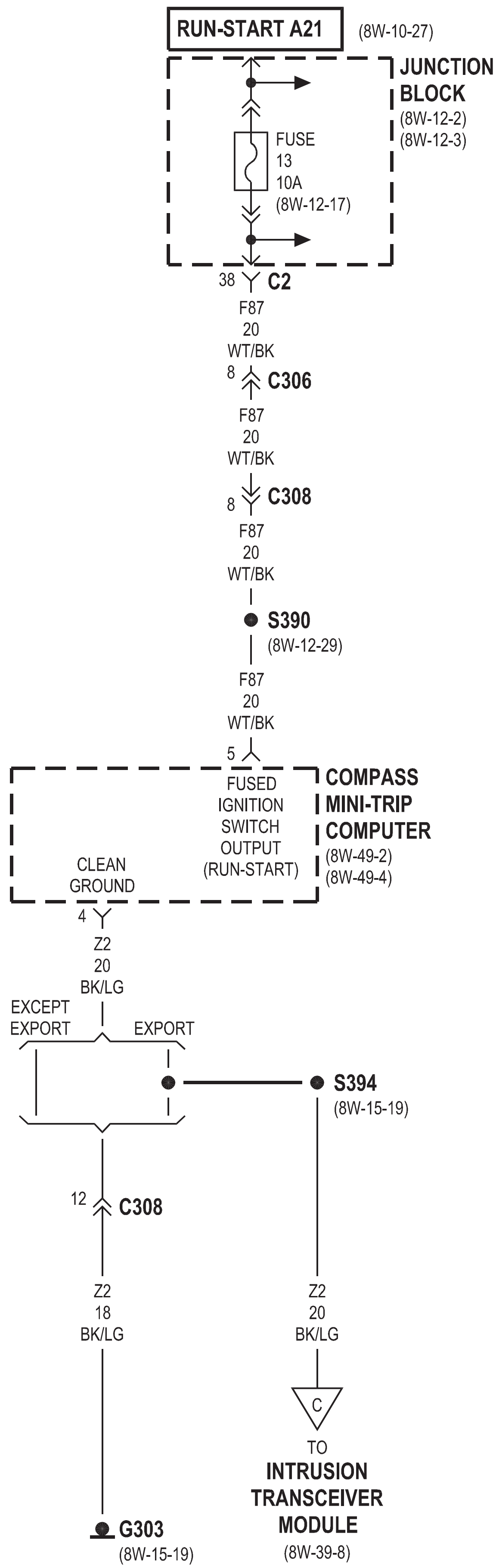

BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
3
15A
(8W-12-9)
86
30
HORN RELAY
(8W-41-2)
85
87
87A
1 JB
HOOD AJAR SWITCH SENSE
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
6 C1
7 C1
39 C3
LHD
RHD
G70
20
BR/TN
13 C100
G70
18
BR/TN
X2
18
DG/RD
23 C100
X3
20
BK/RD
S108
(8W-12-9)
1
HOOD AJAR SWITCH
(8W-45-7)
2 C1
CLOCKSPRING
(8W-41-2)
X2
18
DG/RD
HIGH NOTE HORN
(8W-41-2)
LOW NOTE HORN
(8W-41-2)
2
2 C3
Z142
18
BK/WT
X3
20
BK/RD
Z141
18
BK
S110
(8W-15-8)
S109
(8W-15-5)
Z142
16
BK/WT
HORN SWITCH
(8W-41-2)
Z141
14
BK
G111
(8W-15-8)

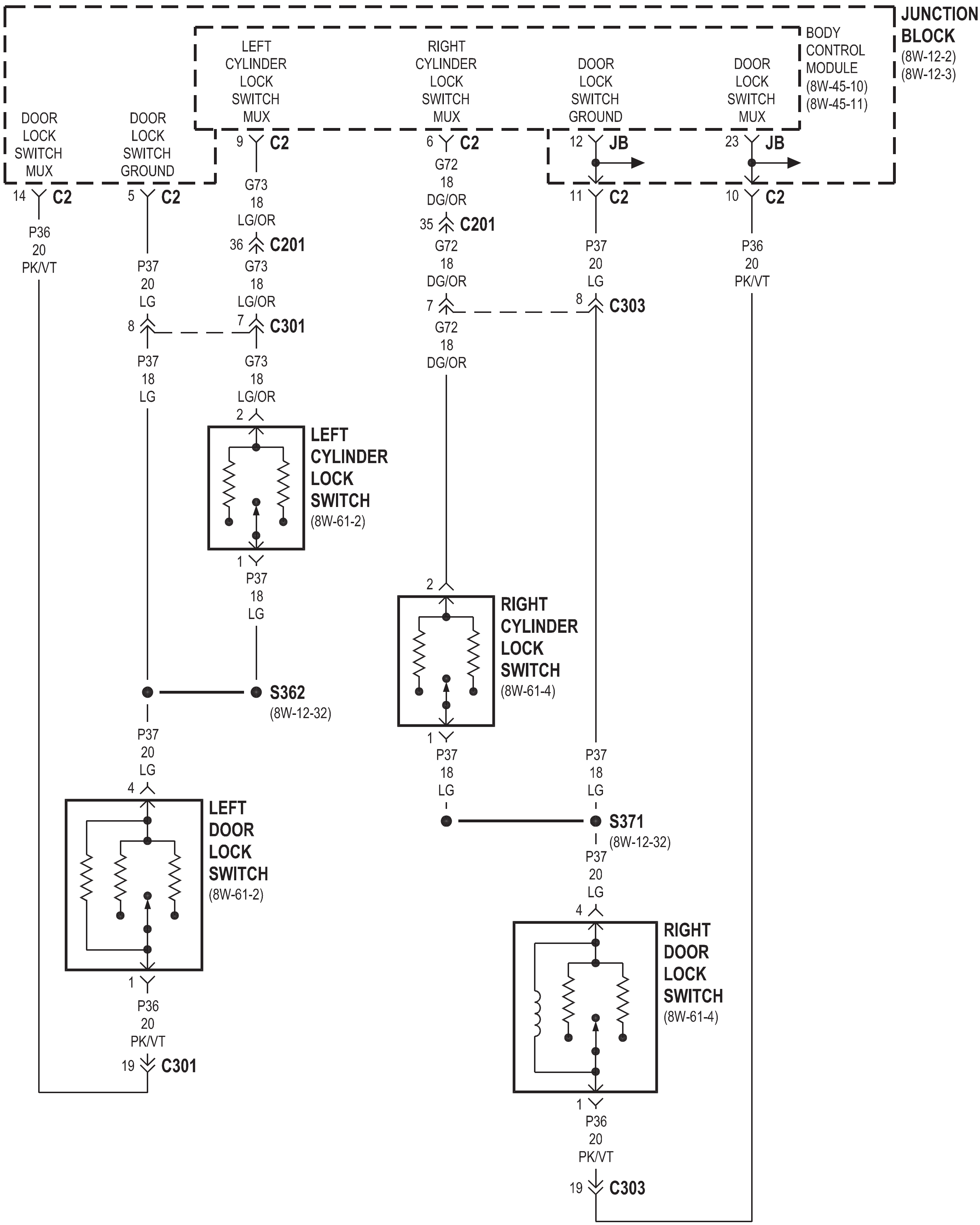

RUN-START A21
(8W-10-27)
BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 15 10A
(8W-12-18)
(8W-12-19)
FUSE 33 10A
(8W-12-28)
9 C1
25 C1
F1 20 DB
F33 20 PK/RD
3
1
SENTRY KEY IMMOBILIZER MODULE
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED B(+)
PCI BUS
GROUND
GROUND
5
2
4
D25 20 YL/VT/BK
S201
(8W-18-3)
D25 18 YL/VT/BR
Z11 20 BK/WT
Z110 20 BK/TN
15 C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
3
14
G202
(8W-15-12)

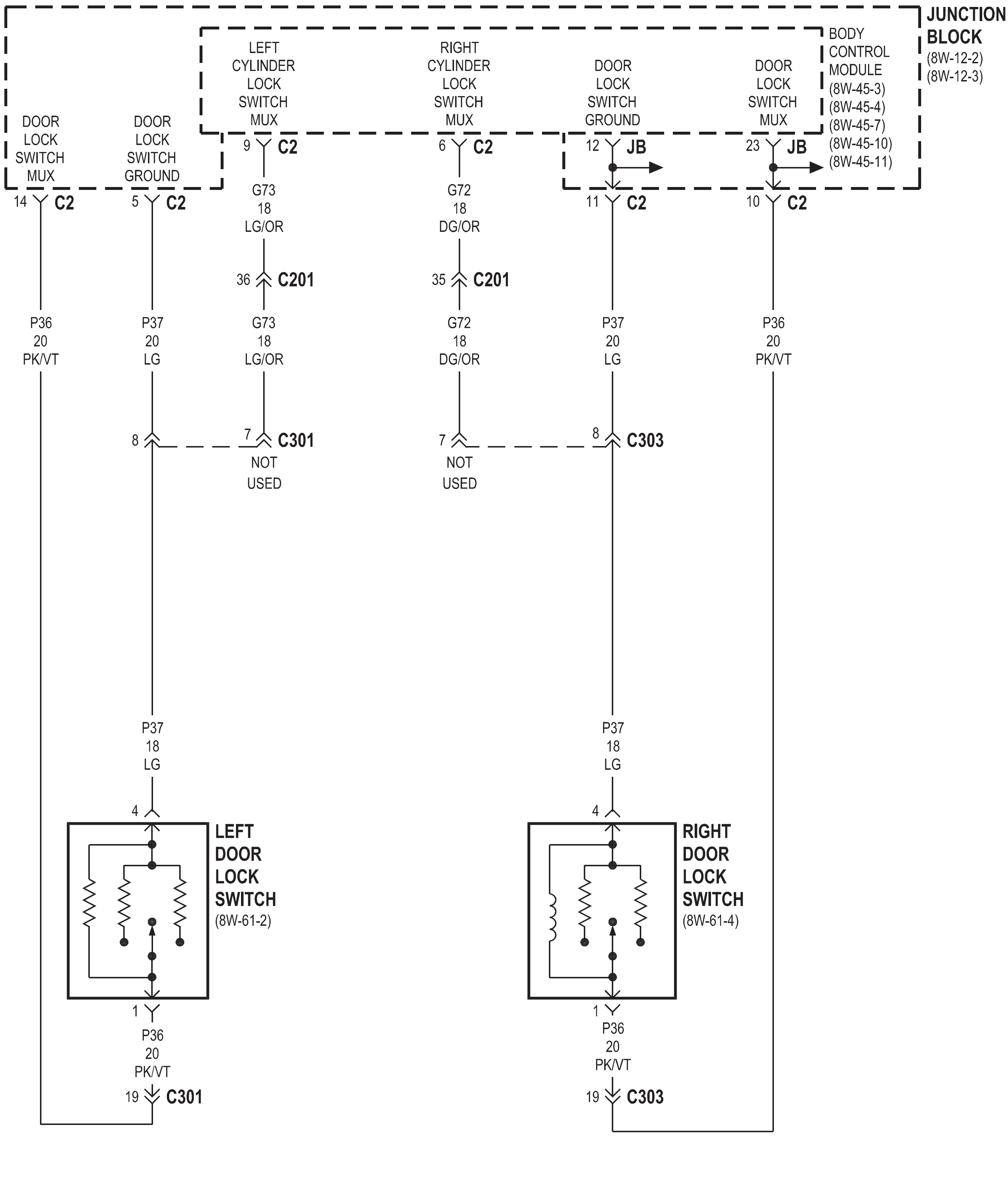


BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
29
C3
M1
18
PK
3
SIREN
(8W-49-3)
FUSED B(+)
SIREN SIGNAL CONTROL
GROUND
2
1
X75
18
DG
47
C100
X75
18
DG
3
C201
X75
18
DG
29
C306
X75
18
DG
7
C308
Z142
18
BK/WT
S110
(8W-15-8)
A
TO
S390
(8W-39-9)
B
TO
S393
(8W-39-9)
C
TO
S394
(8W-39-10)
M1
20
PK
D25
20
YL/VT
Z2
20
BK/LG
X75
20
DG
Z142
16
BK/WT
6
5
1
3
FUSED B(+)
PCI BUS
GROUND
SIREN SIGNAL CONTROL
INTRUSION TRANSCEIVER MODULE
(8W-49-3)
G111
(8W-15-8)

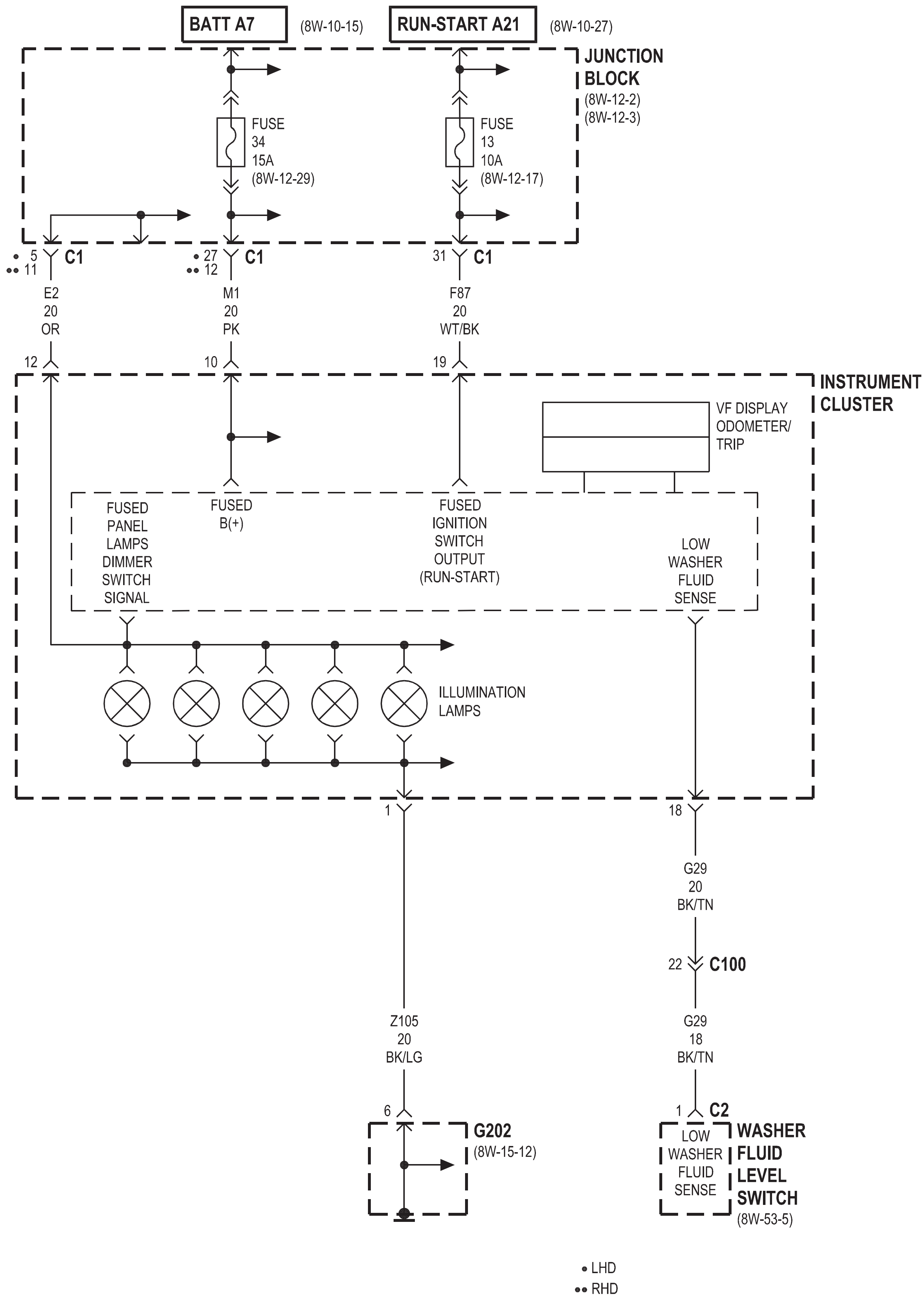

BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
18 C2
M1
20
PK
20 C306
M1
20
PK
3 C308
M1
20
PK
EXPORT
EXCEPT EXPORT
S390
(8W-12-29)
M1
20
PK
A
TO
INTRUSION TRANSCEIVER MODULE
(8W-39-8)
M1
20
PK
3
FUSED B(+)
PCI BUS
2
COMPASS MINI-TRIP COMPUTER
(8W-49-2)
(8W-49-4)
D25
20
YL/VT
EXPORT
EXCEPT EXPORT
S393
(8W-18-3)
D25
20
YL/VT
B
TO
INTRUSION TRANSCEIVER MODULE
(8W-39-8)
14 C308
BODY CONTROL MODULE
(8W-45-6)
15 C1
D25
18
YL/VT/DB
S201
(8W-18-3)
D25
18
YL/VT/DB
33 C201
D25
18
YL/VT
S336
(8W-18-3)
D25
18
YL/VT
39 C306
D25
18
YL/VT

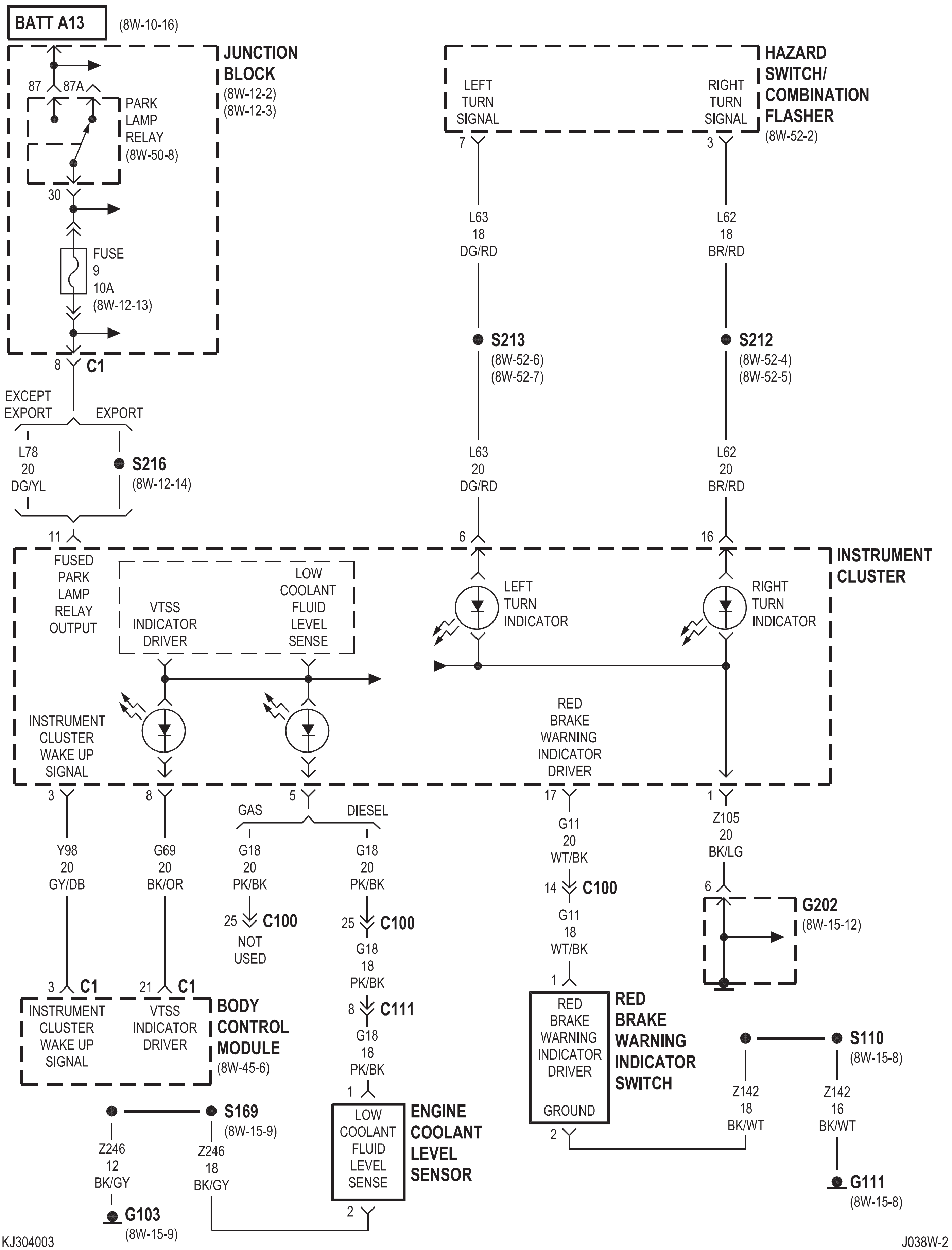

RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
13
10A
(8W-12-17)
38
C2
F87
20
WT/BK
8
C306
F87
20
WT/BK
8
C308
F87
20
WT/BK
S390
(8W-12-29)
F87
20
WT/BK
5
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
CLEAN
GROUND
COMPASS
MINI-TRIP
COMPUTER
(8W-49-2)
(8W-49-4)
4
Z2
20
BK/LG
EXCEPT
EXPORT
EXPORT
S394
(8W-15-19)
12
C308
Z2
18
BK/LG
Z2
20
BK/LG
C
TO
INTRUSION
TRANSCEIVER
MODULE
(8W-39-8)
G303
(8W-15-19)

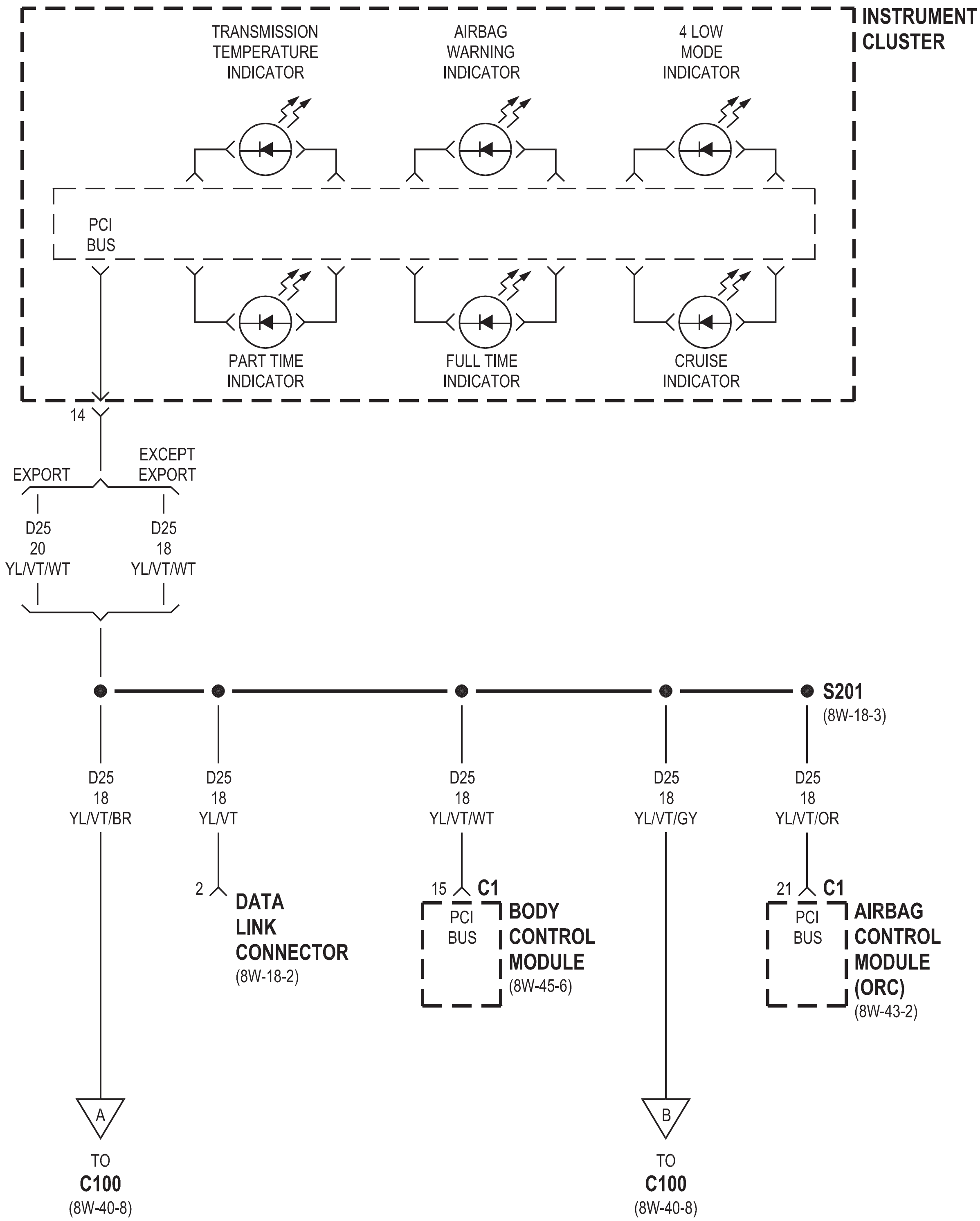

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-10)
(8W-45-11)
DOOR LOCK SWITCH MUX
DOOR LOCK SWITCH GROUND
LEFT CYLINDER LOCK SWITCH MUX
RIGHT CYLINDER LOCK SWITCH MUX
DOOR LOCK SWITCH GROUND
DOOR LOCK SWITCH MUX
14 C2
5 C2
9 C2
6 C2
12 JB
23 JB
11 C2
10 C2
P36 20 PK/VT
P37 20 LG
G73 18 LG/OR
G72 18 DG/OR
36 C201
35 C201
8 7 C301
7 8 C303
P37 18 LG
LEFT CYLINDER LOCK SWITCH
(8W-61-2)
RIGHT CYLINDER LOCK SWITCH
(8W-61-4)
S362
(8W-12-32)
S371
(8W-12-32)
LEFT DOOR LOCK SWITCH
(8W-61-2)
RIGHT DOOR LOCK SWITCH
(8W-61-4)
19 C301
19 C303

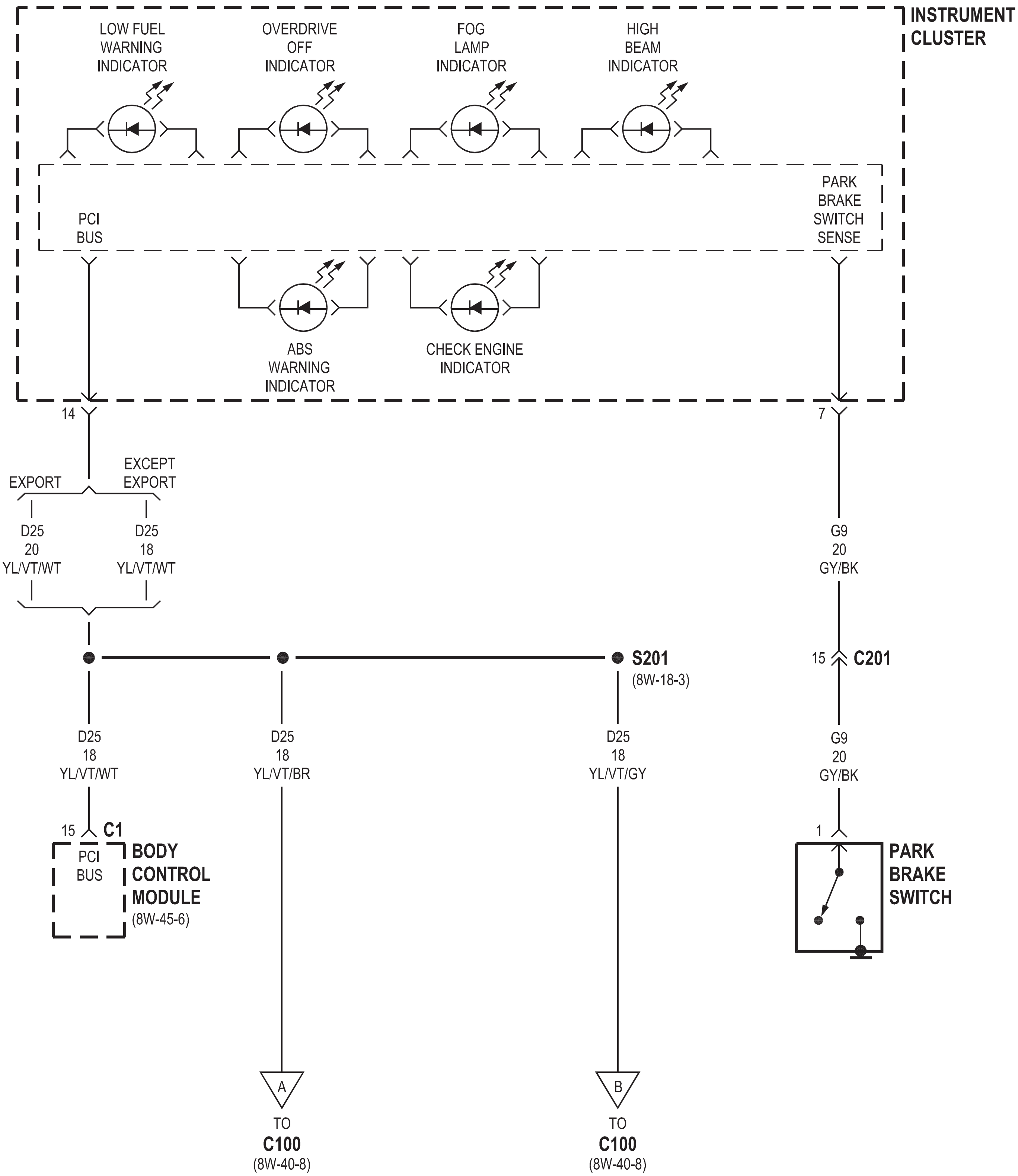

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
(8W-45-7)
(8W-45-10)
(8W-45-11)
LEFT CYLINDER LOCK SWITCH MUX
RIGHT CYLINDER LOCK SWITCH MUX
DOOR LOCK SWITCH GROUND
DOOR LOCK SWITCH MUX
DOOR LOCK SWITCH MUX
DOOR LOCK SWITCH GROUND
9 C2
6 C2
12 JB
23 JB
14 C2
5 C2
11 C2
10 C2
G73 18 LG/OR
G72 18 DG/OR
36 C201
35 C201
P36 20 PK/VT
P37 20 LG
8
7 C301
NOT USED
7
8 C303
NOT USED
P37 18 LG
4
LEFT DOOR LOCK SWITCH
(8W-61-2)
RIGHT DOOR LOCK SWITCH
(8W-61-4)
1
P36 20 PK/VT
19 C301
19 C303

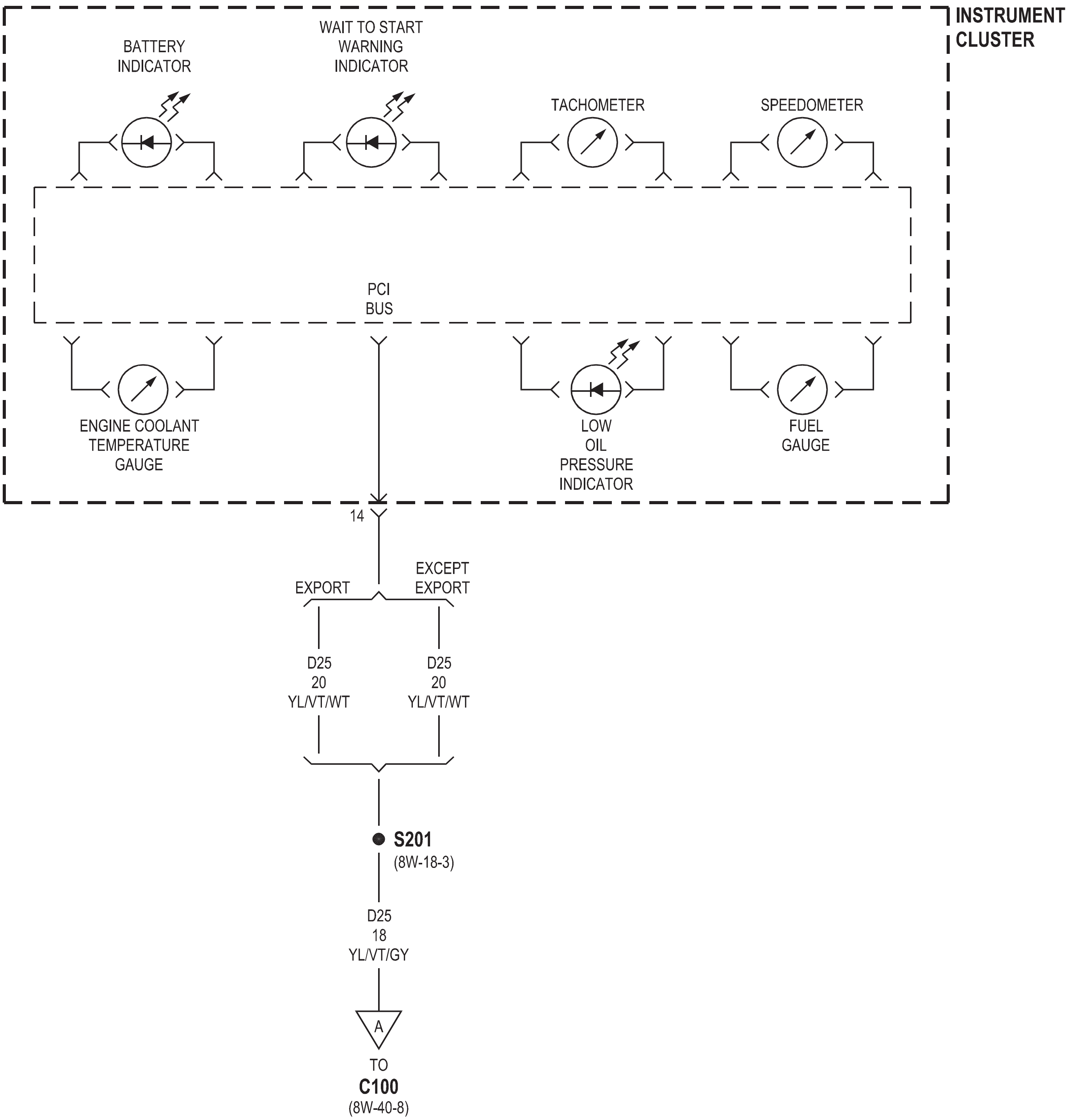
8W-40 INSTRUMENT CLUSTER


BATT A7
(8W-10-15)
RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
FUSE
13
10A
(8W-12-17)
• 5
•• 11
C1
• 27
•• 12
C1
31
C1
E2
20
OR
M1
20
PK
F87
20
WT/BK
12
10
19
INSTRUMENT CLUSTER
VF DISPLAY
ODOMETER/
TRIP
FUSED
PANEL
LAMPS
DIMMER
SWITCH
SIGNAL
FUSED
B(+)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
LOW
WASHER
FLUID
SENSE
ILLUMINATION
LAMPS
1
18
G29
20
BK/TN
22
C100
G29
18
BK/TN
Z105
20
BK/LG
6
G202
(8W-15-12)
1
C2
LOW
WASHER
FLUID
SENSE
WASHER
FLUID
LEVEL
SWITCH
(8W-53-5)
• LHD
•• RHD

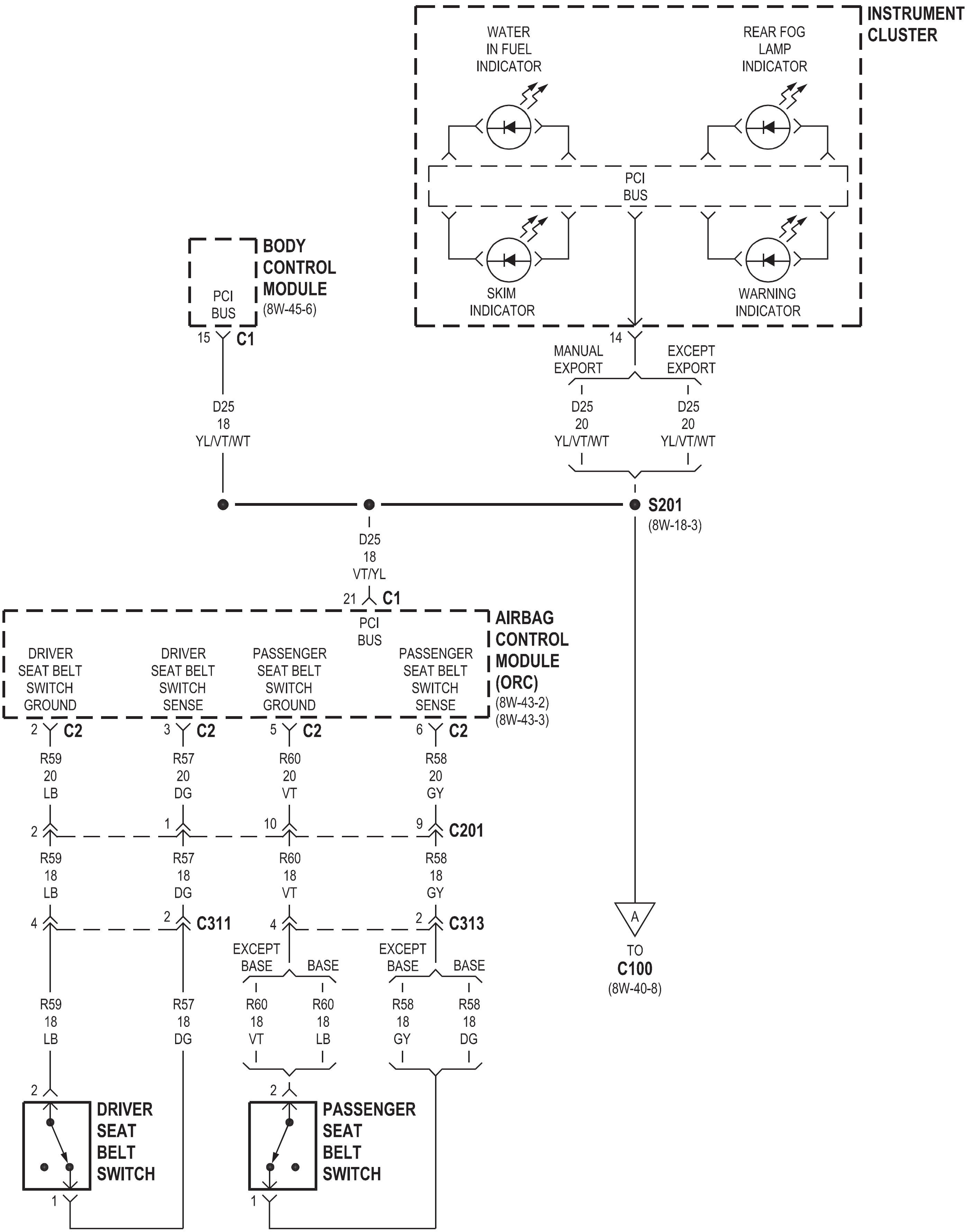

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
87
87A
PARK LAMP RELAY
(8W-50-8)
30
FUSE
9
10A
(8W-12-13)
8
C1
EXCEPT EXPORT
EXPORT
L78
20
DG/YL
S216
(8W-12-14)
11
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
7
3
L63
18
DG/RD
L62
18
BR/RD
S213
(8W-52-6)
(8W-52-7)
S212
(8W-52-4)
(8W-52-5)
L63
20
DG/RD
L62
20
BR/RD
6
16
INSTRUMENT CLUSTER
FUSED PARK LAMP RELAY OUTPUT
VTSS INDICATOR DRIVER
LOW COOLANT FLUID LEVEL SENSE
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
INSTRUMENT CLUSTER WAKE UP SIGNAL
RED BRAKE WARNING INDICATOR DRIVER
3
8
5
17
1
GAS
DIESEL
Y98
20
GY/DB
G69
20
BK/OR
G18
20
PK/BK
G18
20
PK/BK
25
C100
NOT USED
25
C100
G18
18
PK/BK
8
C111
G18
18
PK/BK
1
G11
20
WT/BK
14
C100
G11
18
WT/BK
1
Z105
20
BK/LG
6
G202
(8W-15-12)
3
C1
21
C1
BODY CONTROL MODULE
(8W-45-6)
INSTRUMENT CLUSTER WAKE UP SIGNAL
VTSS INDICATOR DRIVER
ENGINE COOLANT LEVEL SENSOR
LOW COOLANT FLUID LEVEL SENSE
2
RED BRAKE WARNING INDICATOR SWITCH
RED BRAKE WARNING INDICATOR DRIVER
GROUND
2
S169
(8W-15-9)
Z246
12
BK/GY
Z246
18
BK/GY
G103
(8W-15-9)
S110
(8W-15-8)
Z142
18
BK/WT
Z142
16
BK/WT
G111
(8W-15-8)

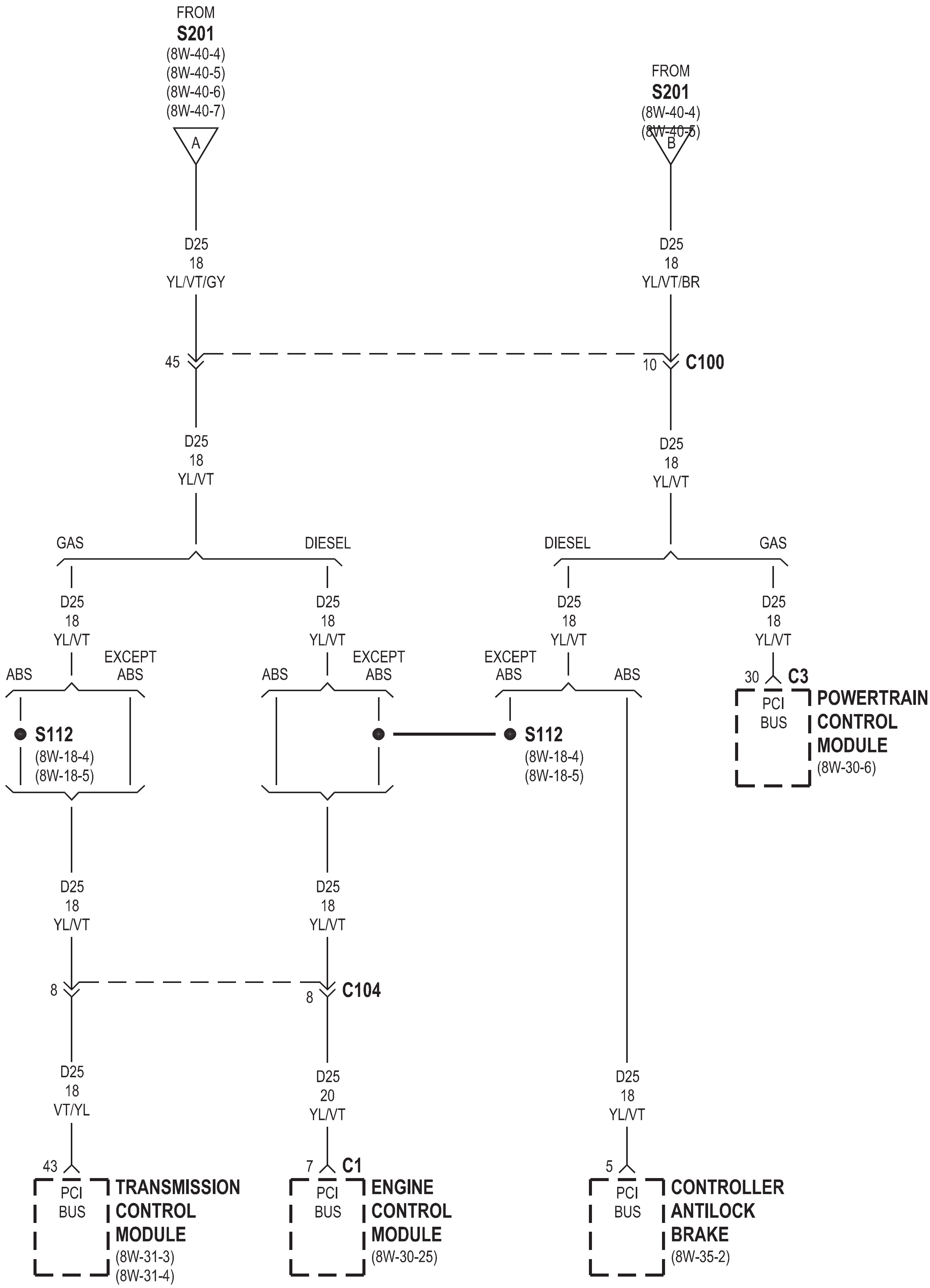

INSTRUMENT CLUSTER
TRANSMISSION TEMPERATURE INDICATOR
AIRBAG WARNING INDICATOR
4 LOW MODE INDICATOR
PCI BUS
PART TIME INDICATOR
FULL TIME INDICATOR
CRUISE INDICATOR
14
EXPORT
EXCEPT EXPORT
D25 20 YL/VT/WT
D25 18 YL/VT/WT
S201
(8W-18-3)
D25 18 YL/VT/BR
D25 18 YL/VT
D25 18 YL/VT/WT
D25 18 YL/VT/GY
D25 18 YL/VT/OR
2
DATA LINK CONNECTOR
(8W-18-2)
15
C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
21
C1
PCI BUS
AIRBAG CONTROL MODULE (ORC)
(8W-43-2)
A
TO
C100
(8W-40-8)
B
TO
C100
(8W-40-8)


INSTRUMENT CLUSTER
LOW FUEL WARNING INDICATOR
OVERDRIVE OFF INDICATOR
FOG LAMP INDICATOR
HIGH BEAM INDICATOR
PCI BUS
PARK BRAKE SWITCH SENSE
ABS WARNING INDICATOR
CHECK ENGINE INDICATOR
14
7
EXPORT
EXCEPT EXPORT
D25 20 YL/VT/WT
D25 18 YL/VT/WT
G9 20 GY/BK
S201
(8W-18-3)
15 C201
D25 18 YL/VT/WT
D25 18 YL/VT/BR
D25 18 YL/VT/GY
G9 20 GY/BK
15 C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
1
PARK BRAKE SWITCH
A
B
TO C100 (8W-40-8)
TO C100 (8W-40-8)

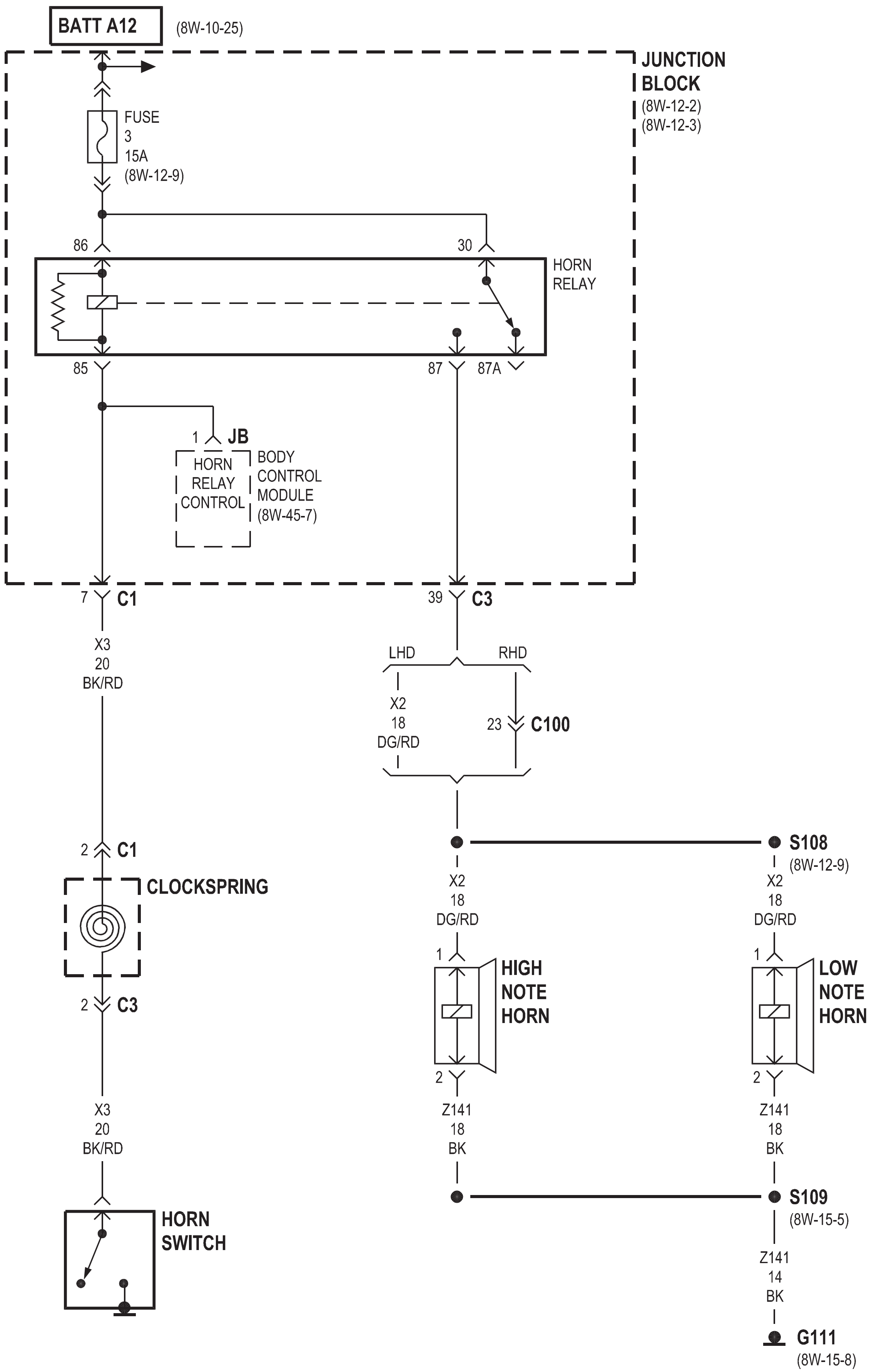


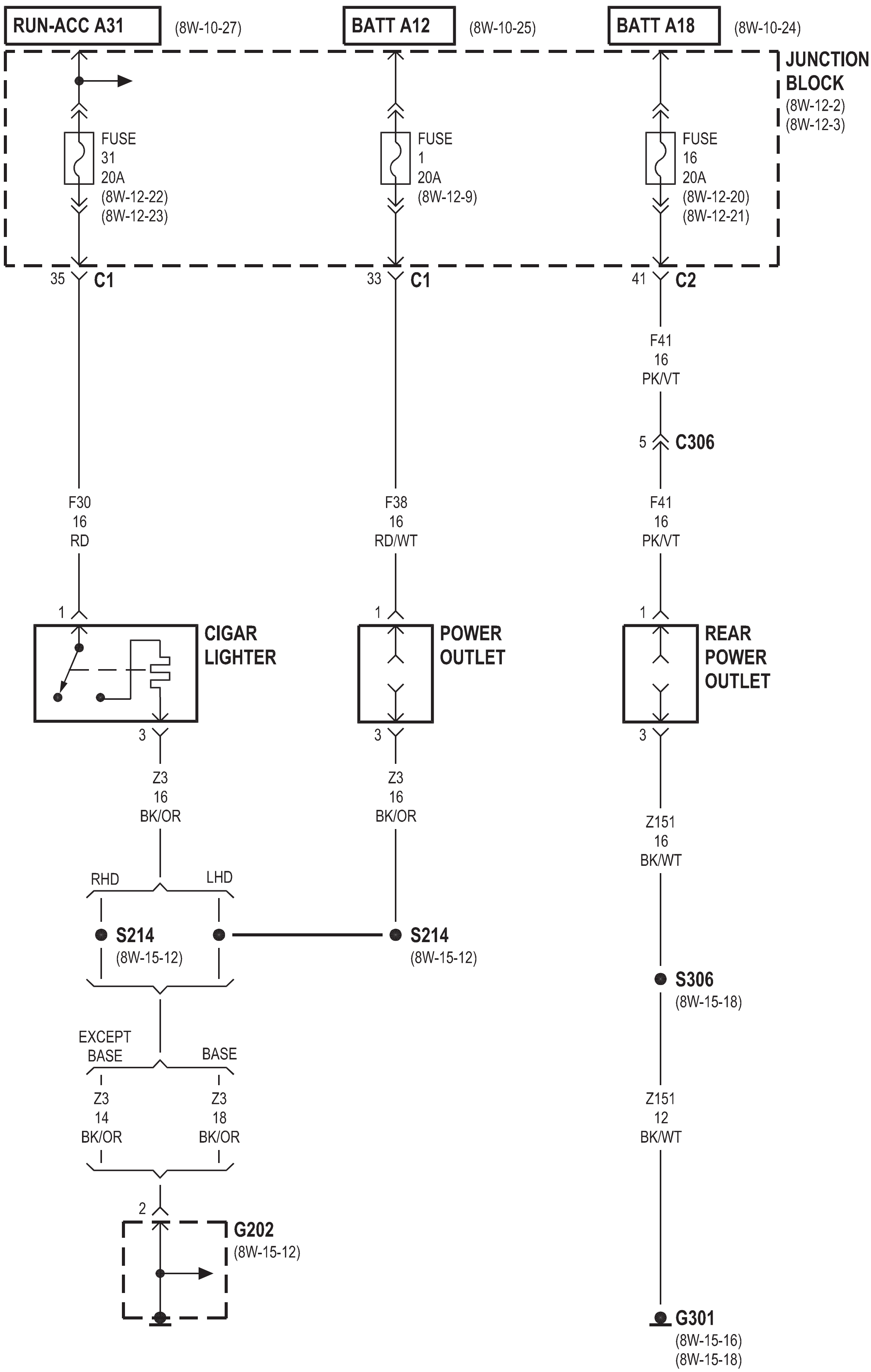
INSTRUMENT CLUSTER
BATTERY INDICATOR
WAIT TO START WARNING INDICATOR
TACHOMETER
SPEEDOMETER
PCI BUS
ENGINE COOLANT TEMPERATURE GAUGE
LOW OIL PRESSURE INDICATOR
FUEL GAUGE
14
EXPORT
EXCEPT EXPORT
D25 20 YL/VT/WT
D25 20 YL/VT/WT
S201
(8W-18-3)
D25 18 YL/VT/GY
A
TO
C100
(8W-40-8)


INSTRUMENT CLUSTER
WATER IN FUEL INDICATOR
REAR FOG LAMP INDICATOR
PCI BUS
SKIM INDICATOR
WARNING INDICATOR
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
D25 18 YL/VT/WT
14
MANUAL EXPORT
EXCEPT EXPORT
D25 20 YL/VT/WT
D25 20 YL/VT/WT
S201
(8W-18-3)
D25 18 VT/YL
21 C1
PCI BUS
AIRBAG CONTROL MODULE (ORC)
(8W-43-2)
(8W-43-3)
DRIVER SEAT BELT SWITCH GROUND
DRIVER SEAT BELT SWITCH SENSE
PASSENGER SEAT BELT SWITCH GROUND
PASSENGER SEAT BELT SWITCH SENSE
2 C2
3 C2
5 C2
6 C2
R59 20 LB
R57 20 DG
R60 20 VT
R58 20 GY
2
1
10
9 C201
R59 18 LB
R57 18 DG
R60 18 VT
R58 18 GY
4
2 C311
4
2 C313
EXCEPT BASE
BASE
EXCEPT BASE
BASE
R59 18 LB
R57 18 DG
R60 18 VT
R60 18 LB
R58 18 GY
R58 18 DG
A
TO C100
(8W-40-8)
2
DRIVER SEAT BELT SWITCH
1
2
PASSENGER SEAT BELT SWITCH
1


FROM
S201
(8W-40-4)
(8W-40-5)
(8W-40-6)
(8W-40-7)
A
FROM
S201
(8W-40-4)
(8W-40-5)
B
D25
18
YL/VT/GY
D25
18
YL/VT/BR
45
10
C100
D25
18
YL/VT
D25
18
YL/VT
GAS
DIESEL
DIESEL
GAS
D25
18
YL/VT
D25
18
YL/VT
D25
18
YL/VT
D25
18
YL/VT
ABS
EXCEPT ABS
ABS
EXCEPT ABS
EXCEPT ABS
ABS
30
C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
S112
(8W-18-4)
(8W-18-5)
S112
(8W-18-4)
(8W-18-5)
D25
18
YL/VT
D25
18
YL/VT
8
8
C104
D25
18
VT/YL
D25
20
YL/VT
D25
18
YL/VT
43
7
C1
5
PCI BUS
TRANSMISSION CONTROL MODULE
(8W-31-3)
(8W-31-4)
PCI BUS
ENGINE CONTROL MODULE
(8W-30-25)
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)

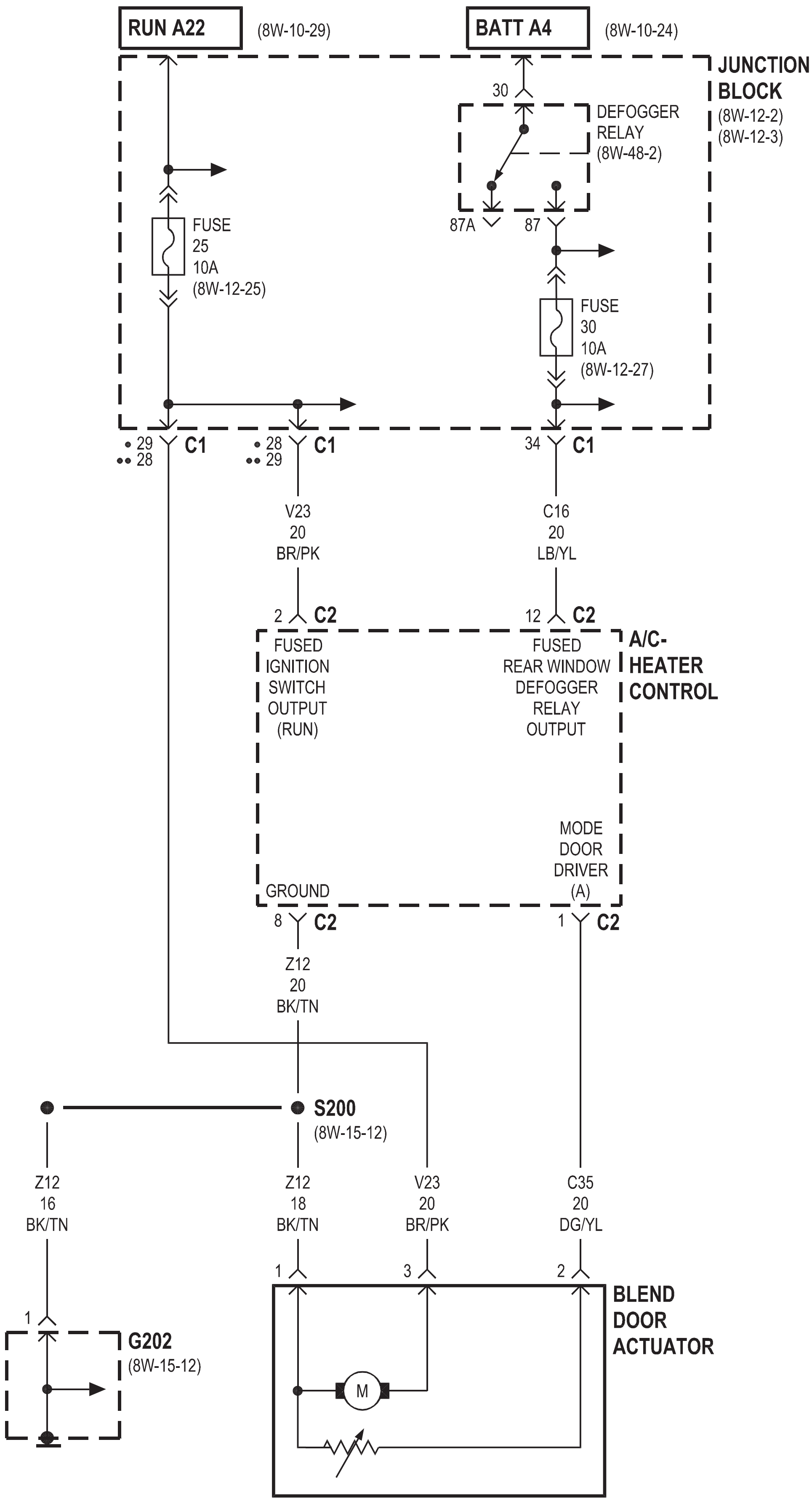
8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

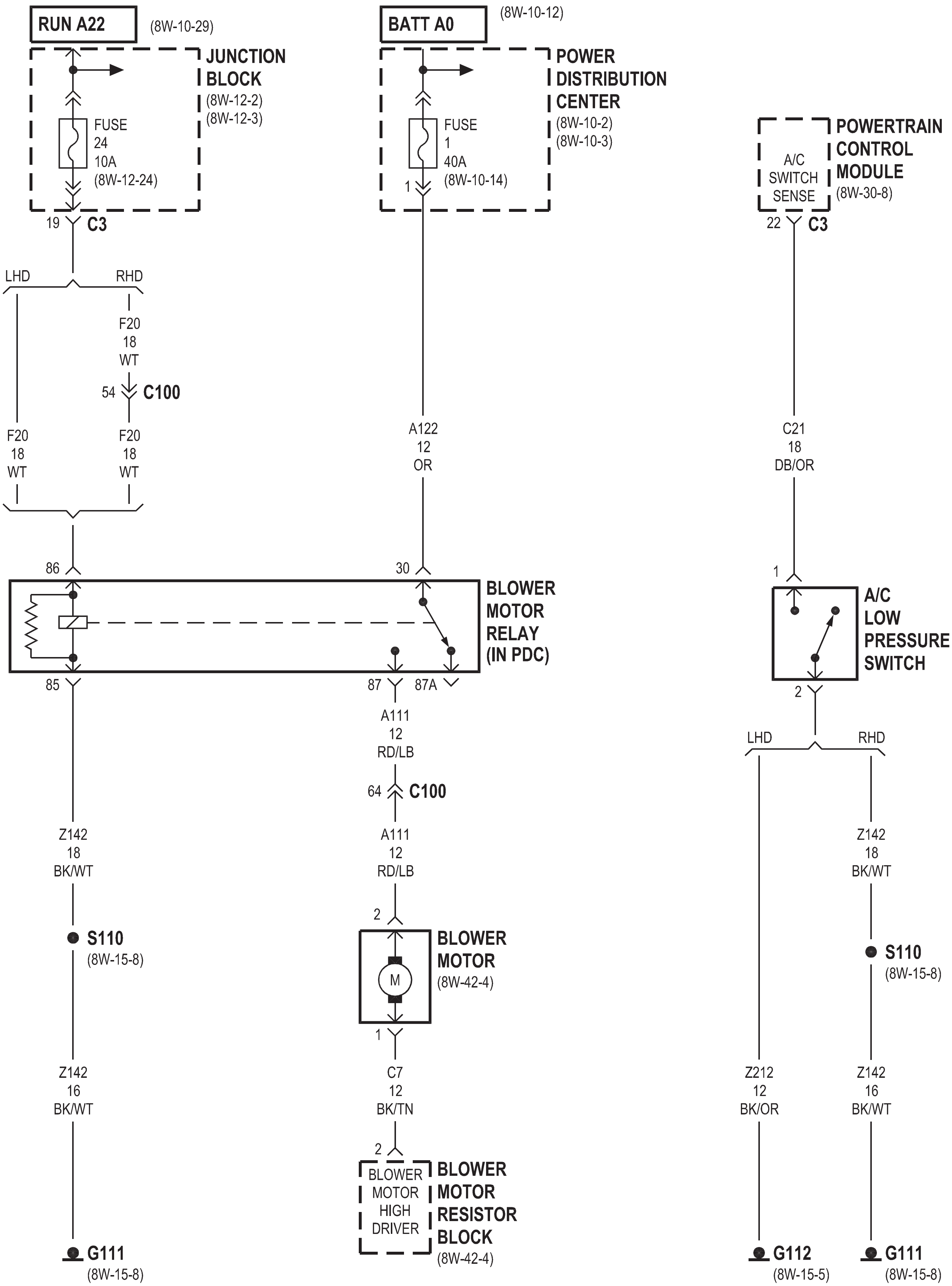

BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
3
15A
(8W-12-9)
86
30
HORN RELAY
85
87
87A
1
JB
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
7
C1
39
C3
X3
20
BK/RD
LHD
RHD
X2
18
DG/RD
23
C100
2
C1
CLOCKSPRING
2
C3
X3
20
BK/RD
HORN SWITCH
S108
(8W-12-9)
X2
18
DG/RD
X2
18
DG/RD
1
HIGH NOTE HORN
1
LOW NOTE HORN
2
2
Z141
18
BK
Z141
18
BK
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)

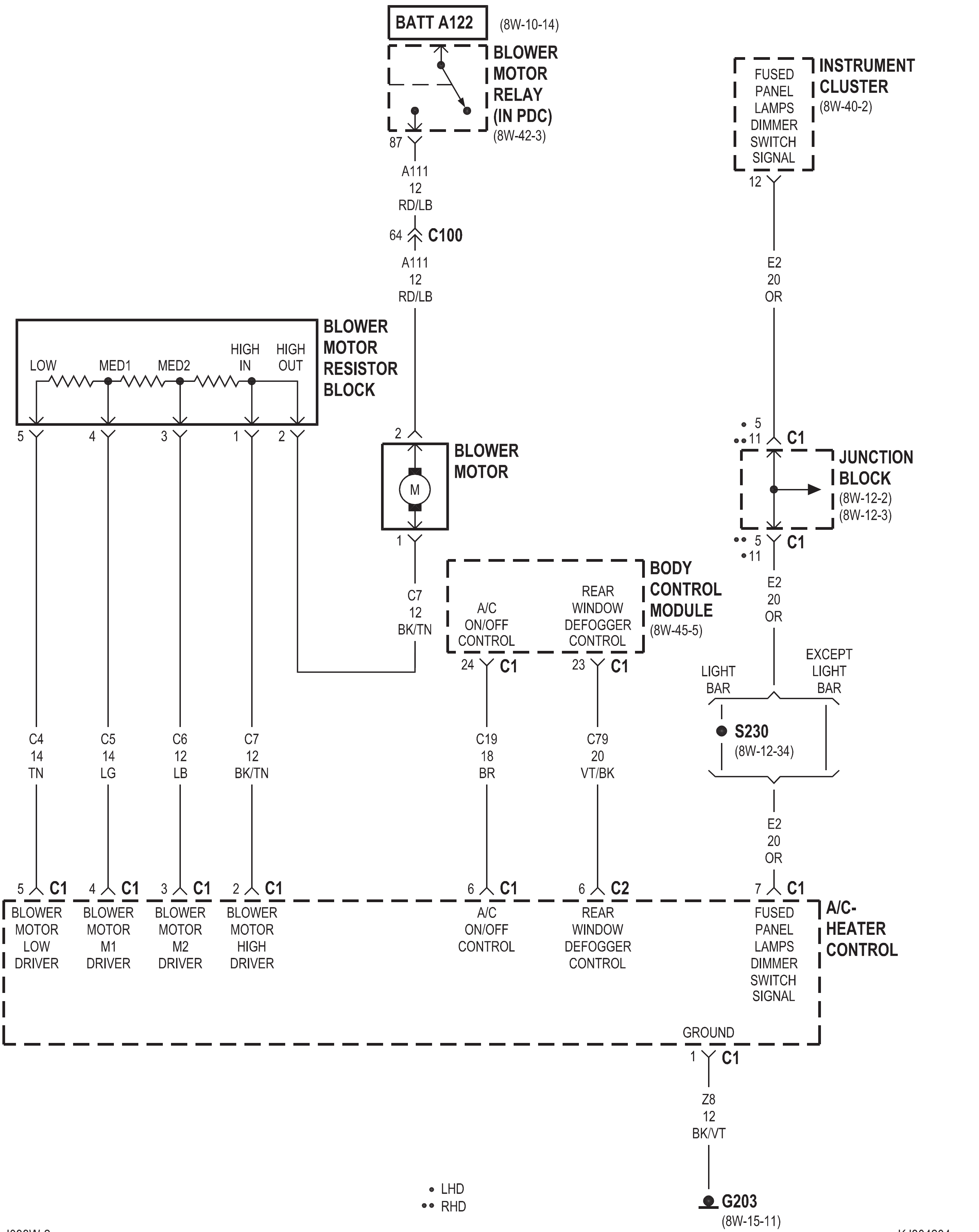


RUN-ACC A31
(8W-10-27)
BATT A12
(8W-10-25)
BATT A18
(8W-10-24)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
31
20A
(8W-12-22)
(8W-12-23)
FUSE
1
20A
(8W-12-9)
FUSE
16
20A
(8W-12-20)
(8W-12-21)
35
C1
33
C1
41
C2
F41
16
PK/VT
5
C306
F41
16
PK/VT
F30
16
RD
F38
16
RD/WT
1
CIGAR
LIGHTER
1
POWER
OUTLET
1
REAR
POWER
OUTLET
3
3
3
Z3
16
BK/OR
Z3
16
BK/OR
Z151
16
BK/WT
RHD
LHD
S214
(8W-15-12)
S214
(8W-15-12)
S306
(8W-15-18)
EXCEPT
BASE
BASE
Z3
14
BK/OR
Z3
18
BK/OR
Z151
12
BK/WT
2
G202
(8W-15-12)
G301
(8W-15-16)
(8W-15-18)

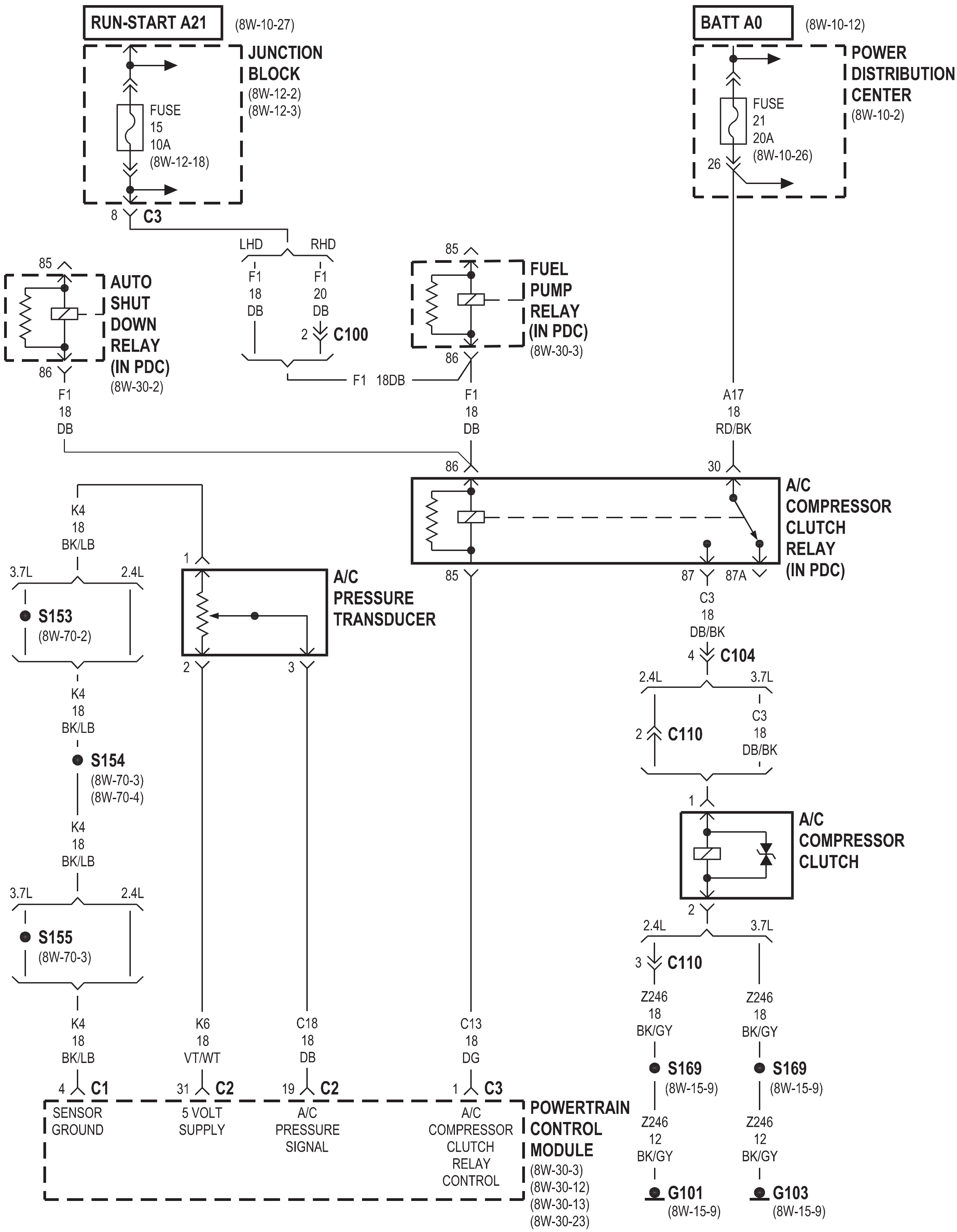
8W-42 AIR CONDITIONING-HEATER


RUN A22
(8W-10-29)
BATT A4
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
DEFOGGER RELAY
(8W-48-2)
87A
87
FUSE 25 10A
(8W-12-25)
FUSE 30 10A
(8W-12-27)
• 29 •• 28 C1
• 28 •• 29 C1
34 C1
V23 20 BR/PK
C16 20 LB/YL
2 C2
12 C2
A/C-HEATER CONTROL
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
MODE DOOR DRIVER (A)
GROUND
8 C2
1 C2
Z12 20 BK/TN
S200
(8W-15-12)
Z12 16 BK/TN
Z12 18 BK/TN
V23 20 BR/PK
C35 20 DG/YL
1
3
2
1
G202
(8W-15-12)
BLEND DOOR ACTUATOR
M
• LHD
•• RHD

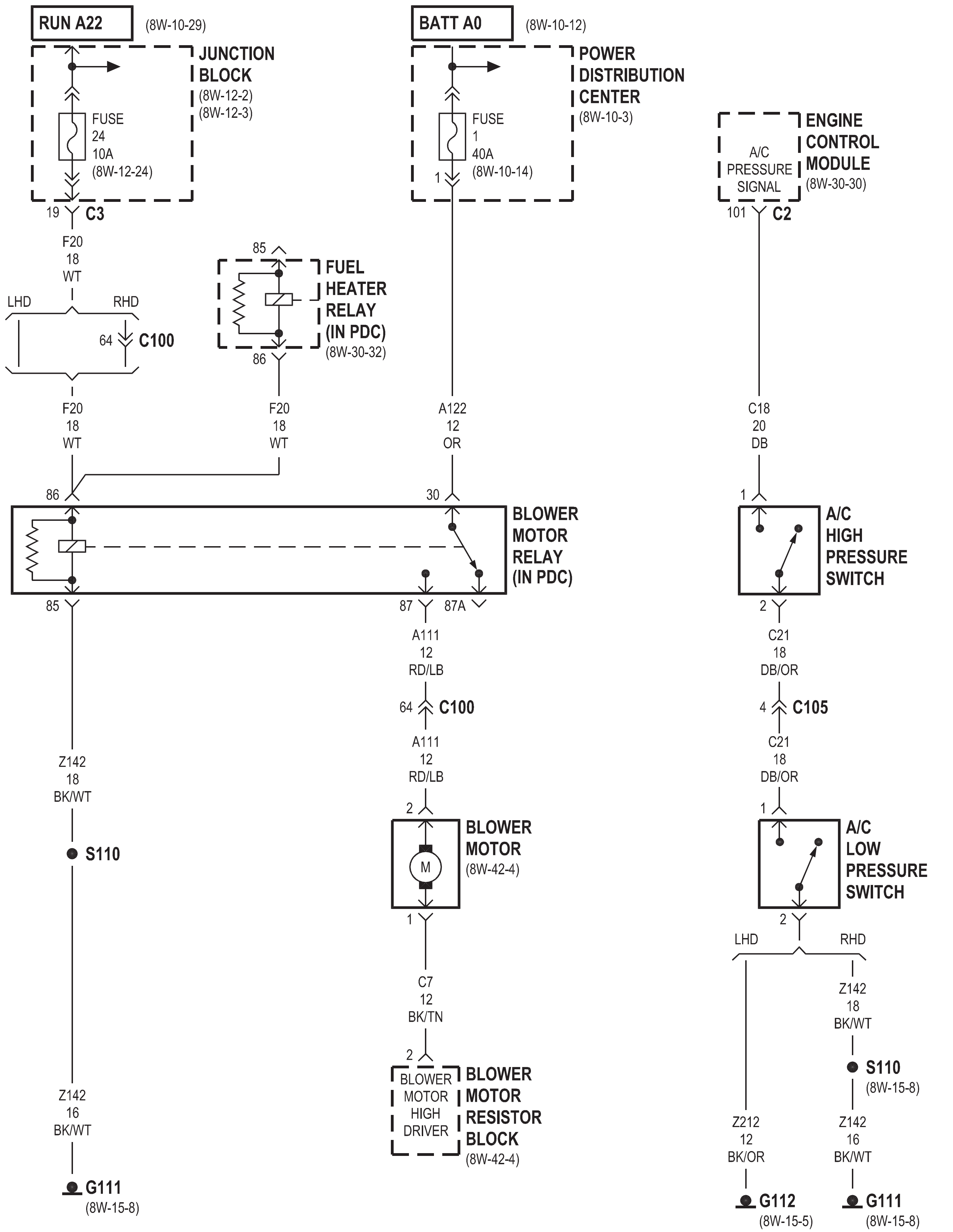

RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
24
10A
(8W-12-24)
19 C3
LHD
RHD
F20
18
WT
54 C100
F20
18
WT
F20
18
WT
86
85
Z142
18
BK/WT
S110
(8W-15-8)
Z142
16
BK/WT
G111
(8W-15-8)
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
1
40A
(8W-10-14)
1
A122
12
OR
30
BLOWER MOTOR RELAY (IN PDC)
87
87A
A111
12
RD/LB
64 C100
A111
12
RD/LB
2
BLOWER MOTOR
(8W-42-4)
M
1
C7
12
BK/TN
2
BLOWER MOTOR HIGH DRIVER
BLOWER MOTOR RESISTOR BLOCK
(8W-42-4)
POWERTRAIN CONTROL MODULE
(8W-30-8)
A/C SWITCH SENSE
22 C3
C21
18
DB/OR
1
A/C LOW PRESSURE SWITCH
2
LHD
RHD
Z142
18
BK/WT
S110
(8W-15-8)
Z212
12
BK/OR
Z142
16
BK/WT
G112
(8W-15-5)
G111
(8W-15-8)


BATT A122
(8W-10-14)
BLOWER MOTOR RELAY (IN PDC)
(8W-42-3)
87
A111
12
RD/LB
64
C100
A111
12
RD/LB
INSTRUMENT CLUSTER
(8W-40-2)
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
12
E2
20
OR
BLOWER MOTOR RESISTOR BLOCK
LOW
MED1
MED2
HIGH IN
HIGH OUT
5
4
3
1
2
2
BLOWER MOTOR
M
1
5
11
C1
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
5
11
C1
C7
12
BK/TN
BODY CONTROL MODULE
(8W-45-5)
A/C ON/OFF CONTROL
REAR WINDOW DEFOGGER CONTROL
24 C1
23 C1
E2
20
OR
LIGHT BAR
EXCEPT LIGHT BAR
S230
(8W-12-34)
C4
14
TN
C5
14
LG
C6
12
LB
C7
12
BK/TN
C19
18
BR
C79
20
VT/BK
E2
20
OR
5 C1
4 C1
3 C1
2 C1
6 C1
6 C2
7 C1
A/C-HEATER CONTROL
BLOWER MOTOR LOW DRIVER
BLOWER MOTOR M1 DRIVER
BLOWER MOTOR M2 DRIVER
BLOWER MOTOR HIGH DRIVER
A/C ON/OFF CONTROL
REAR WINDOW DEFOGGER CONTROL
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
GROUND
1 C1
Z8
12
BK/VT
G203
(8W-15-11)
• LHD
•• RHD

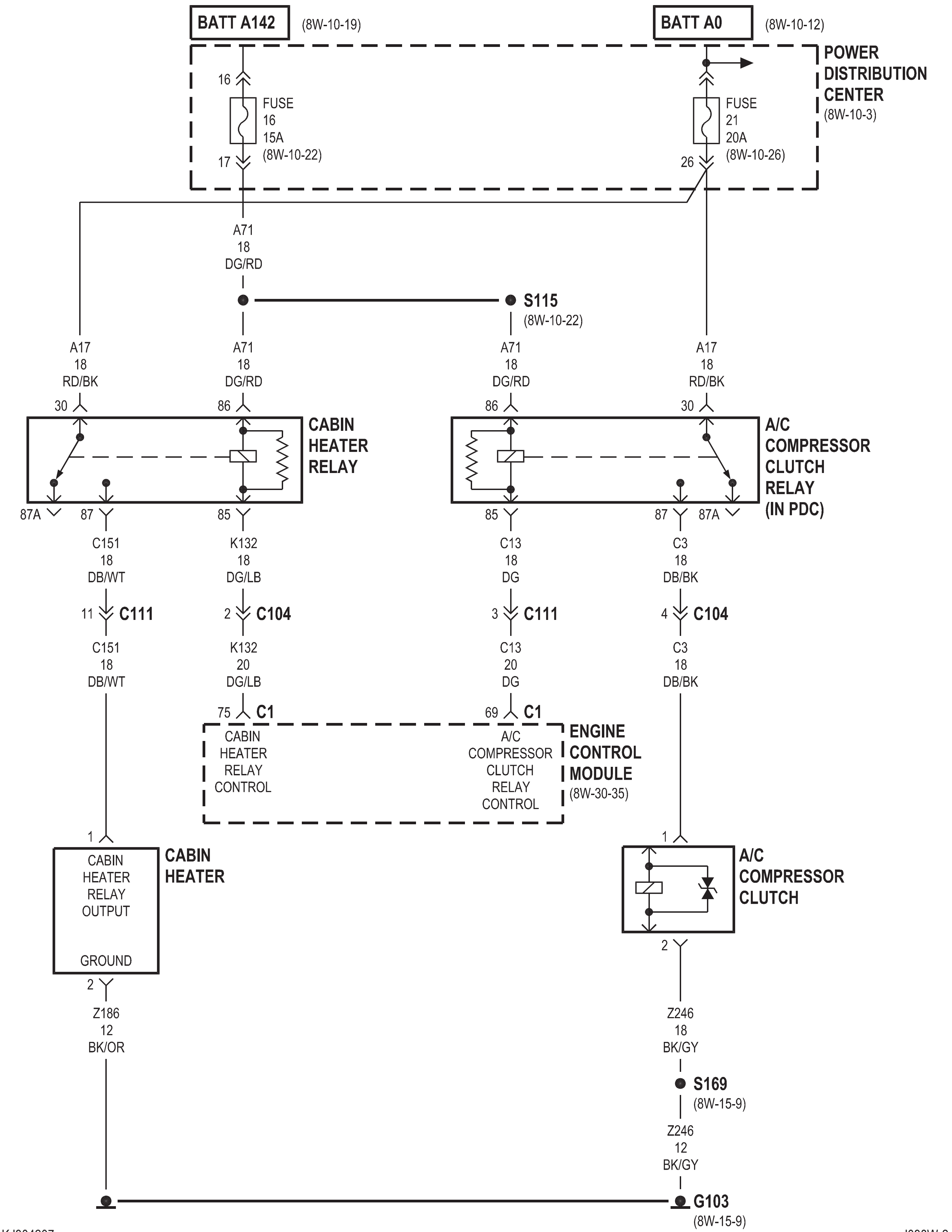
GAS


RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
15
10A
(8W-12-18)
8 C3
LHD
RHD
F1
18
DB
F1
20
DB
2 C100
F1 18DB
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
21
20A
(8W-10-26)
26
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-2)
85
86
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
A17
18
RD/BK
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
87
87A
C3
18
DB/BK
4 C104
2.4L
3.7L
2 C110
A/C COMPRESSOR CLUTCH
3 C110
Z246
18
BK/GY
S169
(8W-15-9)
Z246
12
BK/GY
G101
(8W-15-9)
G103
(8W-15-9)
K4
18
BK/LB
S153
(8W-70-2)
S154
(8W-70-3)
(8W-70-4)
S155
(8W-70-3)
A/C PRESSURE TRANSDUCER
1
2
3
K6
18
VT/WT
C18
18
DB
C13
18
DG
4 C1
31 C2
19 C2
1 C3
SENSOR GROUND
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
A/C COMPRESSOR CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-3)
(8W-30-12)
(8W-30-13)
(8W-30-23)

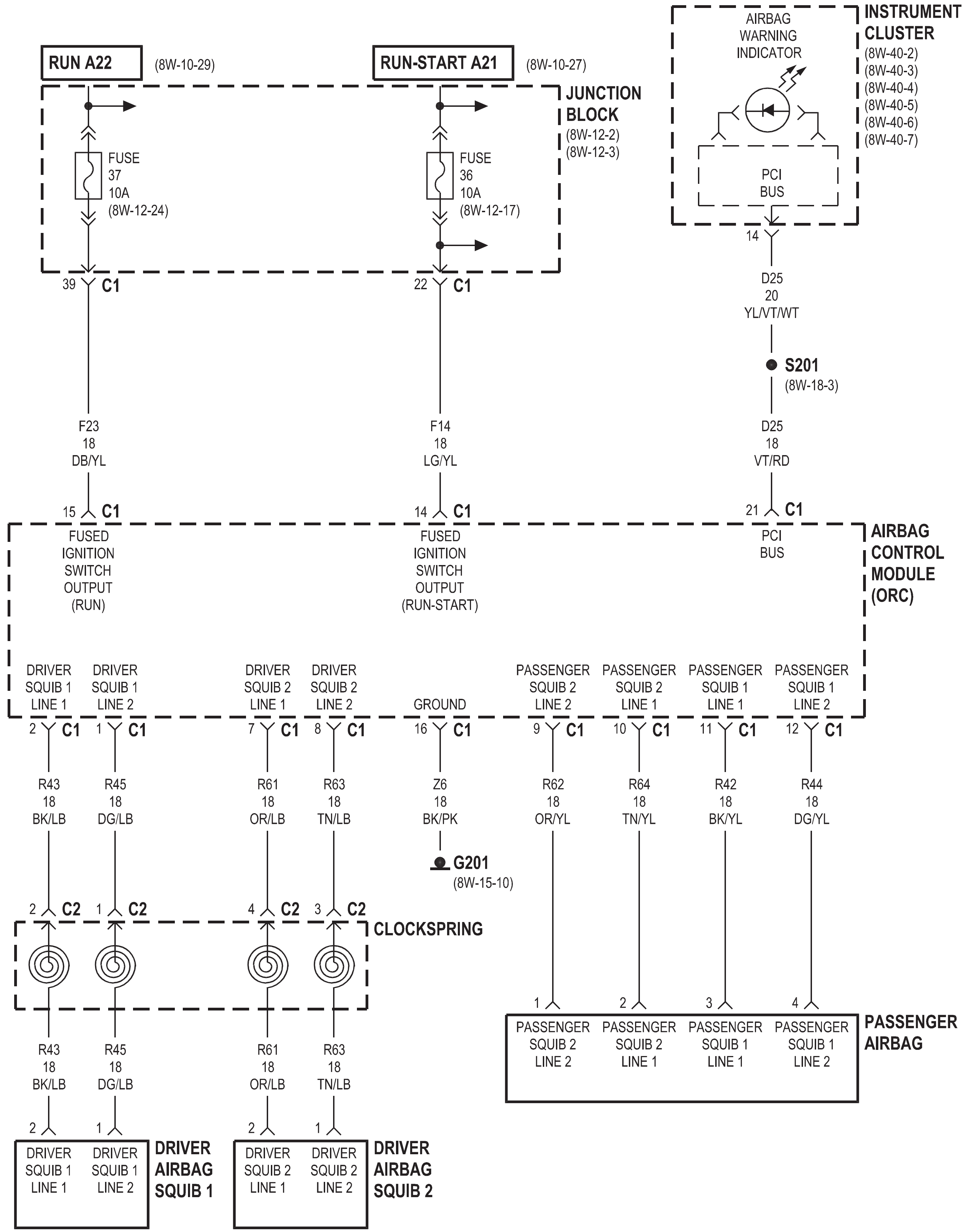
DIESEL

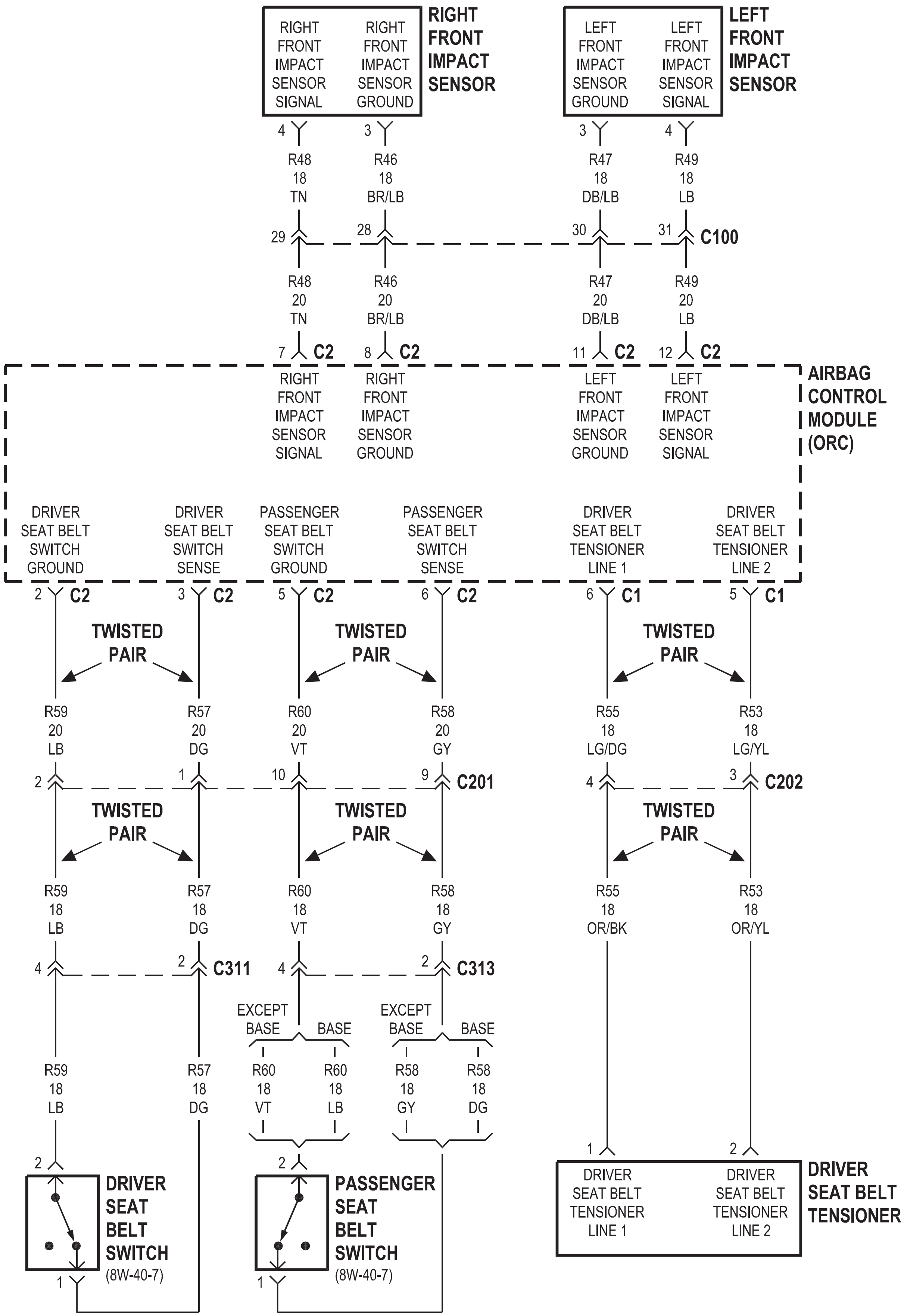

RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
24
10A
(8W-12-24)
19
C3
F20
18
WT
LHD
RHD
64
C100
F20
18
WT
85
FUEL HEATER RELAY (IN PDC)
(8W-30-32)
86
F20
18
WT
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE
1
40A
(8W-10-14)
1
A122
12
OR
ENGINE CONTROL MODULE
(8W-30-30)
A/C PRESSURE SIGNAL
101
C2
C18
20
DB
86
30
BLOWER MOTOR RELAY (IN PDC)
85
87
87A
A111
12
RD/LB
64
C100
A111
12
RD/LB
2
BLOWER MOTOR
(8W-42-4)
M
1
C7
12
BK/TN
2
BLOWER MOTOR HIGH DRIVER
BLOWER MOTOR RESISTOR BLOCK
(8W-42-4)
Z142
18
BK/WT
S110
Z142
16
BK/WT
G111
(8W-15-8)
1
A/C HIGH PRESSURE SWITCH
2
C21
18
DB/OR
4
C105
C21
18
DB/OR
1
A/C LOW PRESSURE SWITCH
2
LHD
RHD
Z142
18
BK/WT
S110
(8W-15-8)
Z212
12
BK/OR
Z142
16
BK/WT
G112
(8W-15-5)
G111
(8W-15-8)

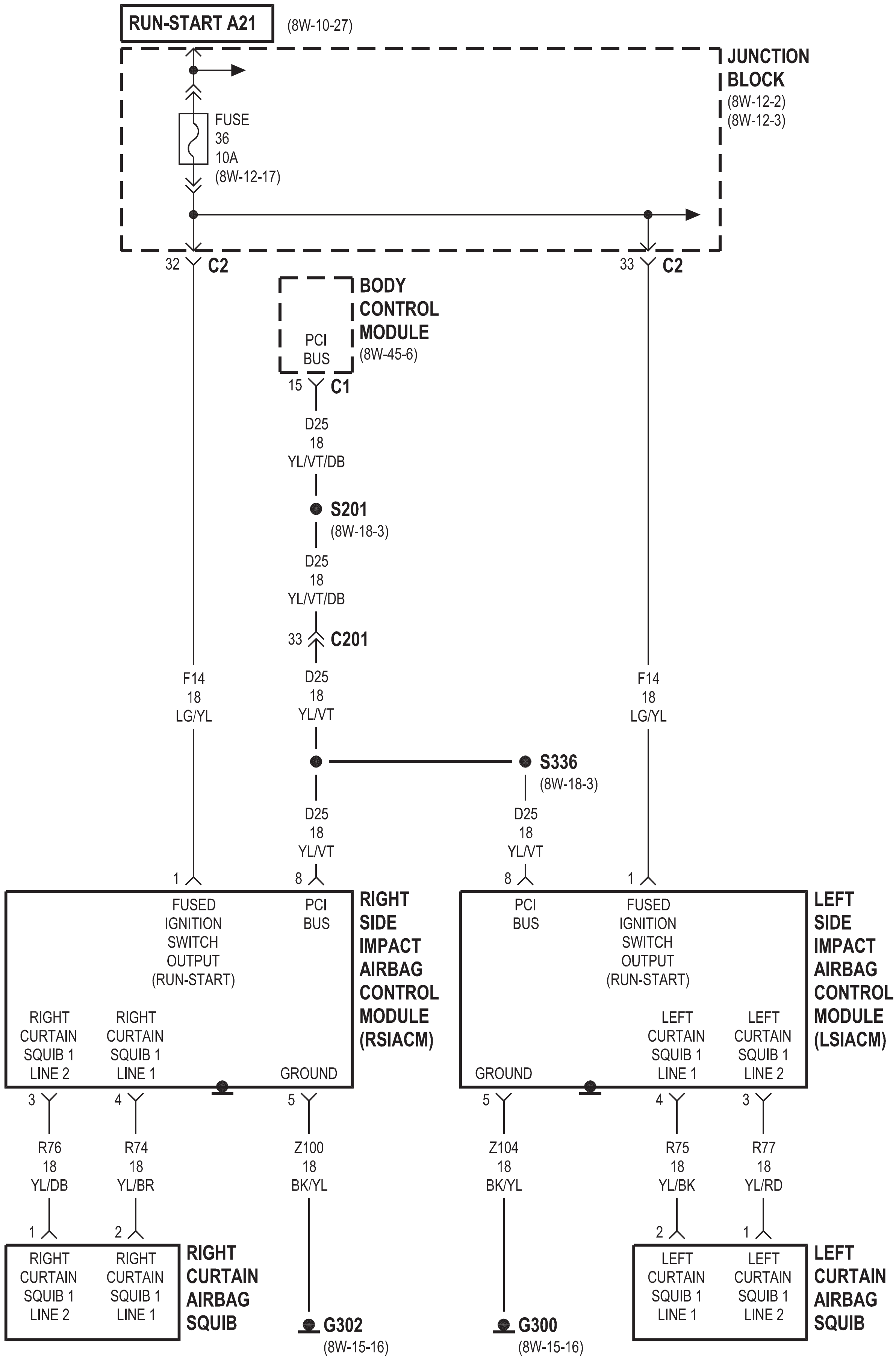
DIESEL


BATT A142
(8W-10-19)
BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-3)
16
FUSE
16
15A
(8W-10-22)
17
FUSE
21
20A
(8W-10-26)
26
A71
18
DG/RD
S115
(8W-10-22)
A17
18
RD/BK
30
86
CABIN
HEATER
RELAY
A/C
COMPRESSOR
CLUTCH
RELAY
(IN PDC)
87A
87
85
C151
18
DB/WT
K132
18
DG/LB
C13
18
DG
C3
18
DB/BK
11
C111
2
C104
3
4
C151
18
DB/WT
K132
20
DG/LB
C13
20
DG
C3
18
DB/BK
75
C1
69
CABIN
HEATER
RELAY
CONTROL
A/C
COMPRESSOR
CLUTCH
RELAY
CONTROL
ENGINE
CONTROL
MODULE
(8W-30-35)
1
CABIN
HEATER
RELAY
OUTPUT
GROUND
CABIN
HEATER
2
Z186
12
BK/OR
A/C
COMPRESSOR
CLUTCH
Z246
18
BK/GY
S169
(8W-15-9)
Z246
12
BK/GY
G103
(8W-15-9)

8W-43 AIRBAG SYSTEM

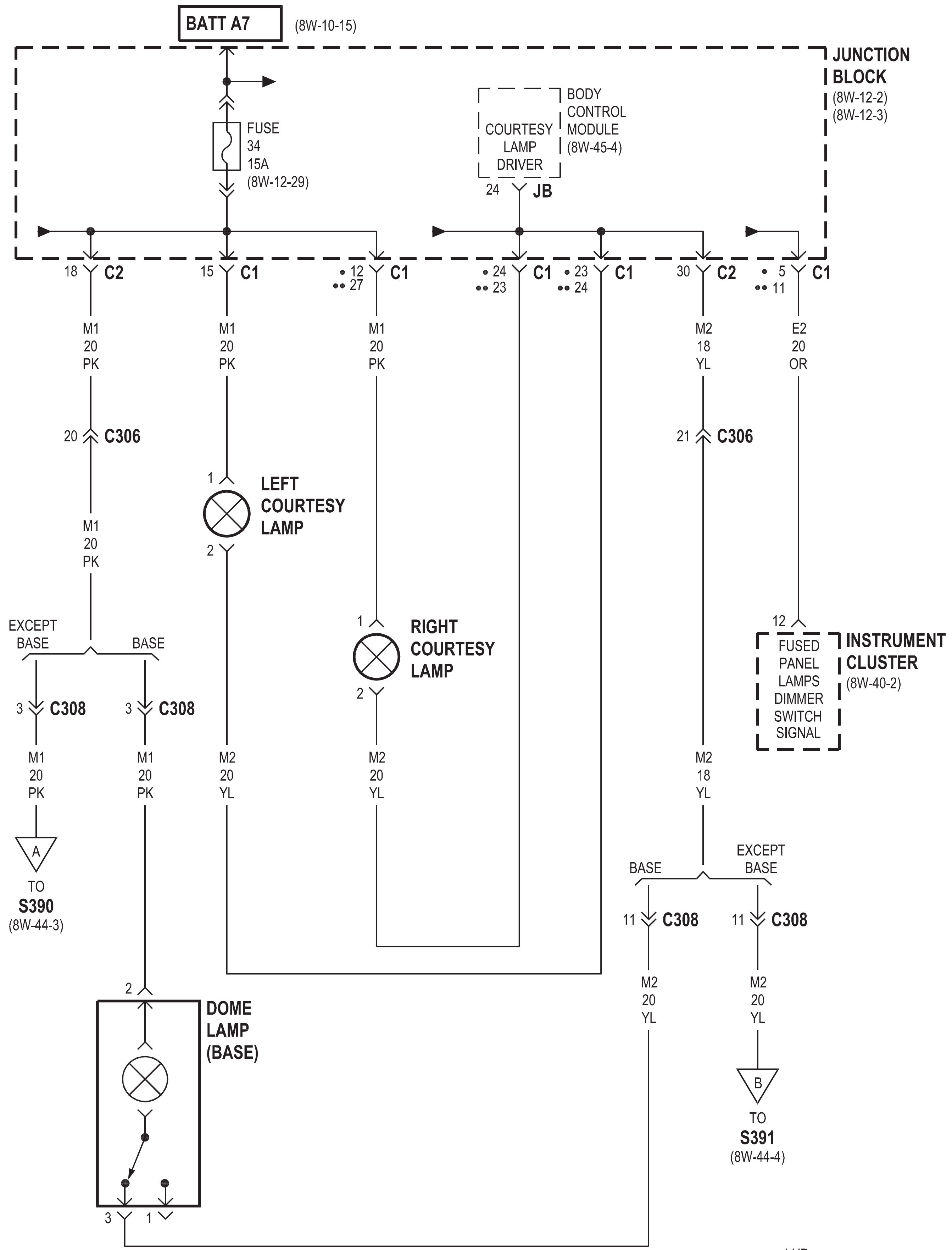

RUN A22
(8W-10-29)
RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 37 10A (8W-12-24)
FUSE 36 10A (8W-12-17)
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-3)
(8W-40-4)
(8W-40-5)
(8W-40-6)
(8W-40-7)
AIRBAG WARNING INDICATOR
PCI BUS
14
D25 20 YL/VT/WT
S201
(8W-18-3)
D25 18 VT/RD
39 C1
22 C1
F23 18 DB/YL
F14 18 LG/YL
15 C1
14 C1
21 C1
AIRBAG CONTROL MODULE (ORC)
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
DRIVER SQUIB 2 LINE 1
DRIVER SQUIB 2 LINE 2
GROUND
PASSENGER SQUIB 2 LINE 2
PASSENGER SQUIB 2 LINE 1
PASSENGER SQUIB 1 LINE 1
PASSENGER SQUIB 1 LINE 2
2 C1
1 C1
7 C1
8 C1
16 C1
9 C1
10 C1
11 C1
12 C1
R43 18 BK/LB
R45 18 DG/LB
R61 18 OR/LB
R63 18 TN/LB
Z6 18 BK/PK
R62 18 OR/YL
R64 18 TN/YL
R42 18 BK/YL
R44 18 DG/YL
G201
(8W-15-10)
2 C2
1 C2
4 C2
3 C2
CLOCKSPRING
R43 18 BK/LB
R45 18 DG/LB
R61 18 OR/LB
R63 18 TN/LB
1
2
3
4
PASSENGER SQUIB 2 LINE 2
PASSENGER SQUIB 2 LINE 1
PASSENGER SQUIB 1 LINE 1
PASSENGER SQUIB 1 LINE 2
PASSENGER AIRBAG
2
1
2
1
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
DRIVER AIRBAG SQUIB 1
DRIVER SQUIB 2 LINE 1
DRIVER SQUIB 2 LINE 2
DRIVER AIRBAG SQUIB 2

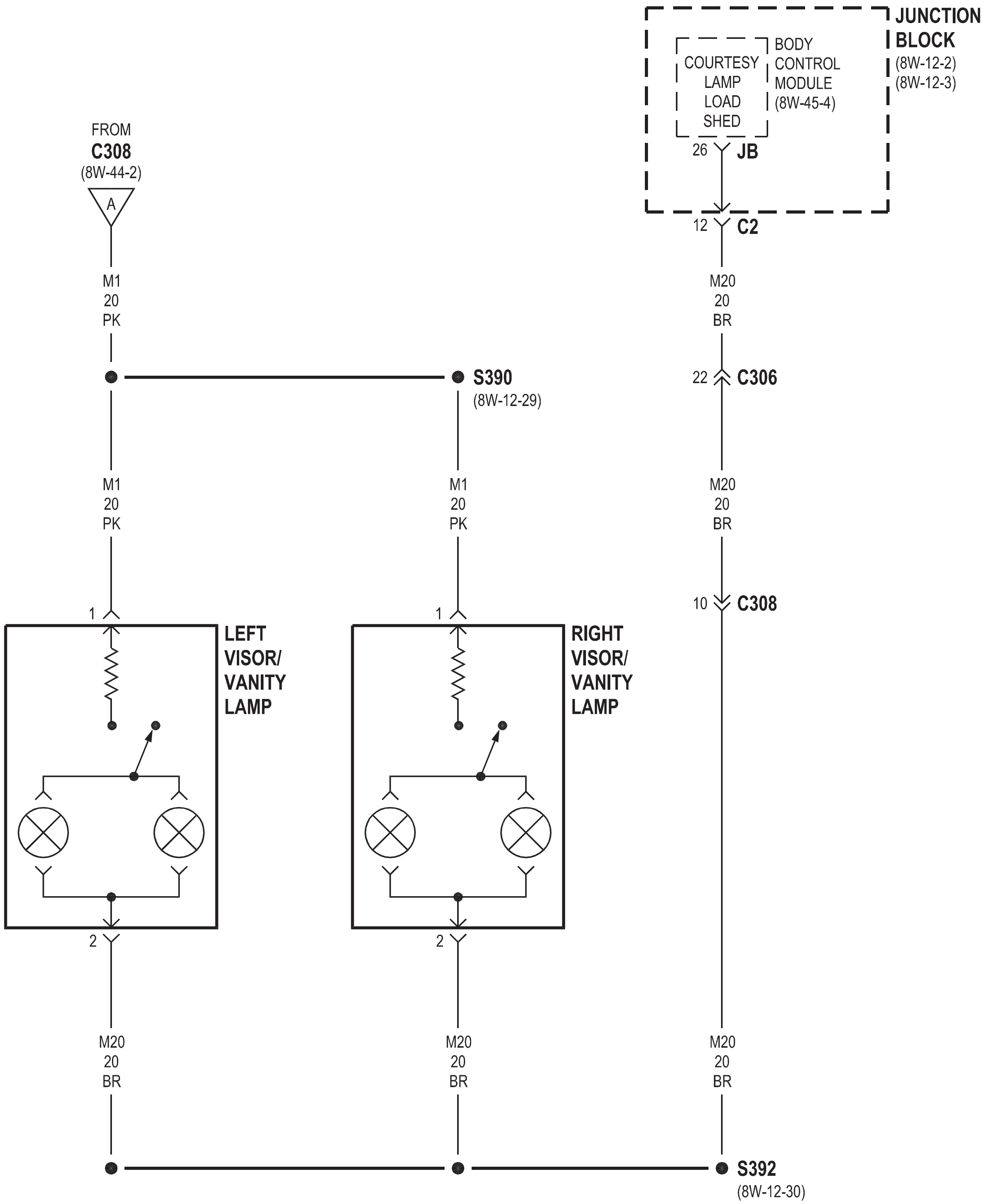

RIGHT FRONT IMPACT SENSOR SIGNAL
RIGHT FRONT IMPACT SENSOR GROUND
RIGHT FRONT IMPACT SENSOR
LEFT FRONT IMPACT SENSOR GROUND
LEFT FRONT IMPACT SENSOR SIGNAL
LEFT FRONT IMPACT SENSOR
4
3
3
4
R48 18 TN
R46 18 BR/LB
R47 18 DB/LB
R49 18 LB
29
28
30
31
C100
R48 20 TN
R46 20 BR/LB
R47 20 DB/LB
R49 20 LB
7 C2
8 C2
11 C2
12 C2
RIGHT FRONT IMPACT SENSOR SIGNAL
RIGHT FRONT IMPACT SENSOR GROUND
LEFT FRONT IMPACT SENSOR GROUND
LEFT FRONT IMPACT SENSOR SIGNAL
AIRBAG CONTROL MODULE (ORC)
DRIVER SEAT BELT SWITCH GROUND
DRIVER SEAT BELT SWITCH SENSE
PASSENGER SEAT BELT SWITCH GROUND
PASSENGER SEAT BELT SWITCH SENSE
DRIVER SEAT BELT TENSIONER LINE 1
DRIVER SEAT BELT TENSIONER LINE 2
2 C2
3 C2
5 C2
6 C2
6 C1
5 C1
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
R59 20 LB
R57 20 DG
R60 20 VT
R58 20 GY
R55 18 LG/DG
R53 18 LG/YL
2
1
10
9
C201
4
3
C202
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
R59 18 LB
R57 18 DG
R60 18 VT
R58 18 GY
R55 18 OR/BK
R53 18 OR/YL
4
2
C311
4
2
C313
EXCEPT BASE
BASE
EXCEPT BASE
BASE
R59 18 LB
R57 18 DG
R60 18 VT
R60 18 LB
R58 18 GY
R58 18 DG
2
DRIVER SEAT BELT SWITCH
(8W-40-7)
1
2
PASSENGER SEAT BELT SWITCH
(8W-40-7)
1
1
2
DRIVER SEAT BELT TENSIONER LINE 1
DRIVER SEAT BELT TENSIONER LINE 2
DRIVER SEAT BELT TENSIONER

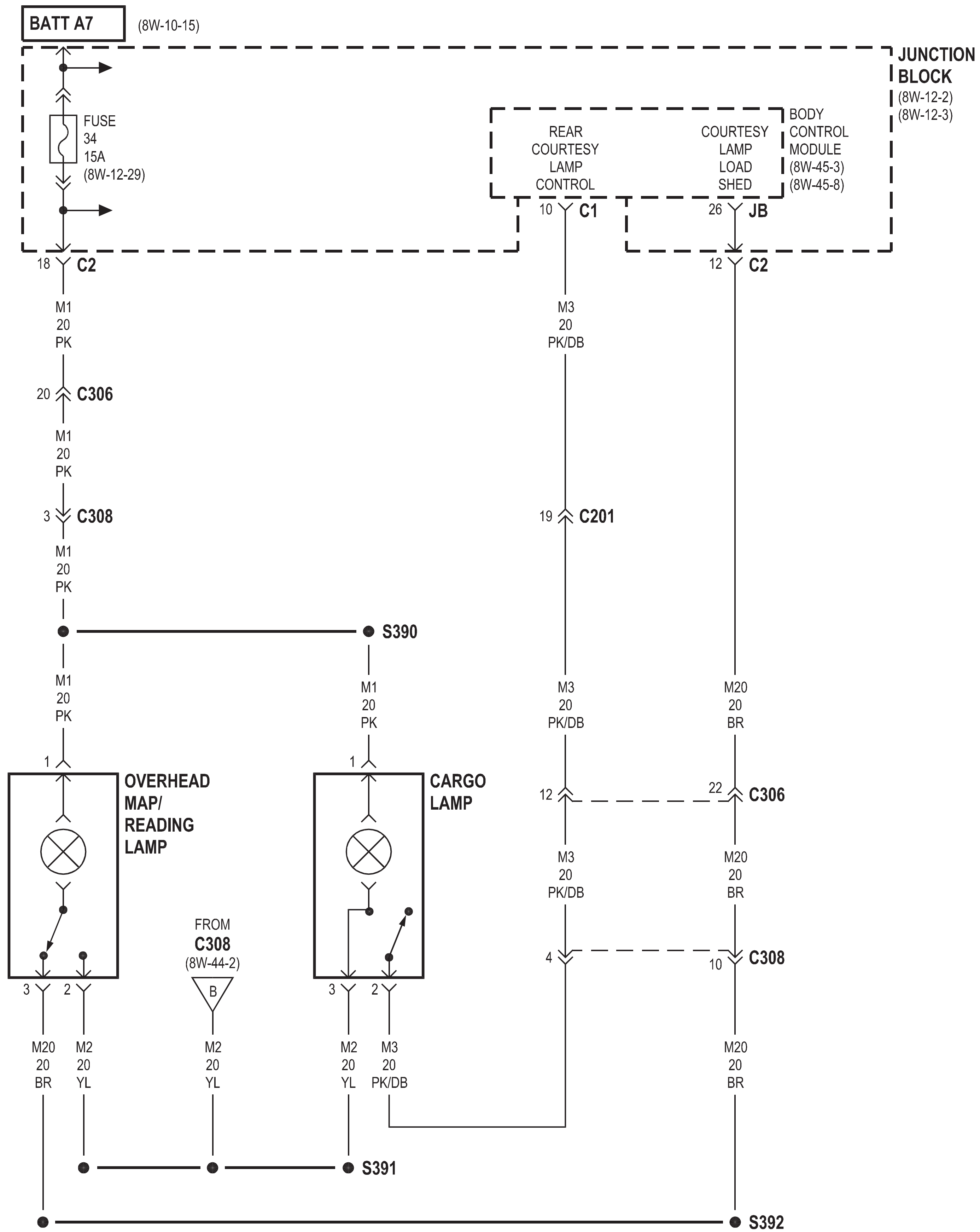


RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
36
10A
(8W-12-17)
32 C2
33 C2
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
D25
18
YL/VT/DB
S201
(8W-18-3)
D25
18
YL/VT/DB
33 C201
D25
18
YL/VT
F14
18
LG/YL
F14
18
LG/YL
S336
(8W-18-3)
D25
18
YL/VT
D25
18
YL/VT
1
8
8
1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE (RSIACM)
RIGHT CURTAIN SQUIB 1 LINE 2
RIGHT CURTAIN SQUIB 1 LINE 1
GROUND
PCI BUS
FUSED IGNITION SWITCH OUTPUT (RUN-START)
LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM)
GROUND
LEFT CURTAIN SQUIB 1 LINE 1
LEFT CURTAIN SQUIB 1 LINE 2
3
4
5
5
4
3
R76
18
YL/DB
R74
18
YL/BR
Z100
18
BK/YL
Z104
18
BK/YL
R75
18
YL/BK
R77
18
YL/RD
1
2
2
1
RIGHT CURTAIN SQUIB 1 LINE 2
RIGHT CURTAIN SQUIB 1 LINE 1
RIGHT CURTAIN AIRBAG SQUIB
G302
(8W-15-16)
G300
(8W-15-16)
LEFT CURTAIN SQUIB 1 LINE 1
LEFT CURTAIN SQUIB 1 LINE 2
LEFT CURTAIN AIRBAG SQUIB

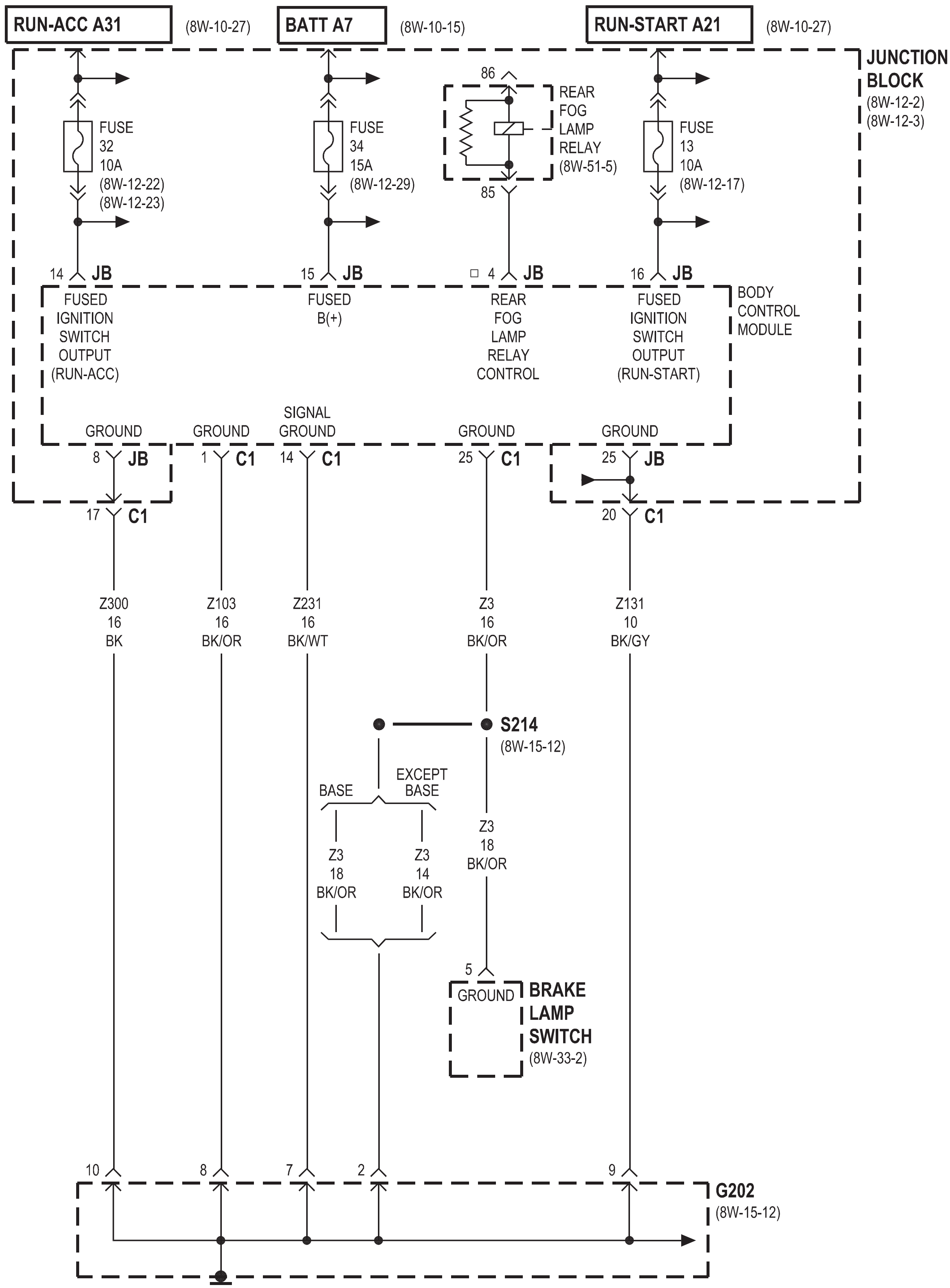
8W-44 INTERIOR LIGHTING


BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
COURTESY LAMP DRIVER
BODY CONTROL MODULE
(8W-45-4)
24
JB
18 C2
15 C1
• 12
•• 27
C1
• 24
•• 23
C1
• 23
•• 24
C1
30 C2
• 5
•• 11
C1
M1 20 PK
M1 20 PK
M1 20 PK
M2 18 YL
E2 20 OR
20 C306
21 C306
1
LEFT COURTESY LAMP
2
M1 20 PK
EXCEPT BASE
BASE
1
RIGHT COURTESY LAMP
2
12
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
INSTRUMENT CLUSTER
(8W-40-2)
3 C308
3 C308
M1 20 PK
M1 20 PK
M2 20 YL
M2 20 YL
M2 18 YL
A
TO
S390
(8W-44-3)
BASE
EXCEPT BASE
11 C308
11 C308
M2 20 YL
M2 20 YL
2
DOME LAMP (BASE)
B
TO
S391
(8W-44-4)
3
1
• LHD
•• RHD


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COURTESY LAMP LOAD SHED
BODY CONTROL MODULE
(8W-45-4)
26
JB
12
C2
FROM
C308
(8W-44-2)
A
M1
20
PK
M20
20
BR
S390
(8W-12-29)
22
C306
M1
20
PK
M1
20
PK
M20
20
BR
10
C308
1
1
LEFT VISOR/ VANITY LAMP
RIGHT VISOR/ VANITY LAMP
2
2
M20
20
BR
M20
20
BR
M20
20
BR
S392
(8W-12-30)

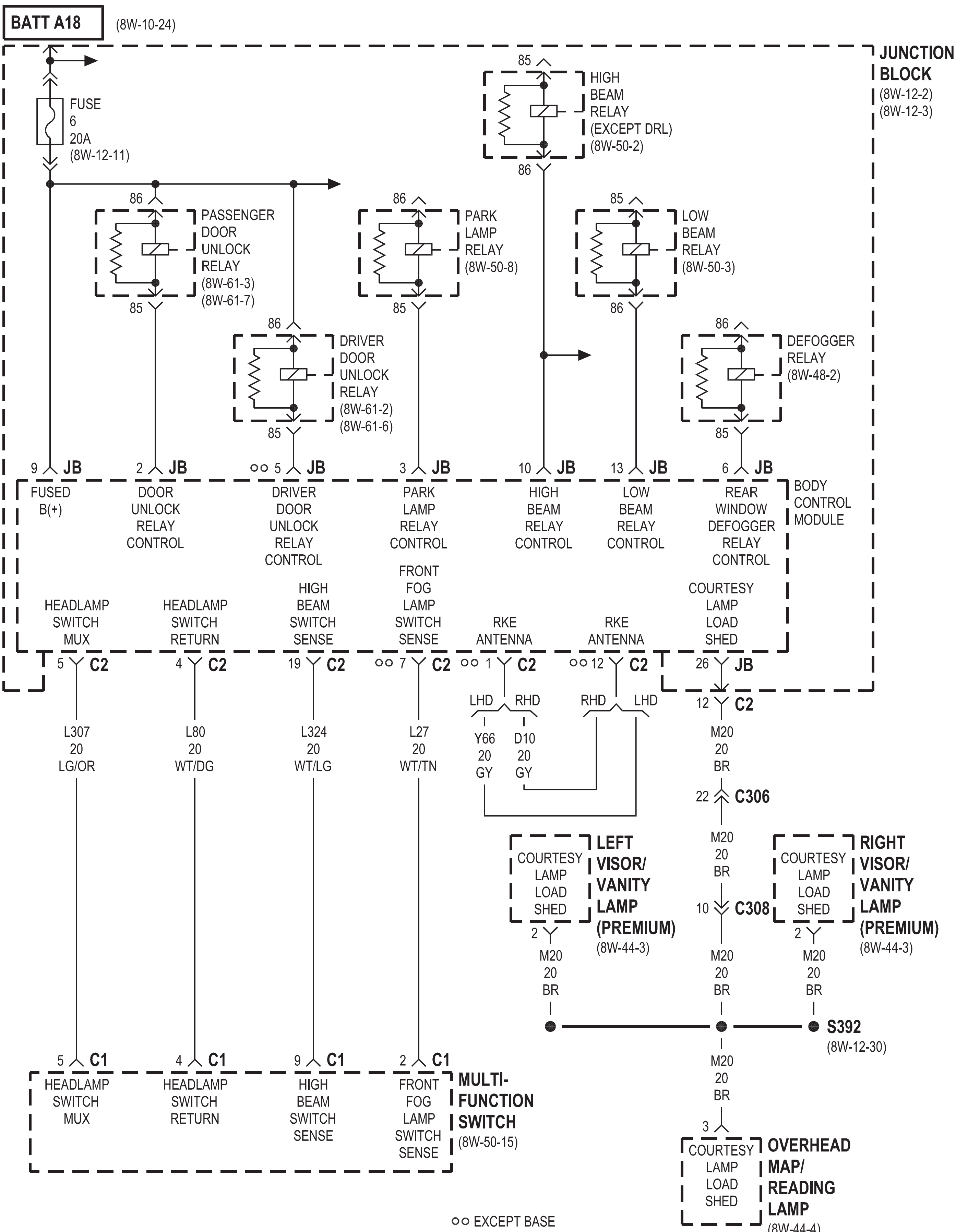

BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
REAR COURTESY LAMP CONTROL
COURTESY LAMP LOAD SHED
BODY CONTROL MODULE
(8W-45-3)
(8W-45-8)
10 C1
26 JB
18 C2
12 C2
M1 20 PK
20 C306
3 C308
M3 20 PK/DB
19 C201
S390
M20 20 BR
1
OVERHEAD MAP/ READING LAMP
CARGO LAMP
12
22 C306
4
10 C308
3
2
FROM C308 (8W-44-2)
B
M2 20 YL
M3 20 PK/DB
S391
S392

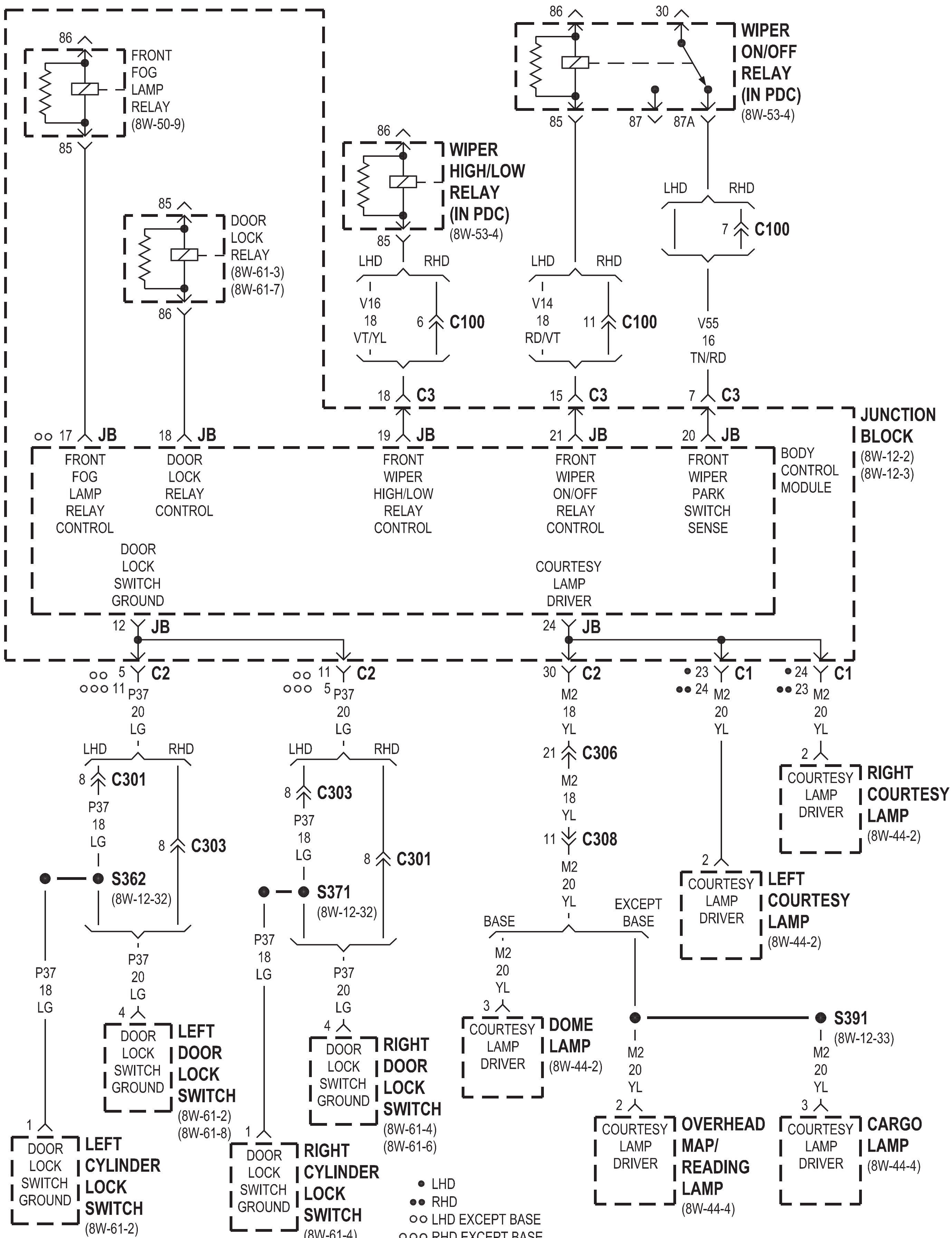
8W-45 BODY CONTROL MODULE



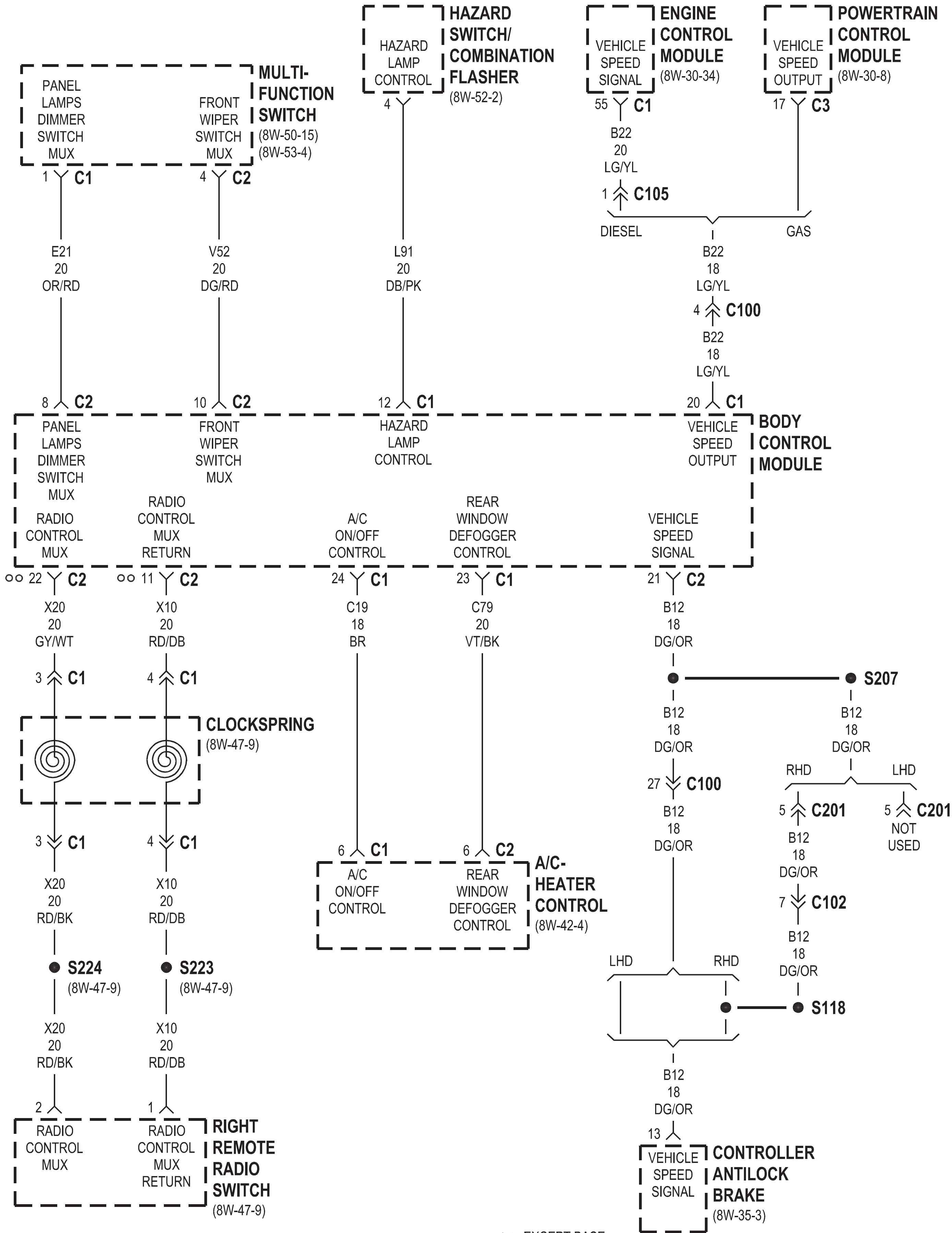
RUN-ACC A31
(8W-10-27)
BATT A7
(8W-10-15)
RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 32 10A (8W-12-22) (8W-12-23)
FUSE 34 15A (8W-12-29)
86
REAR FOG LAMP RELAY (8W-51-5)
85
FUSE 13 10A (8W-12-17)
14 JB
15 JB
4 JB
16 JB
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
FUSED B(+)
REAR FOG LAMP RELAY CONTROL
FUSED IGNITION SWITCH OUTPUT (RUN-START)
BODY CONTROL MODULE
GROUND
GROUND
SIGNAL GROUND
GROUND
GROUND
8 JB
1 C1
14 C1
25 C1
25 JB
17 C1
20 C1
Z300 16 BK
Z103 16 BK/OR
Z231 16 BK/WT
Z3 16 BK/OR
Z131 10 BK/GY
S214
(8W-15-12)
BASE
EXCEPT BASE
Z3 18 BK/OR
Z3 14 BK/OR
Z3 18 BK/OR
5
GROUND
BRAKE LAMP SWITCH
(8W-33-2)
10
8
7
2
9
G202
(8W-15-12)

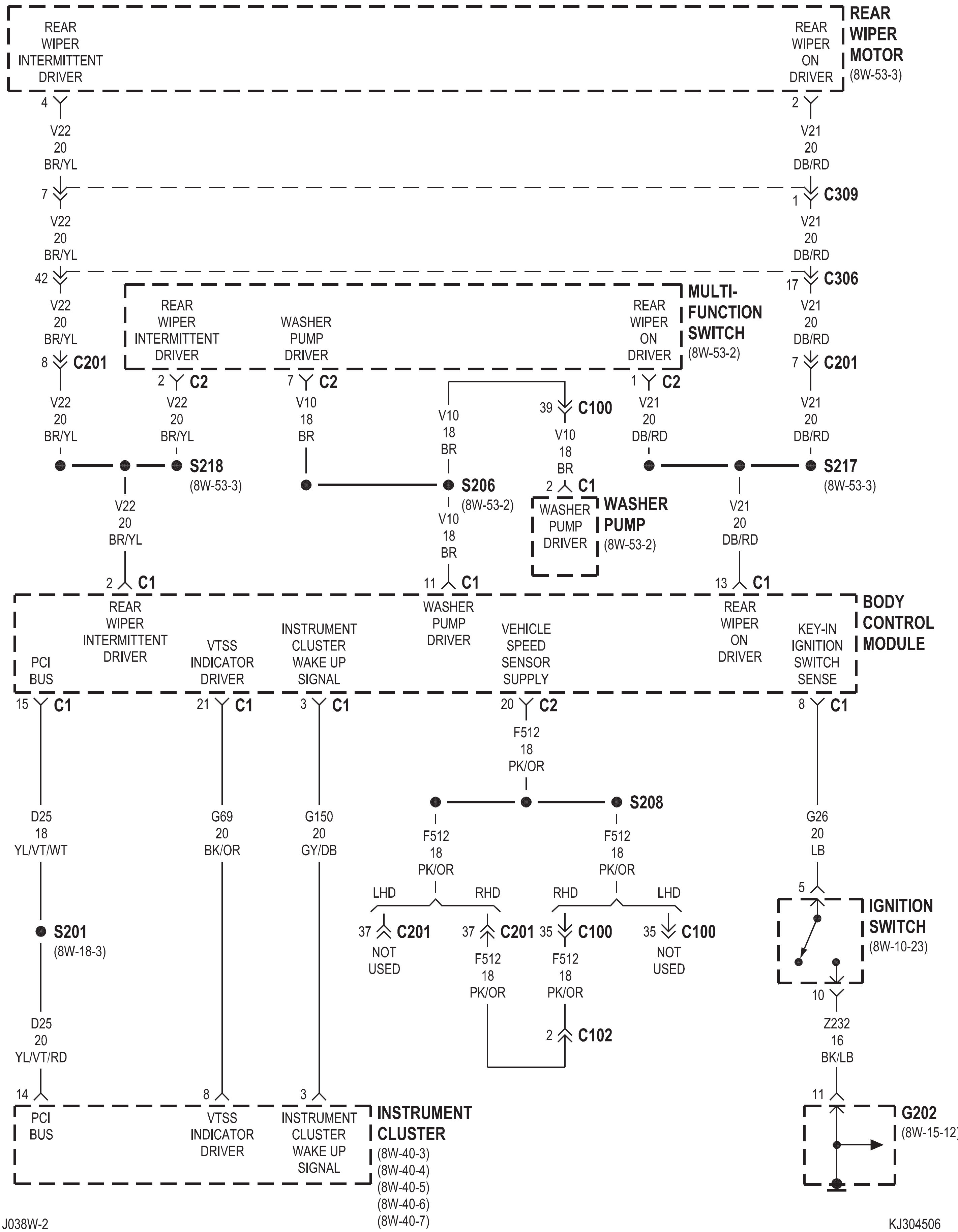
□ PREMIUM


BATT A18
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 6 20A (8W-12-11)
HIGH BEAM RELAY (EXCEPT DRL) (8W-50-2)
PASSENGER DOOR UNLOCK RELAY (8W-61-3) (8W-61-7)
PARK LAMP RELAY (8W-50-8)
LOW BEAM RELAY (8W-50-3)
DRIVER DOOR UNLOCK RELAY (8W-61-2) (8W-61-6)
DEFOGGER RELAY (8W-48-2)
BODY CONTROL MODULE
FUSED B(+)
DOOR UNLOCK RELAY CONTROL
DRIVER DOOR UNLOCK RELAY CONTROL
PARK LAMP RELAY CONTROL
HIGH BEAM RELAY CONTROL
LOW BEAM RELAY CONTROL
REAR WINDOW DEFOGGER RELAY CONTROL
HEADLAMP SWITCH MUX
HEADLAMP SWITCH RETURN
HIGH BEAM SWITCH SENSE
FRONT FOG LAMP SWITCH SENSE
RKE ANTENNA
RKE ANTENNA
COURTESY LAMP LOAD SHED
L307 20 LG/OR
L80 20 WT/DG
L324 20 WT/LG
L27 20 WT/TN
LHD RHD
Y66 20 GY
D10 20 GY
M20 20 BR
C306
C308
LEFT VISOR/ VANITY LAMP (PREMIUM) (8W-44-3)
RIGHT VISOR/ VANITY LAMP (PREMIUM) (8W-44-3)
S392 (8W-12-30)
MULTI-FUNCTION SWITCH (8W-50-15)
OVERHEAD MAP/ READING LAMP (8W-44-4)
○○ EXCEPT BASE

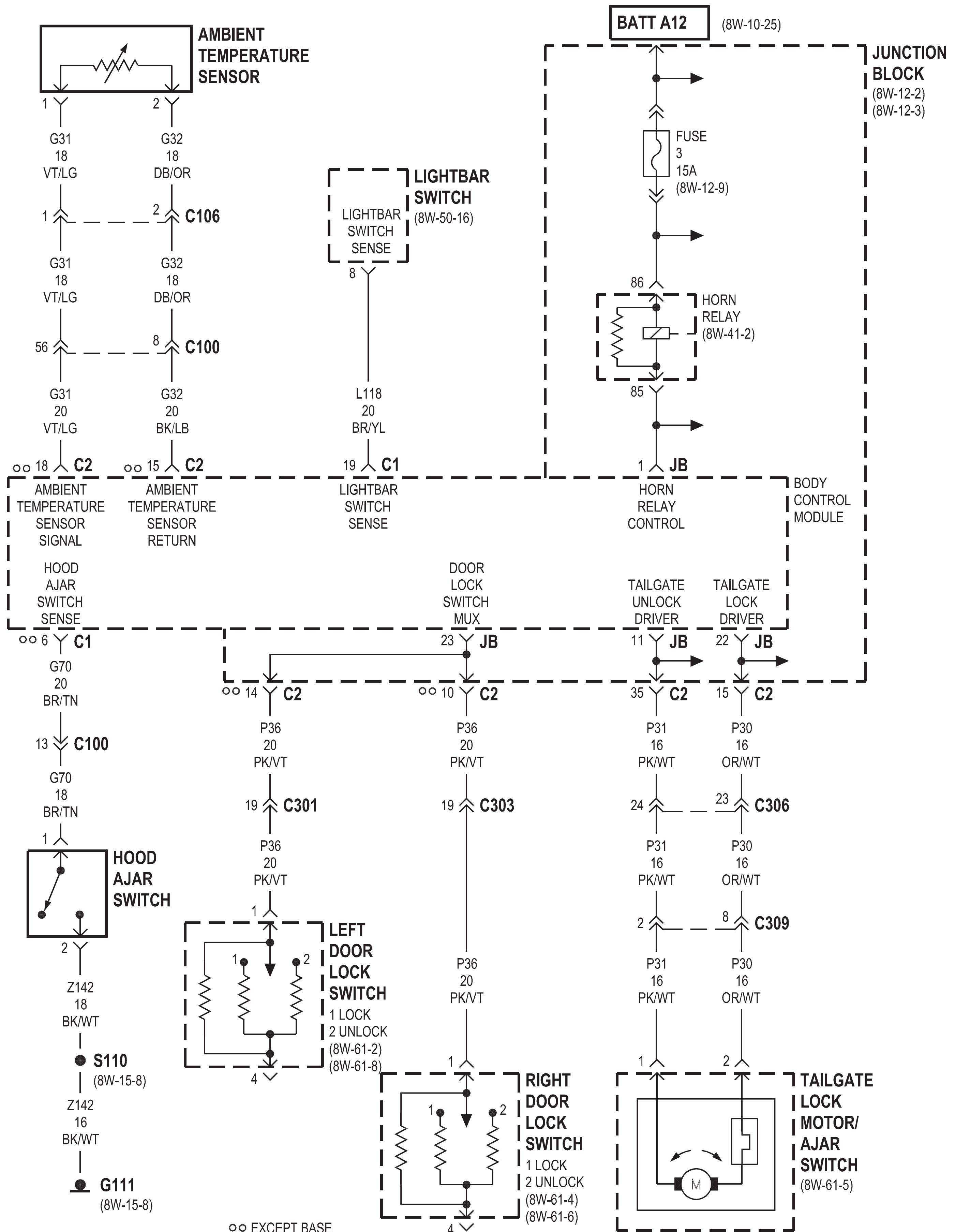


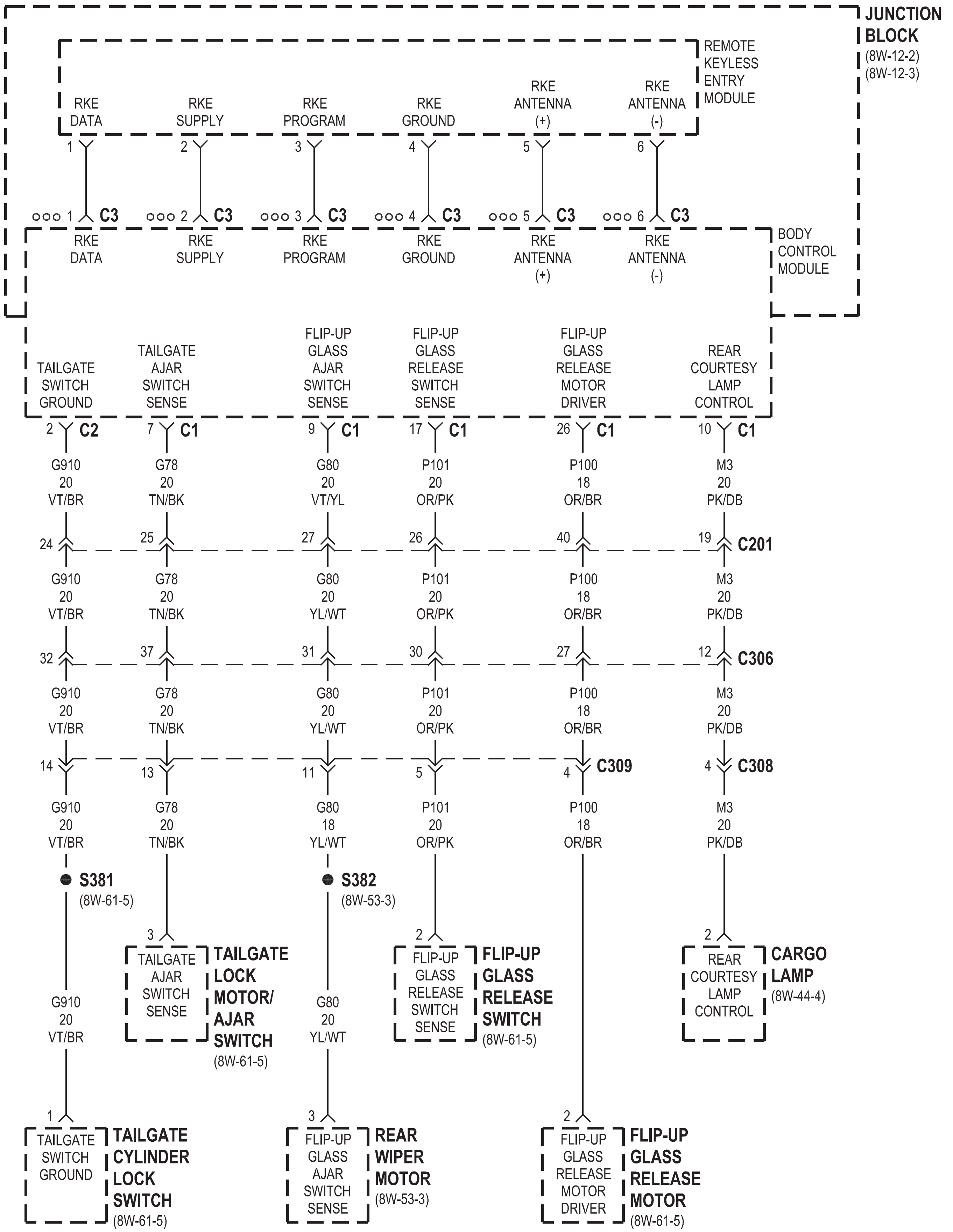
J038W-2 KJ304504

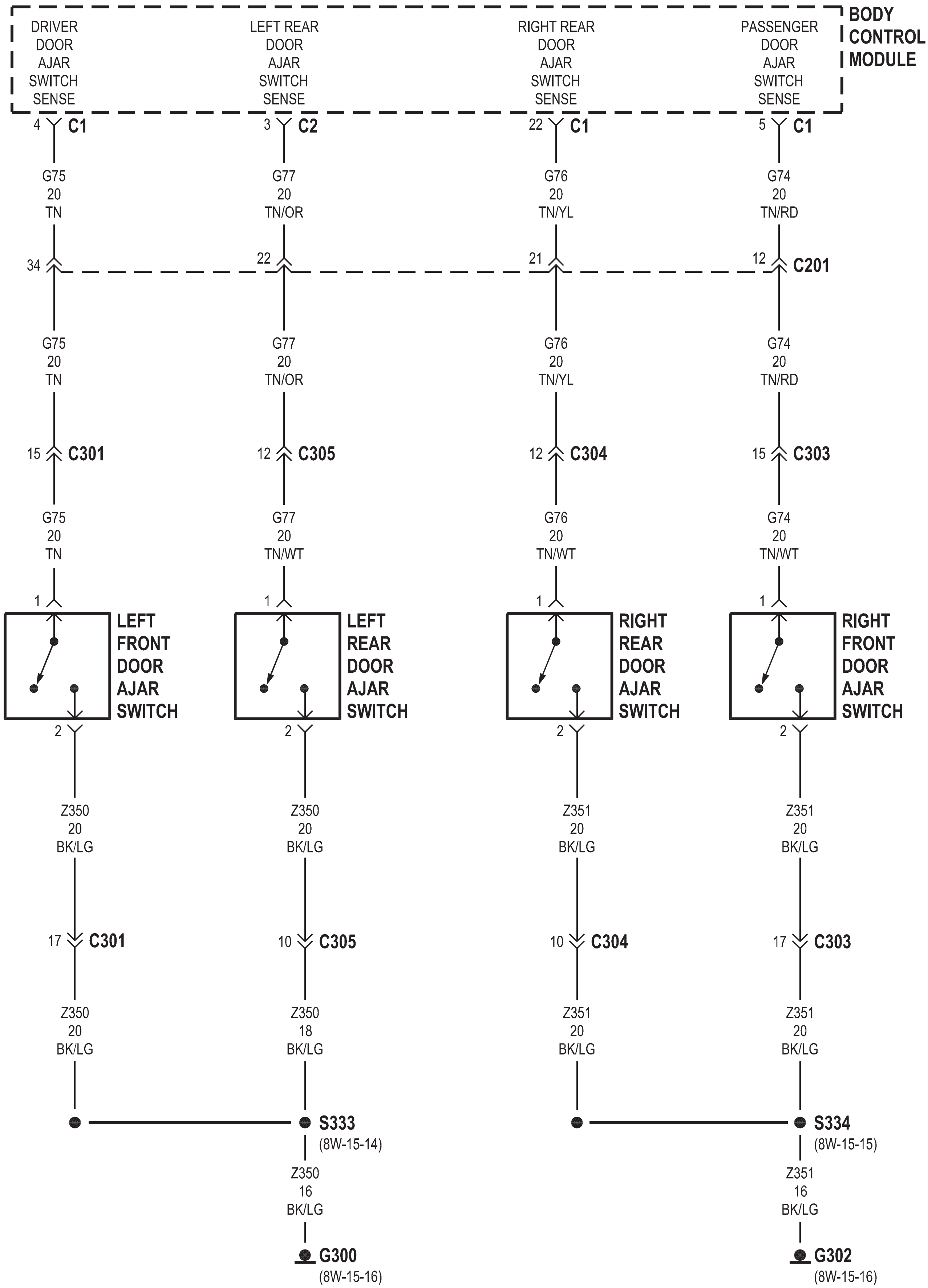

HAZARD LAMP CONTROL
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
VEHICLE SPEED SIGNAL
ENGINE CONTROL MODULE
(8W-30-34)
VEHICLE SPEED OUTPUT
POWERTRAIN CONTROL MODULE
(8W-30-8)
PANEL LAMPS DIMMER SWITCH MUX
FRONT WIPER SWITCH MUX
MULTI-FUNCTION SWITCH
(8W-50-15)
(8W-53-4)
1 C1
4 C2
4
55 C1
17 C3
B22 20 LG/YL
1 C105
DIESEL
GAS
E21 20 OR/RD
V52 20 DG/RD
L91 20 DB/PK
B22 18 LG/YL
4 C100
B22 18 LG/YL
8 C2
10 C2
12 C1
20 C1
PANEL LAMPS DIMMER SWITCH MUX
FRONT WIPER SWITCH MUX
HAZARD LAMP CONTROL
VEHICLE SPEED OUTPUT
BODY CONTROL MODULE
RADIO CONTROL MUX
RADIO CONTROL MUX RETURN
A/C ON/OFF CONTROL
REAR WINDOW DEFOGGER CONTROL
VEHICLE SPEED SIGNAL
○○ 22 C2
○○ 11 C2
24 C1
23 C1
21 C2
X20 20 GY/WT
X10 20 RD/DB
C19 18 BR
C79 20 VT/BK
B12 18 DG/OR
S207
3 C1
4 C1
CLOCKSPRING
(8W-47-9)
B12 18 DG/OR
B12 18 DG/OR
27 C100
RHD
LHD
5 C201
5 C201
NOT USED
B12 18 DG/OR
B12 18 DG/OR
3 C1
4 C1
6 C1
6 C2
A/C ON/OFF CONTROL
REAR WINDOW DEFOGGER CONTROL
A/C-HEATER CONTROL
(8W-42-4)
7 C102
X20 20 RD/BK
X10 20 RD/DB
B12 18 DG/OR
LHD
RHD
S224
(8W-47-9)
S223
(8W-47-9)
S118
X20 20 RD/BK
X10 20 RD/DB
B12 18 DG/OR
2
1
13
RADIO CONTROL MUX
RADIO CONTROL MUX RETURN
RIGHT REMOTE RADIO SWITCH
(8W-47-9)
VEHICLE SPEED SIGNAL
CONTROLLER ANTILOCK BRAKE
(8W-35-3)
○○ EXCEPT BASE



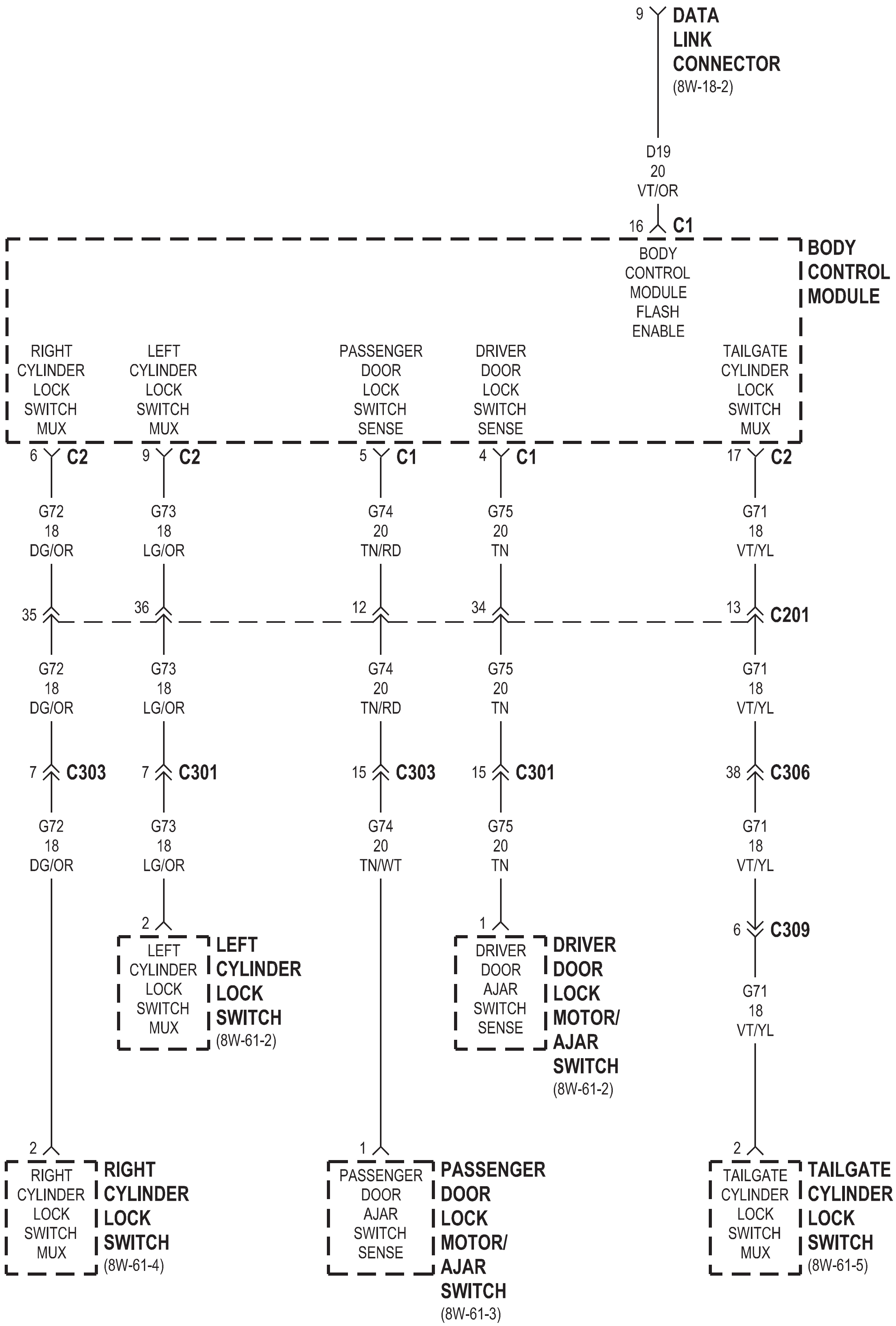
REAR WIPER INTERMITTENT DRIVER
REAR WIPER ON DRIVER
REAR WIPER MOTOR
(8W-53-3)
V22 20 BR/YL
V21 20 DB/RD
C309
C306
MULTI-FUNCTION SWITCH
(8W-53-2)
WASHER PUMP DRIVER
C201
C2
C100
V10 18 BR
S218
(8W-53-3)
S206
(8W-53-2)
S217
(8W-53-3)
WASHER PUMP
(8W-53-2)
C1
BODY CONTROL MODULE
PCI BUS
VTSS INDICATOR DRIVER
INSTRUMENT CLUSTER WAKE UP SIGNAL
VEHICLE SPEED SENSOR SUPPLY
KEY-IN IGNITION SWITCH SENSE
F512 18 PK/OR
S208
LHD
RHD
NOT USED
C102
D25 18 YL/VT/WT
S201
(8W-18-3)
D25 20 YL/VT/RD
G69 20 BK/OR
G150 20 GY/DB
G26 20 LB
IGNITION SWITCH
(8W-10-23)
Z232 16 BK/LB
G202
(8W-15-12)
INSTRUMENT CLUSTER
(8W-40-3)
(8W-40-4)
(8W-40-5)
(8W-40-6)
(8W-40-7)

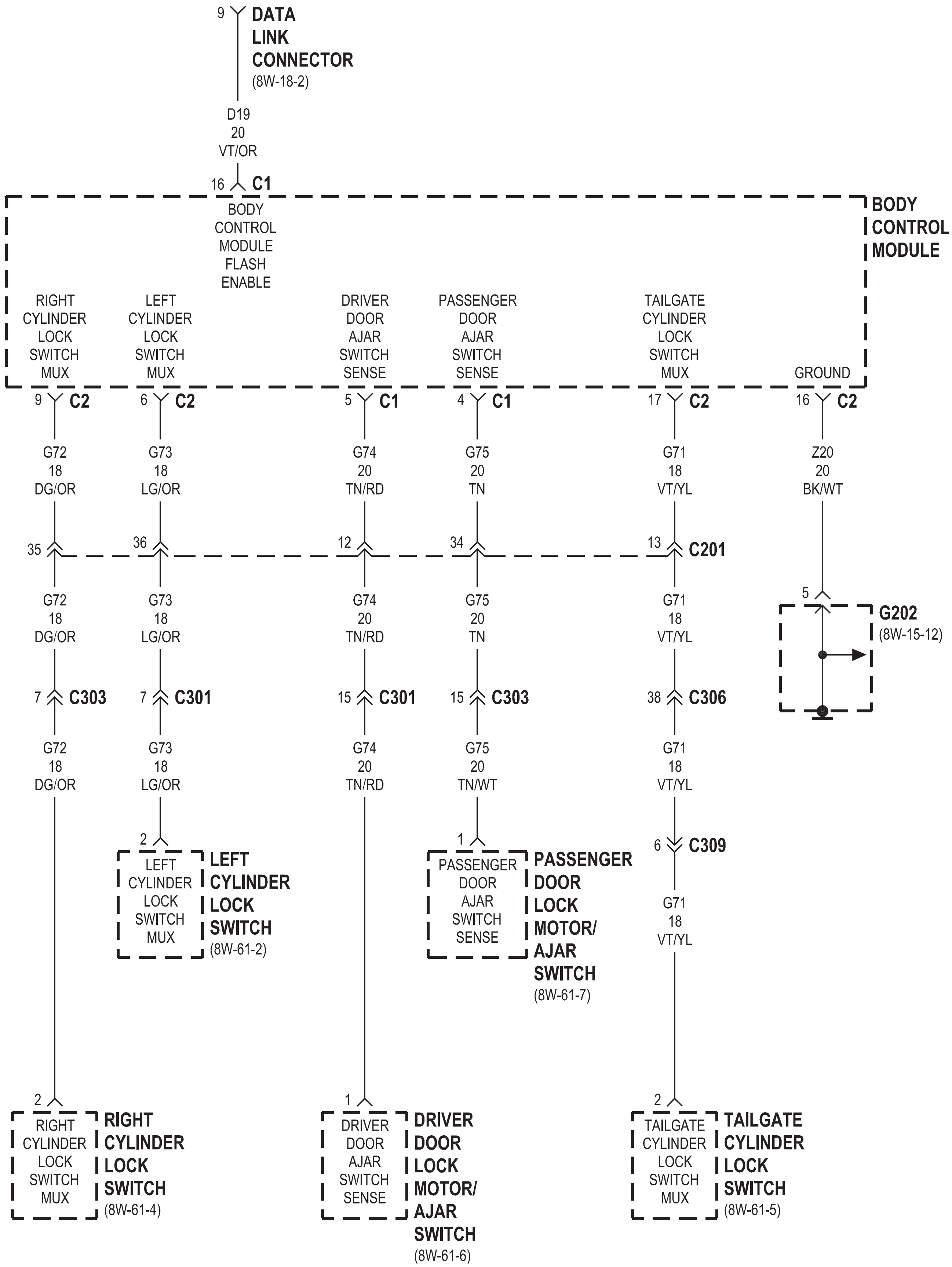

AMBIENT TEMPERATURE SENSOR
G31 18 VT/LG
G32 18 DB/OR
C106
G31 18 VT/LG
G32 18 DB/OR
C100
G31 20 VT/LG
G32 20 BK/LB
LIGHTBAR SWITCH (8W-50-16)
LIGHTBAR SWITCH SENSE
L118 20 BR/YL
BATT A12 (8W-10-25)
JUNCTION BLOCK (8W-12-2) (8W-12-3)
FUSE 3 15A (8W-12-9)
HORN RELAY (8W-41-2)
C2 C2 C1 JB
AMBIENT TEMPERATURE SENSOR SIGNAL
AMBIENT TEMPERATURE SENSOR RETURN
LIGHTBAR SWITCH SENSE
HORN RELAY CONTROL
BODY CONTROL MODULE
HOOD AJAR SWITCH SENSE
DOOR LOCK SWITCH MUX
TAILGATE UNLOCK DRIVER
TAILGATE LOCK DRIVER
C1 JB JB JB
G70 20 BR/TN
C2 C2 C2 C2
C100
G70 18 BR/TN
P36 20 PK/VT
P31 16 PK/WT
P30 16 OR/WT
C301 C303 C306
HOOD AJAR SWITCH
LEFT DOOR LOCK SWITCH
1 LOCK
2 UNLOCK
(8W-61-2)
(8W-61-8)
C309
Z142 18 BK/WT
S110 (8W-15-8)
Z142 16 BK/WT
G111 (8W-15-8)
RIGHT DOOR LOCK SWITCH
1 LOCK
2 UNLOCK
(8W-61-4)
(8W-61-6)
TAILGATE LOCK MOTOR/ AJAR SWITCH (8W-61-5)
M
○○ EXCEPT BASE


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
REMOTE KEYLESS ENTRY MODULE
RKE DATA
RKE SUPPLY
RKE PROGRAM
RKE GROUND
RKE ANTENNA (+)
RKE ANTENNA (-)
1 2 3 4 5 6
C3
BODY CONTROL MODULE
TAILGATE SWITCH GROUND
TAILGATE AJAR SWITCH SENSE
FLIP-UP GLASS AJAR SWITCH SENSE
FLIP-UP GLASS RELEASE SWITCH SENSE
FLIP-UP GLASS RELEASE MOTOR DRIVER
REAR COURTESY LAMP CONTROL
2 C2
7 C1
9 C1
17 C1
26 C1
10 C1
G910 20 VT/BR
G78 20 TN/BK
G80 20 VT/YL
P101 20 OR/PK
P100 18 OR/BR
M3 20 PK/DB
24 25 27 26 40 19 C201
G80 20 YL/WT
32 37 31 30 27 12 C306
14 13 11 5
4 C309
4 C308
G80 18 YL/WT
S381
(8W-61-5)
S382
(8W-53-3)
TAILGATE LOCK MOTOR/ AJAR SWITCH
(8W-61-5)
FLIP-UP GLASS RELEASE SWITCH
(8W-61-5)
CARGO LAMP
(8W-44-4)
TAILGATE CYLINDER LOCK SWITCH
(8W-61-5)
REAR WIPER MOTOR
(8W-53-3)
FLIP-UP GLASS RELEASE MOTOR
(8W-61-5)
○○○ PREMIUM

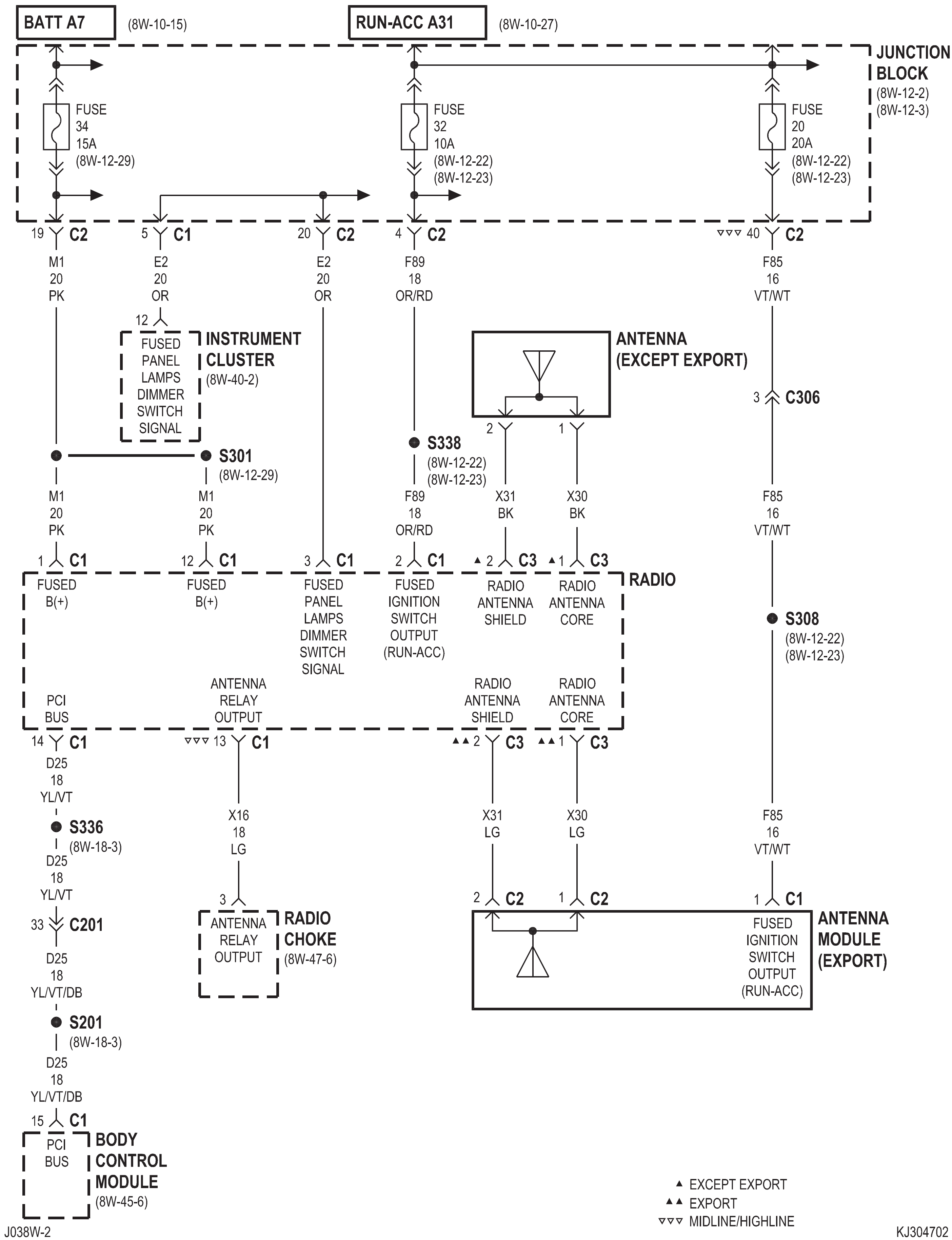

BODY CONTROL MODULE
DRIVER DOOR AJAR SWITCH SENSE
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
PASSENGER DOOR AJAR SWITCH SENSE
4 C1
3 C2
22 C1
5 C1
G75 20 TN
G77 20 TN/OR
G76 20 TN/YL
G74 20 TN/RD
34
22
21
12 C201
G75 20 TN
G77 20 TN/OR
G76 20 TN/YL
G74 20 TN/RD
15 C301
12 C305
12 C304
15 C303
G75 20 TN
G77 20 TN/WT
G76 20 TN/WT
G74 20 TN/WT
1
LEFT FRONT DOOR AJAR SWITCH
LEFT REAR DOOR AJAR SWITCH
RIGHT REAR DOOR AJAR SWITCH
RIGHT FRONT DOOR AJAR SWITCH
2
Z350 20 BK/LG
Z350 20 BK/LG
Z351 20 BK/LG
Z351 20 BK/LG
17 C301
10 C305
10 C304
17 C303
Z350 20 BK/LG
Z350 18 BK/LG
Z351 20 BK/LG
Z351 20 BK/LG
S333 (8W-15-14)
S334 (8W-15-15)
Z350 16 BK/LG
Z351 16 BK/LG
G300 (8W-15-16)
G302 (8W-15-16)

LHD EXCEPT BASE

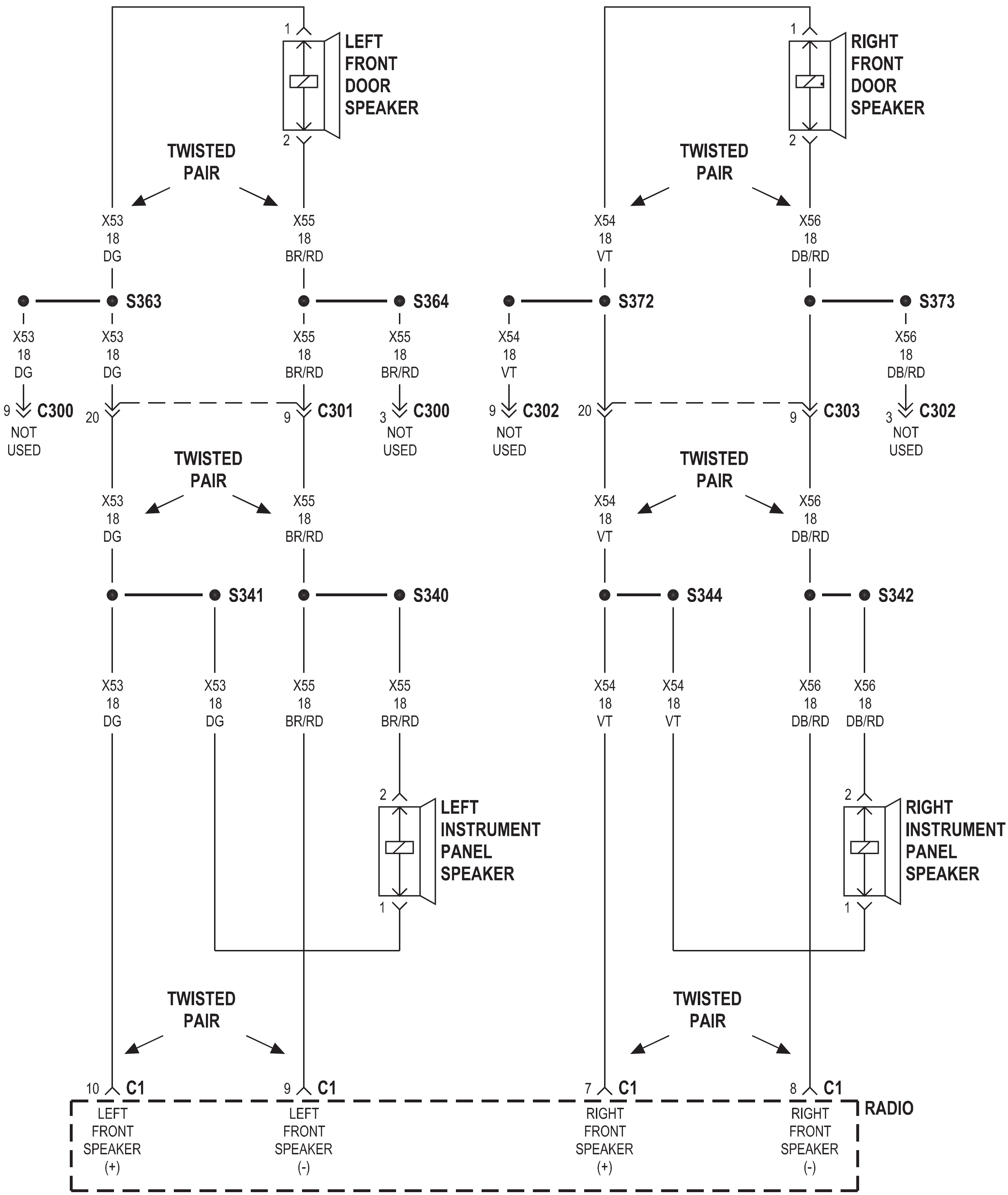


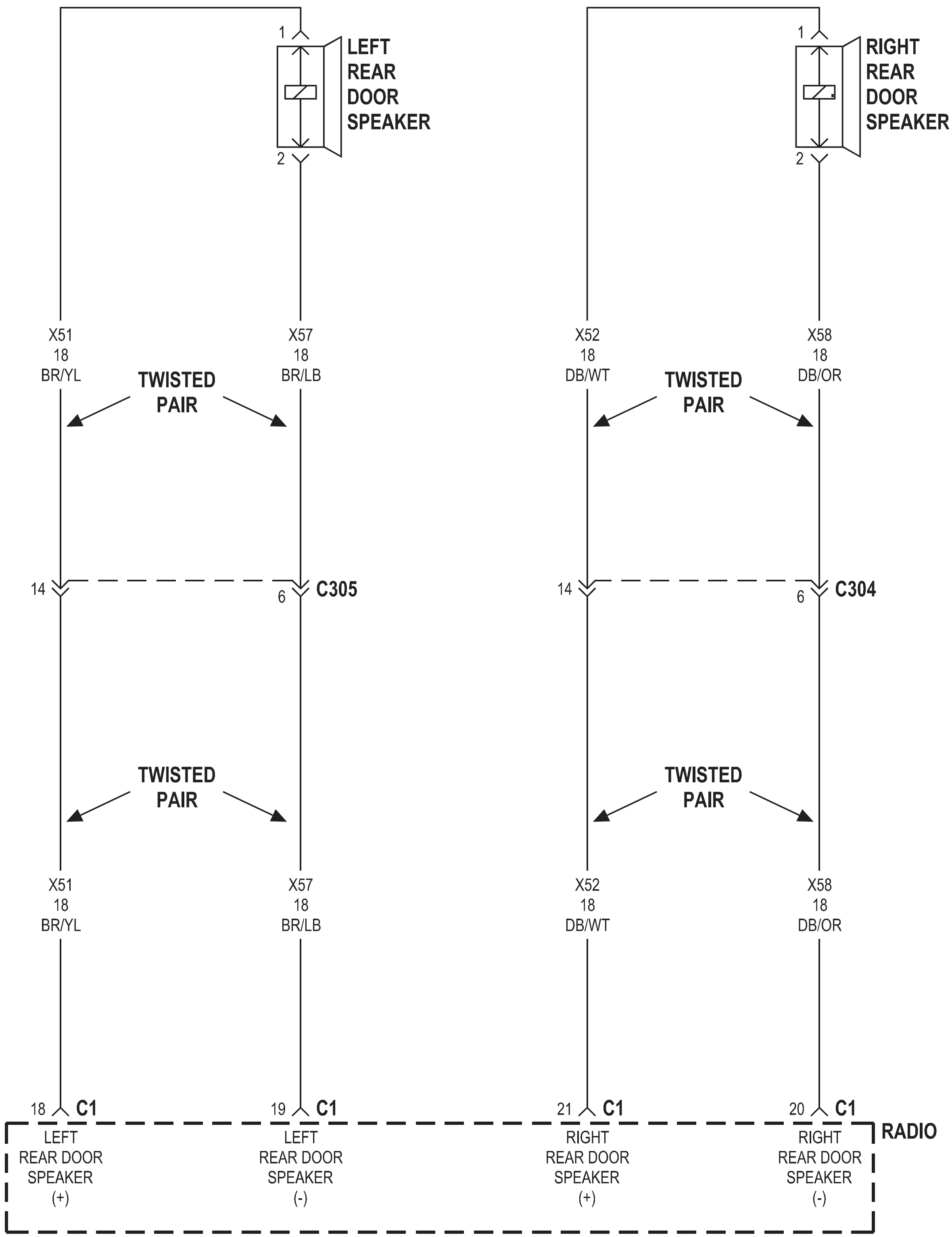

9
DATA LINK CONNECTOR
(8W-18-2)
D19 20 VT/OR
16 C1
BODY CONTROL MODULE FLASH ENABLE
BODY CONTROL MODULE
RIGHT CYLINDER LOCK SWITCH MUX
LEFT CYLINDER LOCK SWITCH MUX
DRIVER DOOR AJAR SWITCH SENSE
PASSENGER DOOR AJAR SWITCH SENSE
TAILGATE CYLINDER LOCK SWITCH MUX
GROUND
9 C2
6 C2
5 C1
4 C1
17 C2
16 C2
G72 18 DG/OR
G73 18 LG/OR
G74 20 TN/RD
G75 20 TN
G71 18 VT/YL
Z20 20 BK/WT
35
36
12
34
13 C201
5
G202
(8W-15-12)
7 C303
7 C301
15 C301
15 C303
38 C306
G75 20 TN/WT
2
LEFT CYLINDER LOCK SWITCH MUX
LEFT CYLINDER LOCK SWITCH
(8W-61-2)
1
PASSENGER DOOR AJAR SWITCH SENSE
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
6 C309
2
RIGHT CYLINDER LOCK SWITCH MUX
RIGHT CYLINDER LOCK SWITCH
(8W-61-4)
1
DRIVER DOOR AJAR SWITCH SENSE
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-6)
2
TAILGATE CYLINDER LOCK SWITCH MUX
TAILGATE CYLINDER LOCK SWITCH
(8W-61-5)

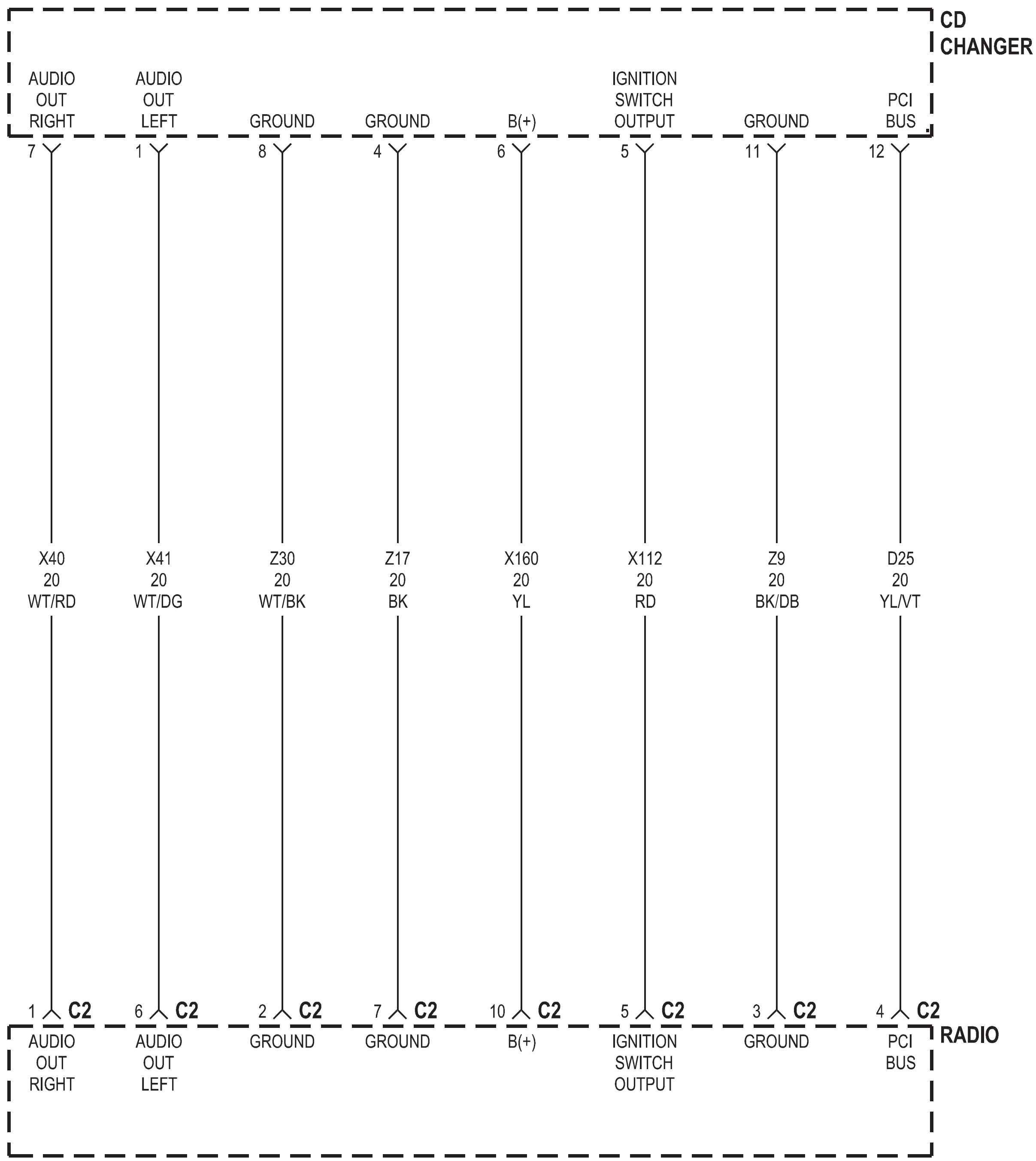
8W-47 AUDIO SYSTEM

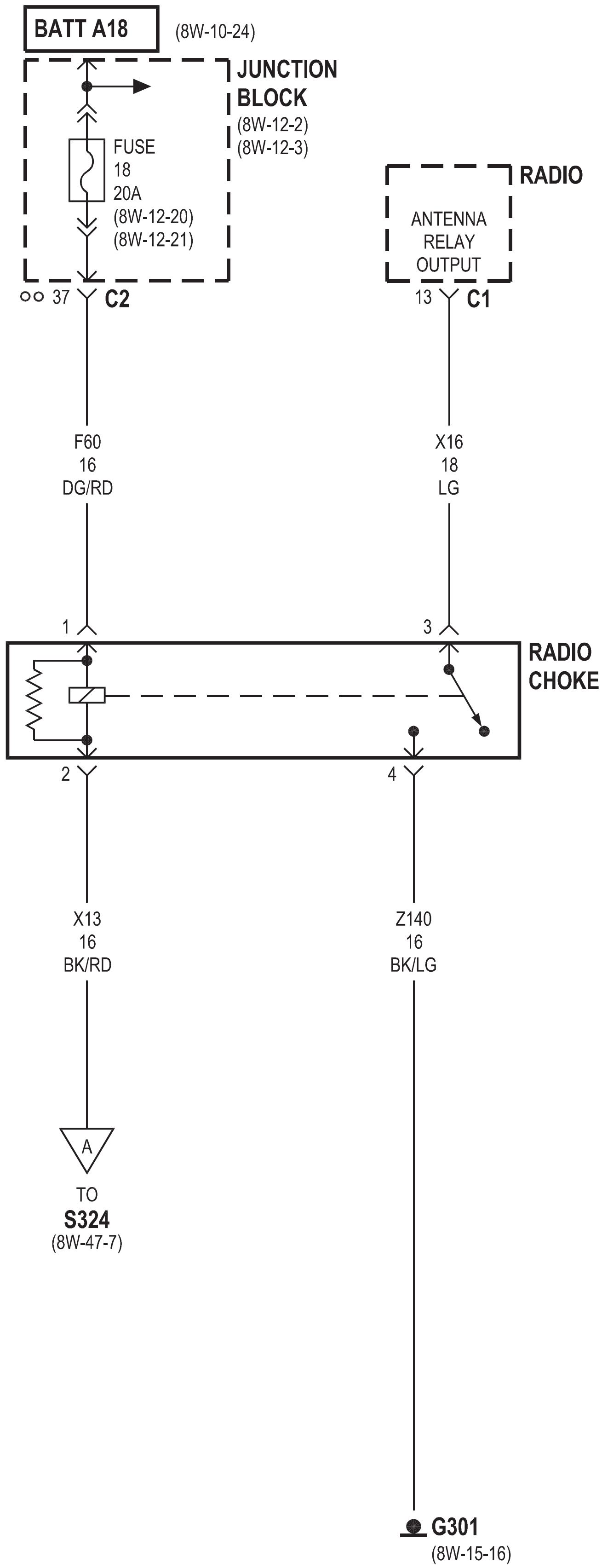


BATT A7
(8W-10-15)
RUN-ACC A31
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 34 15A (8W-12-29)
FUSE 32 10A (8W-12-22) (8W-12-23)
FUSE 20 20A (8W-12-22) (8W-12-23)
19 C2
5 C1
20 C2
4 C2
40 C2
M1 20 PK
E2 20 OR
E2 20 OR
F89 18 OR/RD
F85 16 VT/WT
12
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
INSTRUMENT CLUSTER
(8W-40-2)
ANTENNA (EXCEPT EXPORT)
3 C306
2
1
S301
(8W-12-29)
S338
(8W-12-22)
(8W-12-23)
M1 20 PK
M1 20 PK
F89 18 OR/RD
X31 BK
X30 BK
F85 16 VT/WT
1 C1
12 C1
3 C1
2 C1
2 C3
1 C3
RADIO
FUSED B(+)
FUSED B(+)
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
RADIO ANTENNA SHIELD
RADIO ANTENNA CORE
S308
(8W-12-22)
(8W-12-23)
PCI BUS
ANTENNA RELAY OUTPUT
RADIO ANTENNA SHIELD
RADIO ANTENNA CORE
14 C1
13 C1
2 C3
1 C3
D25 18 YL/VT
S336
(8W-18-3)
D25 18 YL/VT
X16 18 LG
X31 LG
X30 LG
F85 16 VT/WT
3
2 C2
1 C2
1 C1
33 C201
ANTENNA RELAY OUTPUT
RADIO CHOKE
(8W-47-6)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
ANTENNA MODULE (EXPORT)
D25 18 YL/VT/DB
S201
(8W-18-3)
D25 18 YL/VT/DB
15 C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
▲ EXCEPT EXPORT
▲▲ EXPORT
▽▽▽ MIDLINE/HIGHLINE
J038W-2
KJ304702

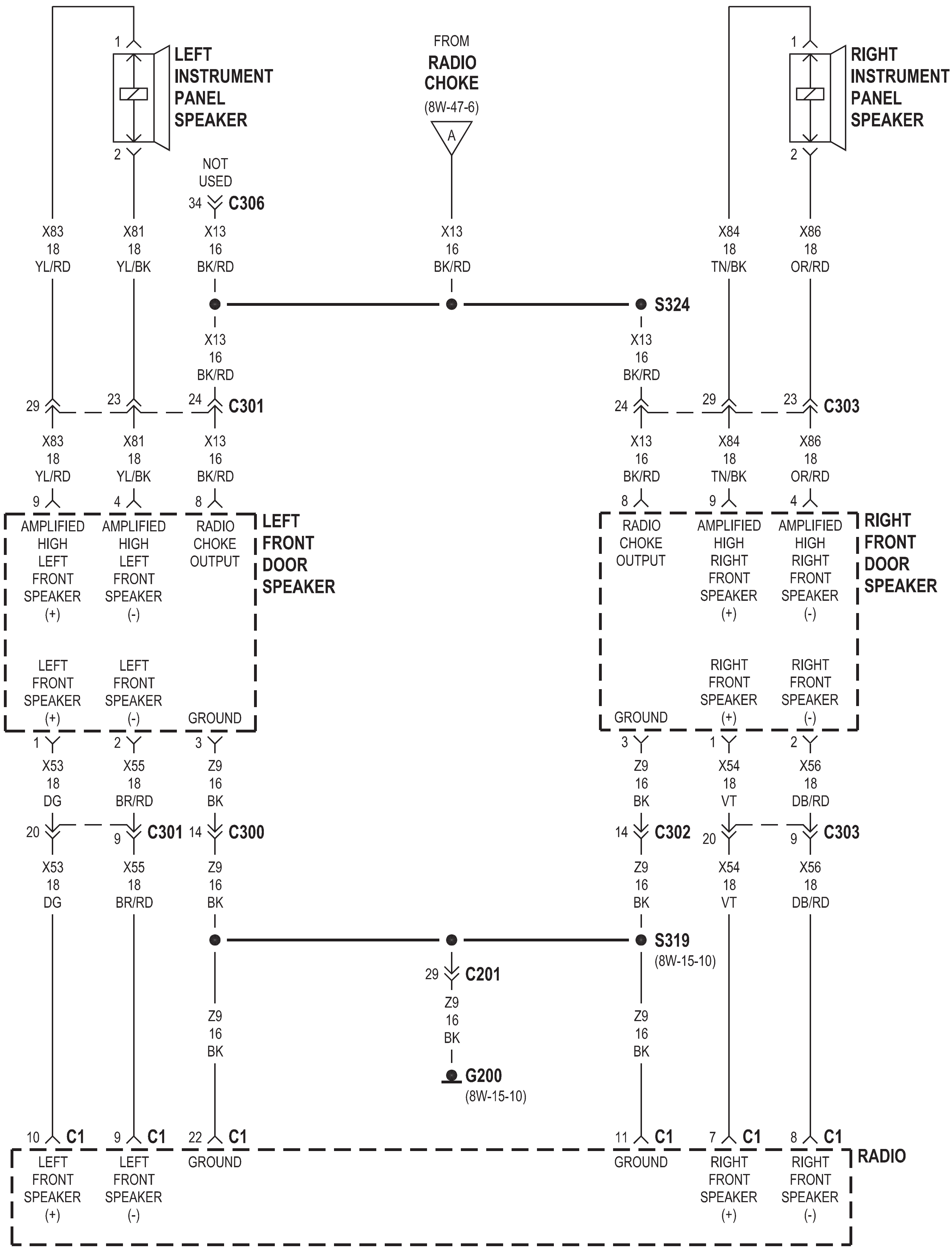

LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
TWISTED PAIR
X53 18 DG
X55 18 BR/RD
X54 18 VT
X56 18 DB/RD
S363
S364
S372
S373
C300
C301
C302
C303
NOT USED
S341
S340
S344
S342
LEFT INSTRUMENT PANEL SPEAKER
RIGHT INSTRUMENT PANEL SPEAKER
C1
RADIO
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)

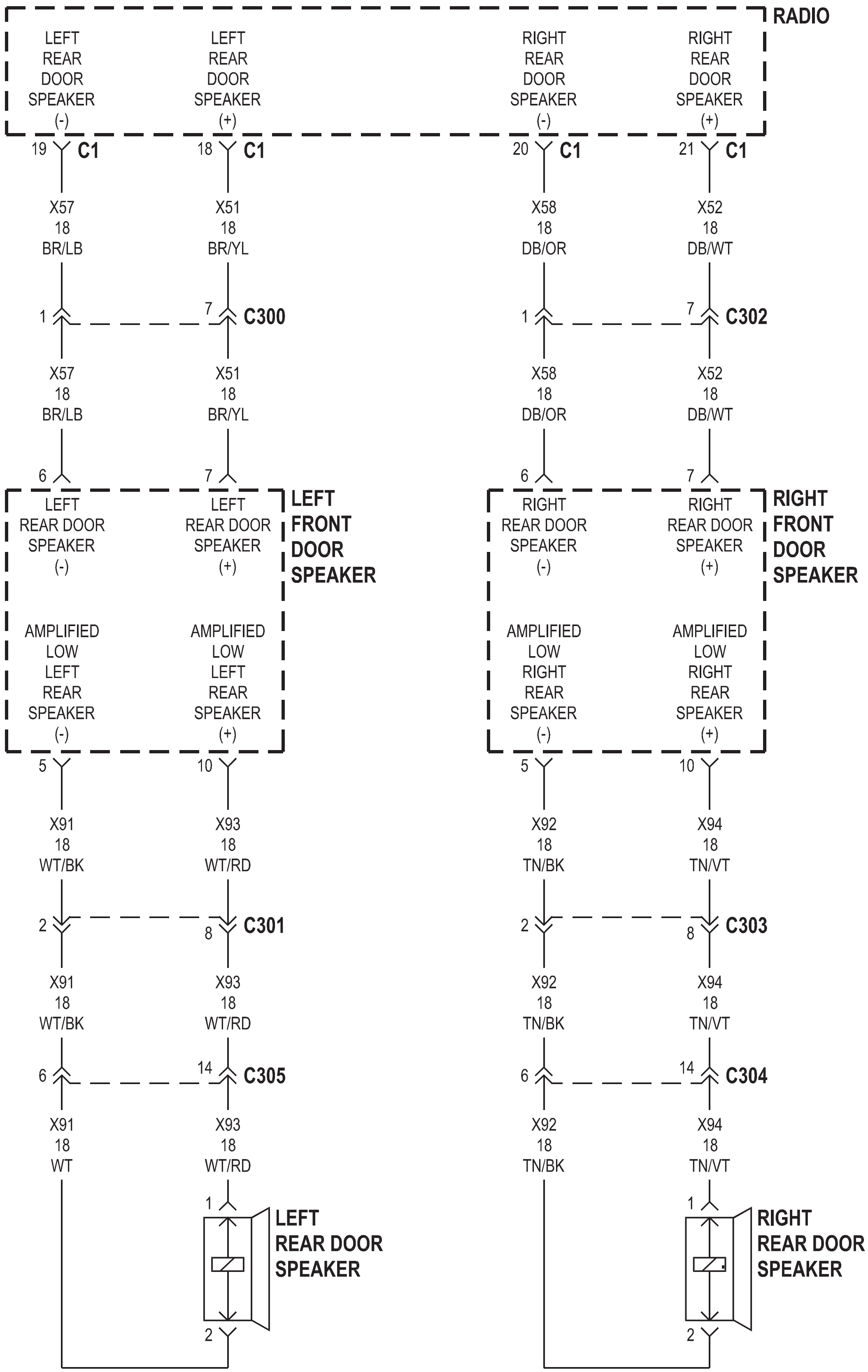

LEFT
REAR
DOOR
SPEAKER
1
2
RIGHT
REAR
DOOR
SPEAKER
1
2
X51
18
BR/YL
X57
18
BR/LB
TWISTED
PAIR
X52
18
DB/WT
X58
18
DB/OR
TWISTED
PAIR
14
6
C305
14
6
C304
TWISTED
PAIR
TWISTED
PAIR
X51
18
BR/YL
X57
18
BR/LB
X52
18
DB/WT
X58
18
DB/OR
18 C1
19 C1
21 C1
20 C1
RADIO
LEFT
REAR DOOR
SPEAKER
(+)
LEFT
REAR DOOR
SPEAKER
(-)
RIGHT
REAR DOOR
SPEAKER
(+)
RIGHT
REAR DOOR
SPEAKER
(-)

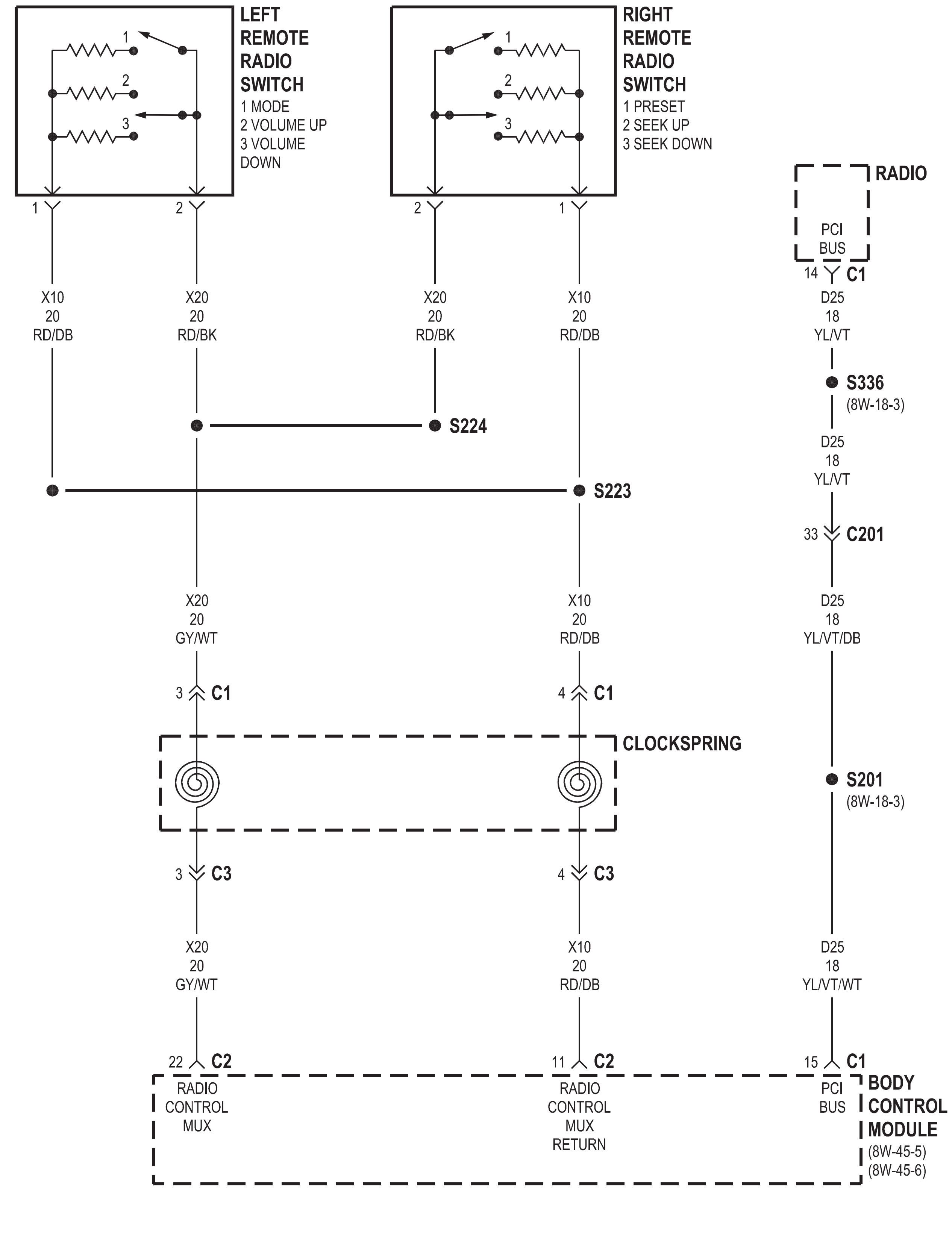

CD CHANGER
AUDIO OUT RIGHT
AUDIO OUT LEFT
GROUND
GROUND
B(+)
IGNITION SWITCH OUTPUT
GROUND
PCI BUS
7
1
8
4
6
5
11
12
X40 20 WT/RD
X41 20 WT/DG
Z30 20 WT/BK
Z17 20 BK
X160 20 YL
X112 20 RD
Z9 20 BK/DB
D25 20 YL/VT
1 C2
6 C2
2 C2
7 C2
10 C2
5 C2
3 C2
4 C2
RADIO
AUDIO OUT RIGHT
AUDIO OUT LEFT
GROUND
GROUND
B(+)
IGNITION SWITCH OUTPUT
GROUND
PCI BUS


BATT A18
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
18
20A
(8W-12-20)
(8W-12-21)
37
C2
RADIO
ANTENNA RELAY OUTPUT
13
C1
F60
16
DG/RD
X16
18
LG
1
3
RADIO CHOKE
2
4
X13
16
BK/RD
Z140
16
BK/LG
A
TO
S324
(8W-47-7)
G301
(8W-15-16)
(8W-15-18)

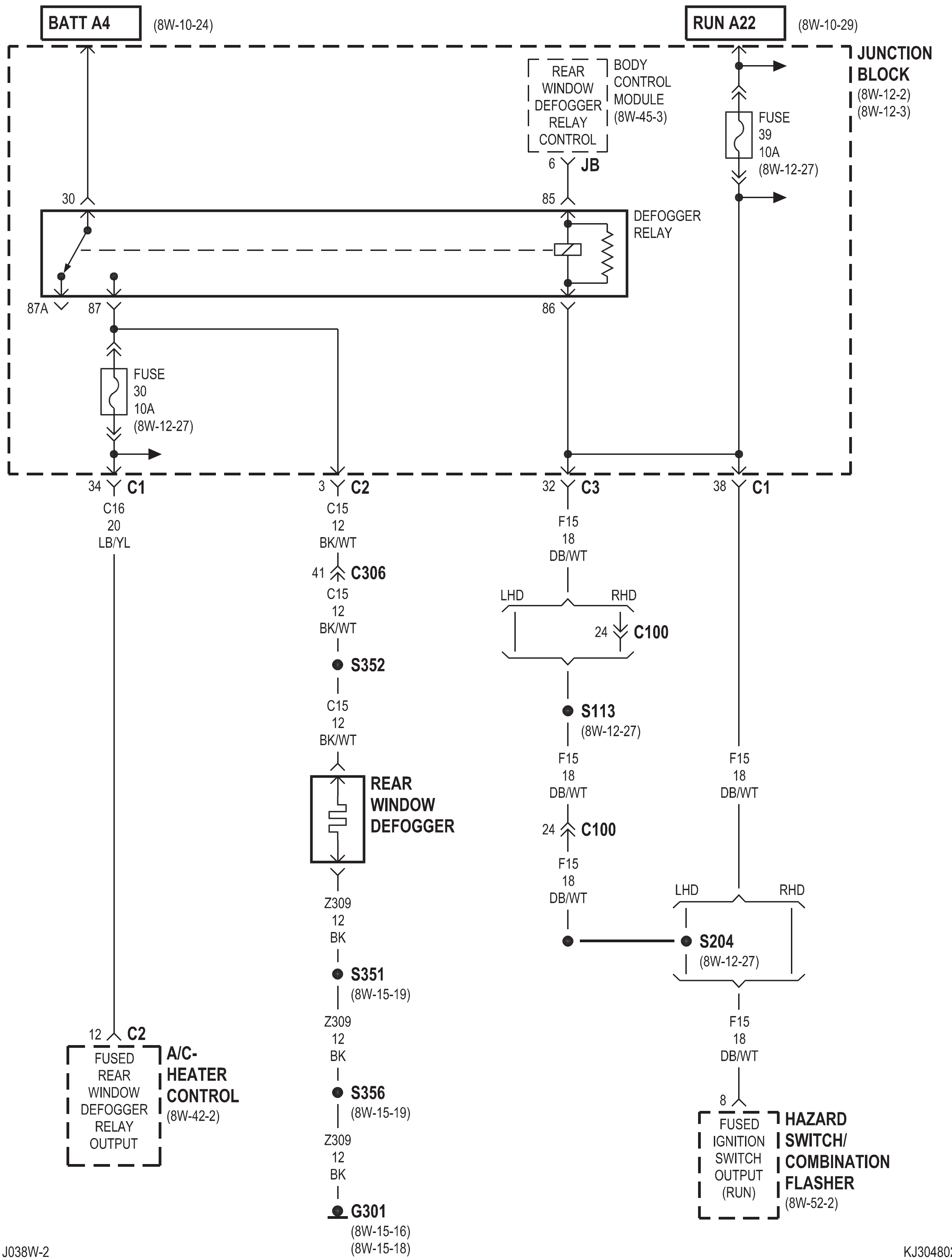
○○ PREMIUM


LEFT INSTRUMENT PANEL SPEAKER
1
2
FROM
RADIO CHOKE
(8W-47-6)
A
RIGHT INSTRUMENT PANEL SPEAKER
1
2
NOT USED
34 C306
X83 18 YL/RD
X81 18 YL/BK
X13 16 BK/RD
X13 16 BK/RD
X84 18 TN/BK
X86 18 OR/RD
S324
X13 16 BK/RD
X13 16 BK/RD
29 23 24 C301
24 29 23 C303
X83 18 YL/RD
X81 18 YL/BK
X13 16 BK/RD
X13 16 BK/RD
X84 18 TN/BK
X86 18 OR/RD
9 4 8
8 9 4
LEFT FRONT DOOR SPEAKER
AMPLIFIED HIGH LEFT FRONT SPEAKER (+)
AMPLIFIED HIGH LEFT FRONT SPEAKER (-)
RADIO CHOKE OUTPUT
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
GROUND
RIGHT FRONT DOOR SPEAKER
RADIO CHOKE OUTPUT
AMPLIFIED HIGH RIGHT FRONT SPEAKER (+)
AMPLIFIED HIGH RIGHT FRONT SPEAKER (-)
GROUND
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
1 2 3
3 1 2
X53 18 DG
X55 18 BR/RD
Z9 16 BK
Z9 16 BK
X54 18 VT
X56 18 DB/RD
20 9 C301
14 C300
14 C302
20 9 C303
X53 18 DG
X55 18 BR/RD
Z9 16 BK
Z9 16 BK
X54 18 VT
X56 18 DB/RD
S319
(8W-15-10)
29 C201
Z9 16 BK
Z9 16 BK
Z9 16 BK
G200
(8W-15-10)
10 C1
9 C1
22 C1
11 C1
7 C1
8 C1
RADIO
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
GROUND
GROUND
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)

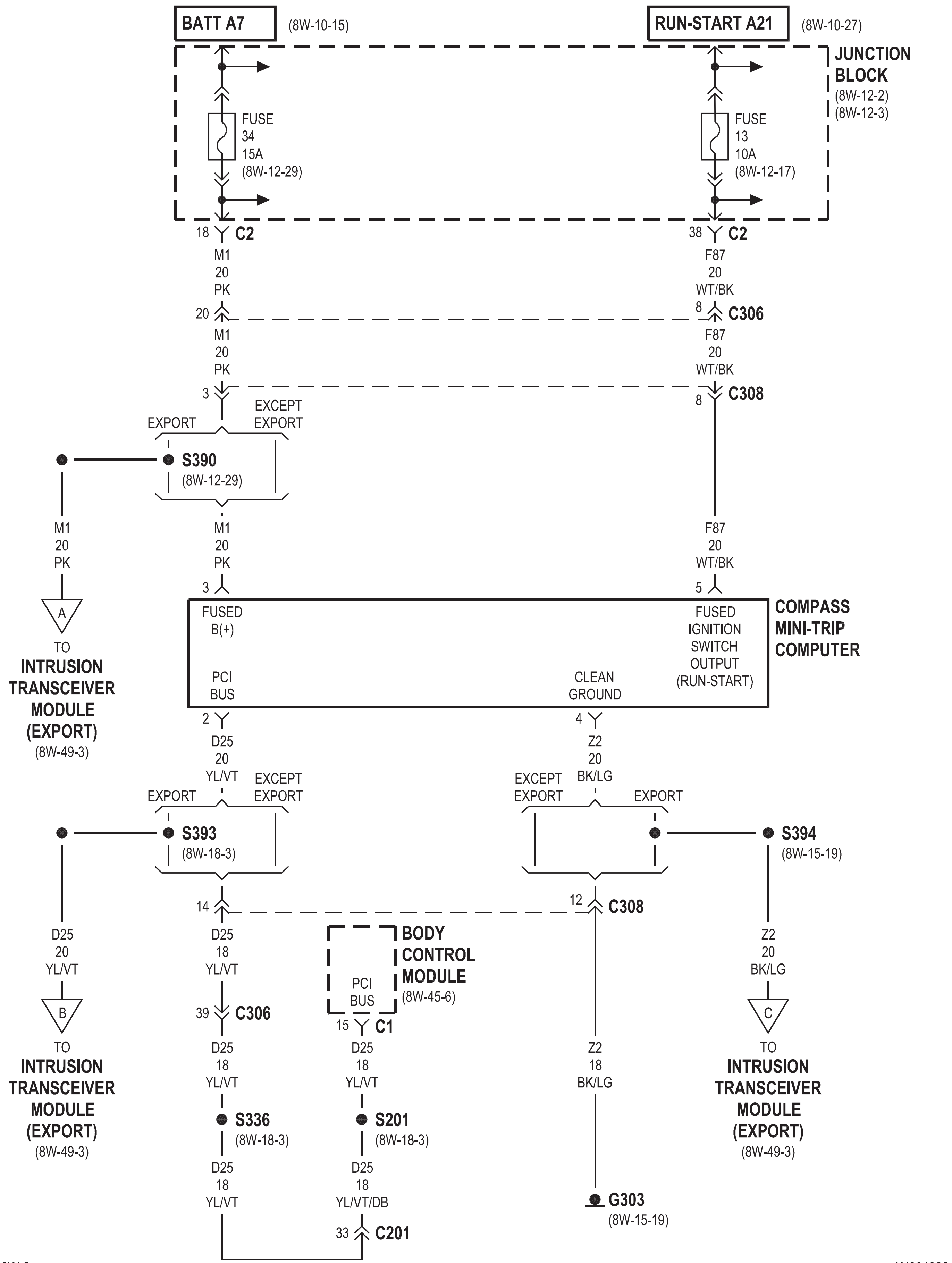

RADIO
LEFT REAR DOOR SPEAKER (-)
LEFT REAR DOOR SPEAKER (+)
RIGHT REAR DOOR SPEAKER (-)
RIGHT REAR DOOR SPEAKER (+)
19 C1
18 C1
20 C1
21 C1
X57 18 BR/LB
X51 18 BR/YL
X58 18 DB/OR
X52 18 DB/WT
1 7 C300
1 7 C302
X57 18 BR/LB
X51 18 BR/YL
X58 18 DB/OR
X52 18 DB/WT
6 7
6 7
LEFT FRONT DOOR SPEAKER
LEFT REAR DOOR SPEAKER (-)
LEFT REAR DOOR SPEAKER (+)
AMPLIFIED LOW LEFT REAR SPEAKER (-)
AMPLIFIED LOW LEFT REAR SPEAKER (+)
RIGHT FRONT DOOR SPEAKER
RIGHT REAR DOOR SPEAKER (-)
RIGHT REAR DOOR SPEAKER (+)
AMPLIFIED LOW RIGHT REAR SPEAKER (-)
AMPLIFIED LOW RIGHT REAR SPEAKER (+)
5 10
5 10
X91 18 WT/BK
X93 18 WT/RD
X92 18 TN/BK
X94 18 TN/VT
2 8 C301
2 8 C303
X91 18 WT/BK
X93 18 WT/RD
X92 18 TN/BK
X94 18 TN/VT
6 14 C305
6 14 C304
X91 18 WT
X93 18 WT/RD
X92 18 TN/BK
X94 18 TN/VT
1 2
LEFT REAR DOOR SPEAKER
1 2
RIGHT REAR DOOR SPEAKER

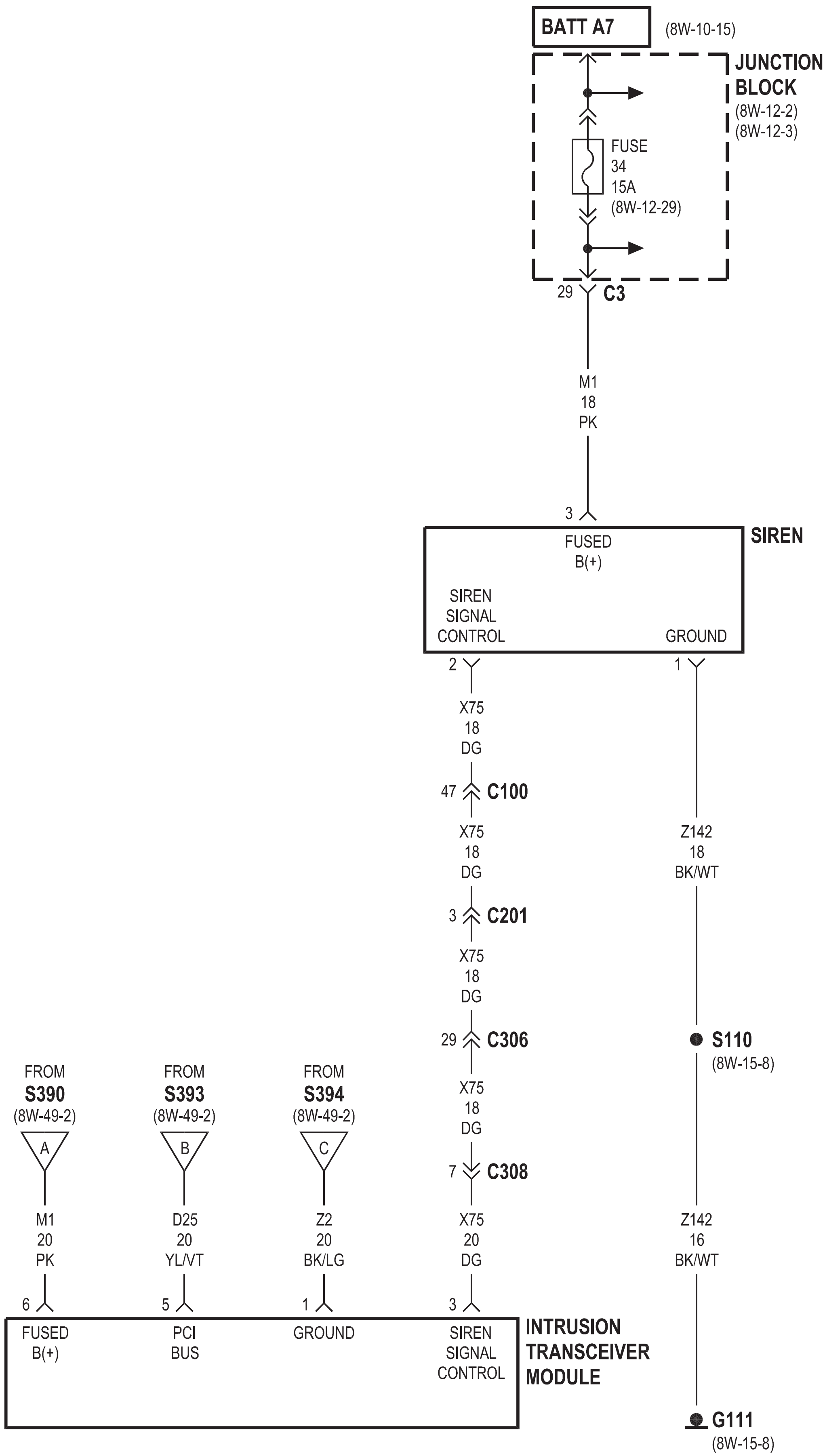

LEFT REMOTE RADIO SWITCH
1 MODE
2 VOLUME UP
3 VOLUME DOWN
RIGHT REMOTE RADIO SWITCH
1 PRESET
2 SEEK UP
3 SEEK DOWN
RADIO
PCI BUS
14 C1
D25 18 YL/VT
S336 (8W-18-3)
D25 18 YL/VT
33 C201
D25 18 YL/VT/DB
S201 (8W-18-3)
D25 18 YL/VT/WT
15 C1
PCI BUS
X10 20 RD/DB
X20 20 RD/BK
X20 20 RD/BK
X10 20 RD/DB
S224
S223
X20 20 GY/WT
X10 20 RD/DB
3 C1
4 C1
CLOCKSPRING
3 C3
4 C3
X20 20 GY/WT
X10 20 RD/DB
22 C2
11 C2
RADIO CONTROL MUX
RADIO CONTROL MUX RETURN
BODY CONTROL MODULE (8W-45-5) (8W-45-6)

8W-48 REAR WINDOW DEFOGGER

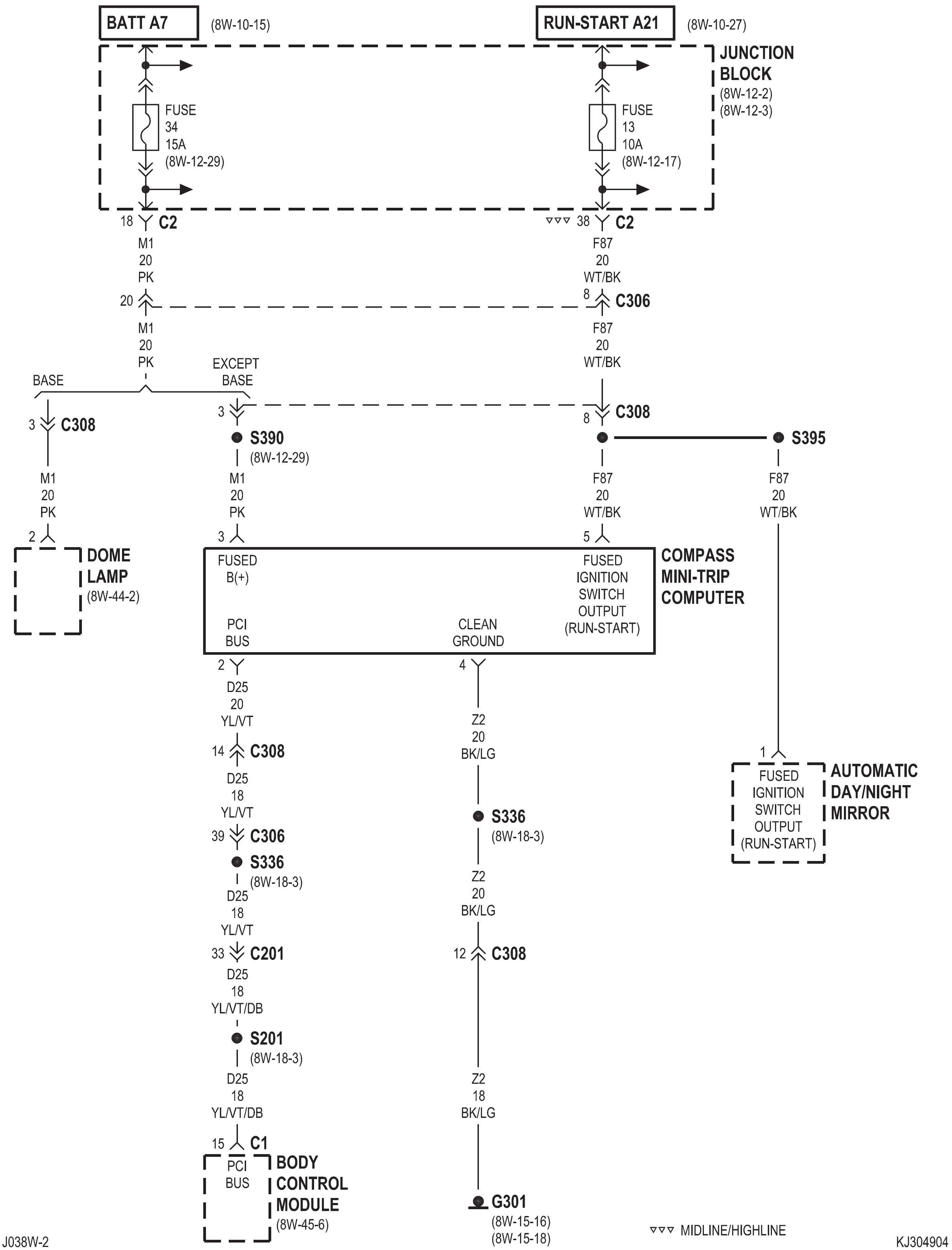

BATT A4
(8W-10-24)
RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
REAR WINDOW DEFOGGER RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
6 JB
FUSE 39 10A
(8W-12-27)
30
85
DEFOGGER RELAY
87A
87
86
FUSE 30 10A
(8W-12-27)
34 C1
3 C2
32 C3
38 C1
C16 20 LB/YL
C15 12 BK/WT
41 C306
C15 12 BK/WT
S352
C15 12 BK/WT
REAR WINDOW DEFOGGER
Z309 12 BK
S351
(8W-15-19)
Z309 12 BK
S356
(8W-15-19)
Z309 12 BK
G301
(8W-15-16)
(8W-15-18)
F15 18 DB/WT
LHD
RHD
24 C100
S113
(8W-12-27)
F15 18 DB/WT
24 C100
F15 18 DB/WT
F15 18 DB/WT
LHD
RHD
S204
(8W-12-27)
F15 18 DB/WT
8
FUSED IGNITION SWITCH OUTPUT (RUN)
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
12 C2
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
A/C-HEATER CONTROL
(8W-42-2)

8W-49 OVERHEAD CONSOLE

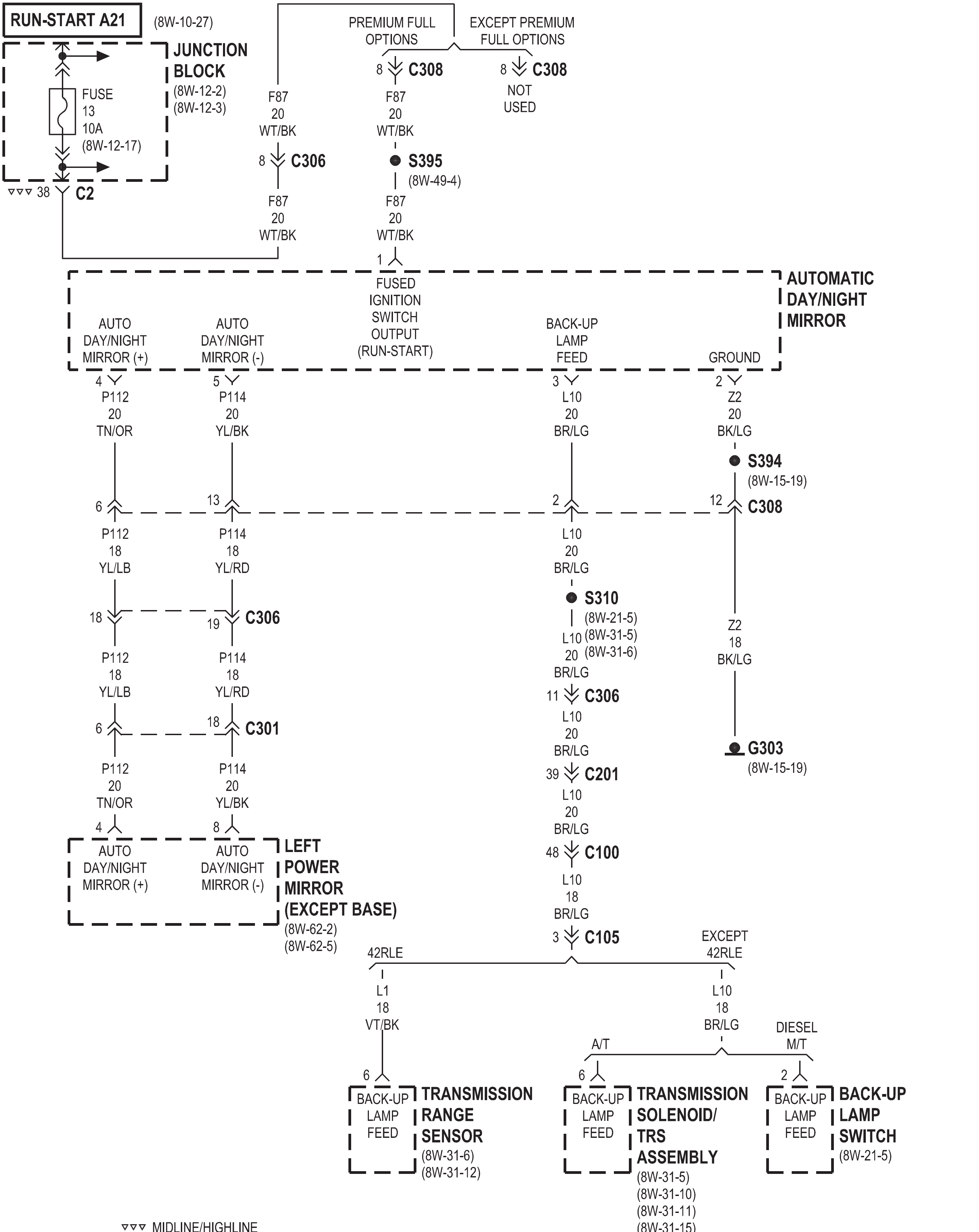

BATT A7
(8W-10-15)
RUN-START A21
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 34 15A (8W-12-29)
FUSE 13 10A (8W-12-17)
18 C2
38 C2
M1 20 PK
F87 20 WT/BK
20
8 C306
3
8 C308
EXPORT
EXCEPT EXPORT
S390
(8W-12-29)
3
5
COMPASS MINI-TRIP COMPUTER
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
CLEAN GROUND
A
TO INTRUSION TRANSCEIVER MODULE (EXPORT)
(8W-49-3)
2
4
D25 20 YL/VT
Z2 20 BK/LG
S393
(8W-18-3)
S394
(8W-15-19)
14
12 C308
D25 18 YL/VT
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
39 C306
B
C
S336
(8W-18-3)
S201
(8W-18-3)
Z2 18 BK/LG
D25 18 YL/VT/DB
33 C201
G303
(8W-15-19)


BATT A7
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
34
15A
(8W-12-29)
29
C3
M1
18
PK
3
FUSED B(+)
SIREN
SIREN SIGNAL CONTROL
GROUND
2
1
X75
18
DG
47
C100
X75
18
DG
Z142
18
BK/WT
3
C201
X75
18
DG
29
C306
S110
(8W-15-8)
FROM
S390
(8W-49-2)
A
FROM
S393
(8W-49-2)
B
FROM
S394
(8W-49-2)
C
X75
18
DG
7
C308
M1
20
PK
D25
20
YL/VT
Z2
20
BK/LG
X75
20
DG
Z142
16
BK/WT
6
5
1
3
FUSED B(+)
PCI BUS
GROUND
SIREN SIGNAL CONTROL
INTRUSION TRANSCEIVER MODULE
G111
(8W-15-8)

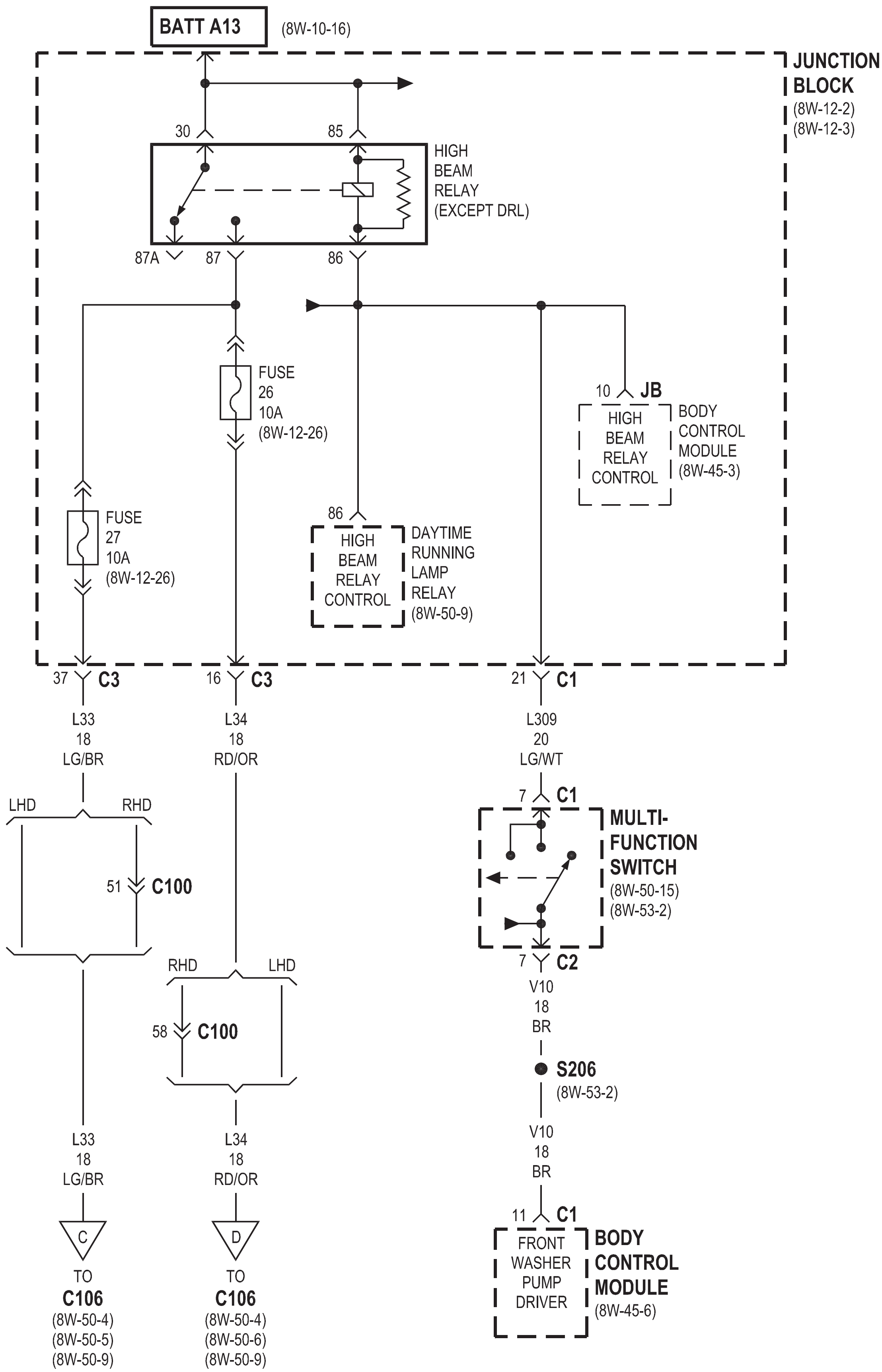
EXCEPT EXPORT

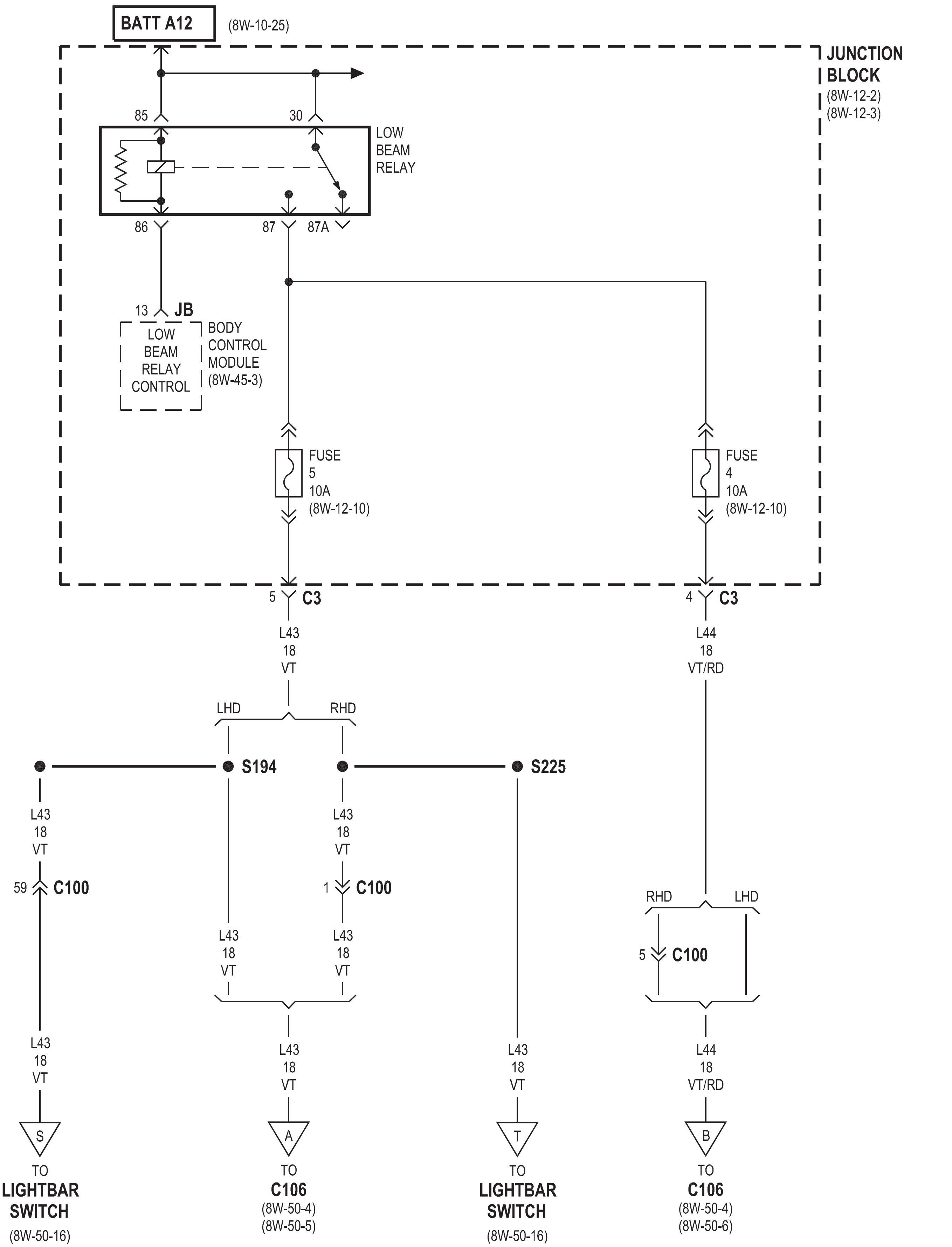


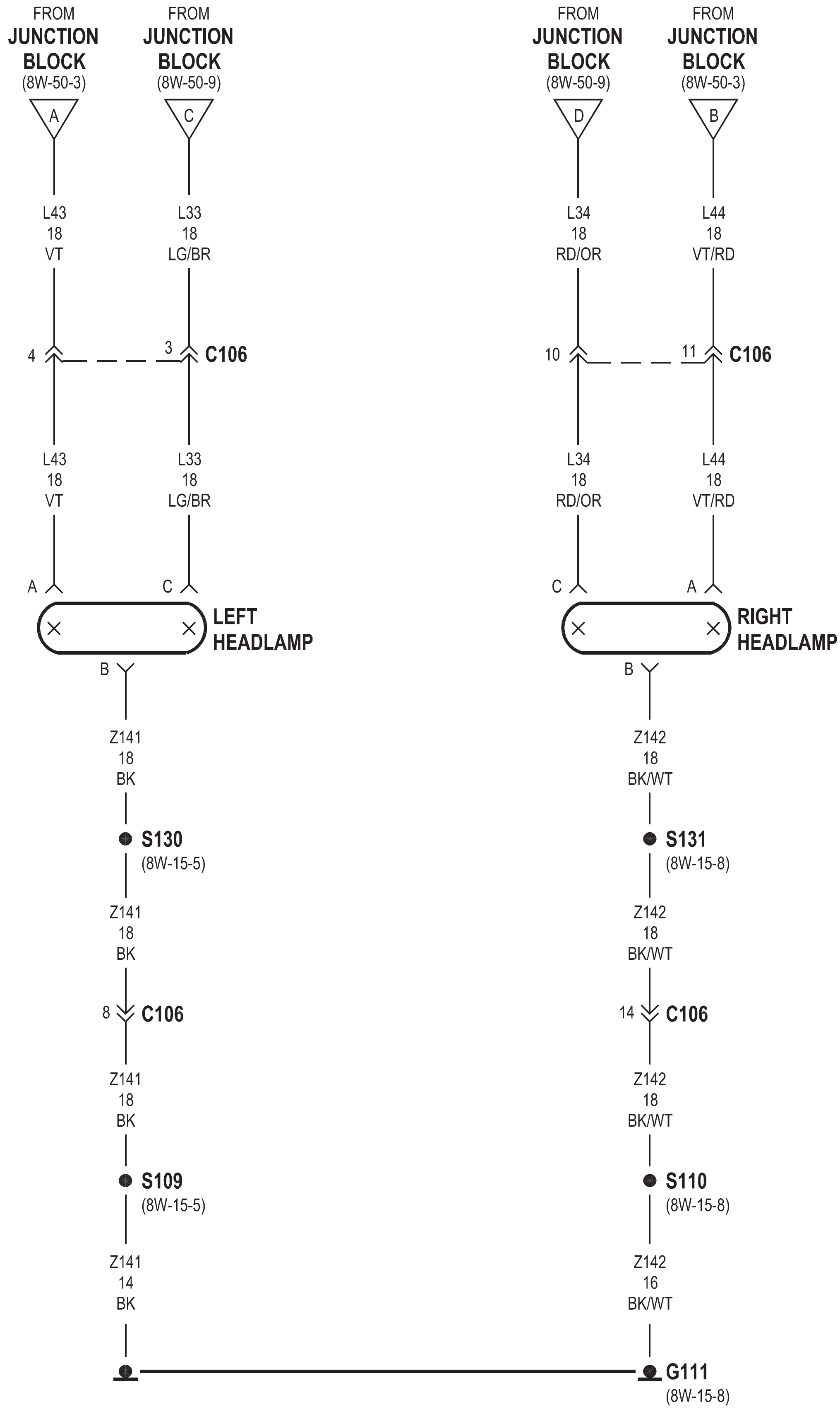
EXCEPT EXPORT

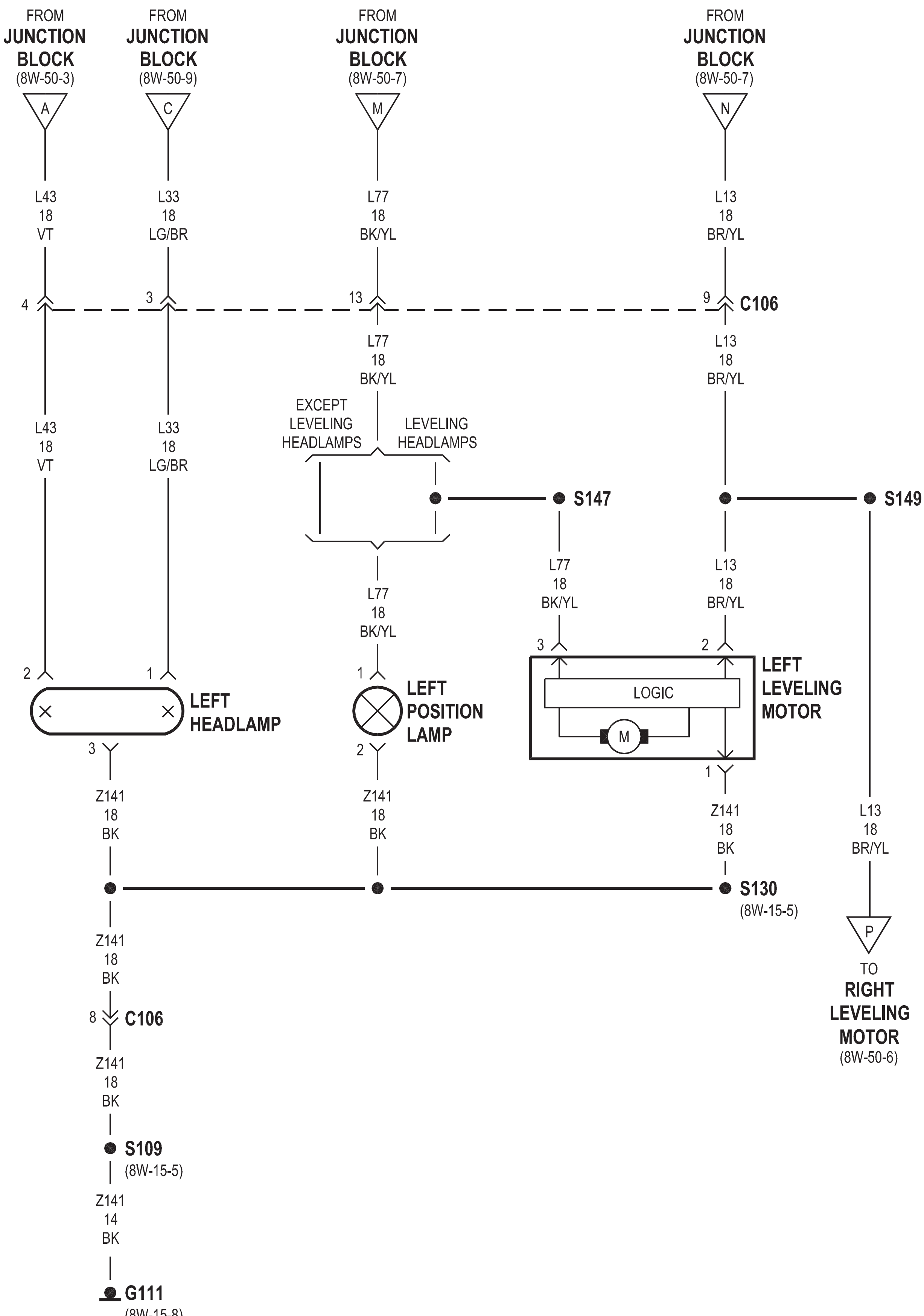


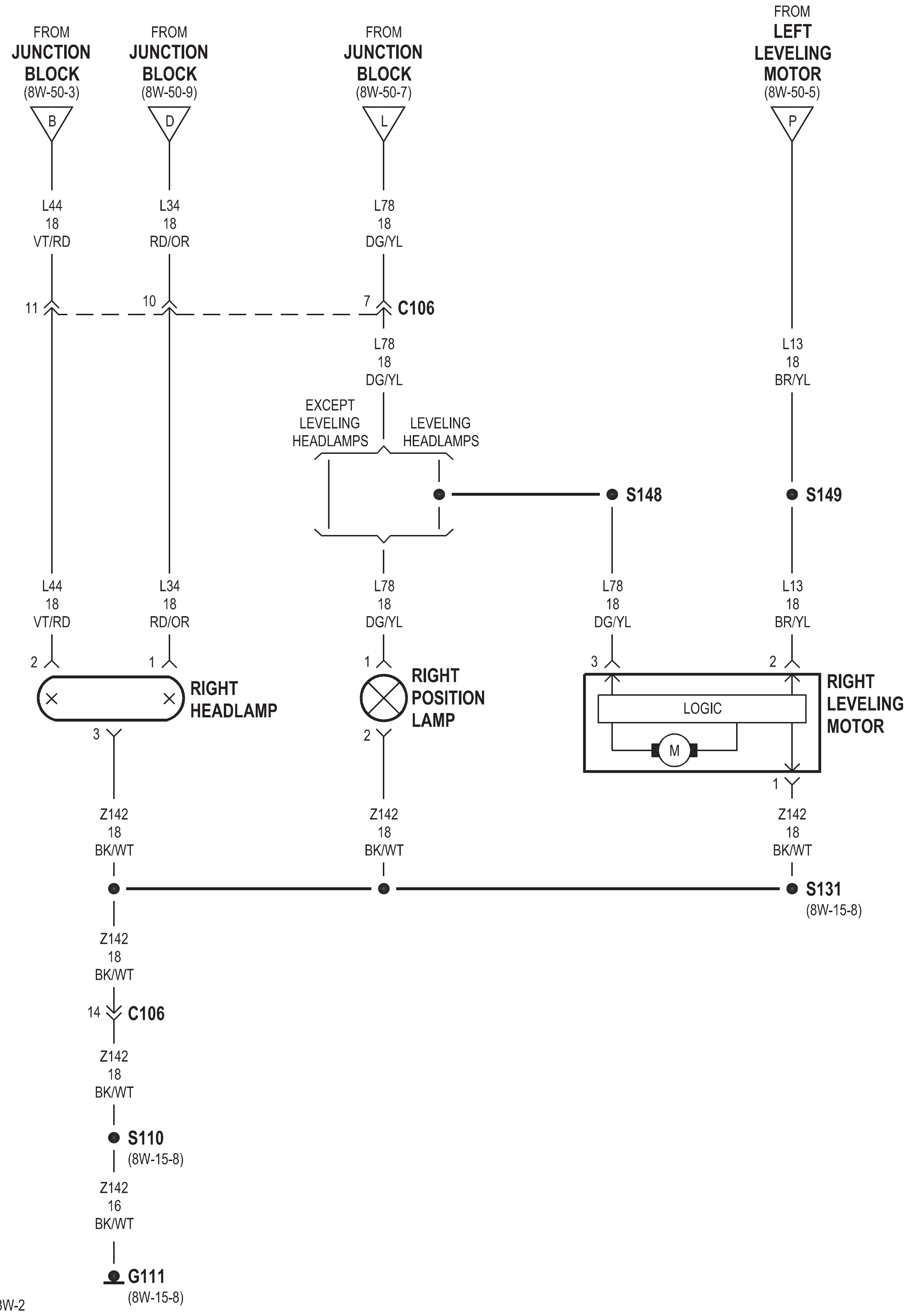
8W-50 FRONT LIGHTING

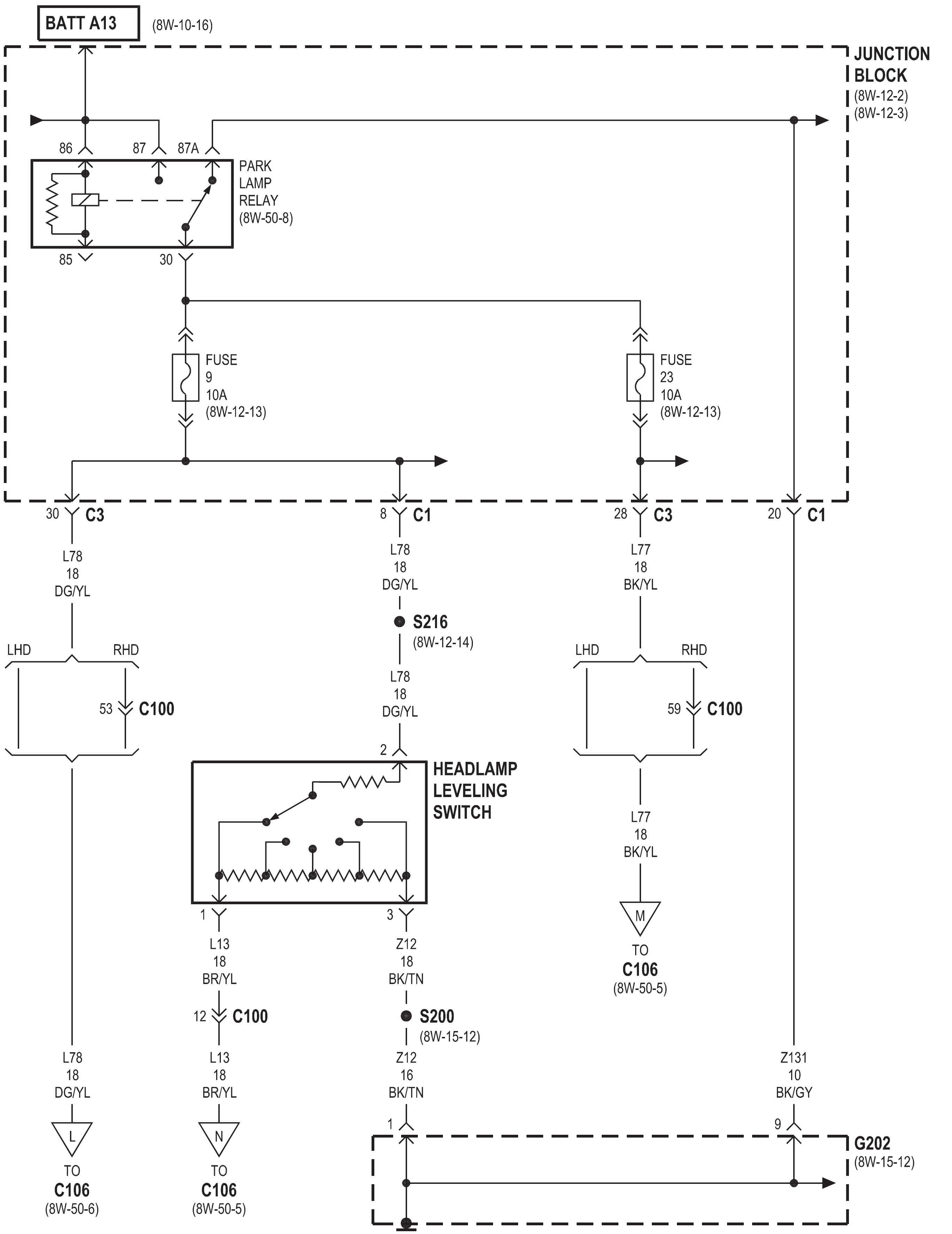

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
85
HIGH BEAM RELAY (EXCEPT DRL)
87A
87
86
FUSE 26 10A (8W-12-26)
FUSE 27 10A (8W-12-26)
86
HIGH BEAM RELAY CONTROL
DAYTIME RUNNING LAMP RELAY (8W-50-9)
10 JB
HIGH BEAM RELAY CONTROL
BODY CONTROL MODULE (8W-45-3)
37 C3
16 C3
21 C1
L33 18 LG/BR
L34 18 RD/OR
L309 20 LG/WT
LHD
RHD
51 C100
RHD
LHD
58 C100
7 C1
MULTI-FUNCTION SWITCH
(8W-50-15)
(8W-53-2)
7 C2
V10 18 BR
S206
(8W-53-2)
V10 18 BR
11 C1
FRONT WASHER PUMP DRIVER
BODY CONTROL MODULE
(8W-45-6)
L33 18 LG/BR
L34 18 RD/OR
C
D
TO C106
(8W-50-4)
(8W-50-5)
(8W-50-9)
TO C106
(8W-50-4)
(8W-50-6)
(8W-50-9)

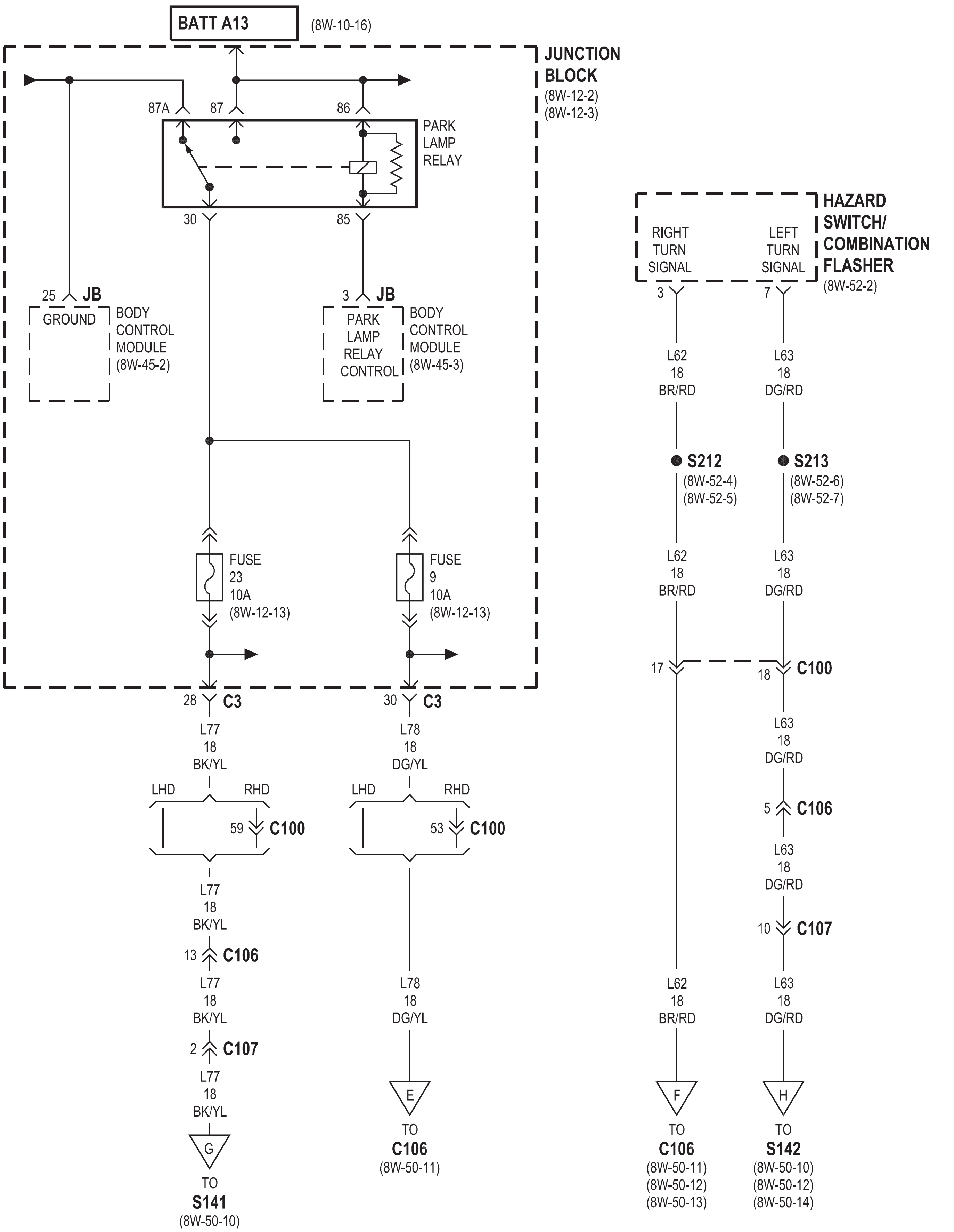

BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
85
30
LOW BEAM RELAY
86
87
87A
13 JB
LOW BEAM RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
FUSE 5 10A
(8W-12-10)
FUSE 4 10A
(8W-12-10)
5 C3
4 C3
L43 18 VT
L44 18 VT/RD
LHD
RHD
S194
S225
59 C100
1 C100
5 C100
RHD
LHD
S
A
T
B
TO LIGHTBAR SWITCH
(8W-50-16)
TO C106
(8W-50-4)
(8W-50-5)
TO LIGHTBAR SWITCH
(8W-50-16)
TO C106
(8W-50-4)
(8W-50-6)


FROM
JUNCTION
BLOCK
(8W-50-3)
A
FROM
JUNCTION
BLOCK
(8W-50-9)
C
FROM
JUNCTION
BLOCK
(8W-50-9)
D
FROM
JUNCTION
BLOCK
(8W-50-3)
B
L43
18
VT
L33
18
LG/BR
L34
18
RD/OR
L44
18
VT/RD
4
3
C106
10
11
C106
L43
18
VT
L33
18
LG/BR
L34
18
RD/OR
L44
18
VT/RD
A
C
C
A
LEFT
HEADLAMP
RIGHT
HEADLAMP
B
B
Z141
18
BK
Z142
18
BK/WT
S130
(8W-15-5)
S131
(8W-15-8)
Z141
18
BK
Z142
18
BK/WT
8
C106
14
C106
Z141
18
BK
Z142
18
BK/WT
S109
(8W-15-5)
S110
(8W-15-8)
Z141
14
BK
Z142
16
BK/WT
G111
(8W-15-8)


FROM
JUNCTION
BLOCK
(8W-50-3)
A
L43
18
VT
FROM
JUNCTION
BLOCK
(8W-50-9)
C
L33
18
LG/BR
FROM
JUNCTION
BLOCK
(8W-50-7)
M
L77
18
BK/YL
FROM
JUNCTION
BLOCK
(8W-50-7)
N
L13
18
BR/YL
4
3
13
9
C106
EXCEPT
LEVELING
HEADLAMPS
LEVELING
HEADLAMPS
S147
S149
LEFT
HEADLAMP
LEFT
POSITION
LAMP
LOGIC
M
LEFT
LEVELING
MOTOR
Z141
18
BK
S130
(8W-15-5)
8
C106
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)
P
TO
RIGHT
LEVELING
MOTOR
(8W-50-6)

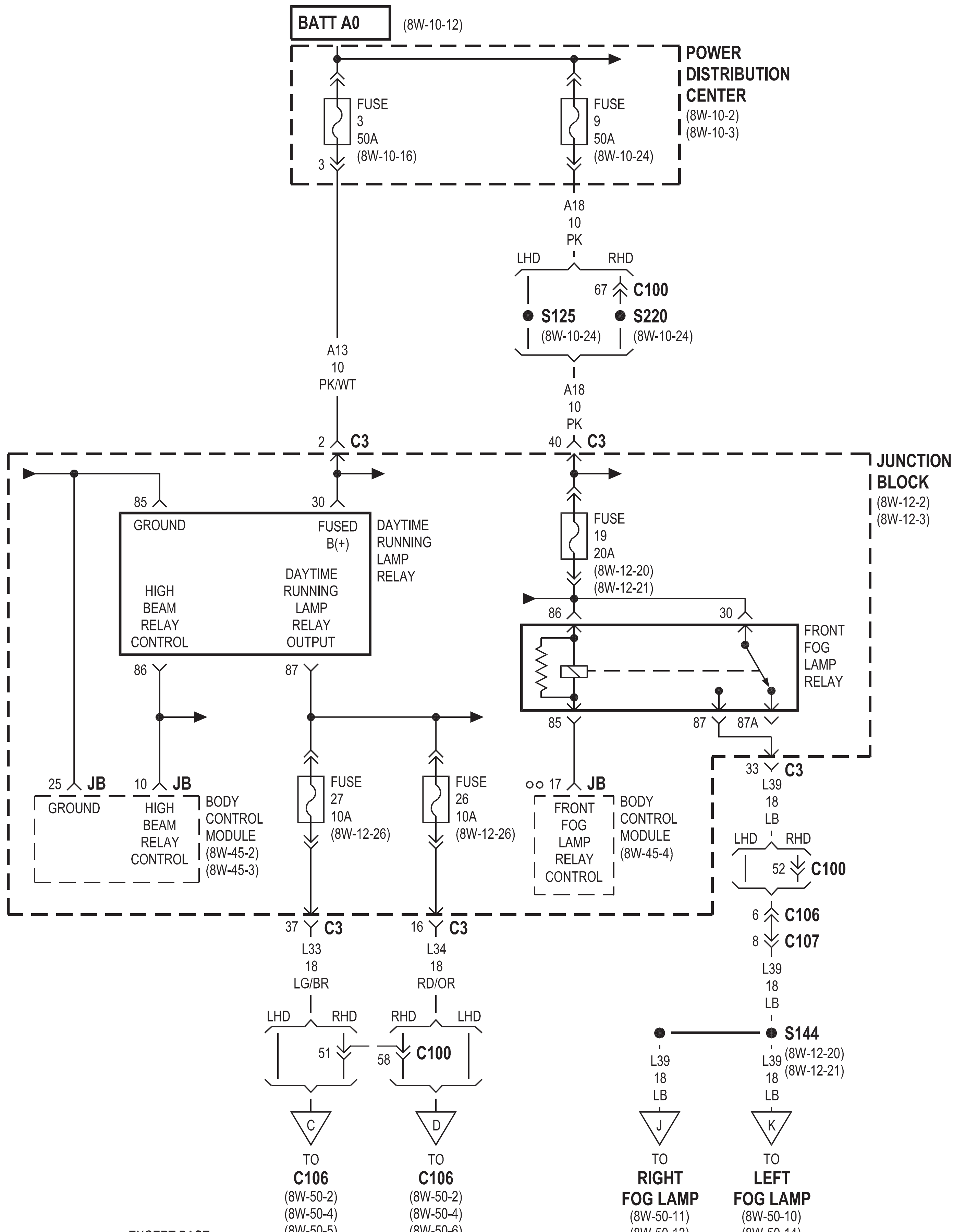

FROM
JUNCTION
BLOCK
(8W-50-3)
B
FROM
JUNCTION
BLOCK
(8W-50-9)
D
FROM
JUNCTION
BLOCK
(8W-50-7)
L
FROM
LEFT
LEVELING
MOTOR
(8W-50-5)
P
L44
18
VT/RD
L34
18
RD/OR
L78
18
DG/YL
11
10
7
C106
L78
18
DG/YL
L13
18
BR/YL
EXCEPT
LEVELING
HEADLAMPS
LEVELING
HEADLAMPS
S148
S149
L44
18
VT/RD
L34
18
RD/OR
L78
18
DG/YL
L78
18
DG/YL
L13
18
BR/YL
2
1
1
3
2
RIGHT
HEADLAMP
RIGHT
POSITION
LAMP
LOGIC
M
RIGHT
LEVELING
MOTOR
3
2
1
Z142
18
BK/WT
Z142
18
BK/WT
Z142
18
BK/WT
S131
(8W-15-8)
Z142
18
BK/WT
14
C106
Z142
18
BK/WT
S110
(8W-15-8)
Z142
16
BK/WT
G111
(8W-15-8)


BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
87
87A
PARK LAMP RELAY
(8W-50-8)
85
30
FUSE 9 10A (8W-12-13)
FUSE 23 10A (8W-12-13)
30 C3
8 C1
28 C3
20 C1
L78 18 DG/YL
L78 18 DG/YL
L77 18 BK/YL
S216
(8W-12-14)
L78 18 DG/YL
LHD
RHD
53 C100
LHD
RHD
59 C100
2
HEADLAMP LEVELING SWITCH
1
3
L77 18 BK/YL
M
TO C106
(8W-50-5)
L13 18 BR/YL
Z12 18 BK/TN
12 C100
S200
(8W-15-12)
L78 18 DG/YL
L13 18 BR/YL
Z12 16 BK/TN
Z131 10 BK/GY
L
TO C106
(8W-50-6)
N
TO C106
(8W-50-5)
1
9
G202
(8W-15-12)

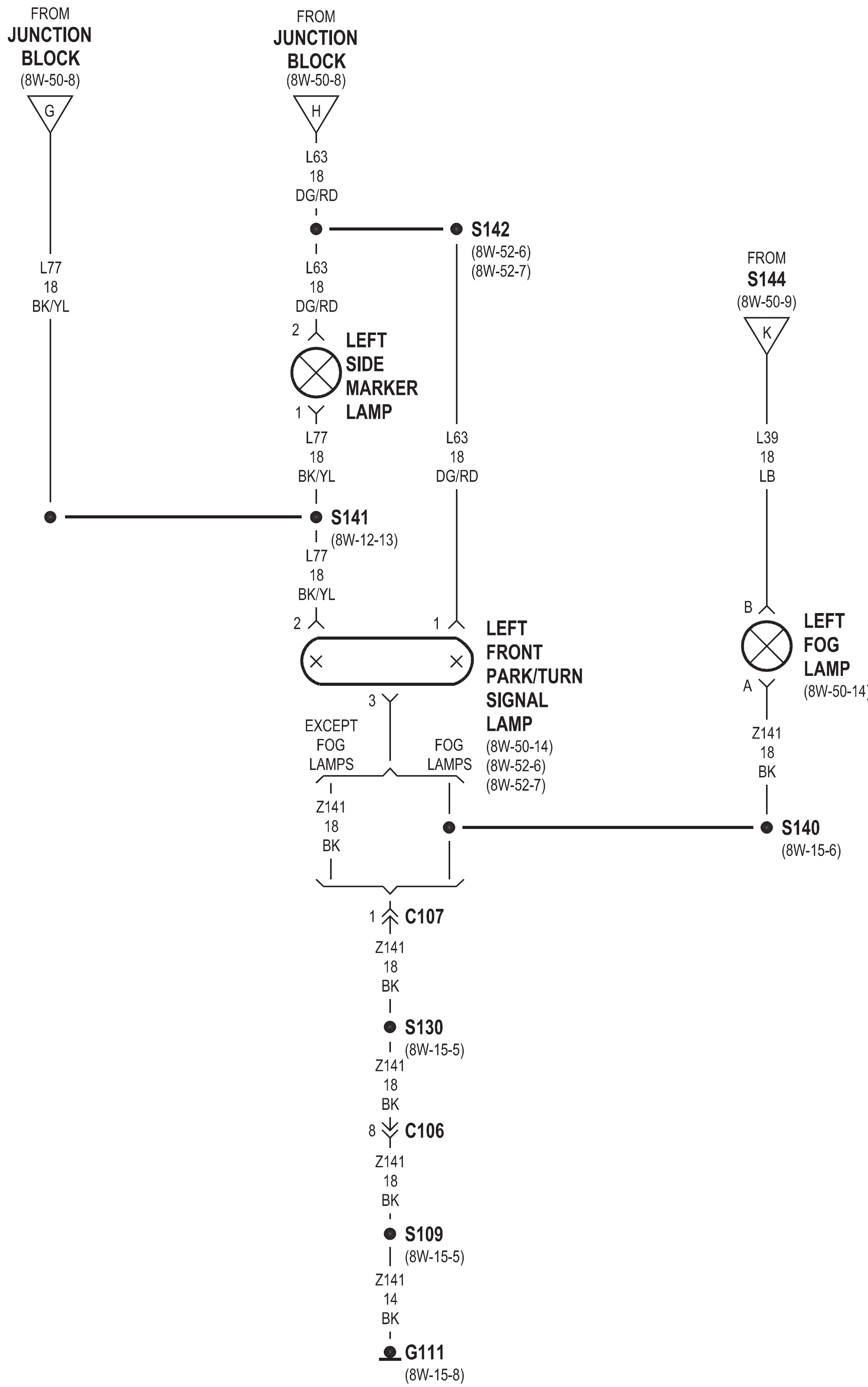


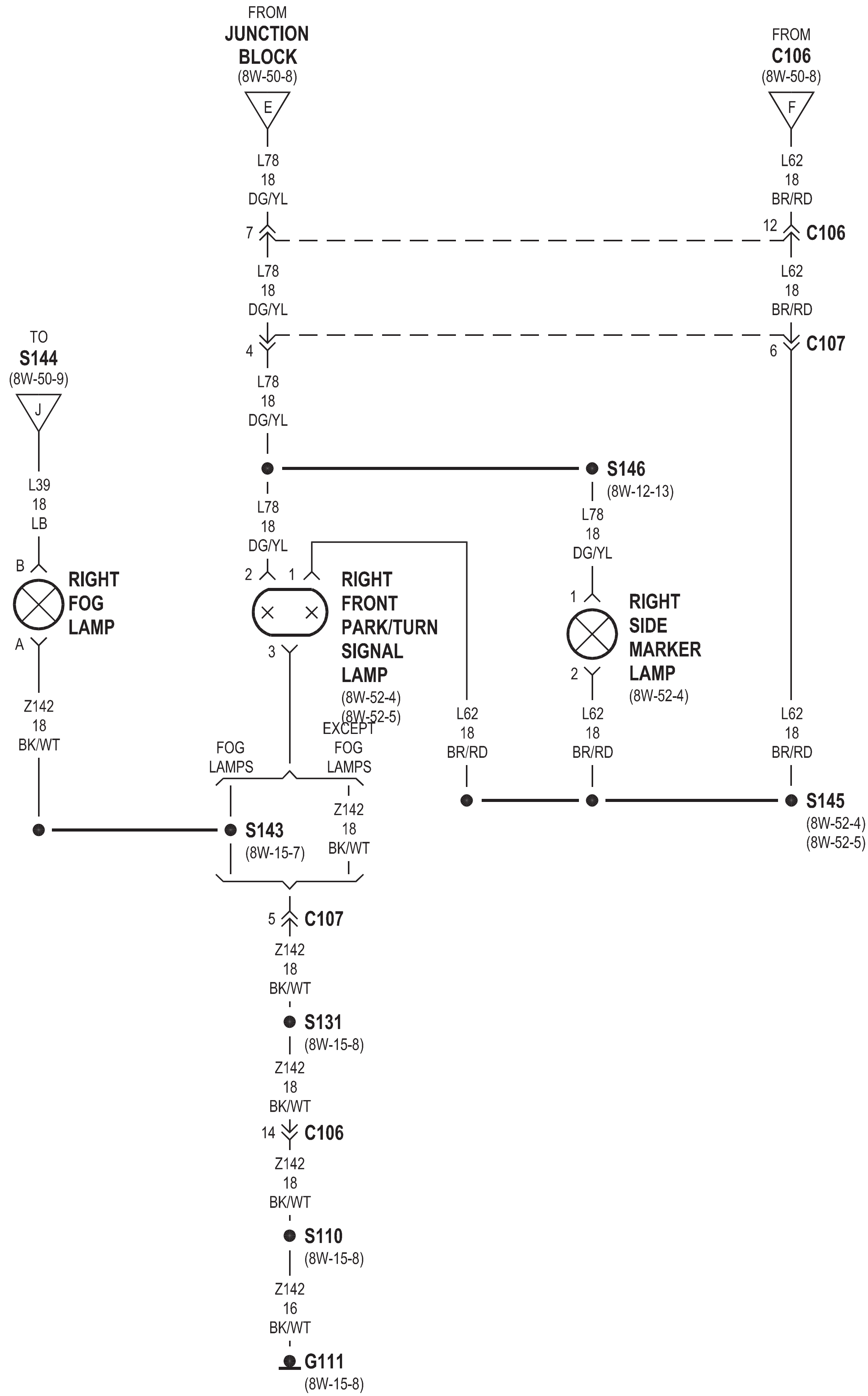
BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
87A
87
86
PARK LAMP RELAY
30
85
25 JB
GROUND
BODY CONTROL MODULE
(8W-45-2)
3 JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
FUSE 23 10A
(8W-12-13)
FUSE 9 10A
(8W-12-13)
28 C3
30 C3
L77 18 BK/YL
L78 18 DG/YL
LHD
RHD
59 C100
53 C100
13 C106
2 C107
G
TO S141
(8W-50-10)
E
TO C106
(8W-50-11)
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
RIGHT TURN SIGNAL
LEFT TURN SIGNAL
3
7
L62 18 BR/RD
L63 18 DG/RD
S212
(8W-52-4)
(8W-52-5)
S213
(8W-52-6)
(8W-52-7)
17
18 C100
5 C106
10 C107
F
TO C106
(8W-50-11)
(8W-50-12)
(8W-50-13)
H
TO S142
(8W-50-10)
(8W-50-12)
(8W-50-14)

DRL

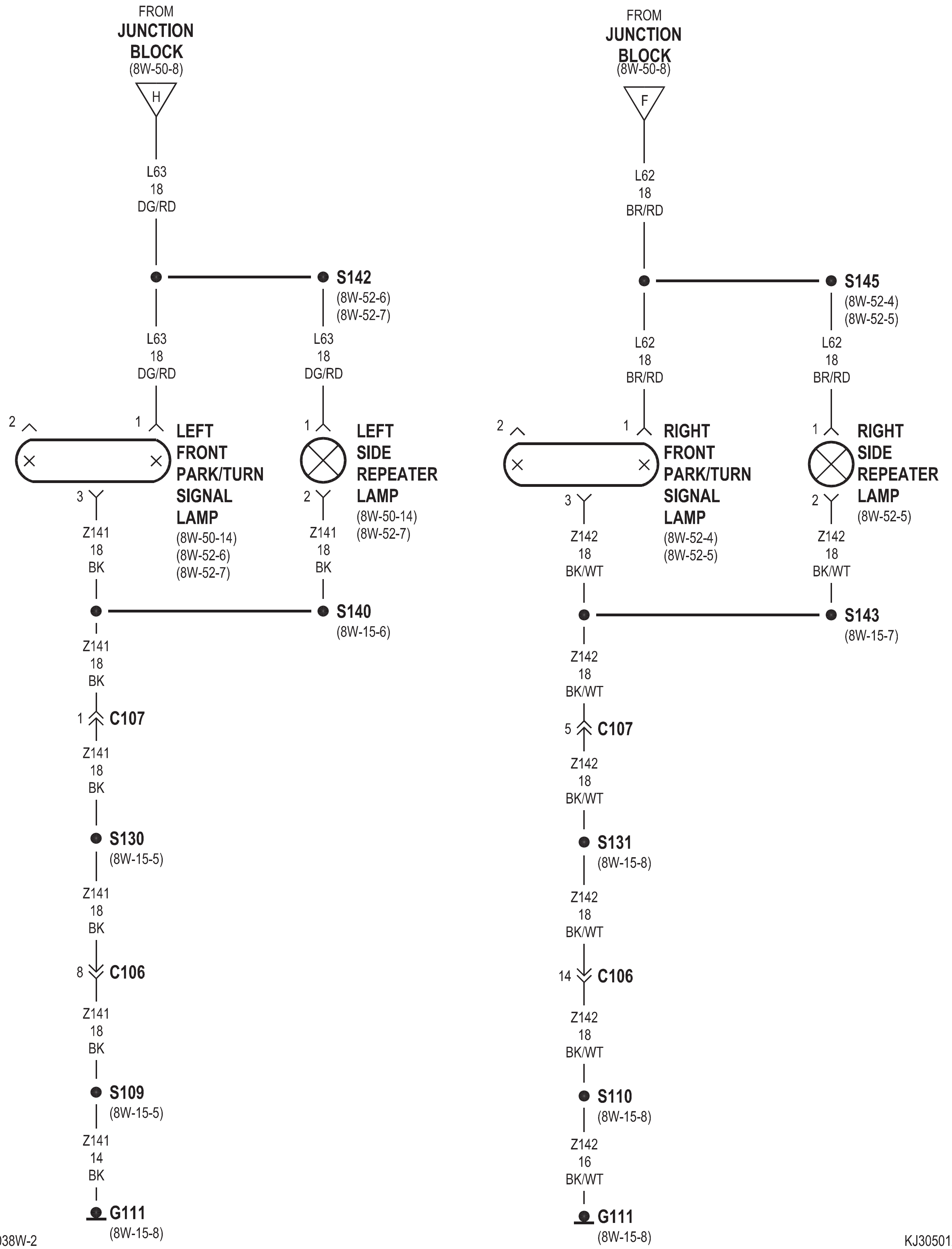


BATT A0
(8W-10-12)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
FUSE
3
50A
(8W-10-16)
FUSE
9
50A
(8W-10-24)
3
A18
10
PK
LHD
RHD
67
C100
S125
(8W-10-24)
S220
(8W-10-24)
A13
10
PK/WT
A18
10
PK
2
C3
40
C3
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
85
30
GROUND
FUSED
B(+)
DAYTIME
RUNNING
LAMP
RELAY
HIGH
BEAM
RELAY
CONTROL
DAYTIME
RUNNING
LAMP
RELAY
OUTPUT
86
87
FUSE
19
20A
(8W-12-20)
(8W-12-21)
86
30
FRONT
FOG
LAMP
RELAY
85
87
87A
33
C3
L39
18
LB
LHD
RHD
52
C100
25
JB
GROUND
10
JB
HIGH
BEAM
RELAY
CONTROL
BODY
CONTROL
MODULE
(8W-45-2)
(8W-45-3)
FUSE
27
10A
(8W-12-26)
FUSE
26
10A
(8W-12-26)
○○ 17
JB
FRONT
FOG
LAMP
RELAY
CONTROL
BODY
CONTROL
MODULE
(8W-45-4)
6
C106
8
C107
L39
18
LB
37
C3
16
C3
L33
18
LG/BR
L34
18
RD/OR
LHD
RHD
RHD
LHD
51
58
C100
S144
(8W-12-20)
(8W-12-21)
L39
18
LB
L39
18
LB
C
D
J
K
TO
C106
(8W-50-2)
(8W-50-4)
(8W-50-5)
TO
C106
(8W-50-2)
(8W-50-4)
(8W-50-6)
TO
RIGHT
FOG LAMP
(8W-50-11)
(8W-50-13)
TO
LEFT
FOG LAMP
(8W-50-10)
(8W-50-14)
○○ EXCEPT BASE

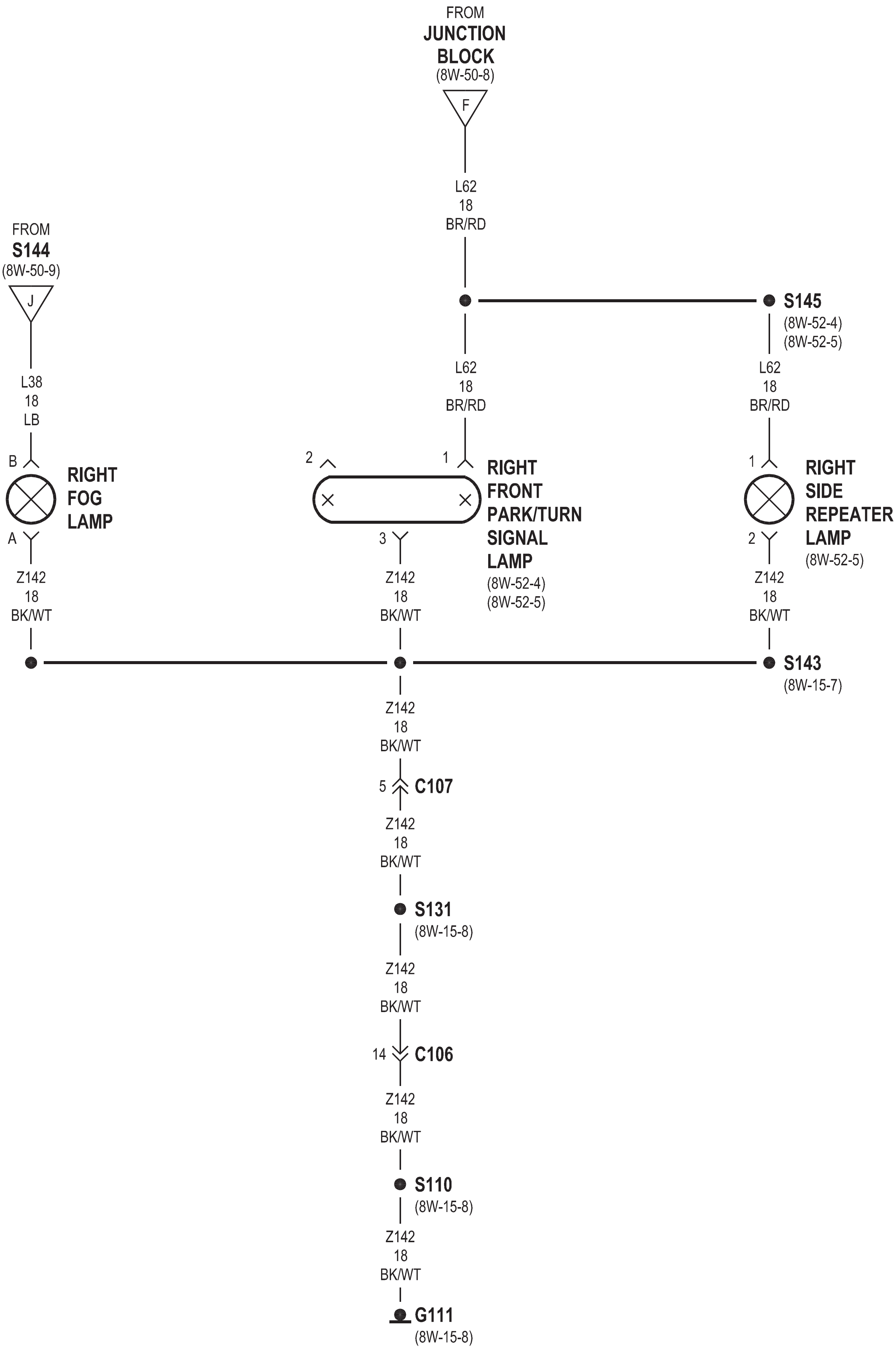

FROM
JUNCTION
BLOCK
(8W-50-8)
G
FROM
JUNCTION
BLOCK
(8W-50-8)
H
L63
18
DG/RD
S142
(8W-52-6)
(8W-52-7)
L77
18
BK/YL
L63
18
DG/RD
FROM
S144
(8W-50-9)
K
2
LEFT
SIDE
MARKER
LAMP
1
L77
18
BK/YL
L63
18
DG/RD
L39
18
LB
S141
(8W-12-13)
L77
18
BK/YL
2
1
LEFT
FRONT
PARK/TURN
SIGNAL
LAMP
(8W-50-14)
(8W-52-6)
(8W-52-7)
B
LEFT
FOG
LAMP
(8W-50-14)
A
3
EXCEPT
FOG
LAMPS
FOG
LAMPS
Z141
18
BK
Z141
18
BK
S140
(8W-15-6)
1
C107
Z141
18
BK
S130
(8W-15-5)
Z141
18
BK
8
C106
Z141
18
BK
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)


FROM
JUNCTION BLOCK
(8W-50-8)
E
FROM
C106
(8W-50-8)
F
L78
18
DG/YL
L62
18
BR/RD
7
12
C106
4
6
C107
TO
S144
(8W-50-9)
J
S146
(8W-12-13)
L39
18
LB
B
RIGHT FOG LAMP
A
2
1
RIGHT FRONT PARK/TURN SIGNAL LAMP
(8W-52-4)
(8W-52-5)
3
RIGHT SIDE MARKER LAMP
(8W-52-4)
Z142
18
BK/WT
FOG LAMPS
EXCEPT FOG LAMPS
S143
(8W-15-7)
S145
(8W-52-4)
(8W-52-5)
5
C107
S131
(8W-15-8)
14
C106
S110
(8W-15-8)
Z142
16
BK/WT
G111
(8W-15-8)

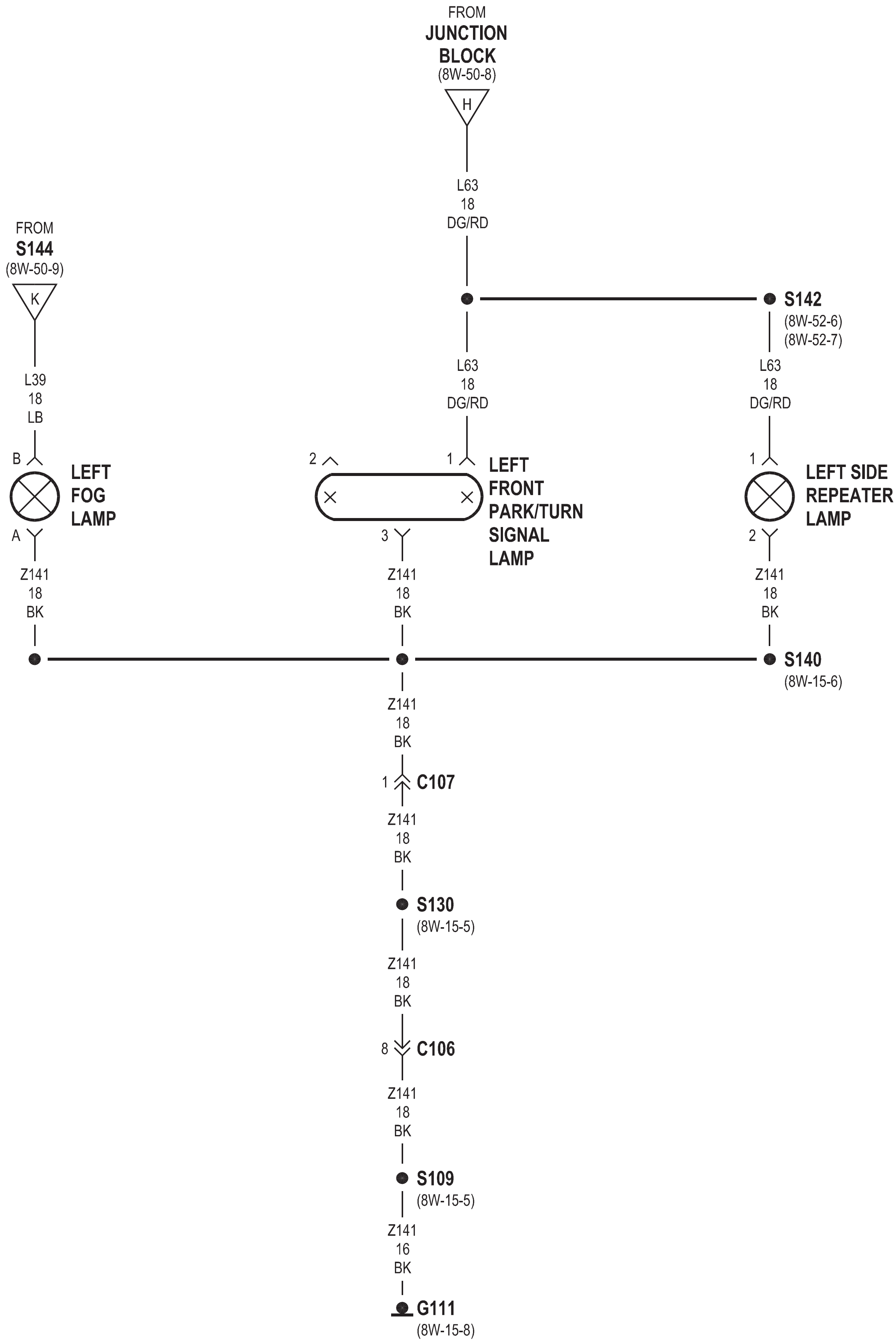
EXPORT EXCEPT FOG LAMPS

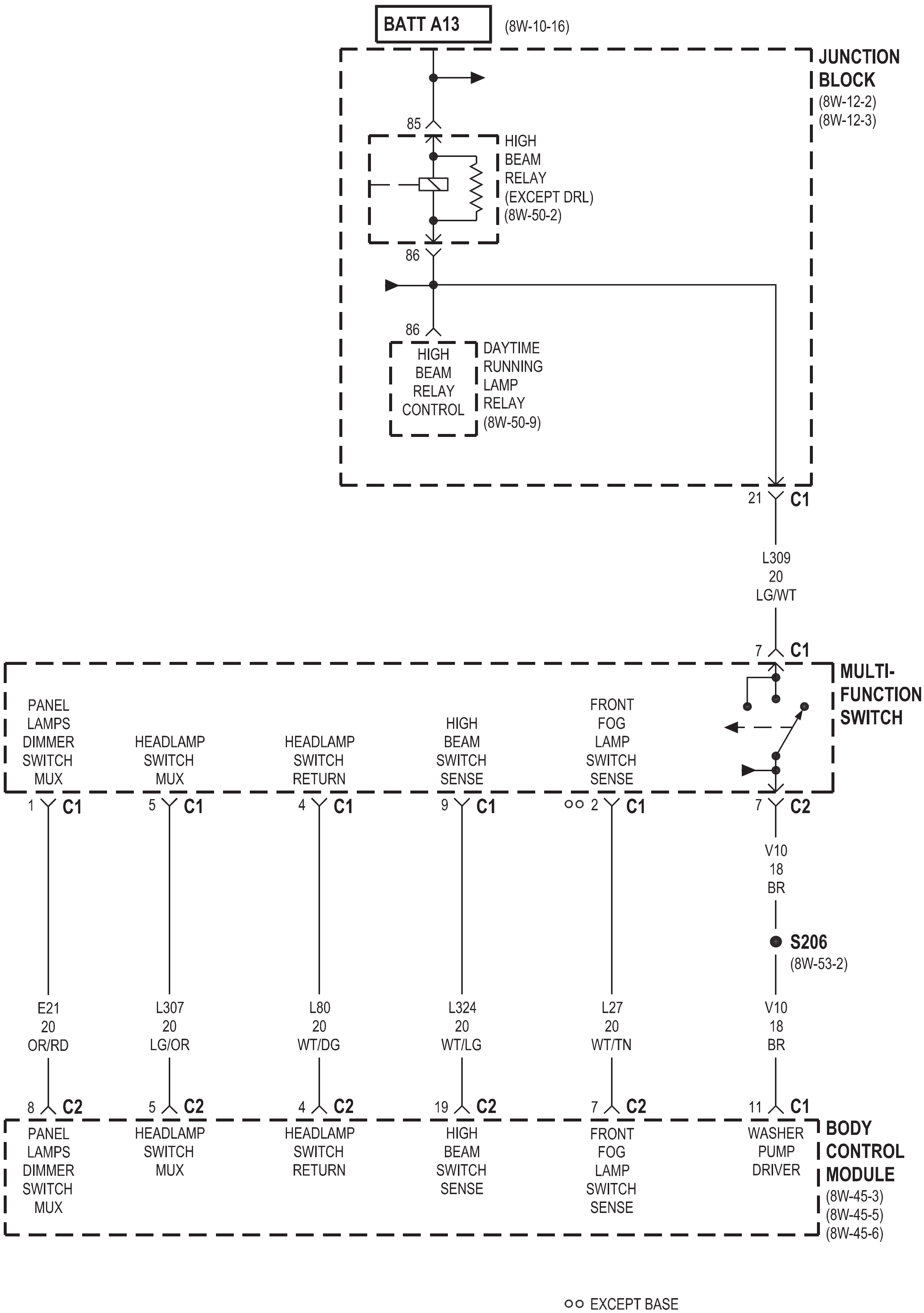


EXPORT FOG LAMPS

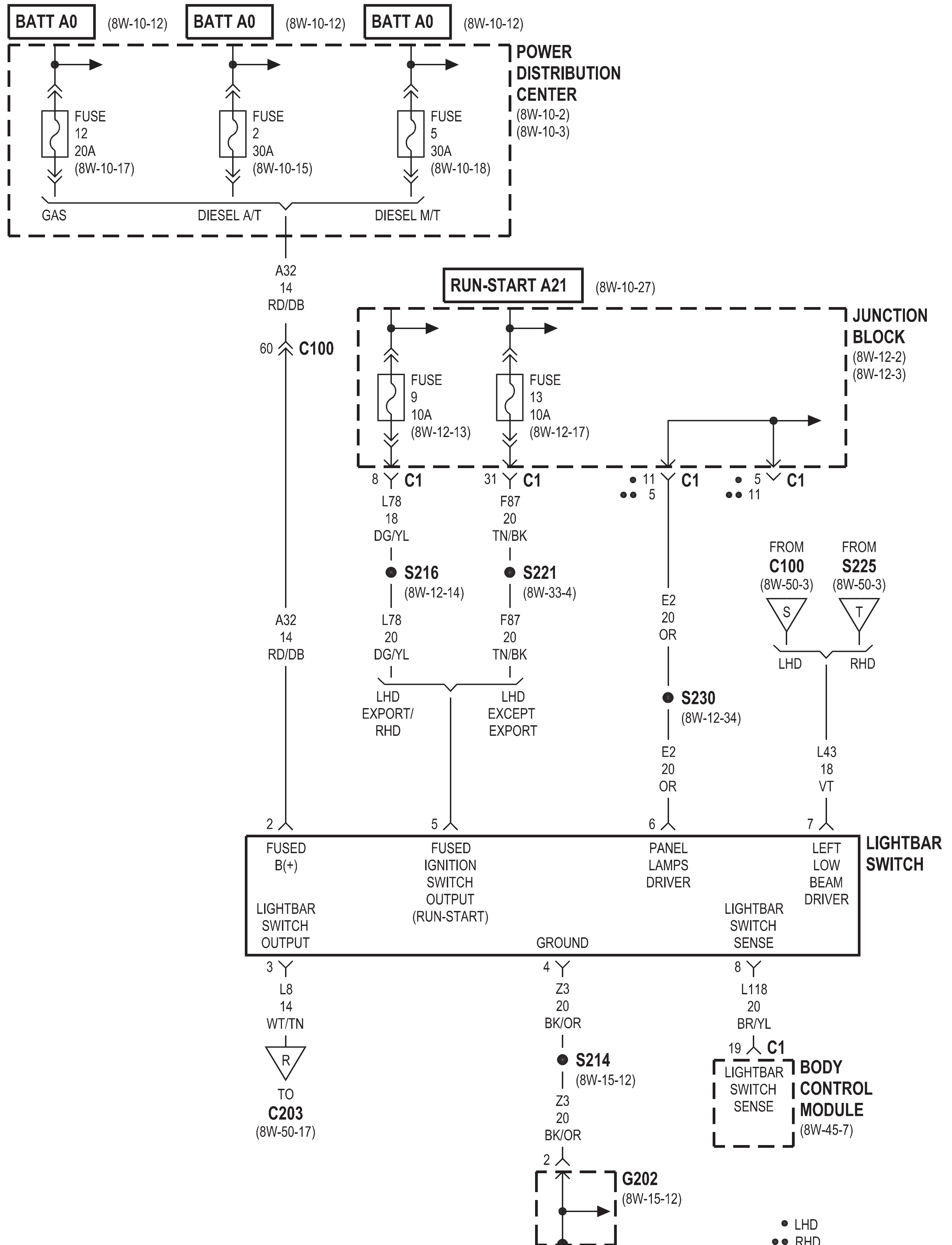


EXPORT FOG LAMPS

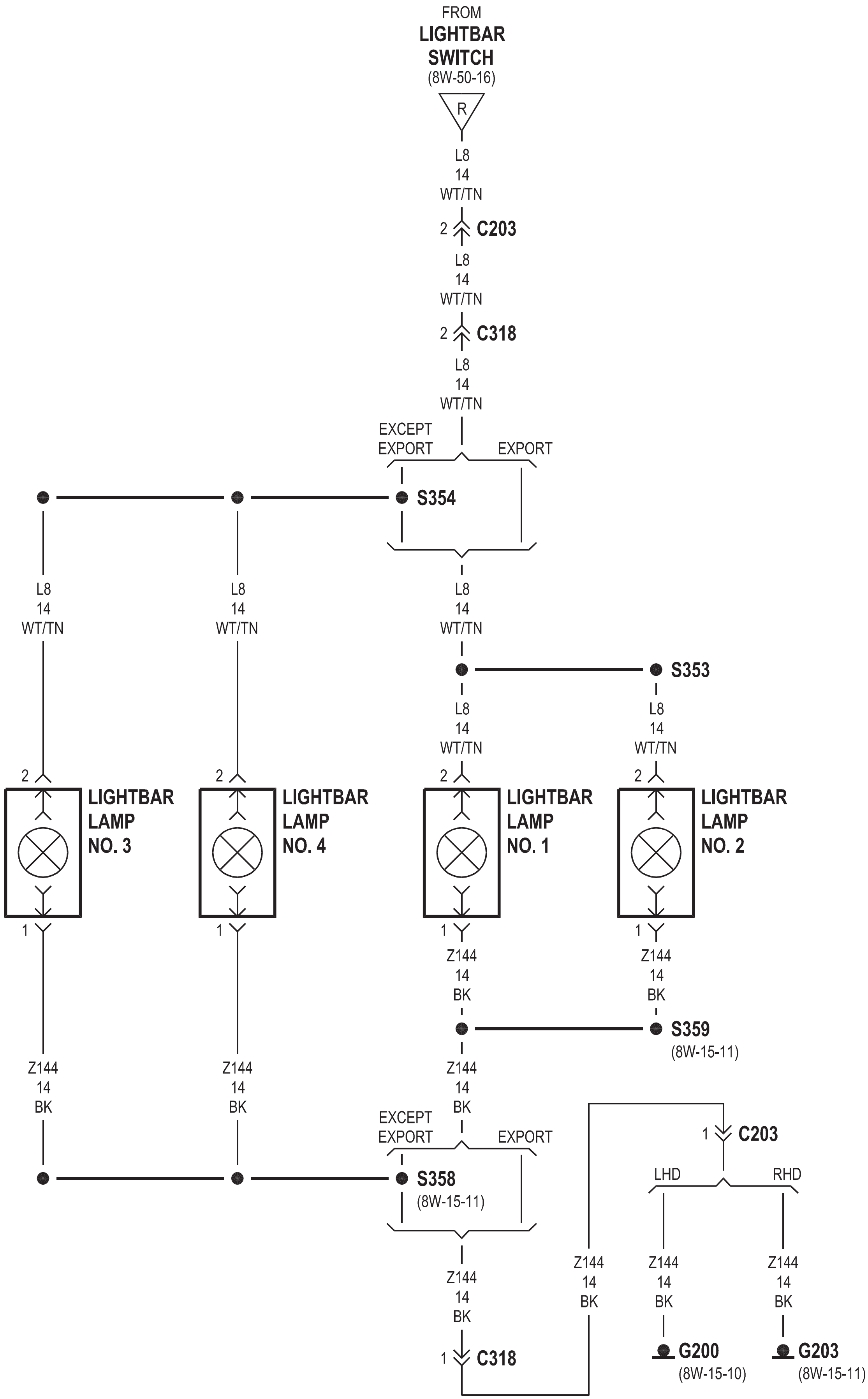



BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
85
HIGH BEAM RELAY (EXCEPT DRL)
(8W-50-2)
86
86
HIGH BEAM RELAY CONTROL
DAYTIME RUNNING LAMP RELAY
(8W-50-9)
21 C1
L309
20
LG/WT
7 C1
MULTI-FUNCTION SWITCH
PANEL LAMPS DIMMER SWITCH MUX
HEADLAMP SWITCH MUX
HEADLAMP SWITCH RETURN
HIGH BEAM SWITCH SENSE
FRONT FOG LAMP SWITCH SENSE
1 C1
5 C1
4 C1
9 C1
oo 2 C1
7 C2
V10
18
BR
S206
(8W-53-2)
E21 20 OR/RD
L307 20 LG/OR
L80 20 WT/DG
L324 20 WT/LG
L27 20 WT/TN
V10 18 BR
8 C2
5 C2
4 C2
19 C2
7 C2
11 C1
PANEL LAMPS DIMMER SWITCH MUX
HEADLAMP SWITCH MUX
HEADLAMP SWITCH RETURN
HIGH BEAM SWITCH SENSE
FRONT FOG LAMP SWITCH SENSE
WASHER PUMP DRIVER
BODY CONTROL MODULE
(8W-45-3)
(8W-45-5)
(8W-45-6)
oo EXCEPT BASE

RENEGADE

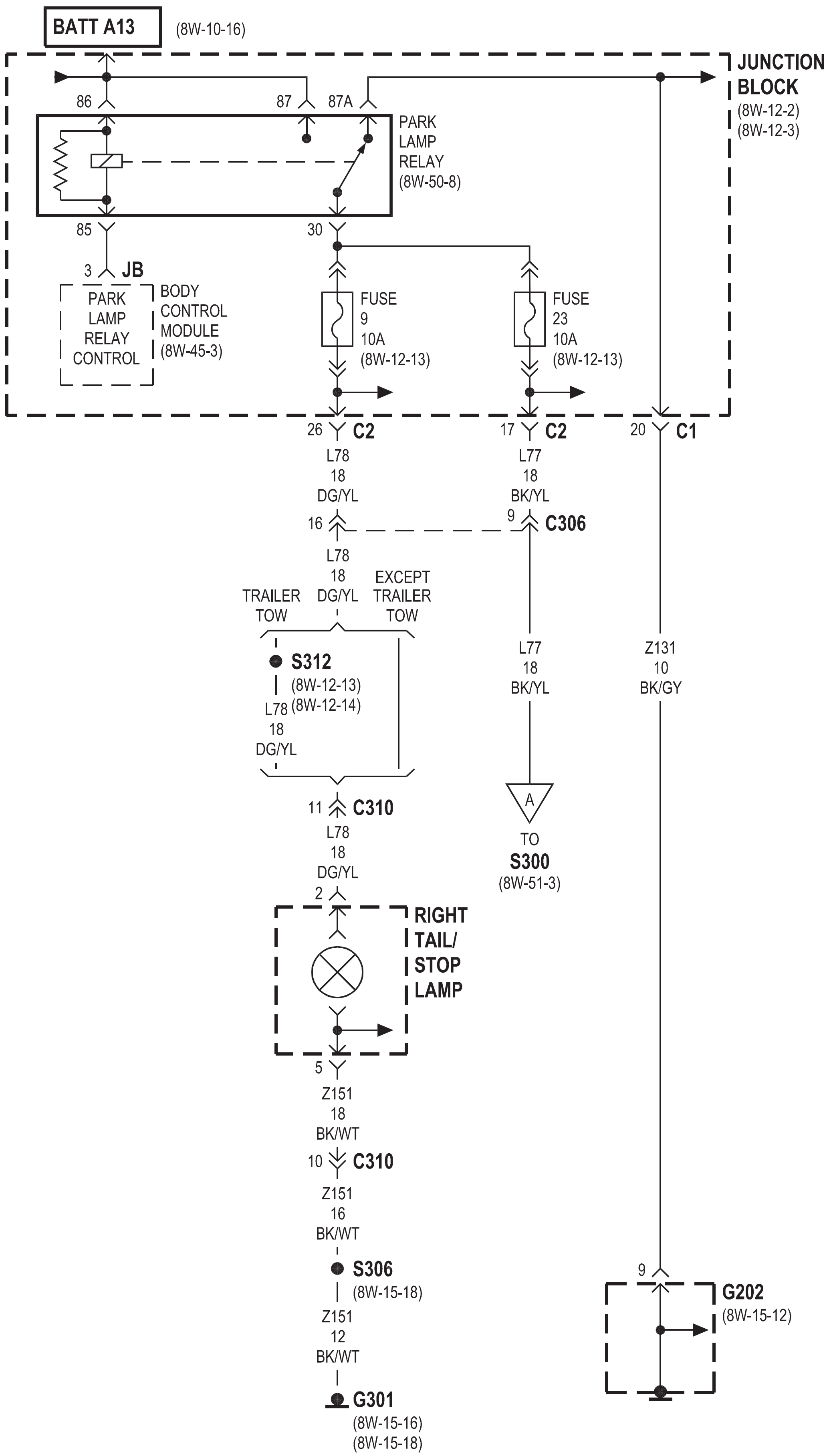

BATT A0 (8W-10-12)
BATT A0 (8W-10-12)
BATT A0 (8W-10-12)
POWER DISTRIBUTION CENTER (8W-10-2) (8W-10-3)
FUSE 12 20A (8W-10-17)
FUSE 2 30A (8W-10-15)
FUSE 5 30A (8W-10-18)
GAS
DIESEL A/T
DIESEL M/T
A32 14 RD/DB
60 C100
RUN-START A21 (8W-10-27)
JUNCTION BLOCK (8W-12-2) (8W-12-3)
FUSE 9 10A (8W-12-13)
FUSE 13 10A (8W-12-17)
8 C1
31 C1
• 11 •• 5 C1
• 5 •• 11 C1
L78 18 DG/YL
F87 20 TN/BK
S216 (8W-12-14)
S221 (8W-33-4)
A32 14 RD/DB
L78 20 DG/YL
F87 20 TN/BK
LHD EXPORT/ RHD
LHD EXCEPT EXPORT
E2 20 OR
S230 (8W-12-34)
E2 20 OR
FROM C100 (8W-50-3)
FROM S225 (8W-50-3)
S
T
LHD
RHD
L43 18 VT
2
5
6
7
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PANEL LAMPS DRIVER
LEFT LOW BEAM DRIVER
LIGHTBAR SWITCH
LIGHTBAR SWITCH OUTPUT
GROUND
LIGHTBAR SWITCH SENSE
3
4
8
L8 14 WT/TN
R
TO C203 (8W-50-17)
Z3 20 BK/OR
S214 (8W-15-12)
Z3 20 BK/OR
2
G202 (8W-15-12)
L118 20 BR/YL
19 C1
LIGHTBAR SWITCH SENSE
BODY CONTROL MODULE (8W-45-7)
• LHD
•• RHD

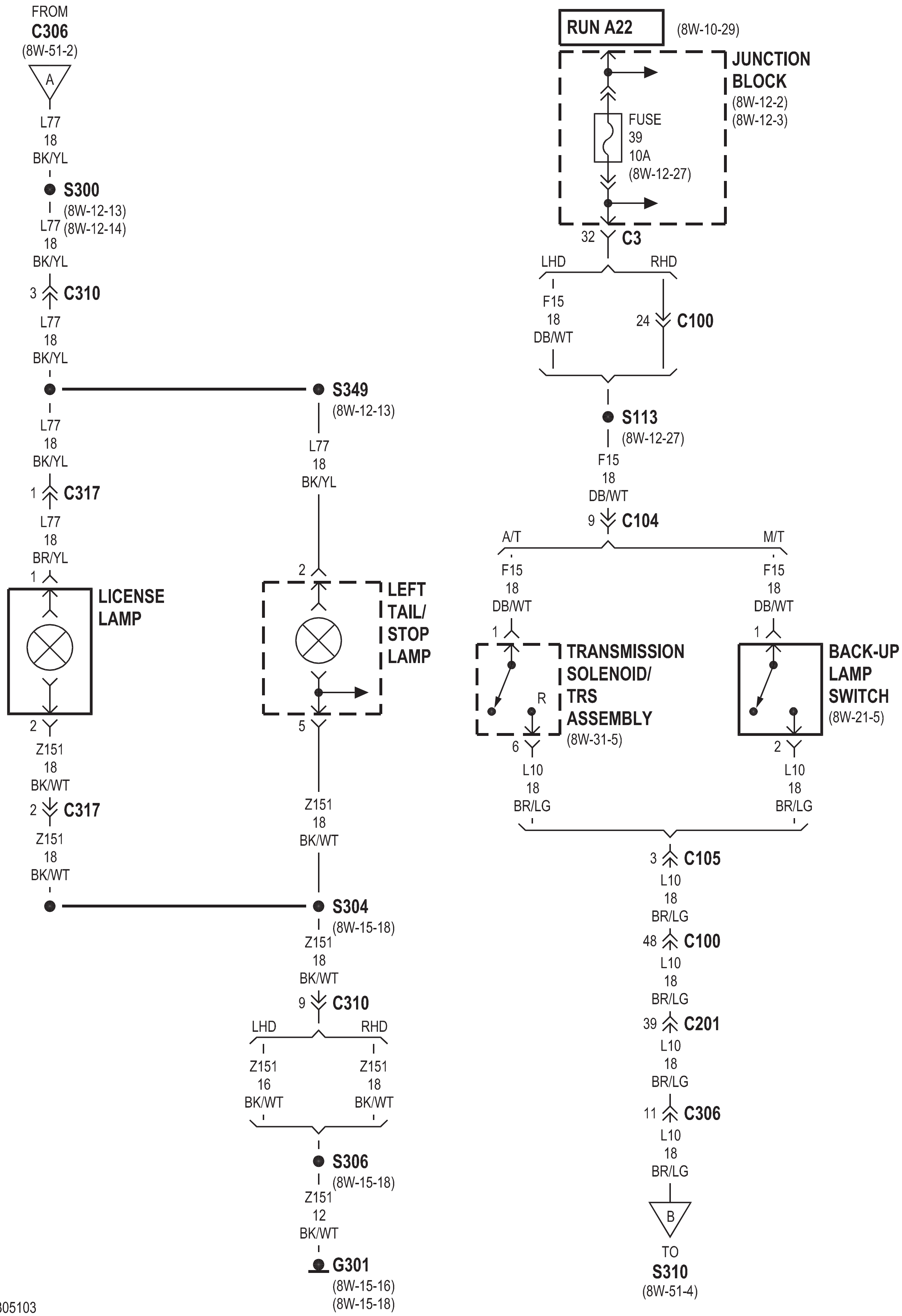
RENEGADE



FROM
LIGHTBAR SWITCH
(8W-50-16)
R
L8
14
WT/TN
2
C203
L8
14
WT/TN
2
C318
L8
14
WT/TN
EXCEPT EXPORT
EXPORT
S354
L8
14
WT/TN
L8
14
WT/TN
L8
14
WT/TN
S353
L8
14
WT/TN
L8
14
WT/TN
2
LIGHTBAR LAMP NO. 3
2
LIGHTBAR LAMP NO. 4
2
LIGHTBAR LAMP NO. 1
2
LIGHTBAR LAMP NO. 2
1
1
1
1
Z144
14
BK
Z144
14
BK
S359
(8W-15-11)
Z144
14
BK
Z144
14
BK
Z144
14
BK
EXCEPT EXPORT
EXPORT
1
C203
S358
(8W-15-11)
LHD
RHD
Z144
14
BK
Z144
14
BK
Z144
14
BK
Z144
14
BK
1
C318
G200
(8W-15-10)
G203
(8W-15-11)

8W-51 REAR LIGHTING


BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
87
87A
PARK LAMP RELAY
(8W-50-8)
85
30
3
JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
FUSE 9 10A
(8W-12-13)
FUSE 23 10A
(8W-12-13)
26
C2
17
C2
20
C1
L78 18 DG/YL
L77 18 BK/YL
16
9
C306
L78 18 DG/YL
TRAILER TOW
EXCEPT TRAILER TOW
S312
(8W-12-13)
(8W-12-14)
L78 18 DG/YL
L77 18 BK/YL
Z131 10 BK/GY
11
C310
A
TO
S300
(8W-51-3)
L78 18 DG/YL
2
RIGHT TAIL/ STOP LAMP
5
Z151 18 BK/WT
10
C310
Z151 16 BK/WT
S306
(8W-15-18)
Z151 12 BK/WT
G301
(8W-15-16)
(8W-15-18)
9
G202
(8W-15-12)



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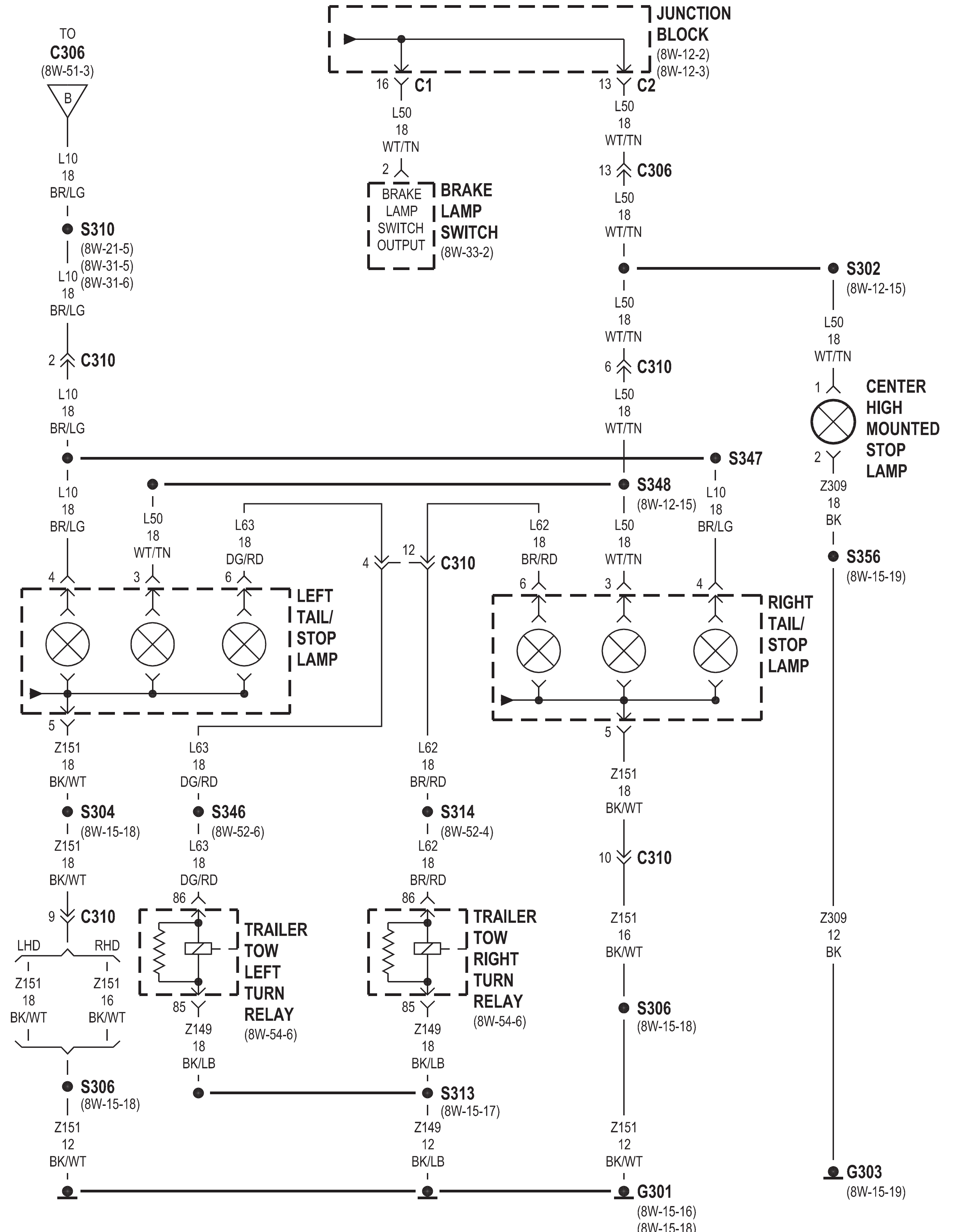
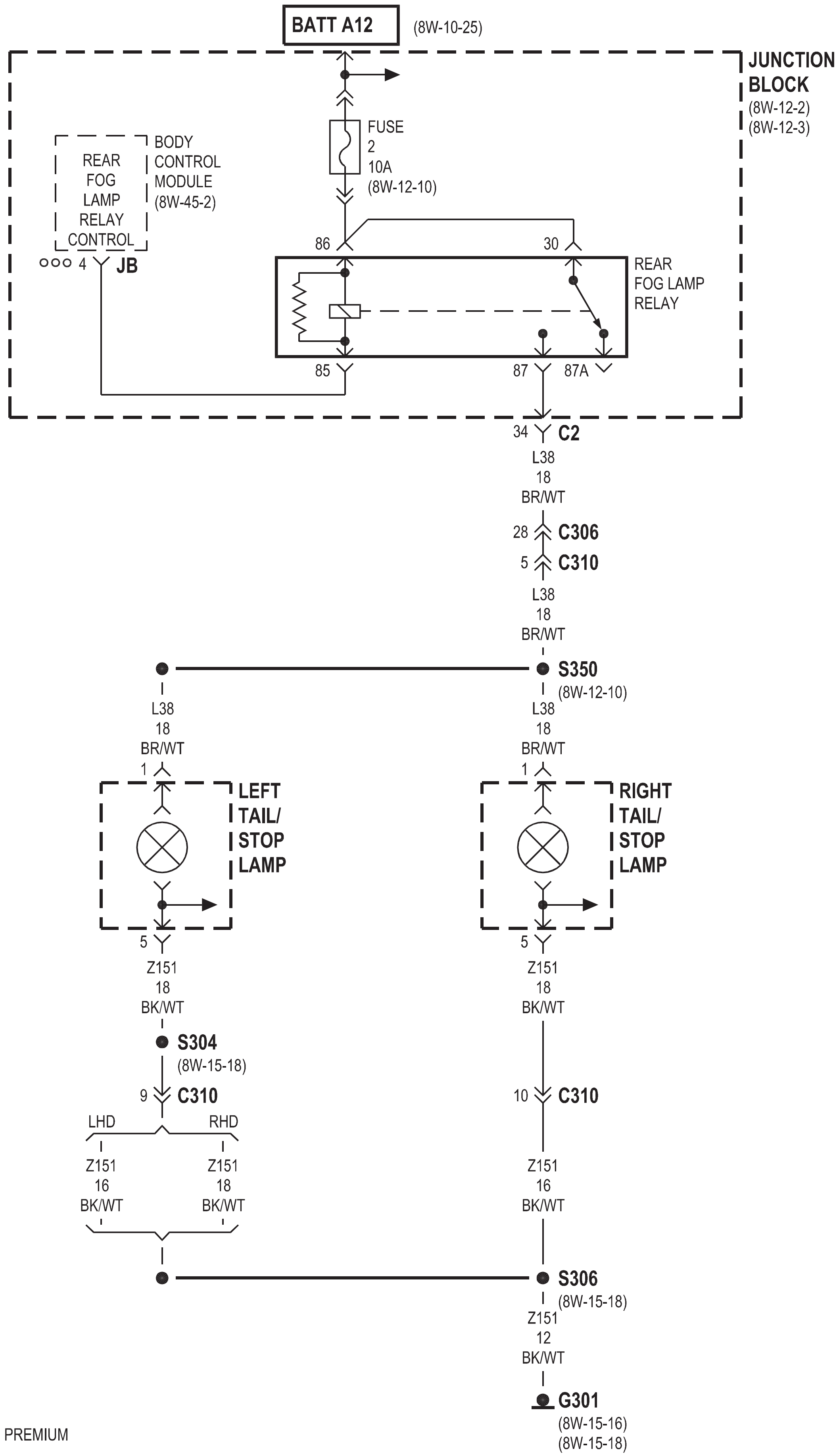
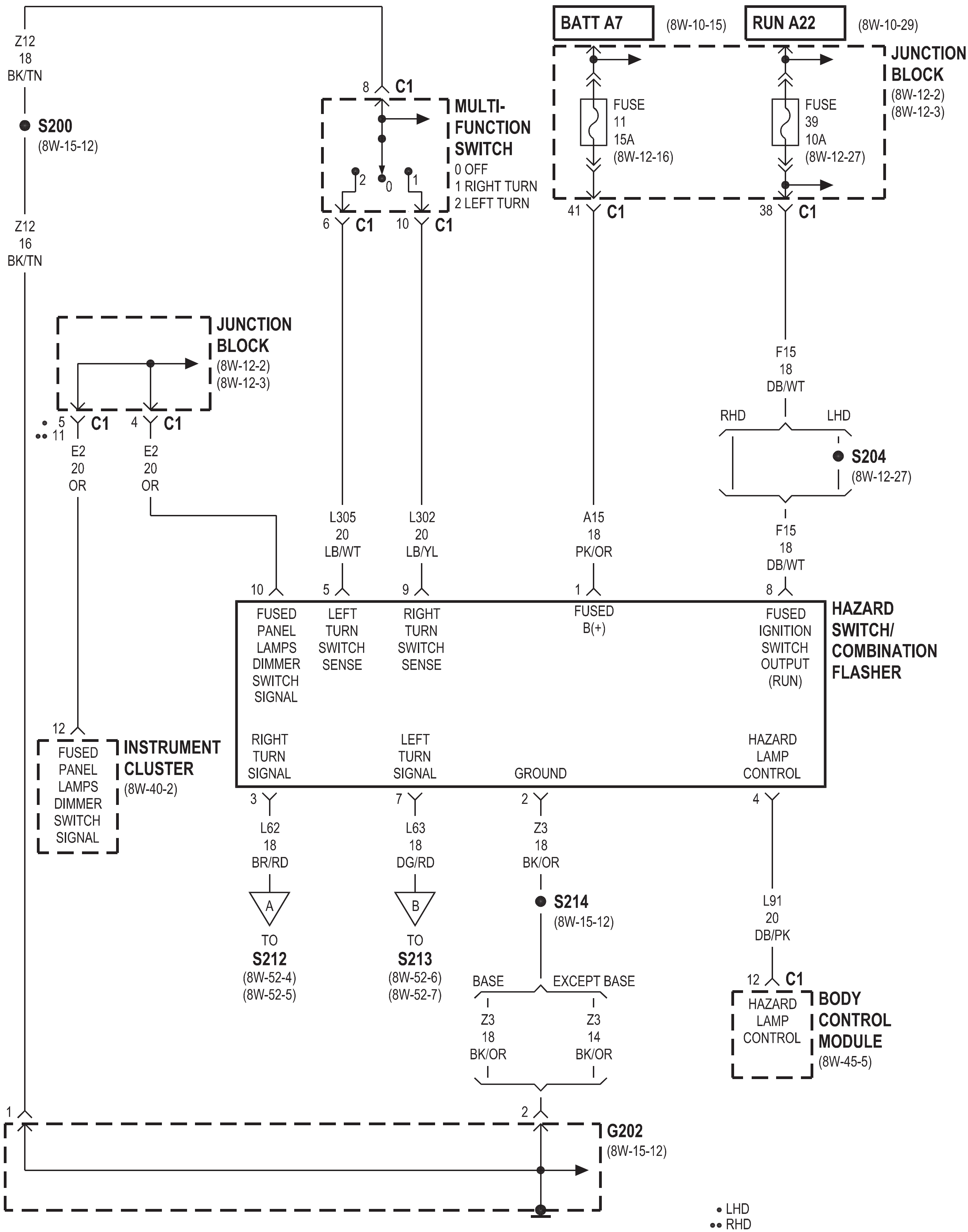
J038W-2


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
TO C306 (8W-51-3)
B
16 C1
13 C2
L50 18 WT/TN
2
BRAKE LAMP SWITCH OUTPUT
BRAKE LAMP SWITCH
(8W-33-2)
13 C306
L10 18 BR/LG
S310
(8W-21-5)
(8W-31-5)
(8W-31-6)
S302
(8W-12-15)
2 C310
6 C310
CENTER HIGH MOUNTED STOP LAMP
1
2
S347
S348
(8W-12-15)
Z309 18 BK
S356
(8W-15-19)
L63 18 DG/RD
L62 18 BR/RD
4
12
C310
LEFT TAIL/ STOP LAMP
RIGHT TAIL/ STOP LAMP
3
6
5
Z151 18 BK/WT
S304
(8W-15-18)
S346
(8W-52-6)
S314
(8W-52-4)
10 C310
9 C310
LHD
RHD
Z151 16 BK/WT
86
85
TRAILER TOW LEFT TURN RELAY
(8W-54-6)
TRAILER TOW RIGHT TURN RELAY
(8W-54-6)
Z309 12 BK
Z149 18 BK/LB
S306
(8W-15-18)
S313
(8W-15-17)
Z151 12 BK/WT
Z149 12 BK/LB
G301
(8W-15-16)
(8W-15-18)
G303
(8W-15-19)

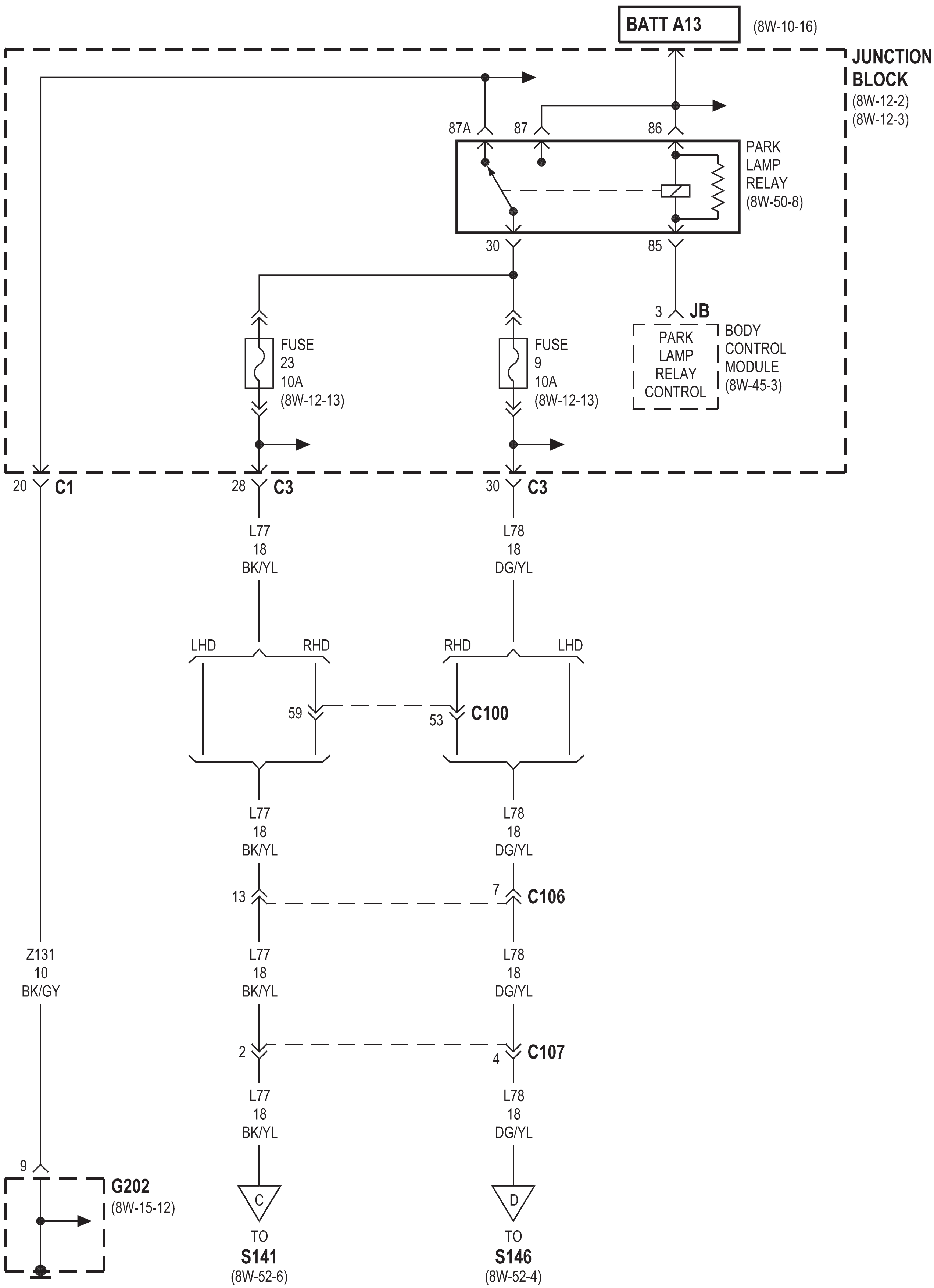
EXPORT


BATT A12
(8W-10-25)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
2
10A
(8W-12-10)
BODY CONTROL MODULE
(8W-45-2)
REAR FOG LAMP RELAY CONTROL
4 JB
86
30
REAR FOG LAMP RELAY
85
87
87A
34 C2
L38
18
BR/WT
28 C306
5 C310
L38
18
BR/WT
S350
(8W-12-10)
L38
18
BR/WT
L38
18
BR/WT
1
1
LEFT TAIL/ STOP LAMP
RIGHT TAIL/ STOP LAMP
5
5
Z151
18
BK/WT
Z151
18
BK/WT
S304
(8W-15-18)
9 C310
10 C310
LHD
RHD
Z151
16
BK/WT
Z151
18
BK/WT
Z151
16
BK/WT
S306
(8W-15-18)
Z151
12
BK/WT
G301
(8W-15-16)
(8W-15-18)
○○○ PREMIUM

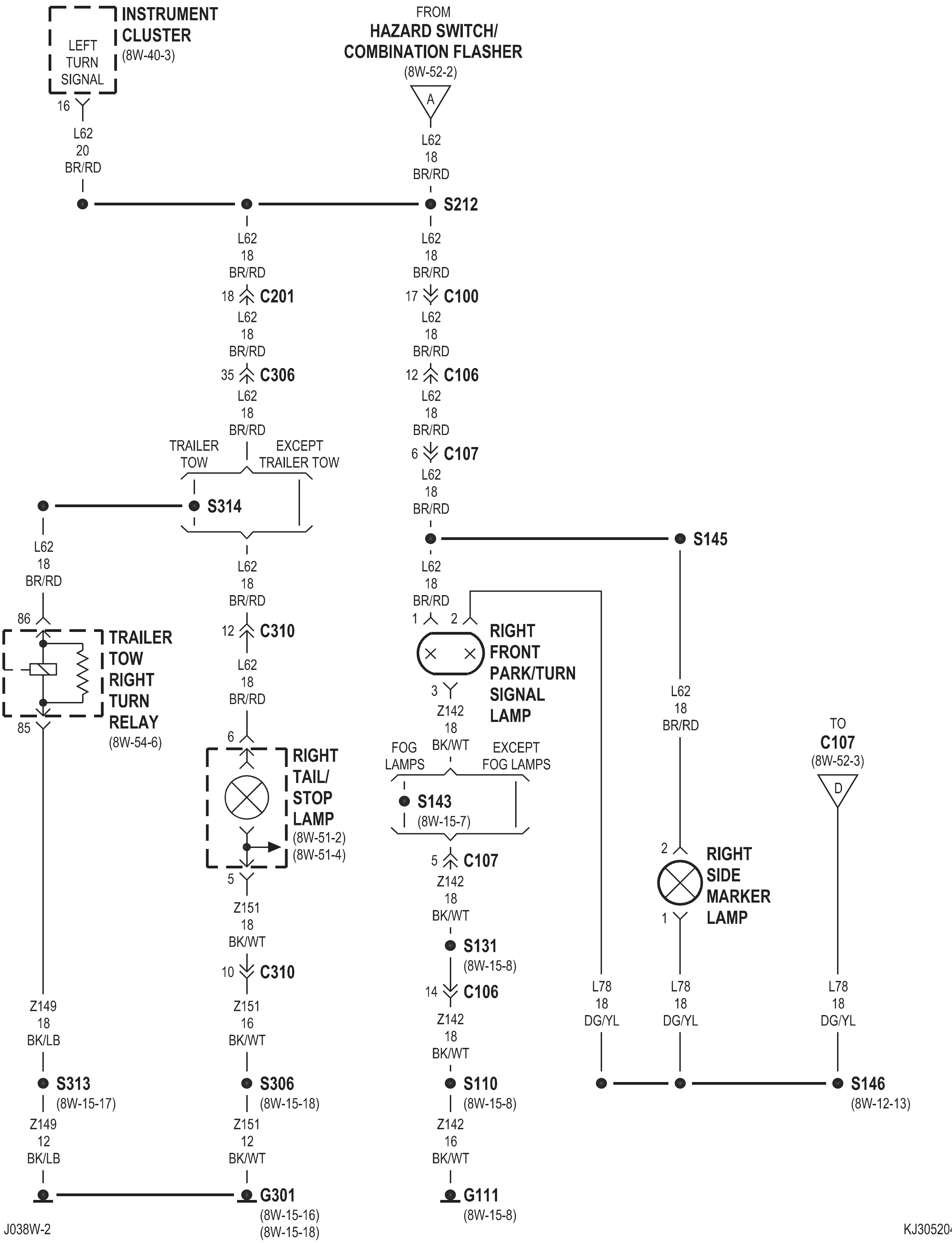
8W-52 TURN SIGNALS

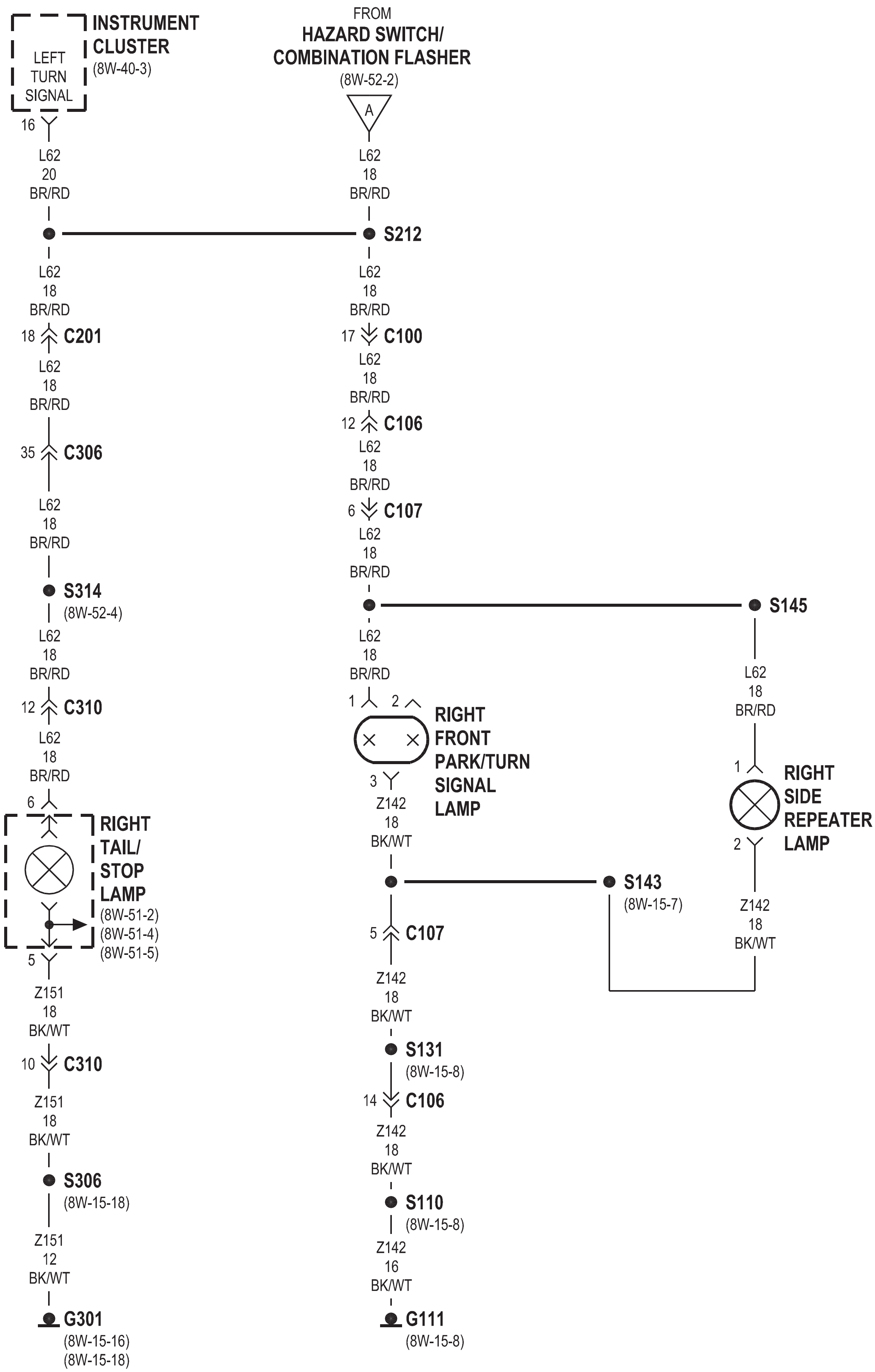


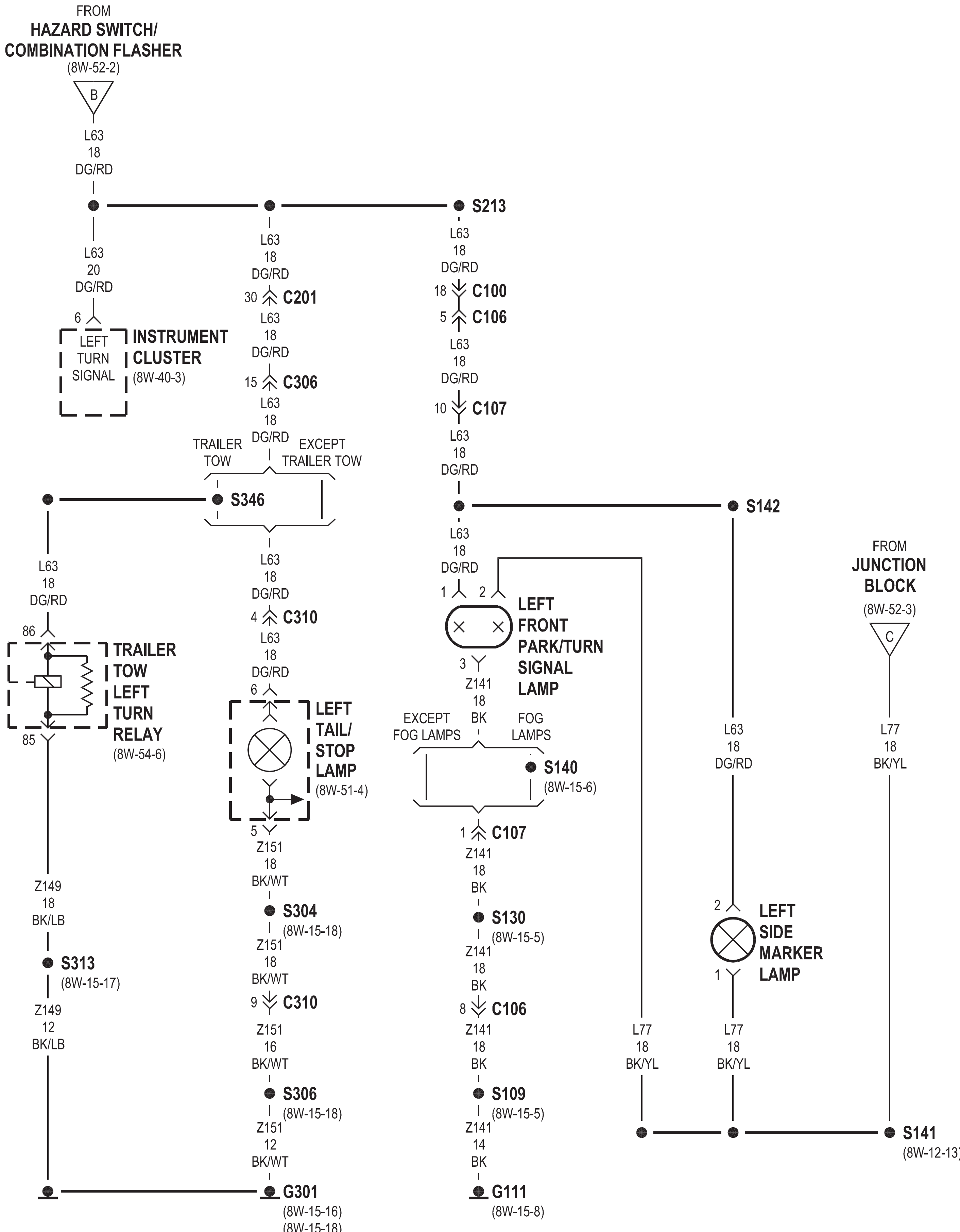
Z12
18
BK/TN
S200
(8W-15-12)
Z12
16
BK/TN
8 C1
MULTI-
FUNCTION
SWITCH
0 OFF
1 RIGHT TURN
2 LEFT TURN
6 C1
10 C1
BATT A7
(8W-10-15)
RUN A22
(8W-10-29)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
FUSE
11
15A
(8W-12-16)
FUSE
39
10A
(8W-12-27)
41 C1
38 C1
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
5 C1
11
4 C1
E2
20
OR
E2
20
OR
L305
20
LB/WT
L302
20
LB/YL
A15
18
PK/OR
F15
18
DB/WT
RHD
LHD
S204
(8W-12-27)
F15
18
DB/WT
FUSED
PANEL
LAMPS
DIMMER
SWITCH
SIGNAL
LEFT
TURN
SWITCH
SENSE
RIGHT
TURN
SWITCH
SENSE
FUSED
B(+)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN)
HAZARD
SWITCH/
COMBINATION
FLASHER
RIGHT
TURN
SIGNAL
LEFT
TURN
SIGNAL
GROUND
HAZARD
LAMP
CONTROL
12
FUSED
PANEL
LAMPS
DIMMER
SWITCH
SIGNAL
INSTRUMENT
CLUSTER
(8W-40-2)
L62
18
BR/RD
A
TO
S212
(8W-52-4)
(8W-52-5)
L63
18
DG/RD
B
TO
S213
(8W-52-6)
(8W-52-7)
Z3
18
BK/OR
S214
(8W-15-12)
BASE
EXCEPT BASE
Z3
18
BK/OR
Z3
14
BK/OR
L91
20
DB/PK
12 C1
HAZARD
LAMP
CONTROL
BODY
CONTROL
MODULE
(8W-45-5)
G202
(8W-15-12)
• LHD
•• RHD



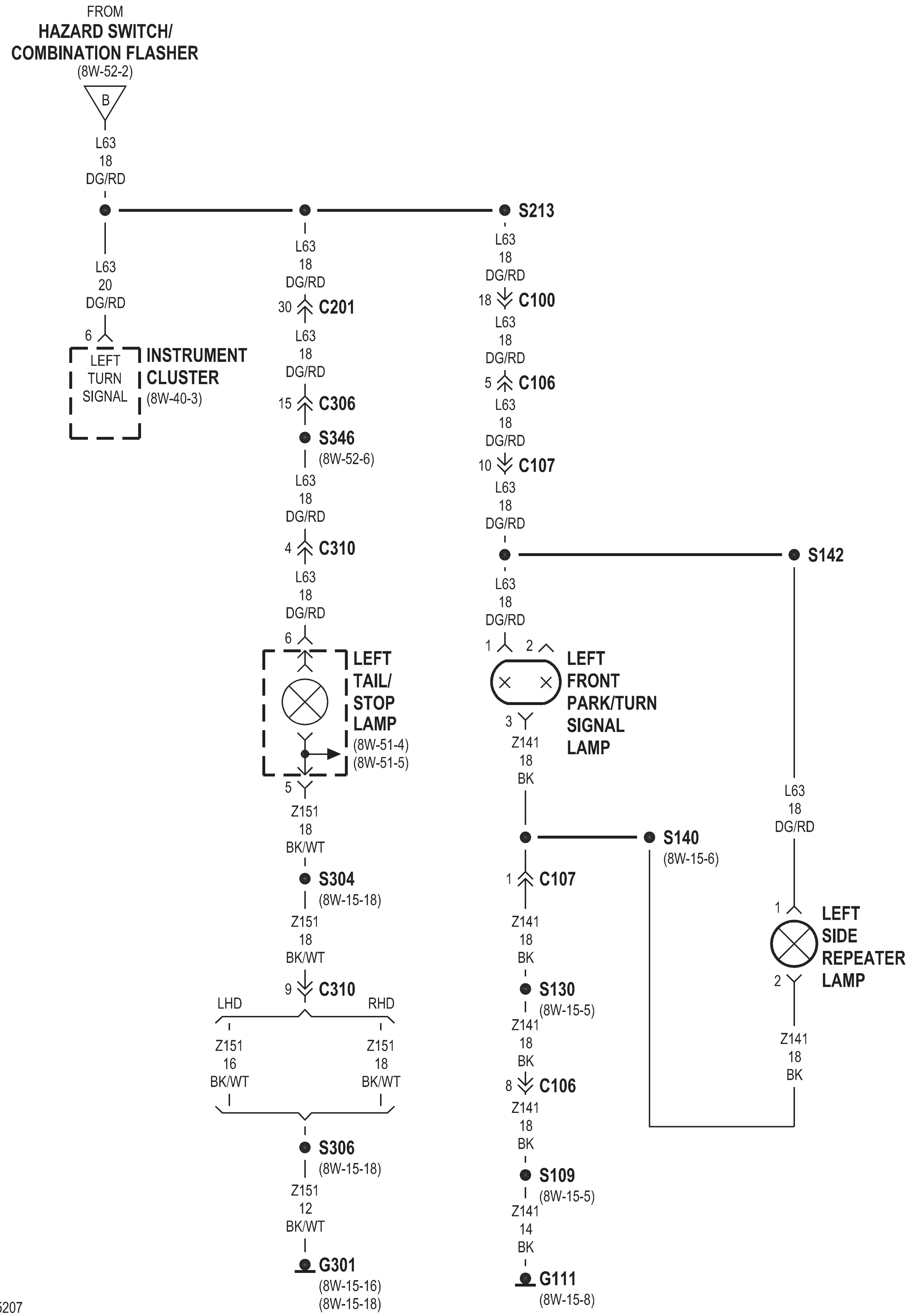
BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
87A
87
86
PARK LAMP RELAY
(8W-50-8)
30
85
3
JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
FUSE
23
10A
(8W-12-13)
FUSE
9
10A
(8W-12-13)
20
C1
28
C3
30
C3
L77
18
BK/YL
L78
18
DG/YL
LHD
RHD
RHD
LHD
59
53
C100
L77
18
BK/YL
L78
18
DG/YL
13
7
C106
Z131
10
BK/GY
L77
18
BK/YL
L78
18
DG/YL
2
4
C107
L77
18
BK/YL
L78
18
DG/YL
9
G202
(8W-15-12)
C
D
TO
S141
(8W-52-6)
TO
S146
(8W-52-4)


INSTRUMENT CLUSTER
LEFT TURN SIGNAL
(8W-40-3)
16
L62
20
BR/RD
FROM
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
A
L62
18
BR/RD
S212
18 C201
17 C100
35 C306
12 C106
6 C107
TRAILER TOW
EXCEPT TRAILER TOW
S314
S145
86
TRAILER TOW RIGHT TURN RELAY
(8W-54-6)
85
12 C310
1 2
RIGHT FRONT PARK/TURN SIGNAL LAMP
3
Z142
18
BK/WT
FOG LAMPS
EXCEPT FOG LAMPS
S143
(8W-15-7)
5 C107
6
RIGHT TAIL/ STOP LAMP
(8W-51-2)
(8W-51-4)
5
Z151
18
BK/WT
10 C310
S131
(8W-15-8)
14 C106
TO
C107
(8W-52-3)
D
2
RIGHT SIDE MARKER LAMP
1
L78
18
DG/YL
Z149
18
BK/LB
Z151
16
BK/WT
S313
(8W-15-17)
S306
(8W-15-18)
S110
(8W-15-8)
S146
(8W-12-13)
Z149
12
BK/LB
Z151
12
BK/WT
Z142
16
BK/WT
G301
(8W-15-16)
(8W-15-18)
G111
(8W-15-8)
J038W-2
KJ305204


INSTRUMENT CLUSTER
(8W-40-3)
LEFT TURN SIGNAL
16
L62
20
BR/RD
FROM
HAZARD SWITCH/ COMBINATION FLASHER
(8W-52-2)
A
L62
18
BR/RD
S212
L62 18 BR/RD
18 C201
17 C100
L62 18 BR/RD
12 C106
35 C306
6 C107
S314
(8W-52-4)
S145
12 C310
1 2
RIGHT FRONT PARK/TURN SIGNAL LAMP
3
Z142 18 BK/WT
1
RIGHT SIDE REPEATER LAMP
2
6
RIGHT TAIL/ STOP LAMP
(8W-51-2)
(8W-51-4)
(8W-51-5)
5
S143
(8W-15-7)
5 C107
Z151 18 BK/WT
10 C310
S131
(8W-15-8)
14 C106
S306
(8W-15-18)
S110
(8W-15-8)
Z151 12 BK/WT
Z142 16 BK/WT
G301
(8W-15-16)
(8W-15-18)
G111
(8W-15-8)

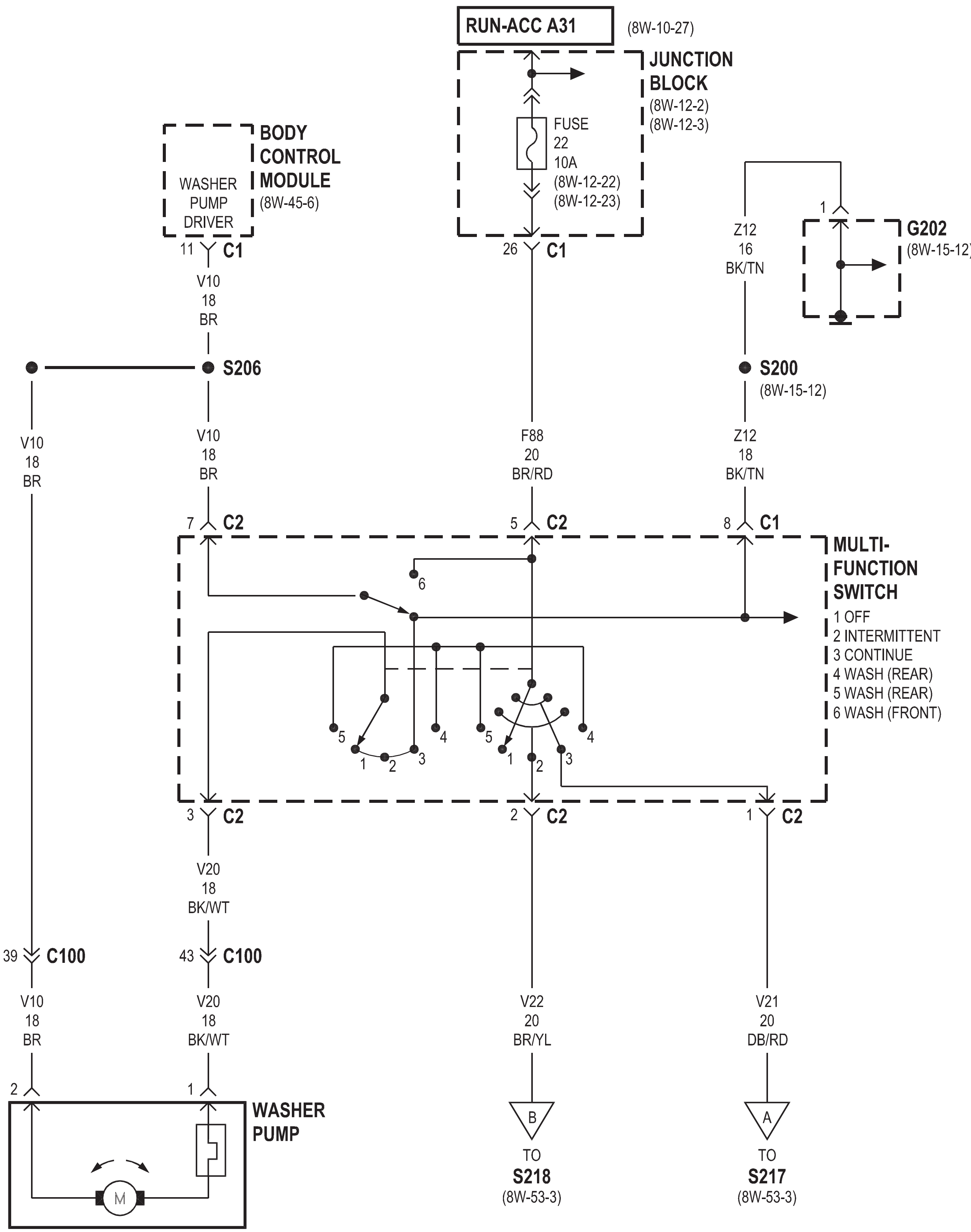

FROM
HAZARD SWITCH/
COMBINATION FLASHER
(8W-52-2)
B
L63
18
DG/RD
S213
L63
20
DG/RD
6
LEFT
TURN
SIGNAL
INSTRUMENT
CLUSTER
(8W-40-3)
L63
18
DG/RD
30 C201
15 C306
TRAILER
TOW
EXCEPT
TRAILER TOW
S346
18 C100
5 C106
10 C107
S142
4 C310
6
LEFT
TAIL/
STOP
LAMP
(8W-51-4)
5
Z151
18
BK/WT
S304
(8W-15-18)
9 C310
Z151
16
BK/WT
S306
(8W-15-18)
Z151
12
BK/WT
G301
(8W-15-16)
(8W-15-18)
86
TRAILER
TOW
LEFT
TURN
RELAY
(8W-54-6)
85
Z149
18
BK/LB
S313
(8W-15-17)
Z149
12
BK/LB
1
2
LEFT
FRONT
PARK/TURN
SIGNAL
LAMP
3
Z141
18
BK
EXCEPT
FOG LAMPS
FOG
LAMPS
S140
(8W-15-6)
1 C107
S130
(8W-15-5)
8 C106
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)
FROM
JUNCTION
BLOCK
(8W-52-3)
C
L77
18
BK/YL
2
LEFT
SIDE
MARKER
LAMP
1
S141
(8W-12-13)
J038W-2
KJ305206

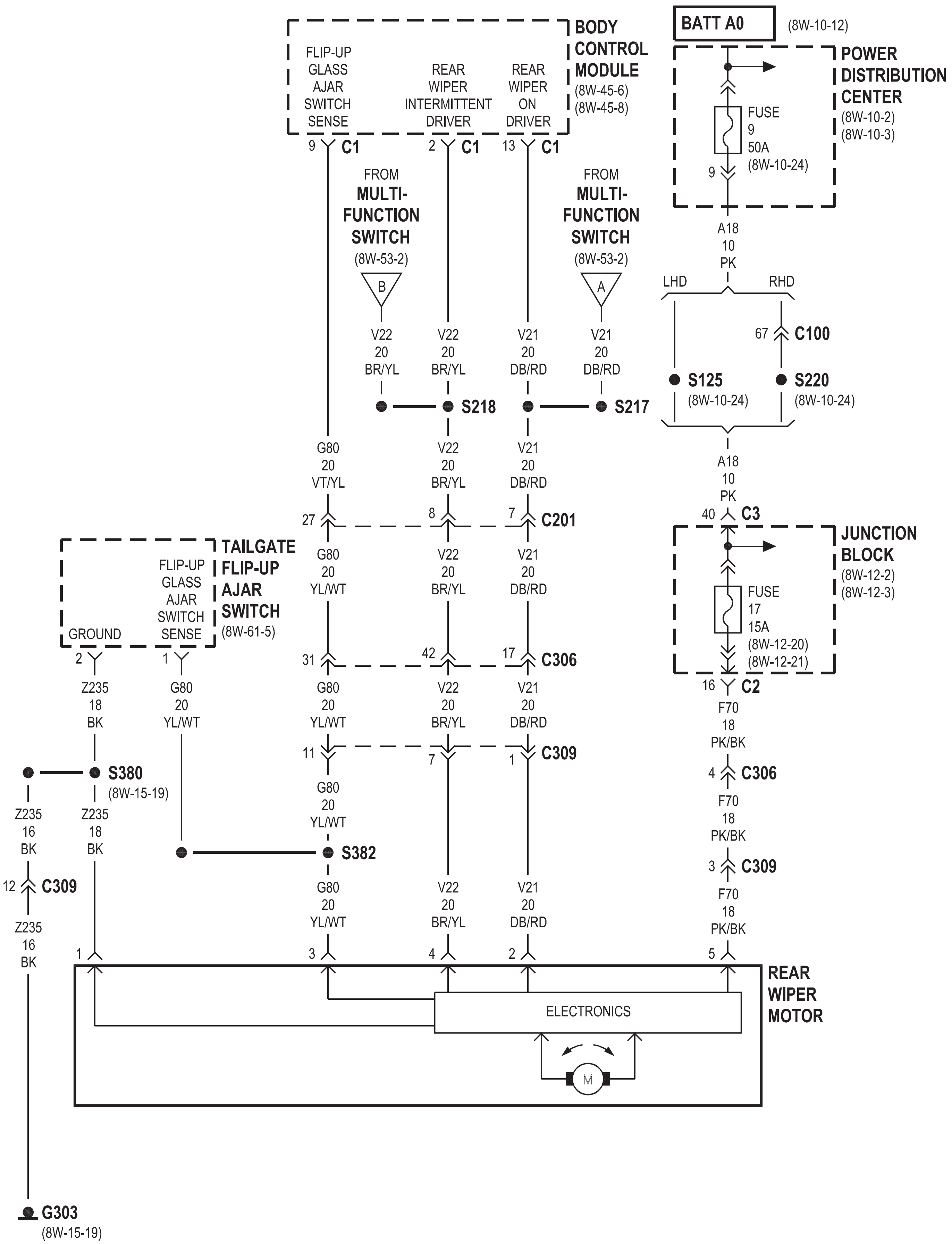
EXPORT



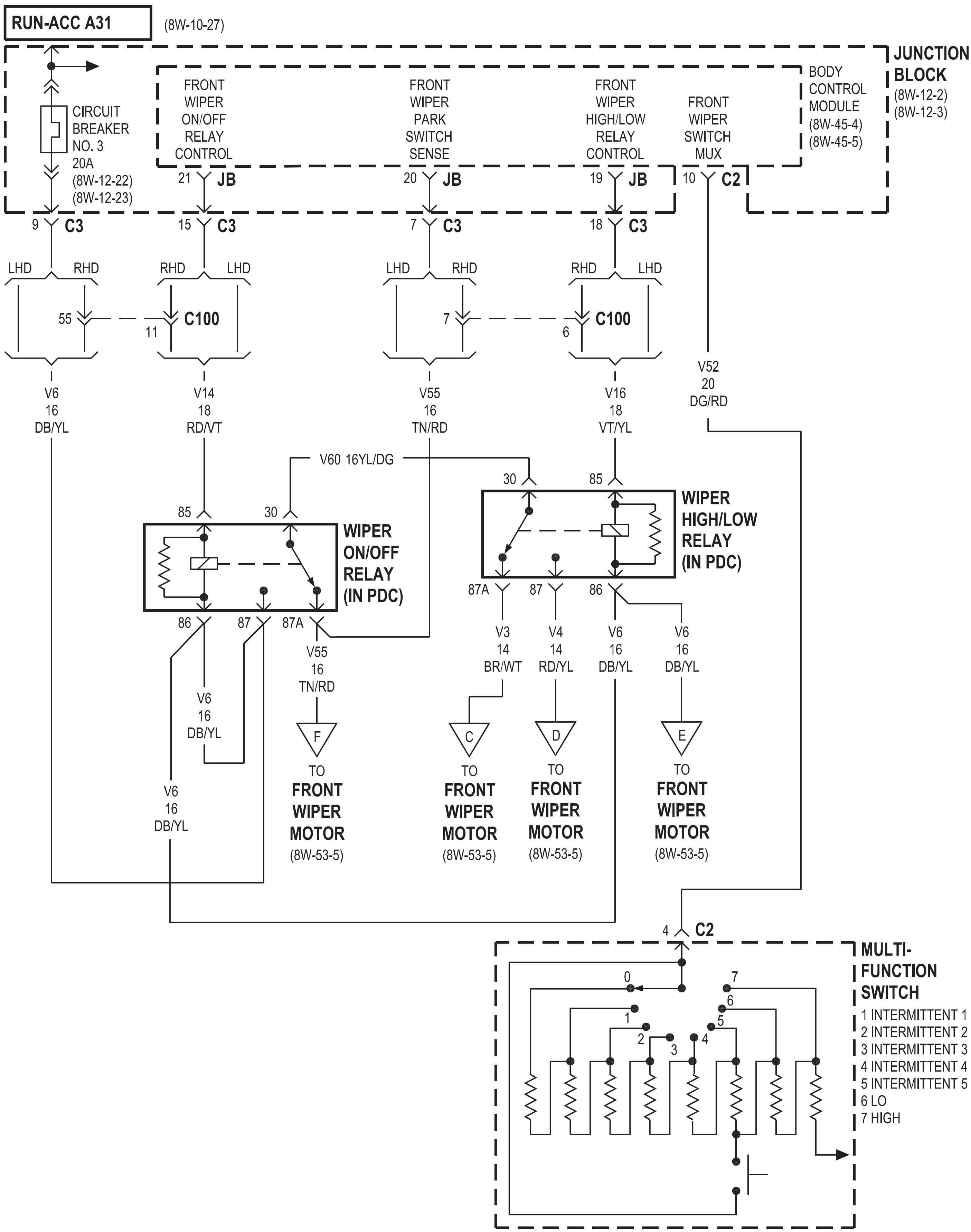
FROM
HAZARD SWITCH/
COMBINATION FLASHER
(8W-52-2)
B
L63
18
DG/RD
L63
20
DG/RD
6
LEFT TURN SIGNAL
INSTRUMENT CLUSTER
(8W-40-3)
L63
18
DG/RD
30
C201
L63
18
DG/RD
15
C306
S346
(8W-52-6)
L63
18
DG/RD
4
C310
L63
18
DG/RD
6
LEFT TAIL/ STOP LAMP
(8W-51-4)
(8W-51-5)
5
Z151
18
BK/WT
S304
(8W-15-18)
Z151
18
BK/WT
9
C310
LHD
RHD
Z151
16
BK/WT
Z151
18
BK/WT
S306
(8W-15-18)
Z151
12
BK/WT
G301
(8W-15-16)
(8W-15-18)
S213
L63
18
DG/RD
18
C100
L63
18
DG/RD
5
C106
L63
18
DG/RD
10
C107
L63
18
DG/RD
S142
L63
18
DG/RD
1
2
LEFT FRONT PARK/TURN SIGNAL LAMP
3
Z141
18
BK
S140
(8W-15-6)
1
C107
Z141
18
BK
S130
(8W-15-5)
Z141
18
BK
8
C106
Z141
18
BK
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)
L63
18
DG/RD
1
LEFT SIDE REPEATER LAMP
2
Z141
18
BK

8W-53 WIPERS

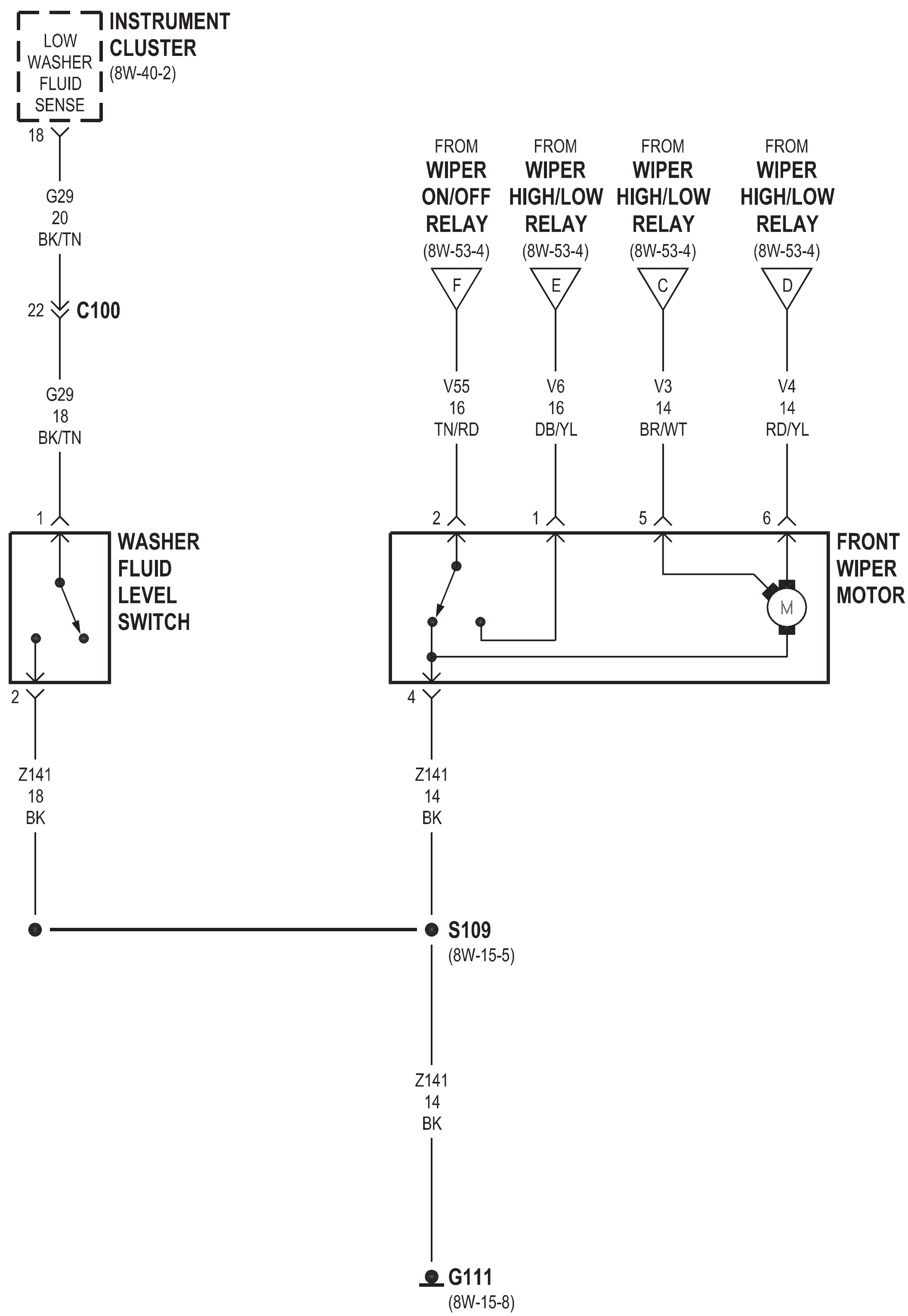

RUN-ACC A31
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
22
10A
(8W-12-22)
(8W-12-23)
BODY CONTROL MODULE
(8W-45-6)
WASHER PUMP DRIVER
11 C1
26 C1
V10 18 BR
S206
V10 18 BR
V10 18 BR
F88 20 BR/RD
Z12 16 BK/TN
1
G202
(8W-15-12)
S200
(8W-15-12)
Z12 18 BK/TN
7 C2
5 C2
8 C1
MULTI-FUNCTION SWITCH
1 OFF
2 INTERMITTENT
3 CONTINUE
4 WASH (REAR)
5 WASH (REAR)
6 WASH (FRONT)
6
5 1 2 3 4
5 1 2 3 4
3 C2
2 C2
1 C2
V20 18 BK/WT
39 C100
43 C100
V10 18 BR
V20 18 BK/WT
V22 20 BR/YL
V21 20 DB/RD
2
1
WASHER PUMP
M
B
TO S218
(8W-53-3)
A
TO S217
(8W-53-3)



BODY CONTROL MODULE
(8W-45-6)
(8W-45-8)
FLIP-UP GLASS AJAR SWITCH SENSE
REAR WIPER INTERMITTENT DRIVER
REAR WIPER ON DRIVER
9 C1
2 C1
13 C1
FROM MULTI-FUNCTION SWITCH (8W-53-2)
B
A
V22 20 BR/YL
V21 20 DB/RD
S218
S217
G80 20 VT/YL
27
8
7
C201
G80 20 YL/WT
TAILGATE FLIP-UP AJAR SWITCH
(8W-61-5)
GROUND
FLIP-UP GLASS AJAR SWITCH SENSE
2
1
31
42
17
C306
Z235 18 BK
G80 20 YL/WT
11
7
1
C309
S380
(8W-15-19)
Z235 16 BK
S382
12 C309
1
3
4
2
5
ELECTRONICS
M
REAR WIPER MOTOR
G303
(8W-15-19)
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 9 50A (8W-10-24)
9
A18 10 PK
LHD
RHD
67 C100
S125
(8W-10-24)
S220
(8W-10-24)
40 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 17 15A (8W-12-20) (8W-12-21)
16 C2
F70 18 PK/BK
4 C306
3 C309

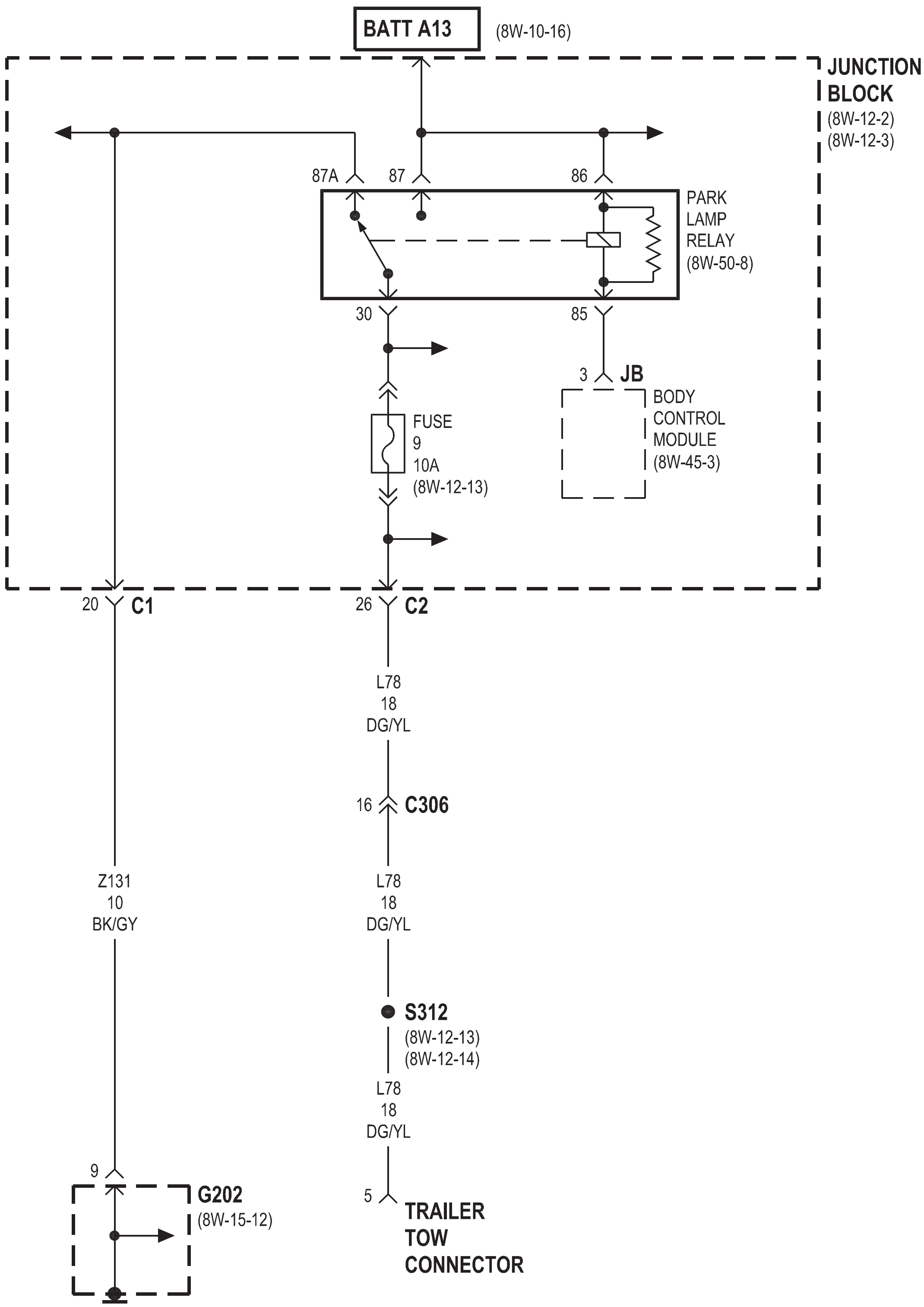


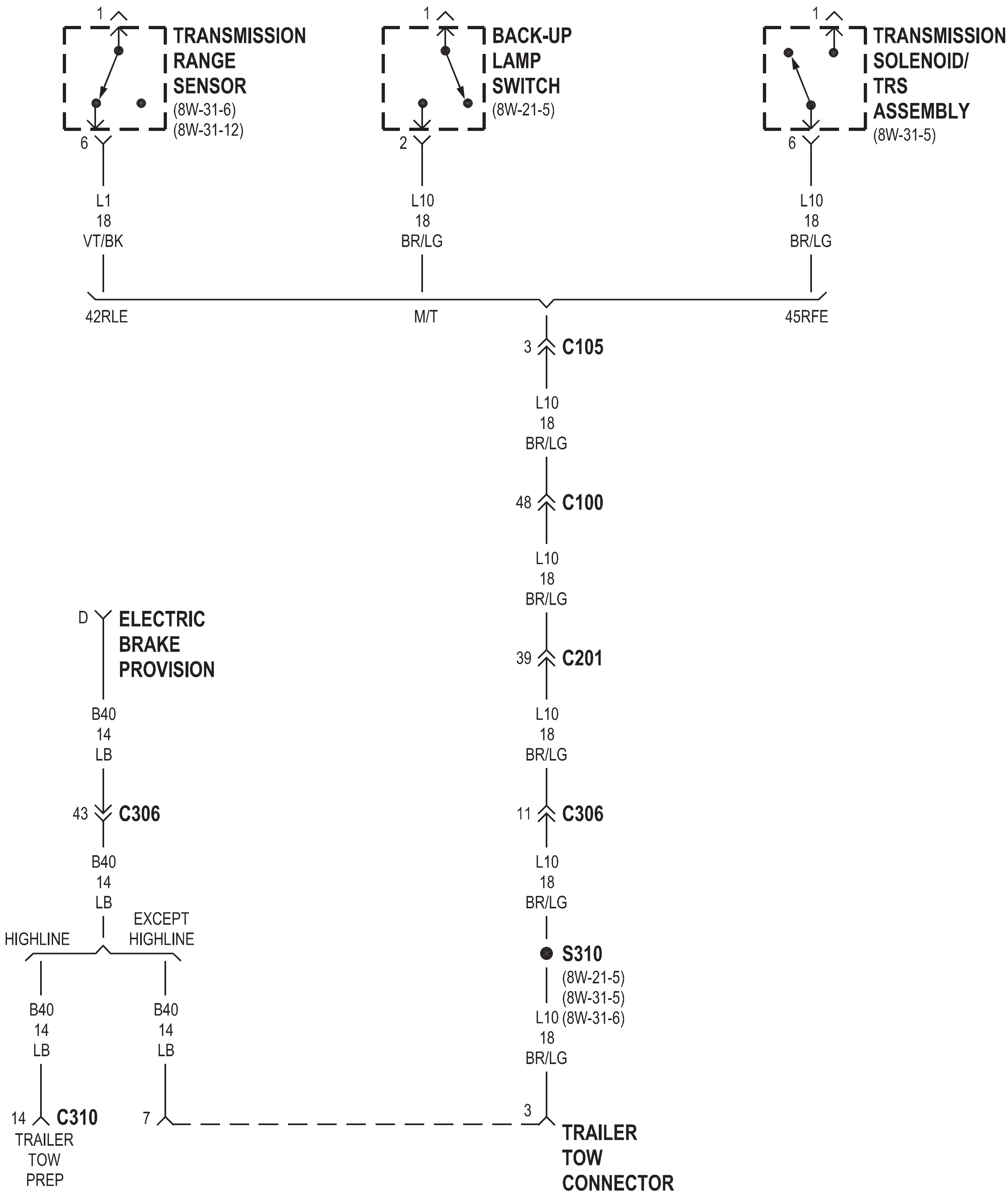
J038W-2 KJ305304

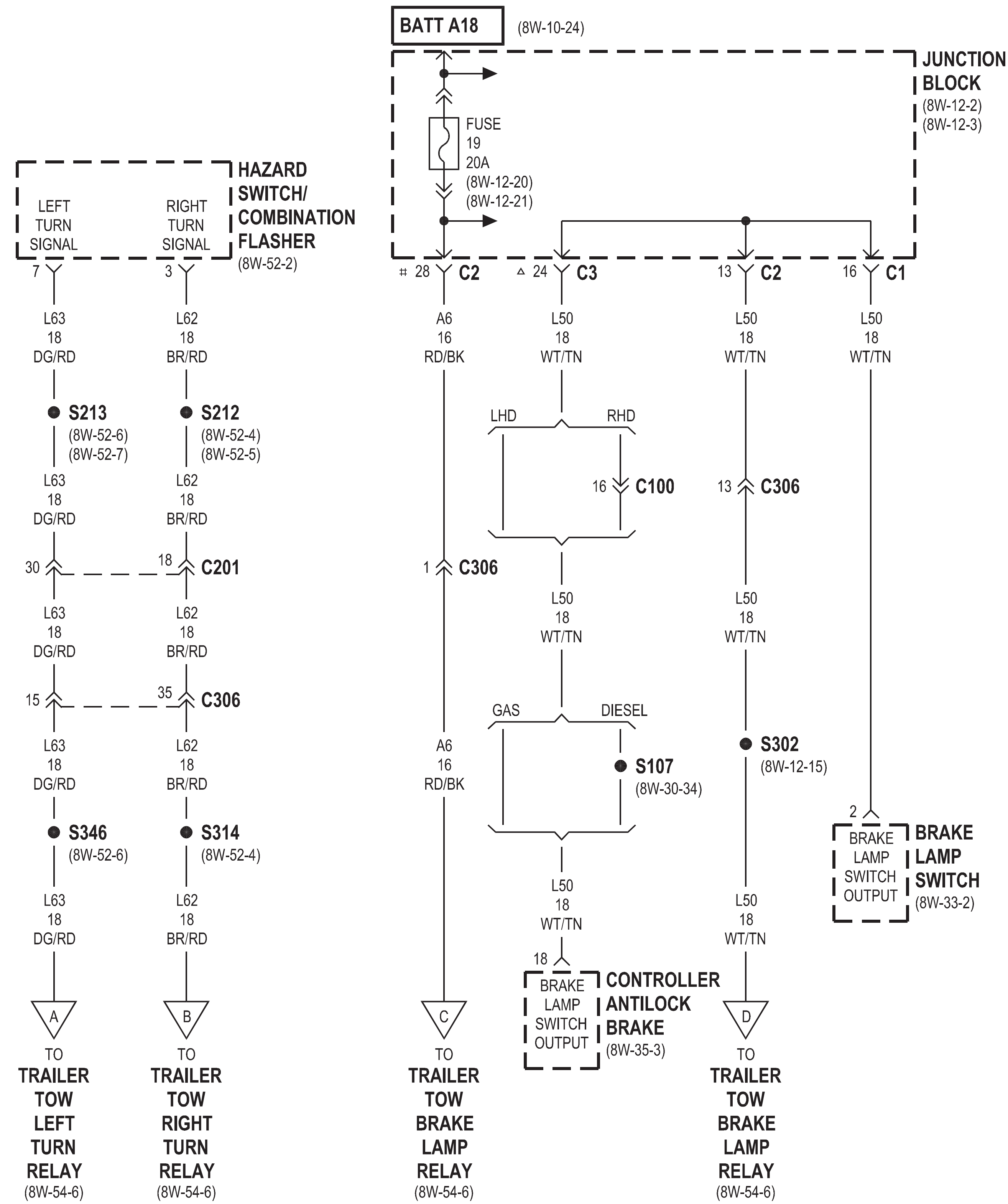


INSTRUMENT CLUSTER
(8W-40-2)
LOW WASHER FLUID SENSE
18
G29
20
BK/TN
22
C100
G29
18
BK/TN
1
WASHER FLUID LEVEL SWITCH
2
Z141
18
BK
FROM WIPER ON/OFF RELAY
(8W-53-4)
F
FROM WIPER HIGH/LOW RELAY
(8W-53-4)
E
FROM WIPER HIGH/LOW RELAY
(8W-53-4)
C
FROM WIPER HIGH/LOW RELAY
(8W-53-4)
D
V55
16
TN/RD
V6
16
DB/YL
V3
14
BR/WT
V4
14
RD/YL
2
1
5
6
FRONT WIPER MOTOR
M
4
Z141
14
BK
S109
(8W-15-5)
Z141
14
BK
G111
(8W-15-8)

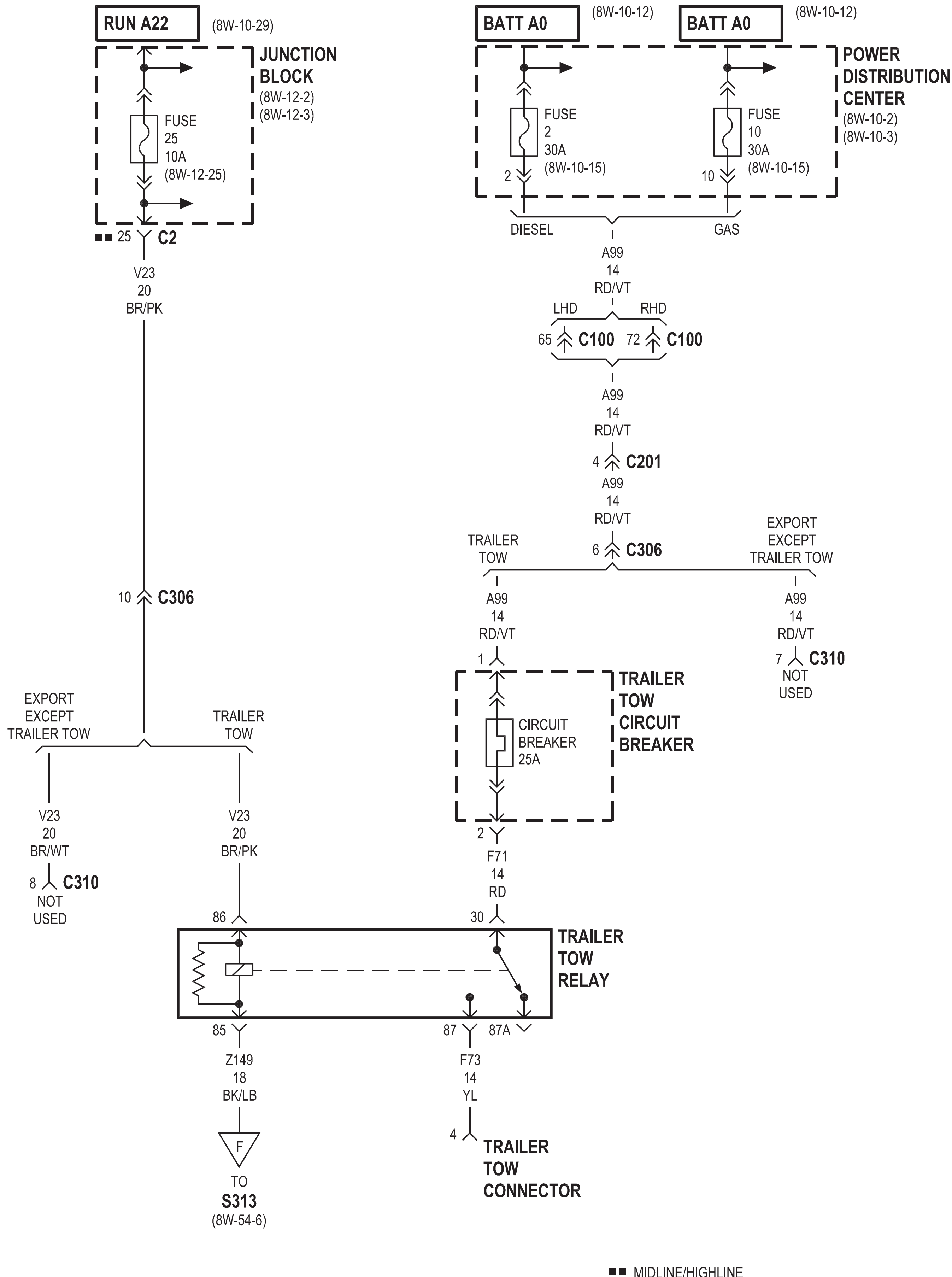
8W-54 TRAILER TOW

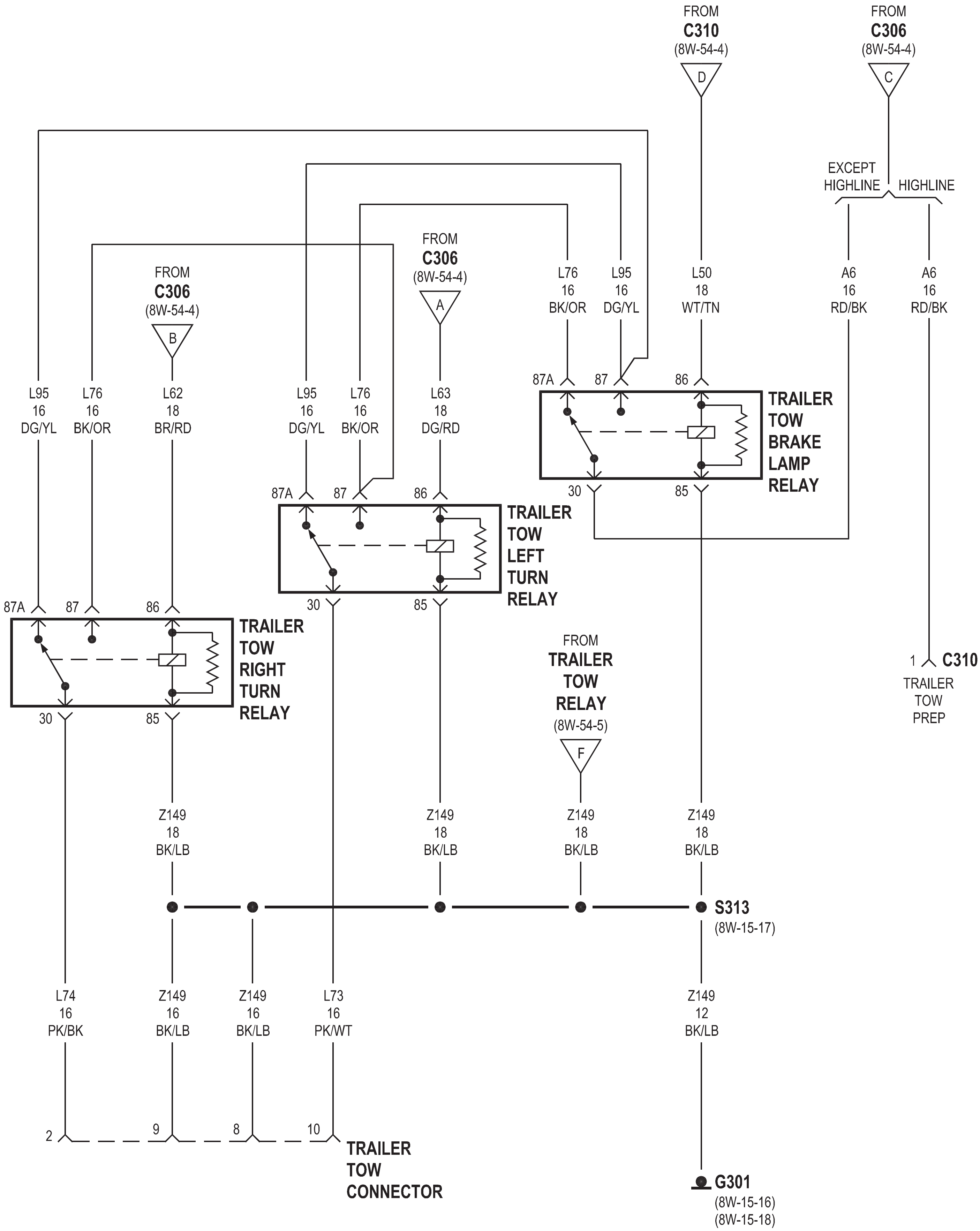

BATT A13
(8W-10-16)
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
87A
87
86
PARK
LAMP
RELAY
(8W-50-8)
30
85
3 JB
BODY
CONTROL
MODULE
(8W-45-3)
FUSE
9
10A
(8W-12-13)
20 C1
26 C2
L78
18
DG/YL
16 C306
Z131
10
BK/GY
L78
18
DG/YL
S312
(8W-12-13)
(8W-12-14)
L78
18
DG/YL
9
G202
(8W-15-12)
5
TRAILER
TOW
CONNECTOR


1
TRANSMISSION RANGE SENSOR
(8W-31-6)
(8W-31-12)
6
L1
18
VT/BK
1
BACK-UP LAMP SWITCH
(8W-21-5)
2
L10
18
BR/LG
1
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)
6
L10
18
BR/LG
42RLE
M/T
45RFE
3 C105
L10
18
BR/LG
48 C100
L10
18
BR/LG
39 C201
L10
18
BR/LG
11 C306
L10
18
BR/LG
S310
(8W-21-5)
(8W-31-5)
(8W-31-6)
L10
18
BR/LG
3
TRAILER TOW CONNECTOR
D
ELECTRIC BRAKE PROVISION
B40
14
LB
43 C306
B40
14
LB
HIGHLINE
EXCEPT HIGHLINE
B40
14
LB
B40
14
LB
14 C310
TRAILER TOW PREP
7

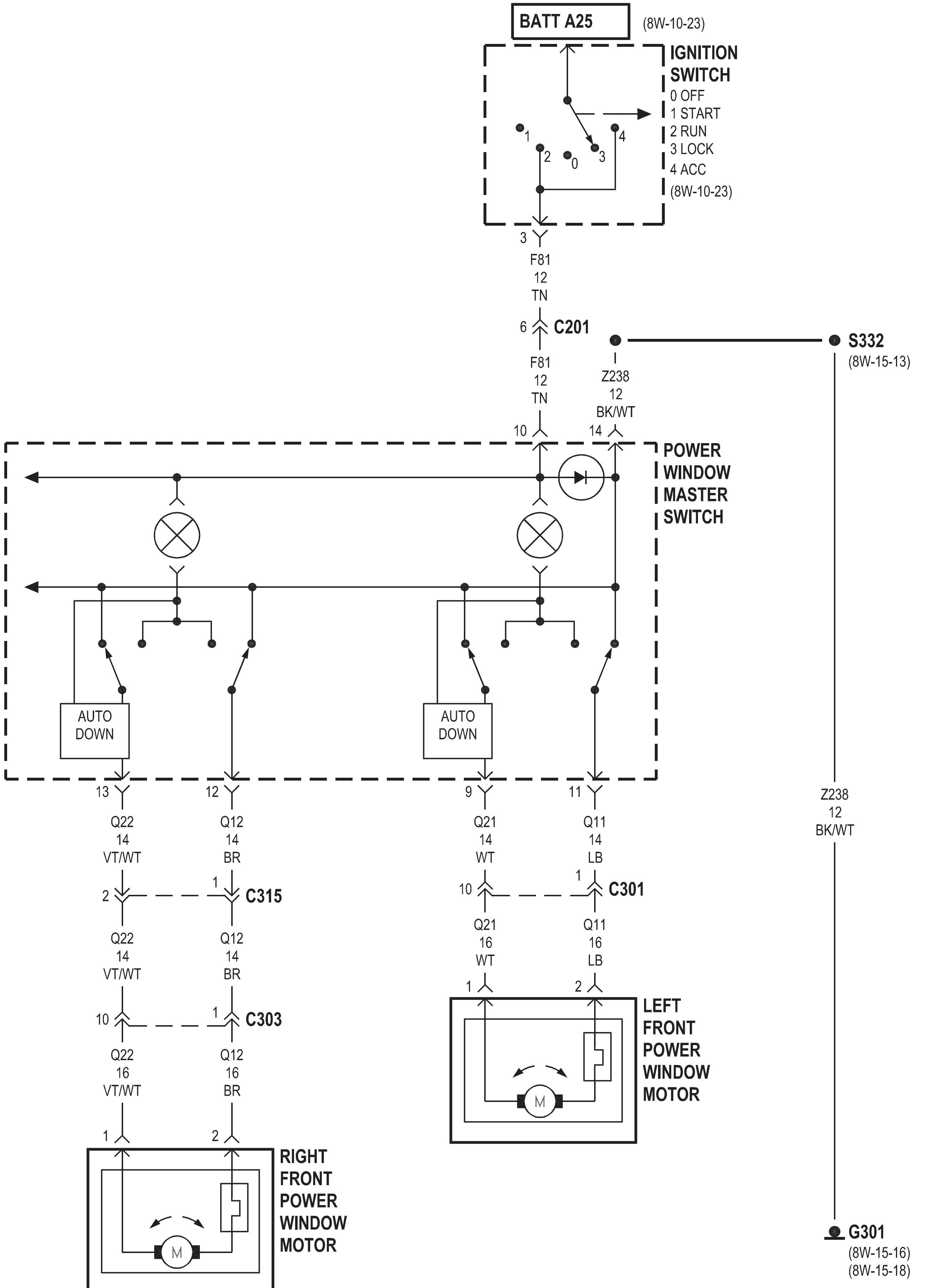


△ ABS
MIDLINE/HIGHLINE

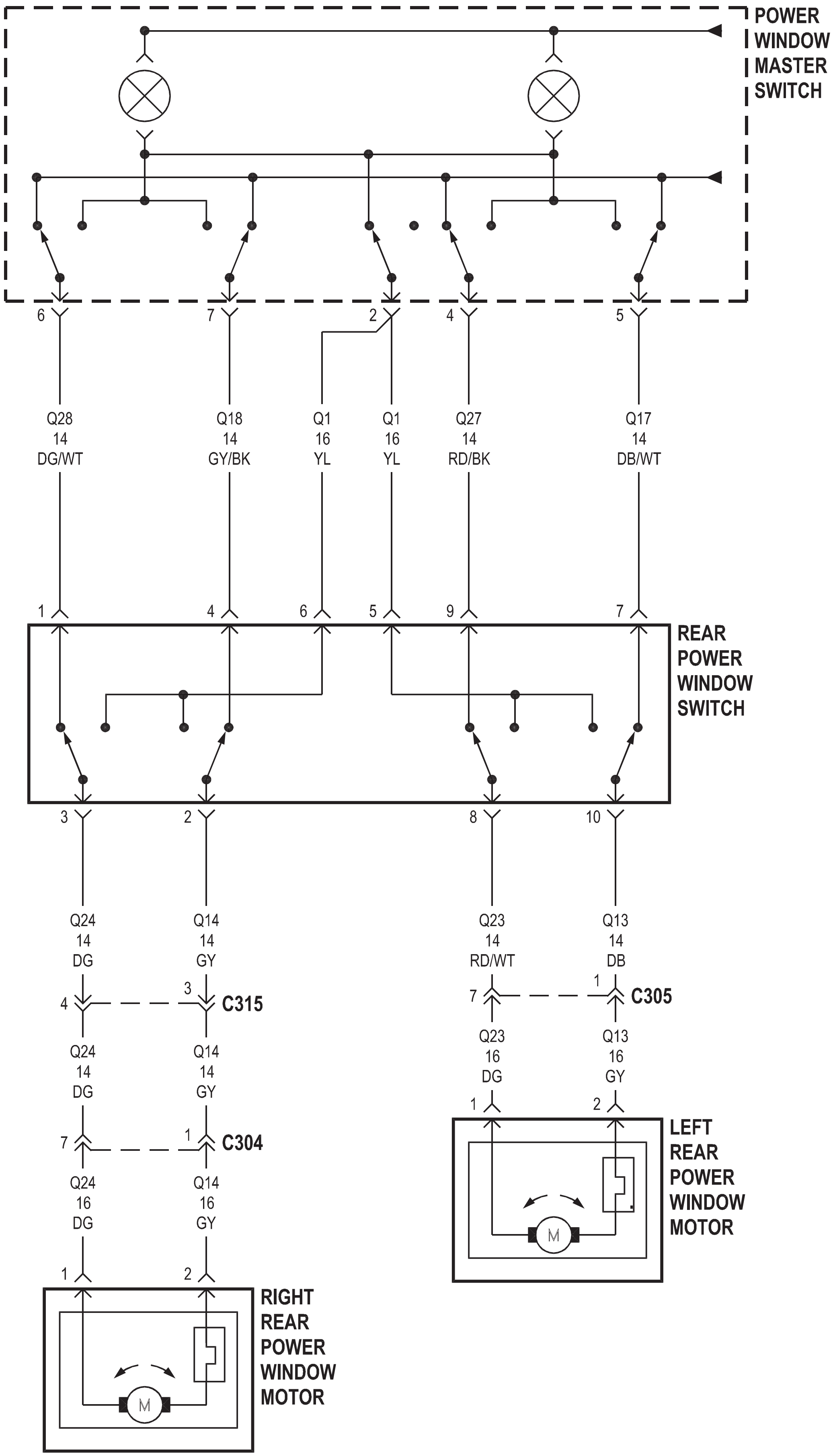

RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
25
10A
(8W-12-25)
25 C2
V23
20
BR/PK
BATT A0
(8W-10-12)
BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
2
30A
(8W-10-15)
FUSE
10
30A
(8W-10-15)
2
10
DIESEL
GAS
A99
14
RD/VT
LHD
RHD
65 C100
72 C100
A99
14
RD/VT
4 C201
A99
14
RD/VT
TRAILER TOW
6 C306
EXPORT EXCEPT TRAILER TOW
A99
14
RD/VT
A99
14
RD/VT
7 C310
NOT USED
1
TRAILER TOW CIRCUIT BREAKER
CIRCUIT BREAKER 25A
2
F71
14
RD
10 C306
EXPORT EXCEPT TRAILER TOW
TRAILER TOW
V23
20
BR/WT
8 C310
NOT USED
V23
20
BR/PK
86
30
TRAILER TOW RELAY
85
87
87A
Z149
18
BK/LB
F
TO
S313
(8W-54-6)
F73
14
YL
4
TRAILER TOW CONNECTOR
MIDLINE/HIGHLINE


FROM
C310
(8W-54-4)
D
FROM
C306
(8W-54-4)
C
EXCEPT HIGHLINE
HIGHLINE
FROM
C306
(8W-54-4)
A
FROM
C306
(8W-54-4)
B
L76 16 BK/OR
L95 16 DG/YL
L50 18 WT/TN
A6 16 RD/BK
A6 16 RD/BK
87A
87
86
30
85
TRAILER TOW BRAKE LAMP RELAY
L95 16 DG/YL
L76 16 BK/OR
L62 18 BR/RD
L95 16 DG/YL
L76 16 BK/OR
L63 18 DG/RD
TRAILER TOW LEFT TURN RELAY
TRAILER TOW RIGHT TURN RELAY
1 C310
TRAILER TOW PREP
FROM
TRAILER TOW RELAY
(8W-54-5)
F
Z149 18 BK/LB
Z149 18 BK/LB
Z149 18 BK/LB
Z149 18 BK/LB
S313
(8W-15-17)
L74 16 PK/BK
Z149 16 BK/LB
Z149 16 BK/LB
L73 16 PK/WT
Z149 12 BK/LB
2
9
8
10
TRAILER TOW CONNECTOR
G301
(8W-15-16)
(8W-15-18)

8W-60 POWER WINDOWS

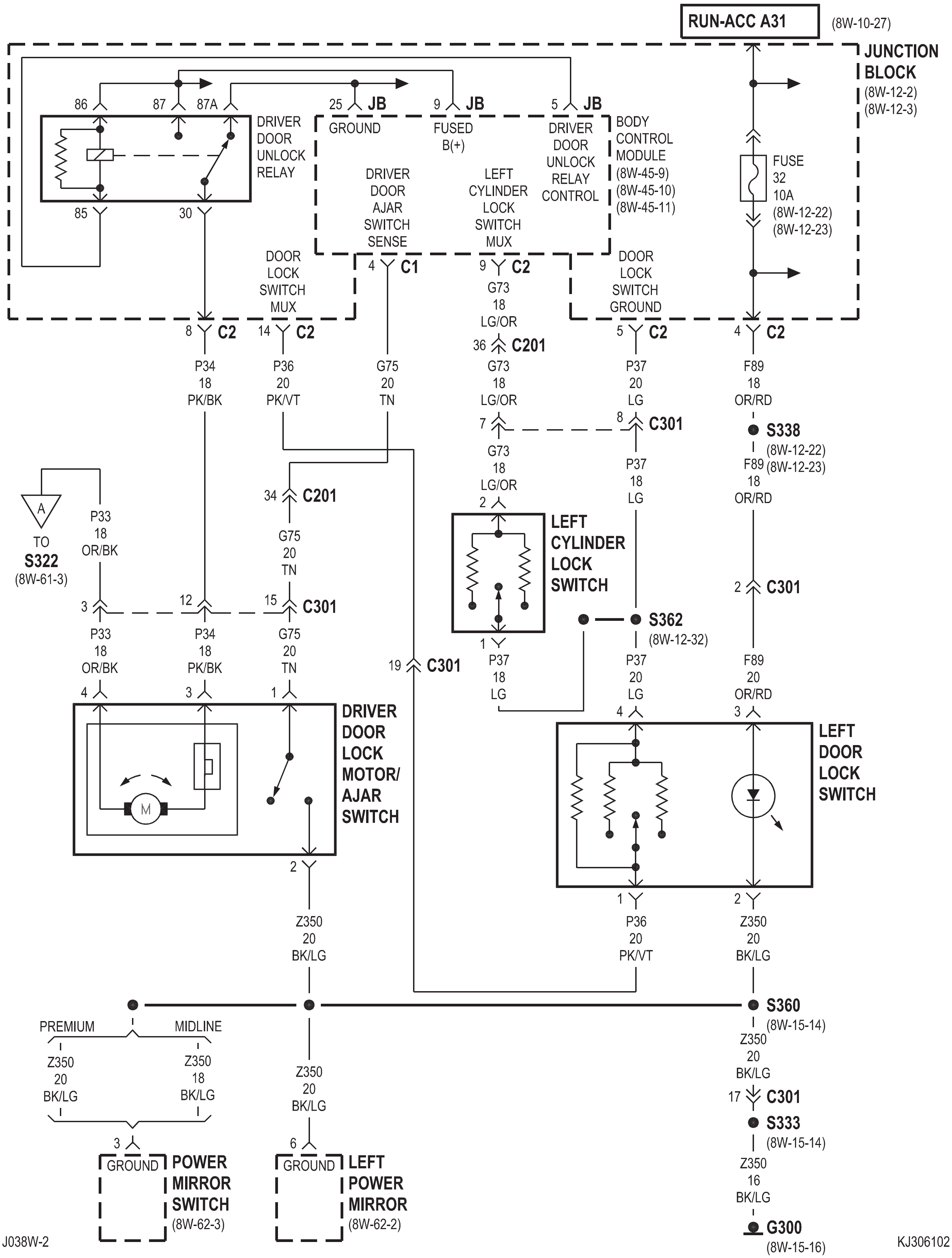


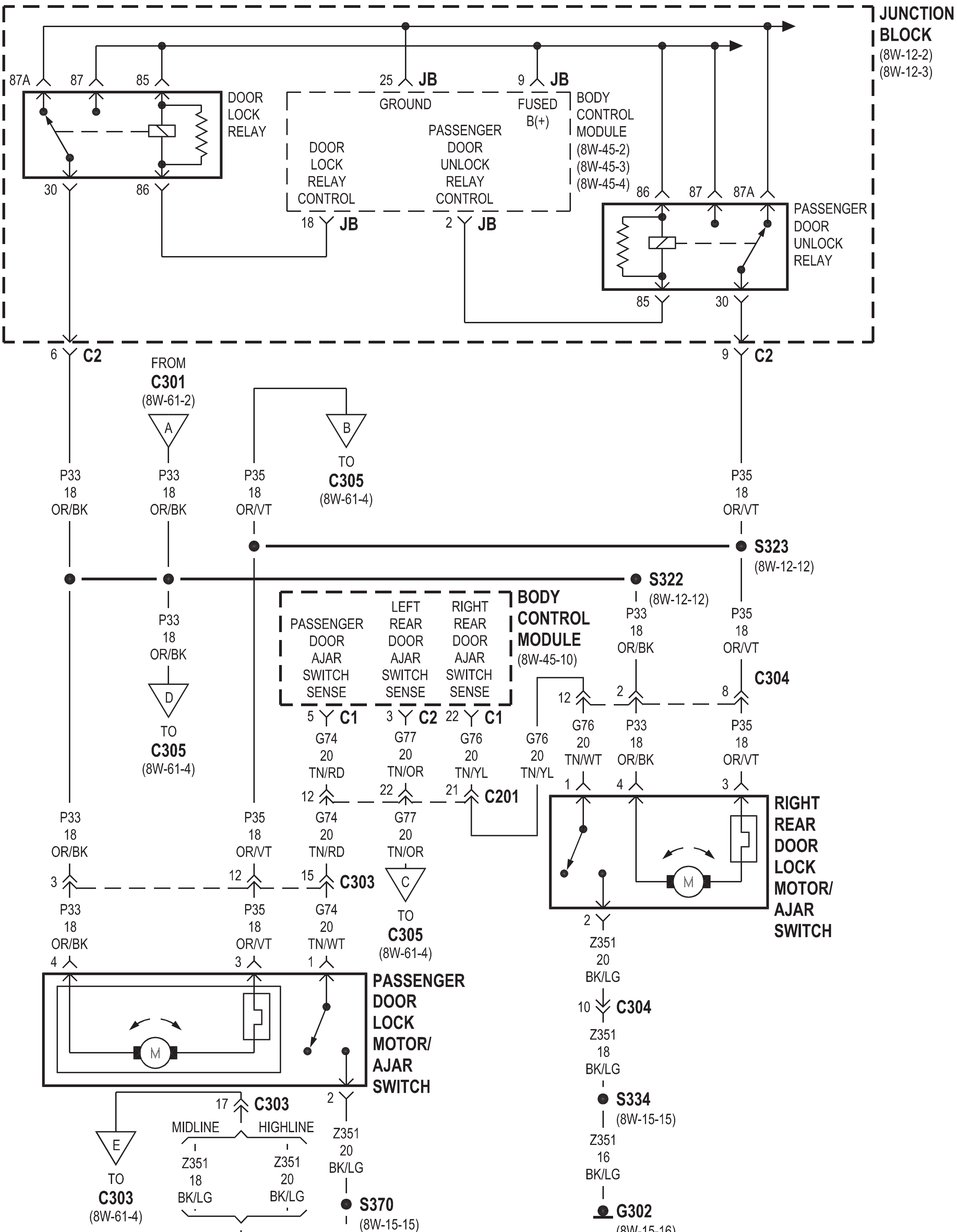
BATT A25
(8W-10-23)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-23)
F81
12
TN
C201
Z238
12
BK/WT
S332
(8W-15-13)
POWER WINDOW MASTER SWITCH
AUTO DOWN
AUTO DOWN
Q22
14
VT/WT
Q12
14
BR
Q21
14
WT
Q11
14
LB
C315
C301
Q21
16
WT
Q11
16
LB
C303
Q22
16
VT/WT
Q12
16
BR
LEFT FRONT POWER WINDOW MOTOR
RIGHT FRONT POWER WINDOW MOTOR
M
G301
(8W-15-16)
(8W-15-18)

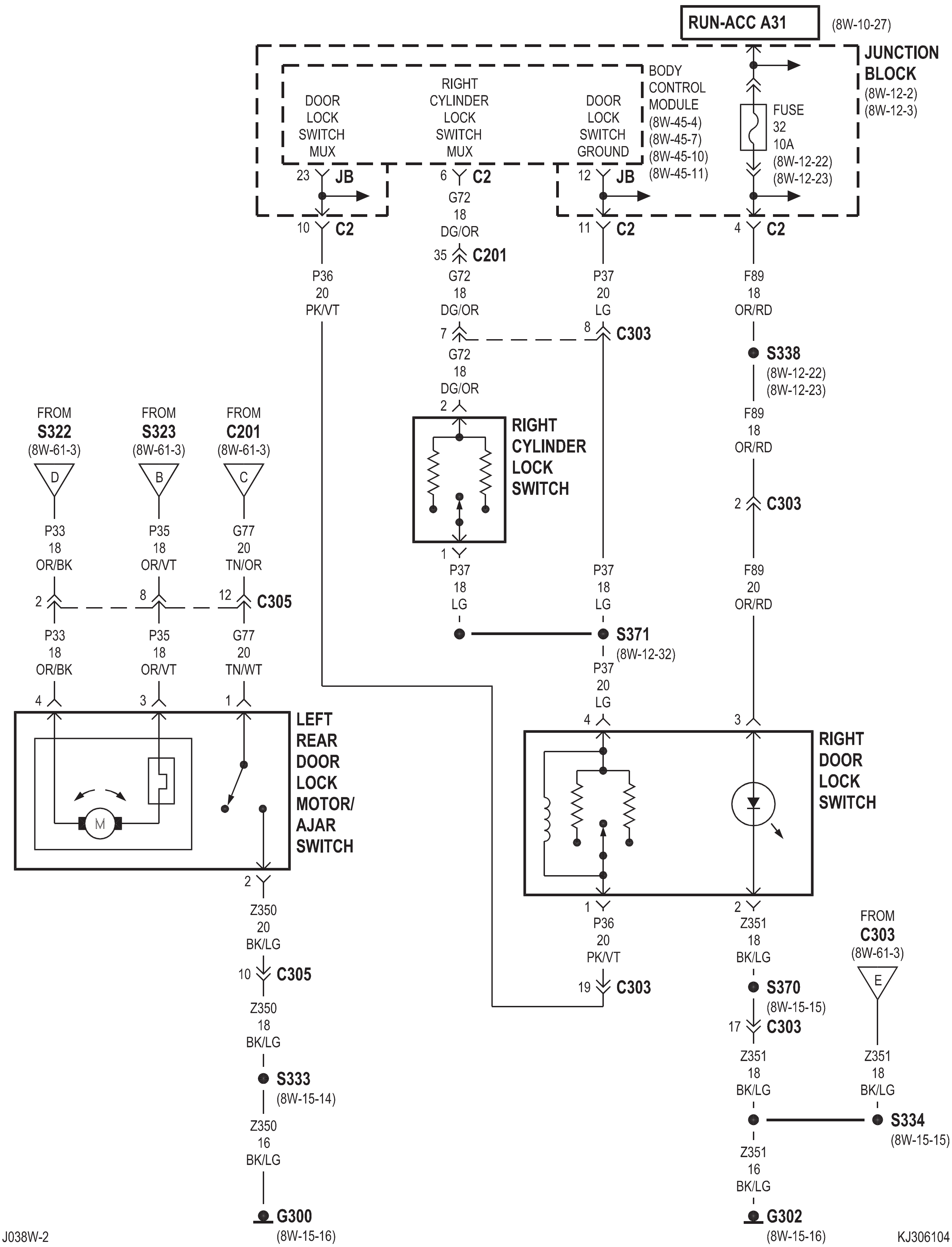

POWER WINDOW MASTER SWITCH
6
7
2
4
5
Q28 14 DG/WT
Q18 14 GY/BK
Q1 16 YL
Q1 16 YL
Q27 14 RD/BK
Q17 14 DB/WT
1
4
6
5
9
7
REAR POWER WINDOW SWITCH
3
2
8
10
Q24 14 DG
Q14 14 GY
Q23 14 RD/WT
Q13 14 DB
4
3
C315
7
1
C305
Q24 14 DG
Q14 14 GY
Q23 16 DG
Q13 16 GY
7
1
C304
1
2
LEFT REAR POWER WINDOW MOTOR
M
Q24 16 DG
Q14 16 GY
1
2
RIGHT REAR POWER WINDOW MOTOR
M

8W-61 POWER DOOR LOCKS

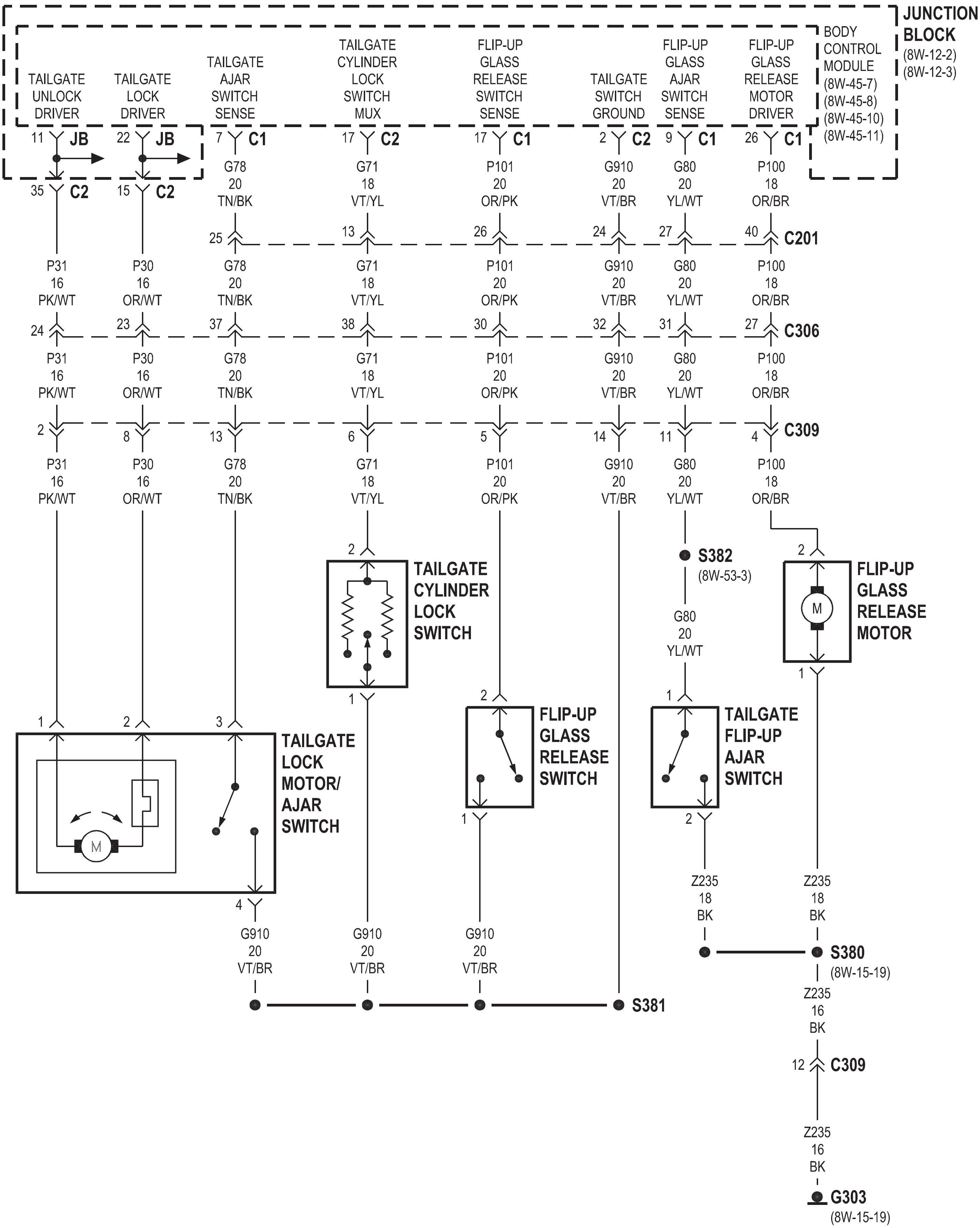
LHD EXCEPT BASE



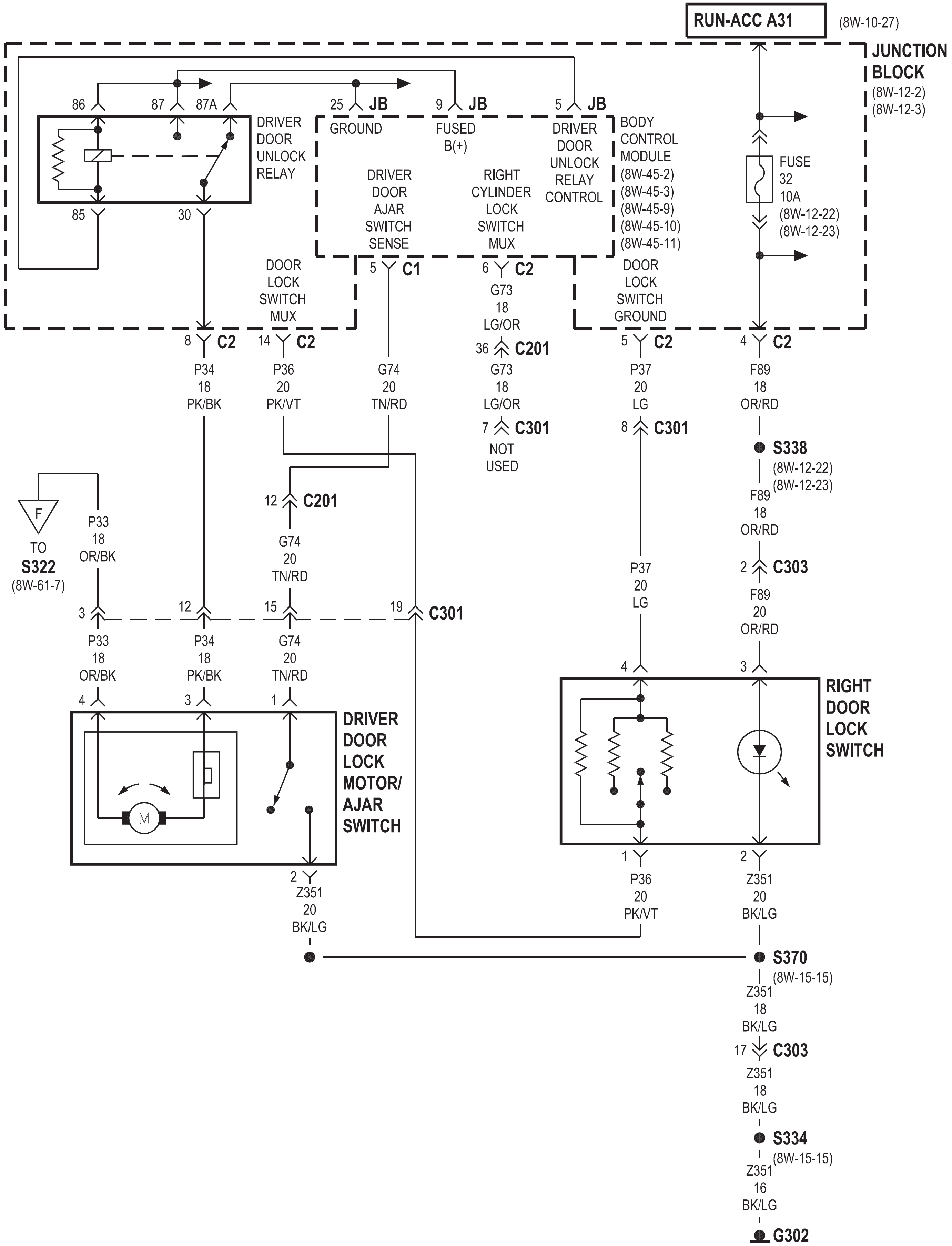

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
DOOR LOCK RELAY
87A
87
85
30
86
25 JB
GROUND
9 JB
FUSED B(+)
BODY CONTROL MODULE
(8W-45-2)
(8W-45-3)
(8W-45-4)
DOOR LOCK RELAY CONTROL
PASSENGER DOOR UNLOCK RELAY CONTROL
18 JB
2 JB
PASSENGER DOOR UNLOCK RELAY
6 C2
9 C2
FROM C301 (8W-61-2)
TO C305 (8W-61-4)
P33 18 OR/BK
P35 18 OR/VT
S323 (8W-12-12)
S322 (8W-12-12)
BODY CONTROL MODULE (8W-45-10)
PASSENGER DOOR AJAR SWITCH SENSE
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
5 C1
3 C2
22 C1
G74 20 TN/RD
G77 20 TN/OR
G76 20 TN/YL
C201
C304
G76 20 TN/WT
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
C303
G74 20 TN/WT
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
TO C303 (8W-61-4)
MIDLINE
HIGHLINE
Z351 18 BK/LG
Z351 20 BK/LG
S370 (8W-15-15)
Z351 16 BK/LG
S334 (8W-15-15)
G302 (8W-15-16)



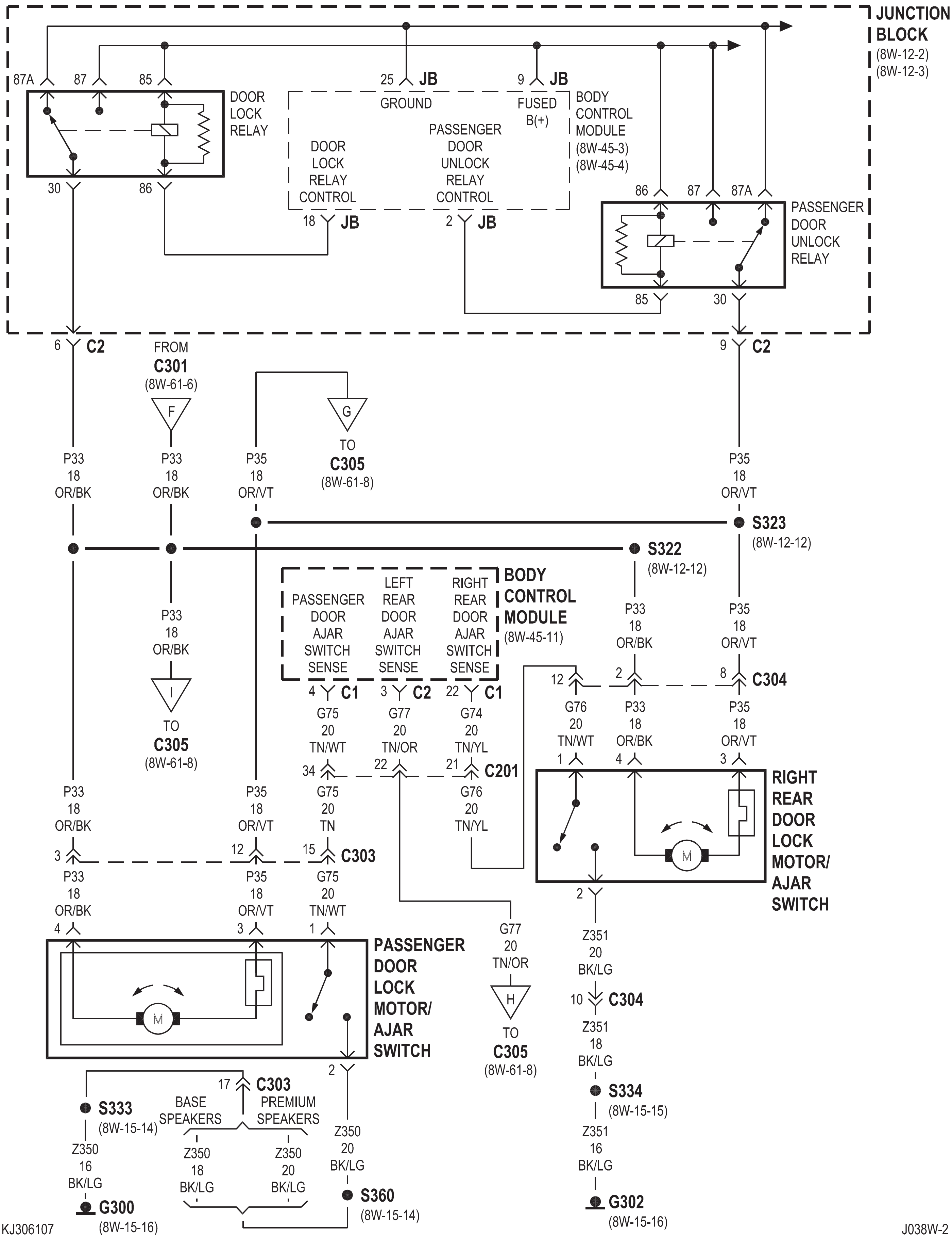
J038W-2 KJ306104


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-7)
(8W-45-8)
(8W-45-10)
(8W-45-11)
TAILGATE UNLOCK DRIVER
TAILGATE LOCK DRIVER
TAILGATE AJAR SWITCH SENSE
TAILGATE CYLINDER LOCK SWITCH MUX
FLIP-UP GLASS RELEASE SWITCH SENSE
TAILGATE SWITCH GROUND
FLIP-UP GLASS AJAR SWITCH SENSE
FLIP-UP GLASS RELEASE MOTOR DRIVER
11 JB
22 JB
7 C1
17 C2
17 C1
2 C2
9 C1
26 C1
35 C2
15 C2
G78 20 TN/BK
G71 18 VT/YL
P101 20 OR/PK
G910 20 VT/BR
G80 20 YL/WT
P100 18 OR/BR
C201
P31 16 PK/WT
P30 16 OR/WT
C306
C309
S382
(8W-53-3)
TAILGATE CYLINDER LOCK SWITCH
FLIP-UP GLASS RELEASE MOTOR
M
FLIP-UP GLASS RELEASE SWITCH
TAILGATE FLIP-UP AJAR SWITCH
TAILGATE LOCK MOTOR/ AJAR SWITCH
Z235 18 BK
S380
(8W-15-19)
S381
Z235 16 BK
C309
G303
(8W-15-19)

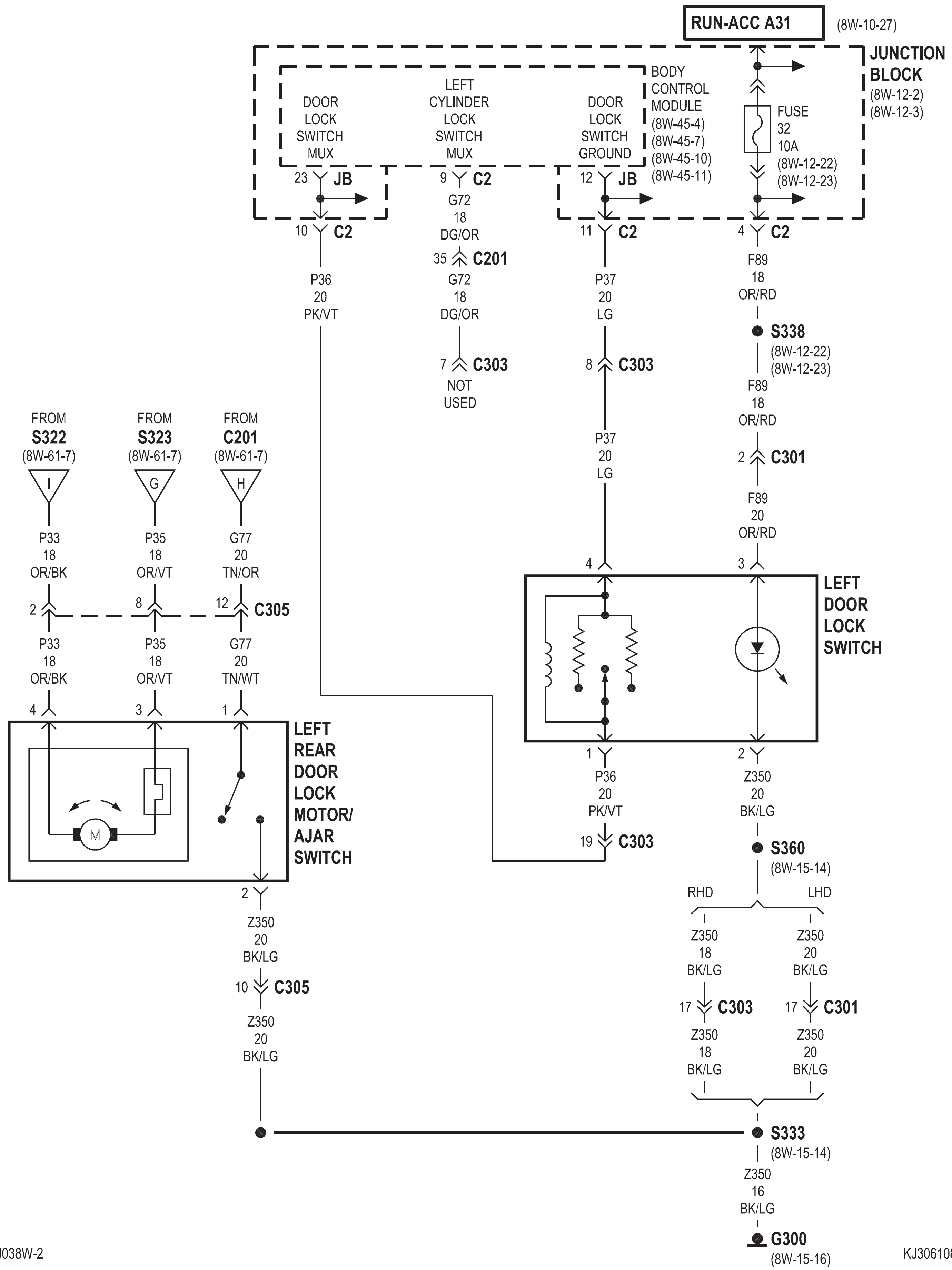
RHD EXCEPT BASE



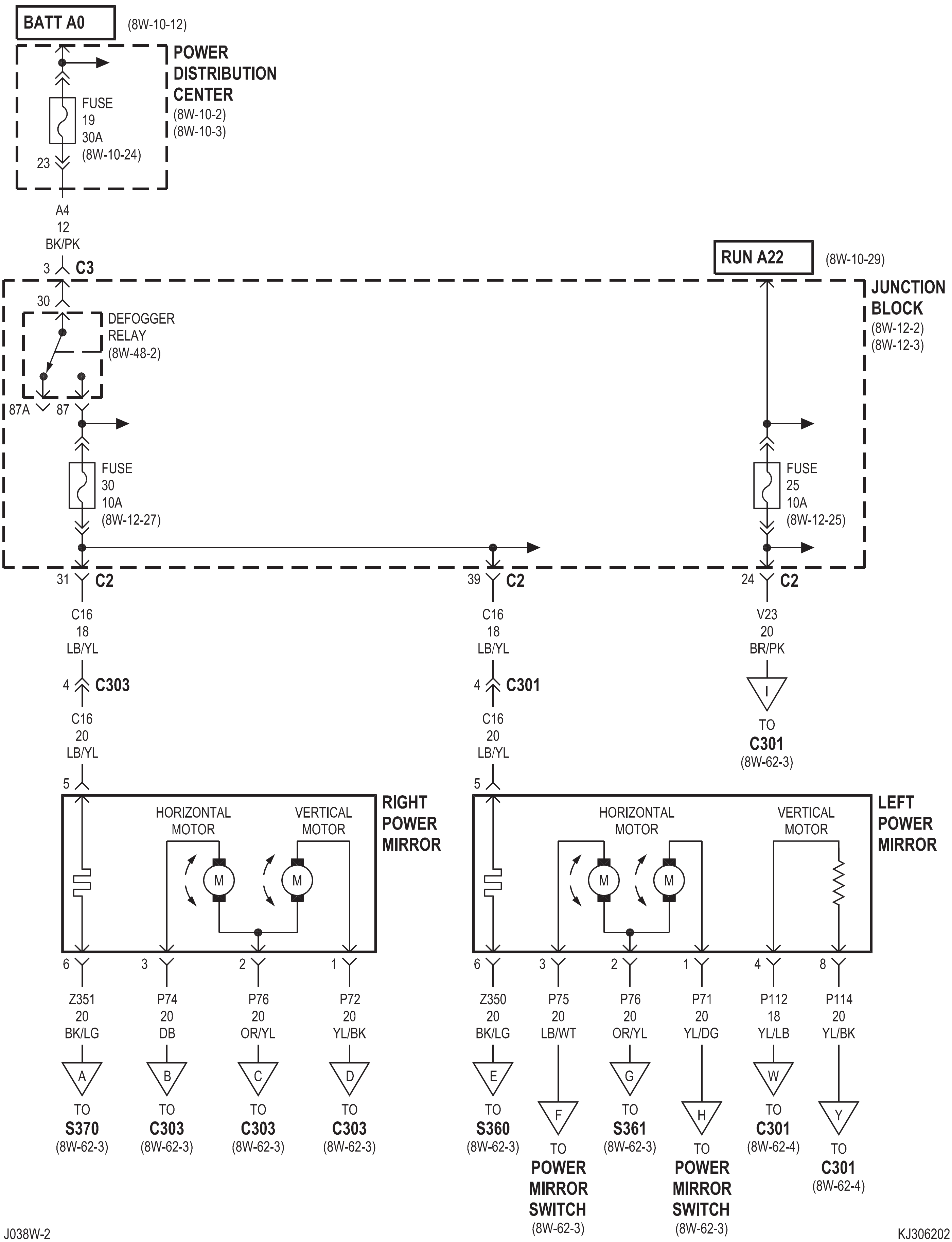
RHD EXCEPT BASE



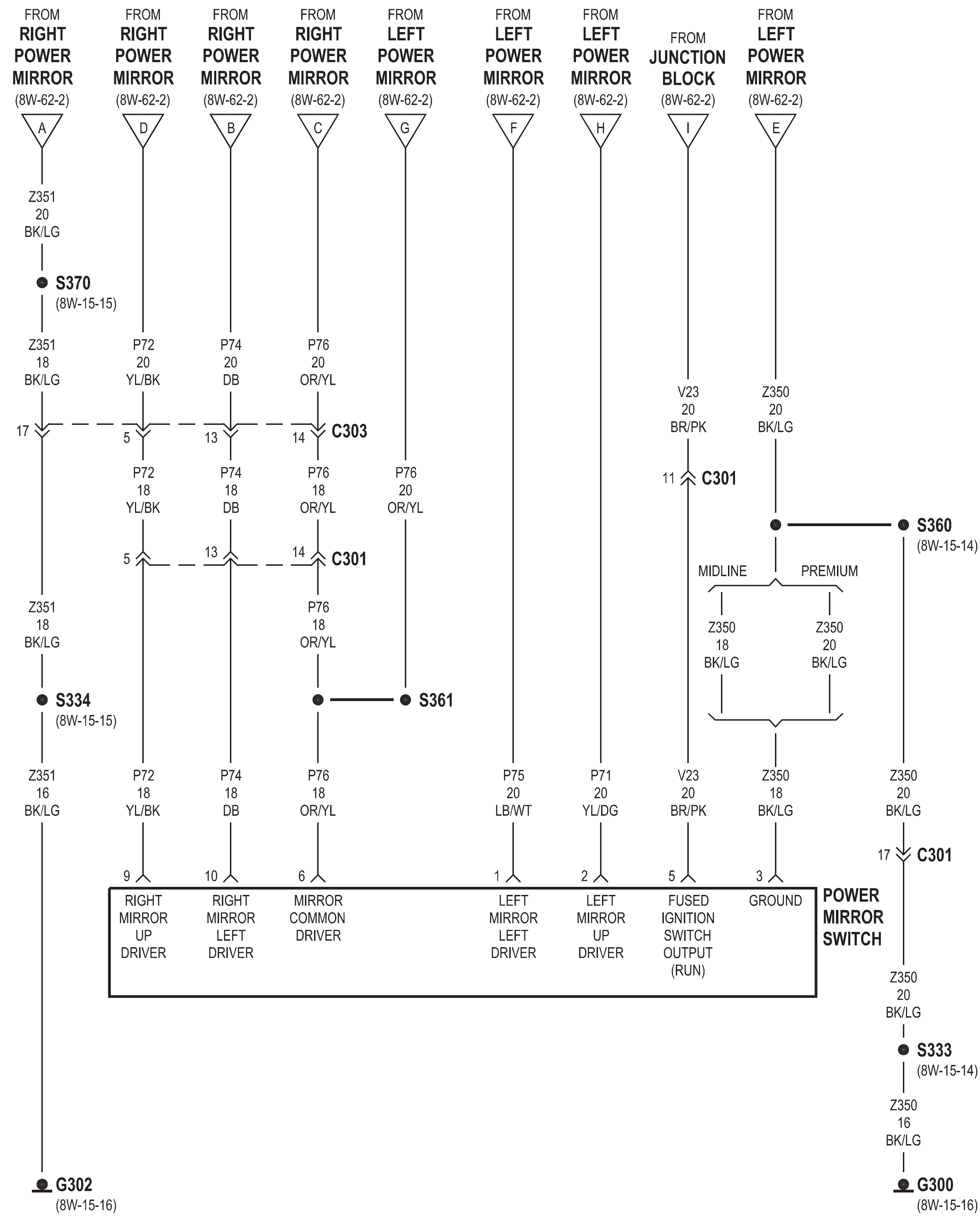
RHD EXCEPT BASE



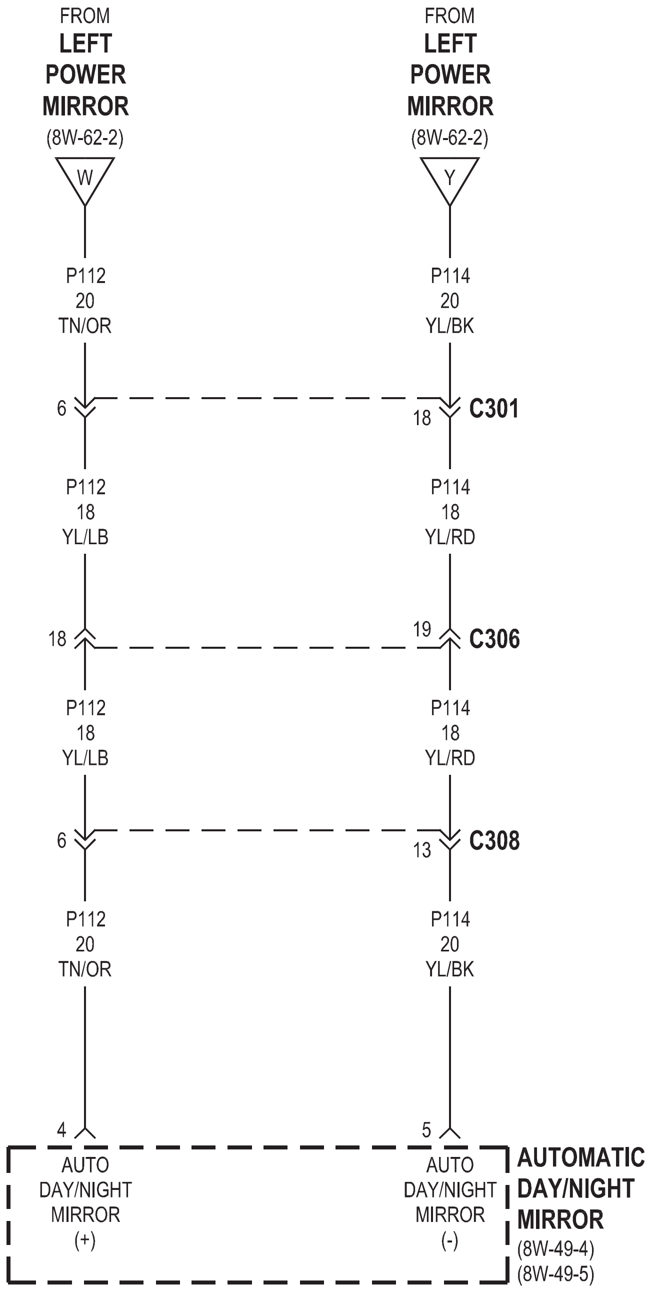
8W-62 POWER MIRRORS


BATT A0
(8W-10-12)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 19 30A (8W-10-24)
23
A4 12 BK/PK
3 C3
RUN A22
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
DEFOGGER RELAY (8W-48-2)
87A 87
FUSE 30 10A (8W-12-27)
FUSE 25 10A (8W-12-25)
31 C2
39 C2
24 C2
C16 18 LB/YL
C16 18 LB/YL
V23 20 BR/PK
4 C303
4 C301
I
TO C301 (8W-62-3)
C16 20 LB/YL
C16 20 LB/YL
5
5
RIGHT POWER MIRROR
HORIZONTAL MOTOR
VERTICAL MOTOR
M
M
LEFT POWER MIRROR
HORIZONTAL MOTOR
VERTICAL MOTOR
M
M
6 3 2 1
6 3 2 1 4 8
Z351 20 BK/LG
P74 20 DB
P76 20 OR/YL
P72 20 YL/BK
Z350 20 BK/LG
P75 20 LB/WT
P76 20 OR/YL
P71 20 YL/DG
P112 18 YL/LB
P114 20 YL/BK
A TO S370 (8W-62-3)
B TO C303 (8W-62-3)
C TO C303 (8W-62-3)
D TO C303 (8W-62-3)
E TO S360 (8W-62-3)
F TO POWER MIRROR SWITCH (8W-62-3)
G TO S361 (8W-62-3)
H TO POWER MIRROR SWITCH (8W-62-3)
W TO C301 (8W-62-4)
Y TO C301 (8W-62-4)

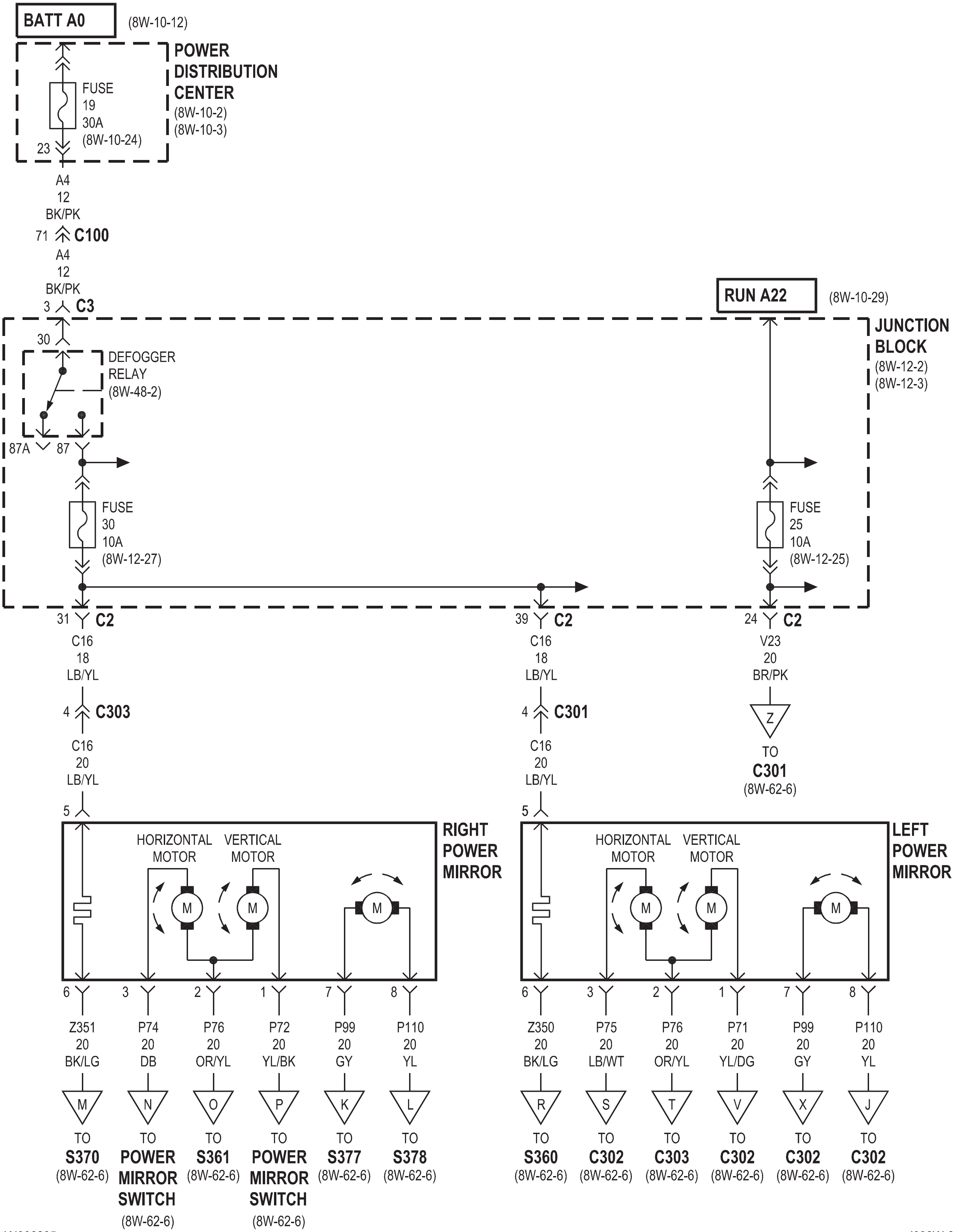
LHD EXCEPT BASE



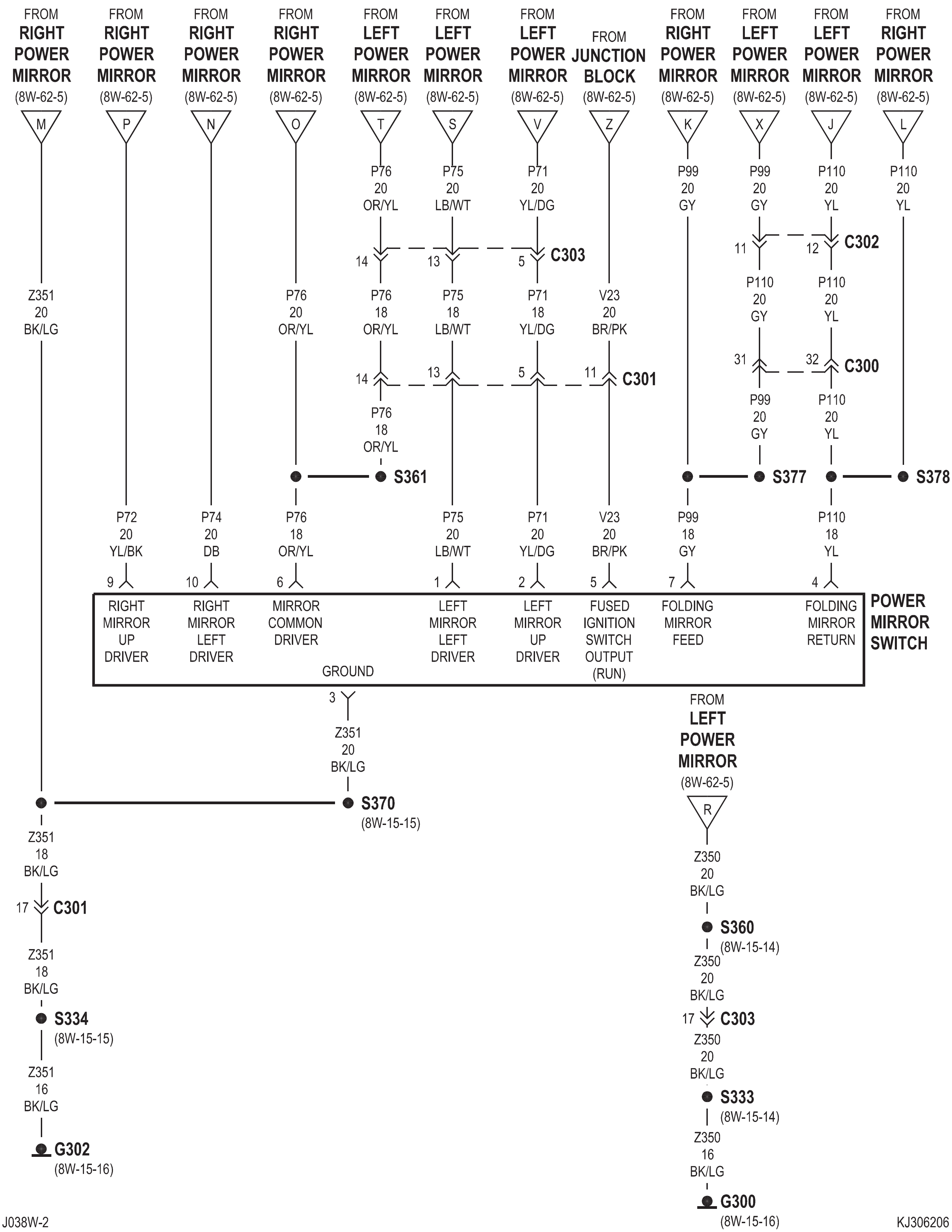
KJ306203 J038W-2


FROM
LEFT
POWER
MIRROR
(8W-62-2)
W
FROM
LEFT
POWER
MIRROR
(8W-62-2)
Y
P112
20
TN/OR
P114
20
YL/BK
6
18
C301
P112
18
YL/LB
P114
18
YL/RD
18
19
C306
P112
18
YL/LB
P114
18
YL/RD
6
13
C308
P112
20
TN/OR
P114
20
YL/BK
4
5
AUTO
DAY/NIGHT
MIRROR
(+)
AUTO
DAY/NIGHT
MIRROR
(-)
AUTOMATIC
DAY/NIGHT
MIRROR
(8W-49-4)
(8W-49-5)

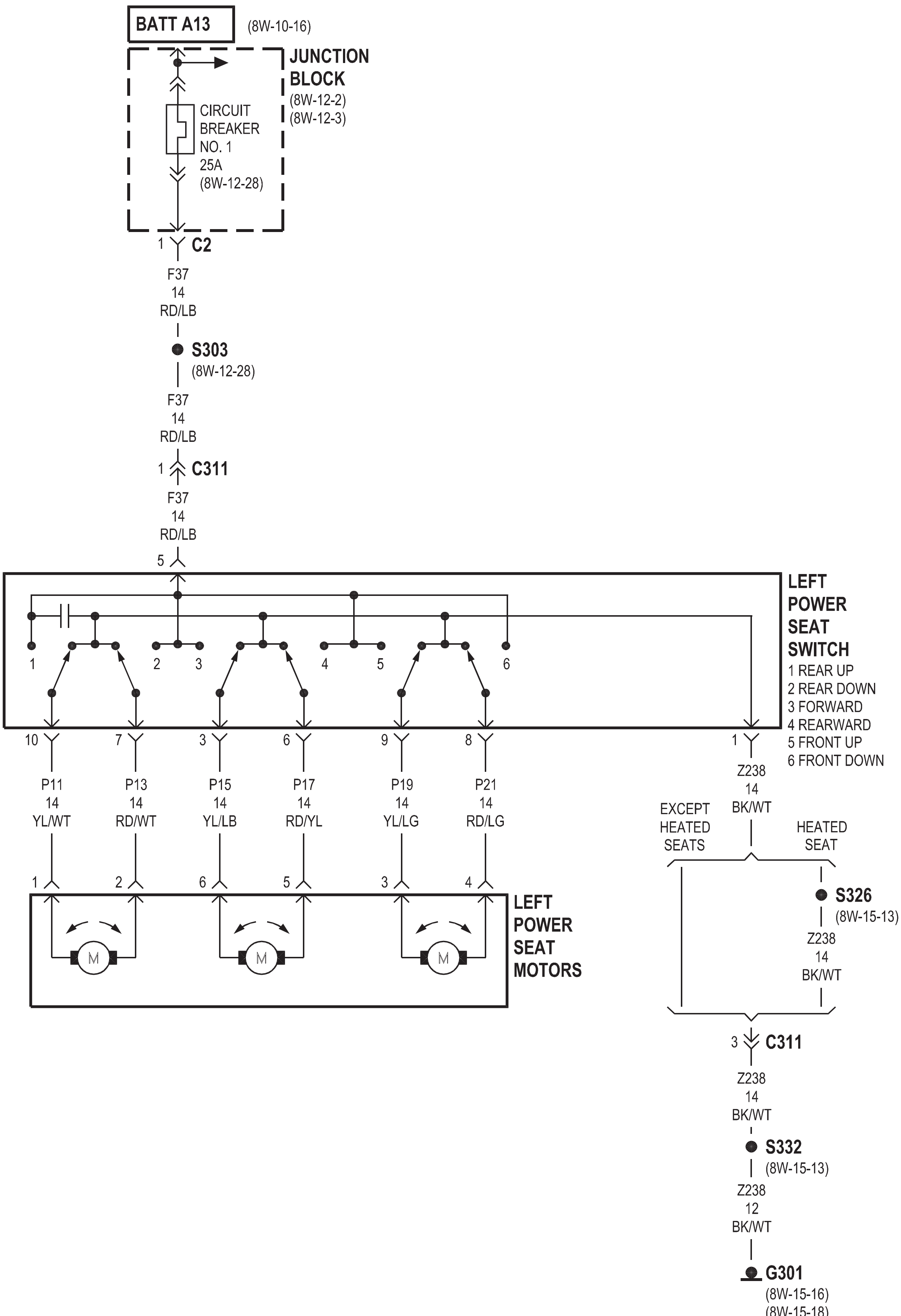
RHD EXCEPT BASE

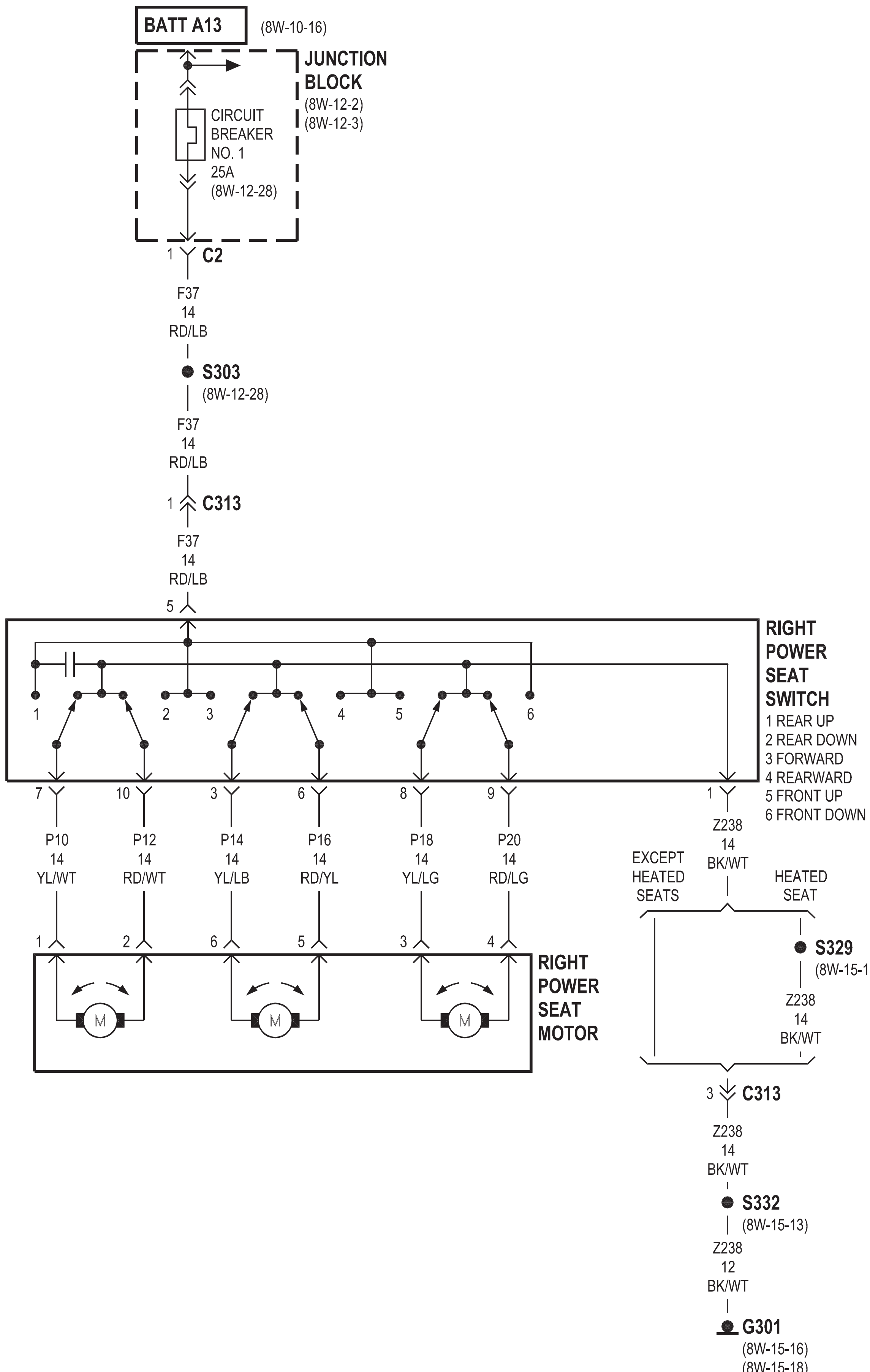


RHD EXCEPT BASE

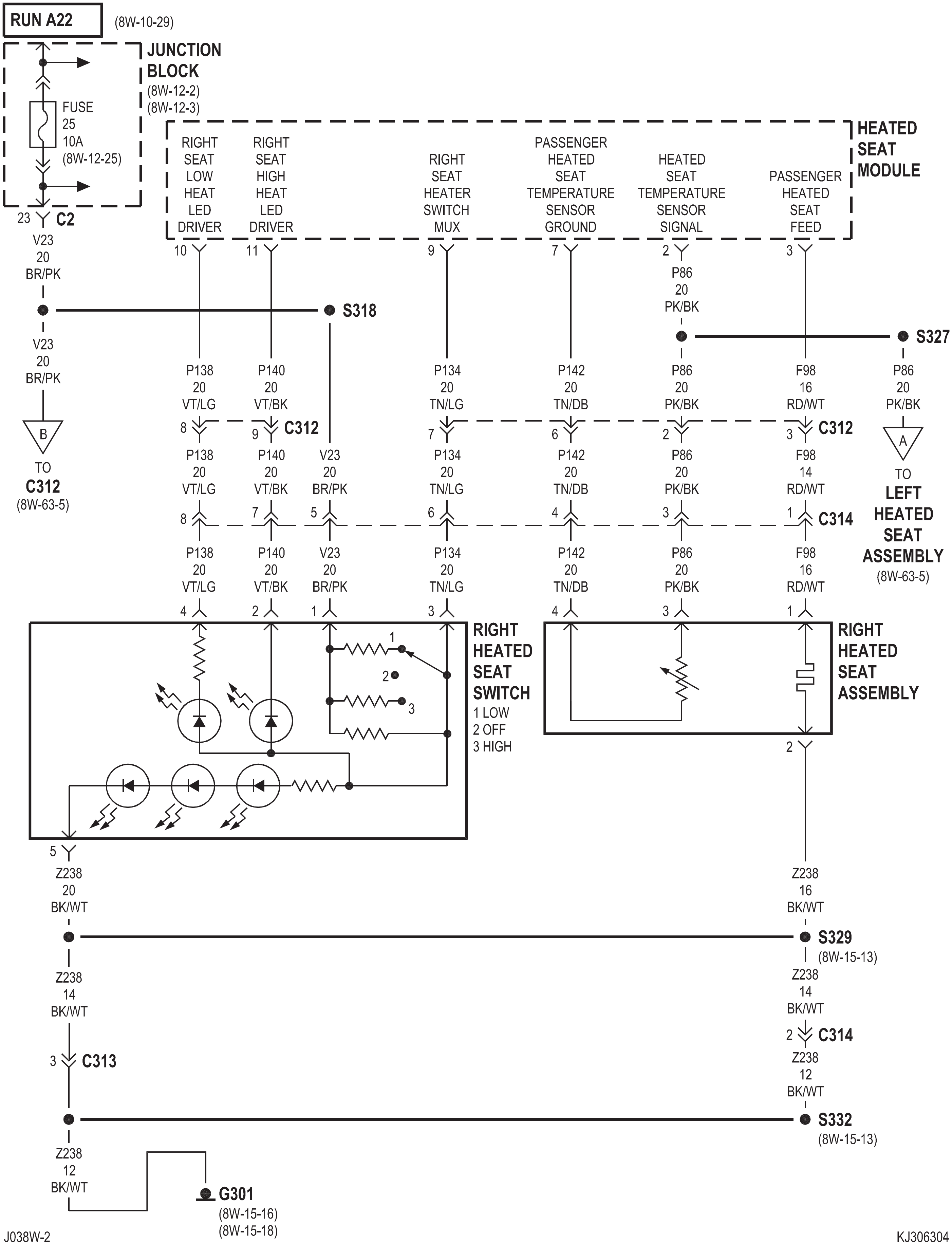


8W-63 POWER SEAT

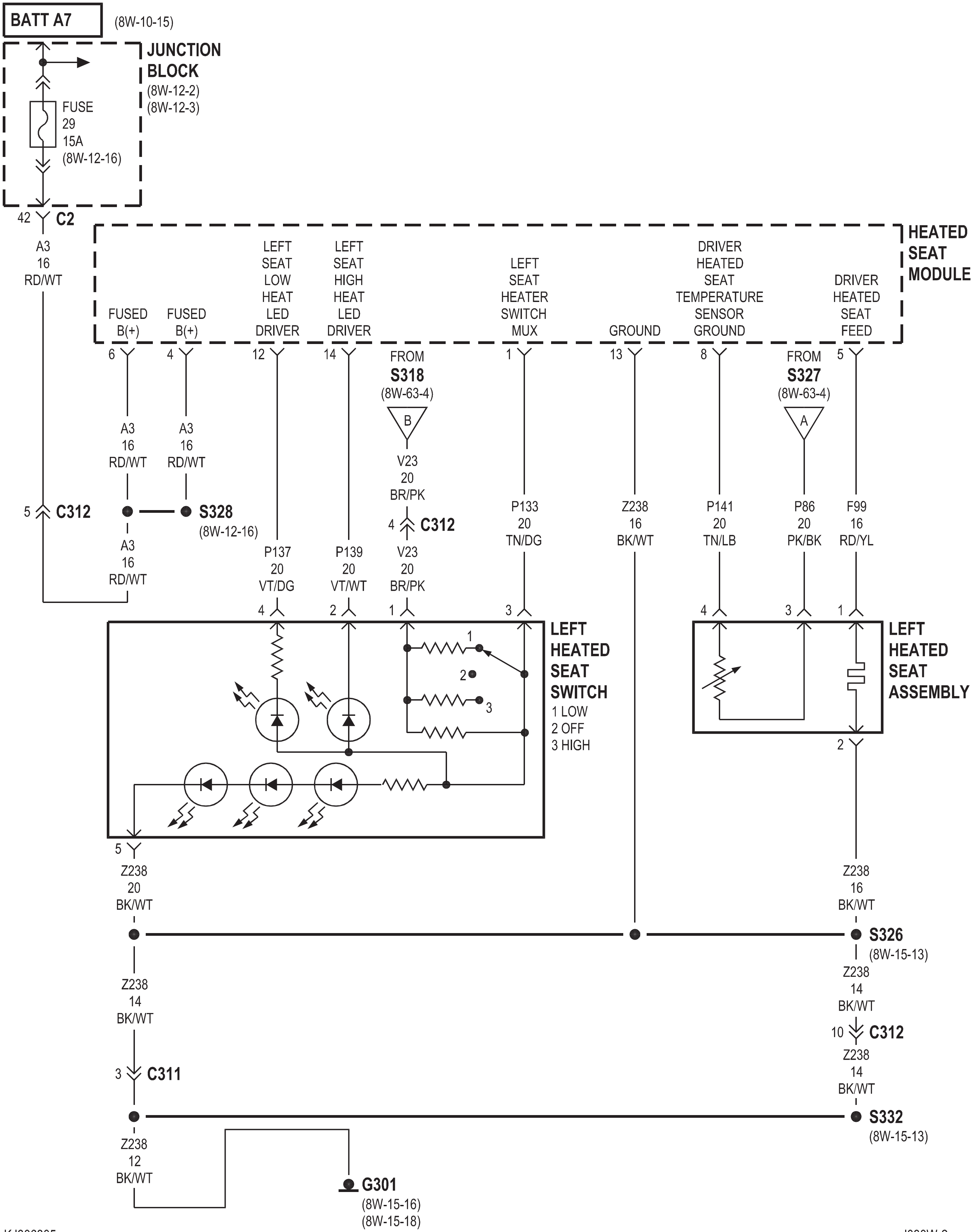

BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 1 25A
(8W-12-28)
1 C2
F37 14 RD/LB
S303
(8W-12-28)
F37 14 RD/LB
1 C311
F37 14 RD/LB
5
1 2 3 4 5 6
LEFT POWER SEAT SWITCH
1 REAR UP
2 REAR DOWN
3 FORWARD
4 REARWARD
5 FRONT UP
6 FRONT DOWN
10 7 3 6 9 8 1
P11 14 YL/WT
P13 14 RD/WT
P15 14 YL/LB
P17 14 RD/YL
P19 14 YL/LG
P21 14 RD/LG
Z238 14 BK/WT
EXCEPT HEATED SEATS
HEATED SEAT
S326
(8W-15-13)
Z238 14 BK/WT
1 2 6 5 3 4
M
LEFT POWER SEAT MOTORS
3 C311
Z238 14 BK/WT
S332
(8W-15-13)
Z238 12 BK/WT
G301
(8W-15-16)
(8W-15-18)


BATT A13
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 1
25A
(8W-12-28)
1 C2
F37 14 RD/LB
S303
(8W-12-28)
F37 14 RD/LB
1 C313
F37 14 RD/LB
5
RIGHT POWER SEAT SWITCH
1 2 3 4 5 6
1 REAR UP
2 REAR DOWN
3 FORWARD
4 REARWARD
5 FRONT UP
6 FRONT DOWN
7 10 3 6 8 9 1
P10 14 YL/WT
P12 14 RD/WT
P14 14 YL/LB
P16 14 RD/YL
P18 14 YL/LG
P20 14 RD/LG
Z238 14 BK/WT
EXCEPT HEATED SEATS
HEATED SEAT
S329
(8W-15-13)
Z238 14 BK/WT
1 2 6 5 3 4
M M M
RIGHT POWER SEAT MOTOR
3 C313
Z238 14 BK/WT
S332
(8W-15-13)
Z238 12 BK/WT
G301
(8W-15-16)
(8W-15-18)

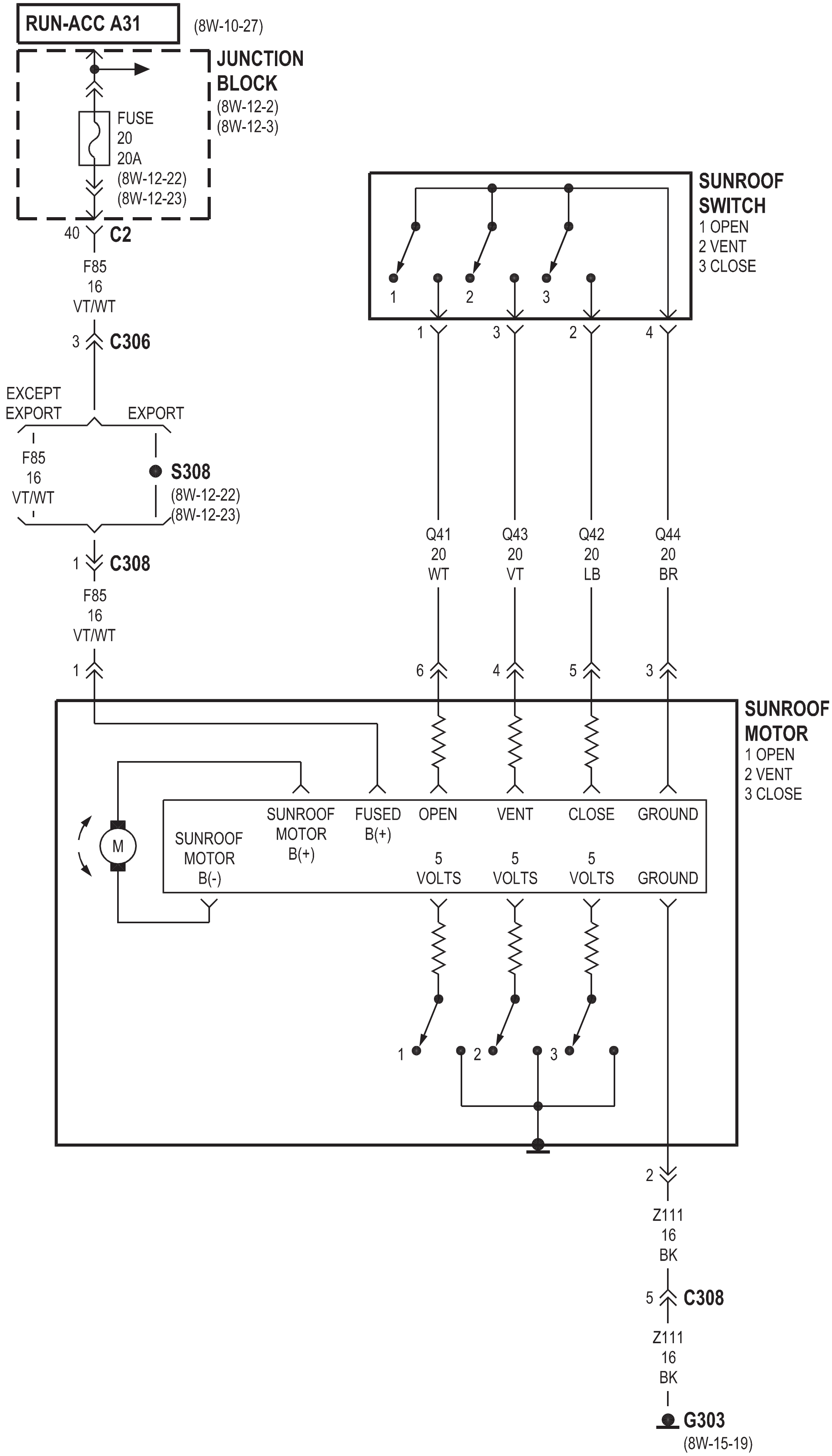
HEATED SEATS



HEATED SEATS



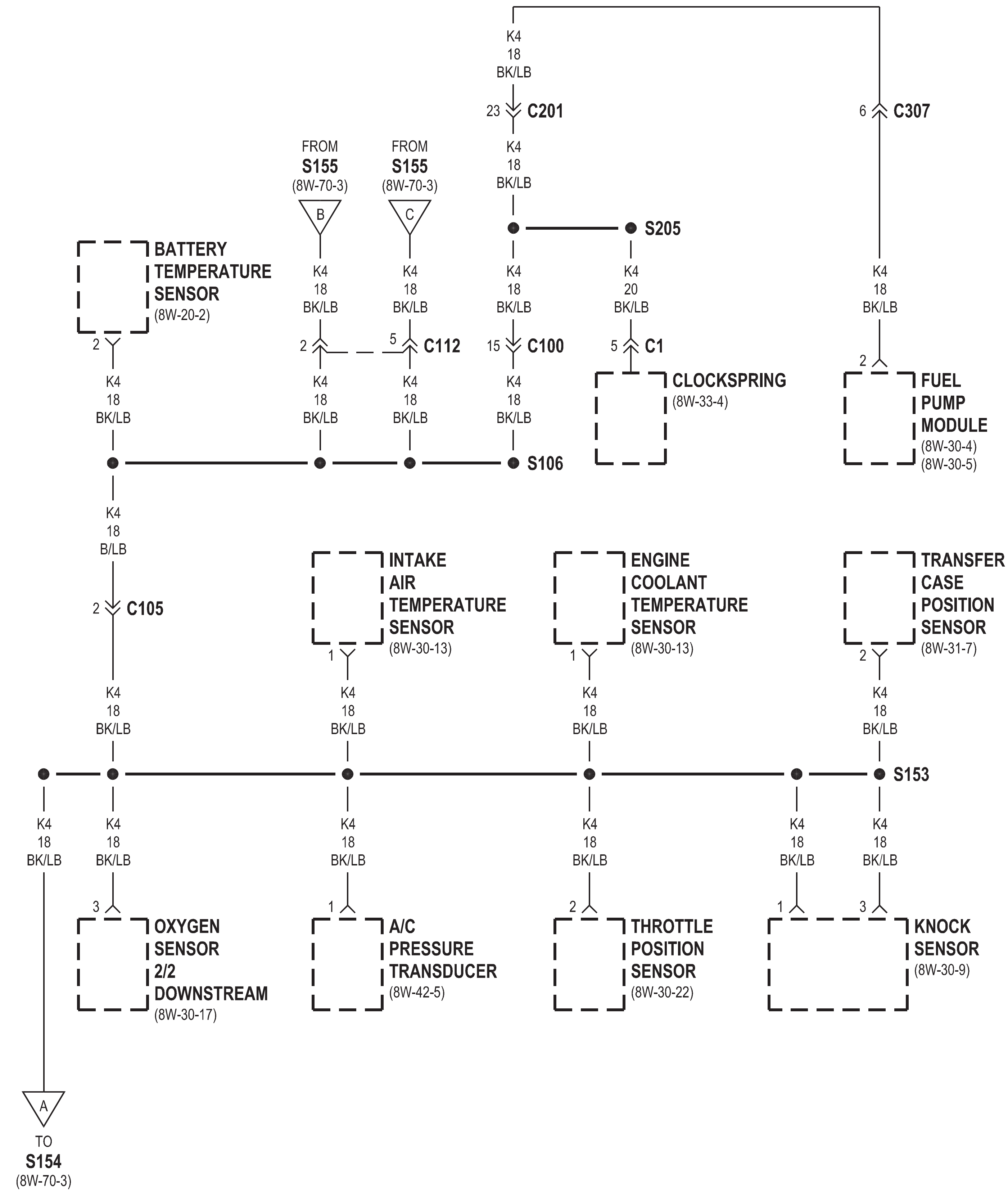
8W-64 POWER SUNROOF


RUN-ACC A31
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
20A
(8W-12-22)
(8W-12-23)
40
C2
F85
16
VT/WT
3
C306
EXCEPT EXPORT
EXPORT
F85
16
VT/WT
S308
(8W-12-22)
(8W-12-23)
1
C308
F85
16
VT/WT
1
SUNROOF SWITCH
1 OPEN
2 VENT
3 CLOSE
1 2 3
1 3 2 4
Q41
20
WT
Q43
20
VT
Q42
20
LB
Q44
20
BR
6 4 5 3
SUNROOF MOTOR
1 OPEN
2 VENT
3 CLOSE
M
SUNROOF MOTOR B(-)
SUNROOF MOTOR B(+)
FUSED B(+)
OPEN
5 VOLTS
VENT
5 VOLTS
CLOSE
5 VOLTS
GROUND
GROUND
1 2 3
2
Z111
16
BK
5
C308
Z111
16
BK
G303
(8W-15-19)

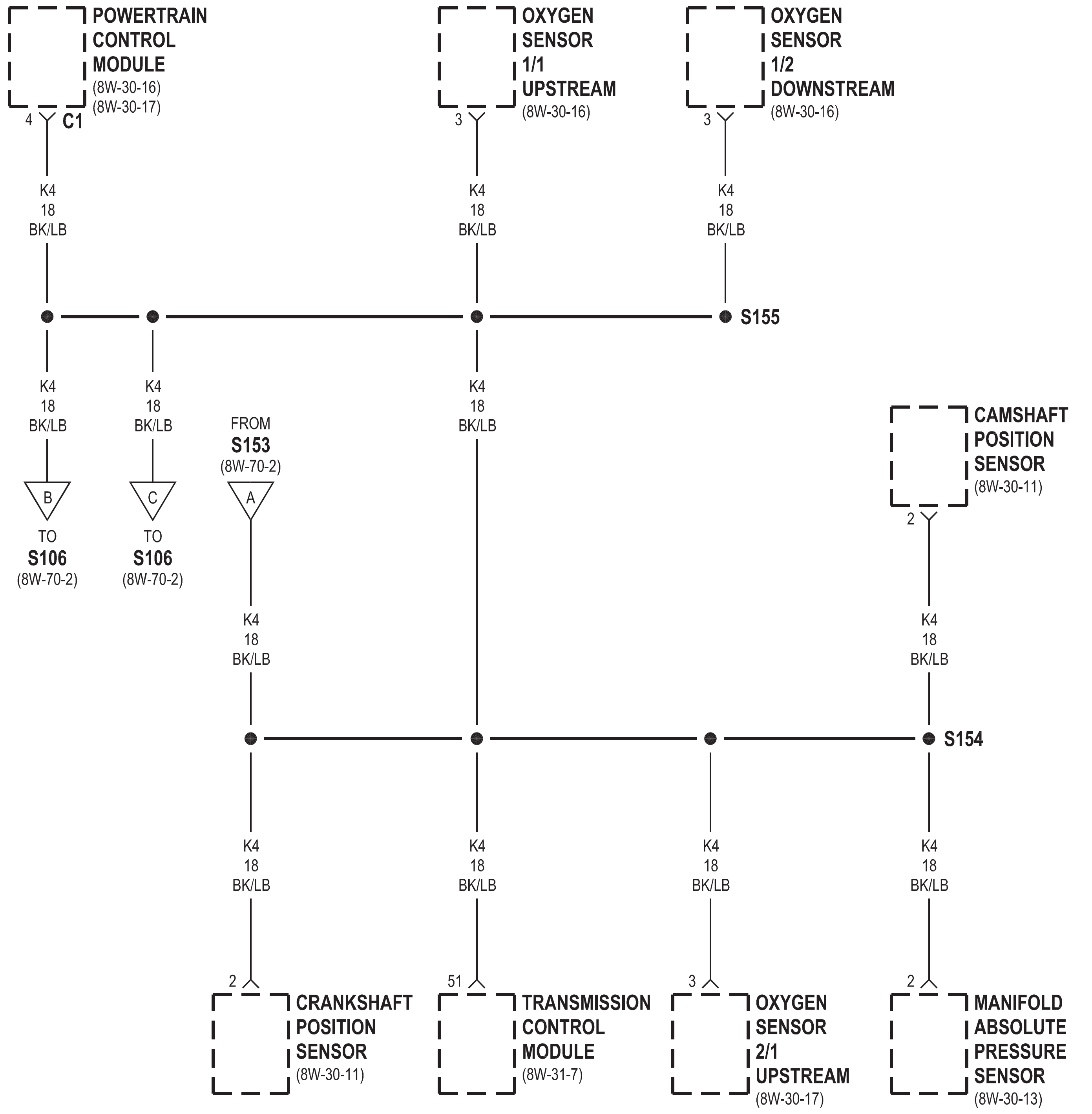
KJ306402

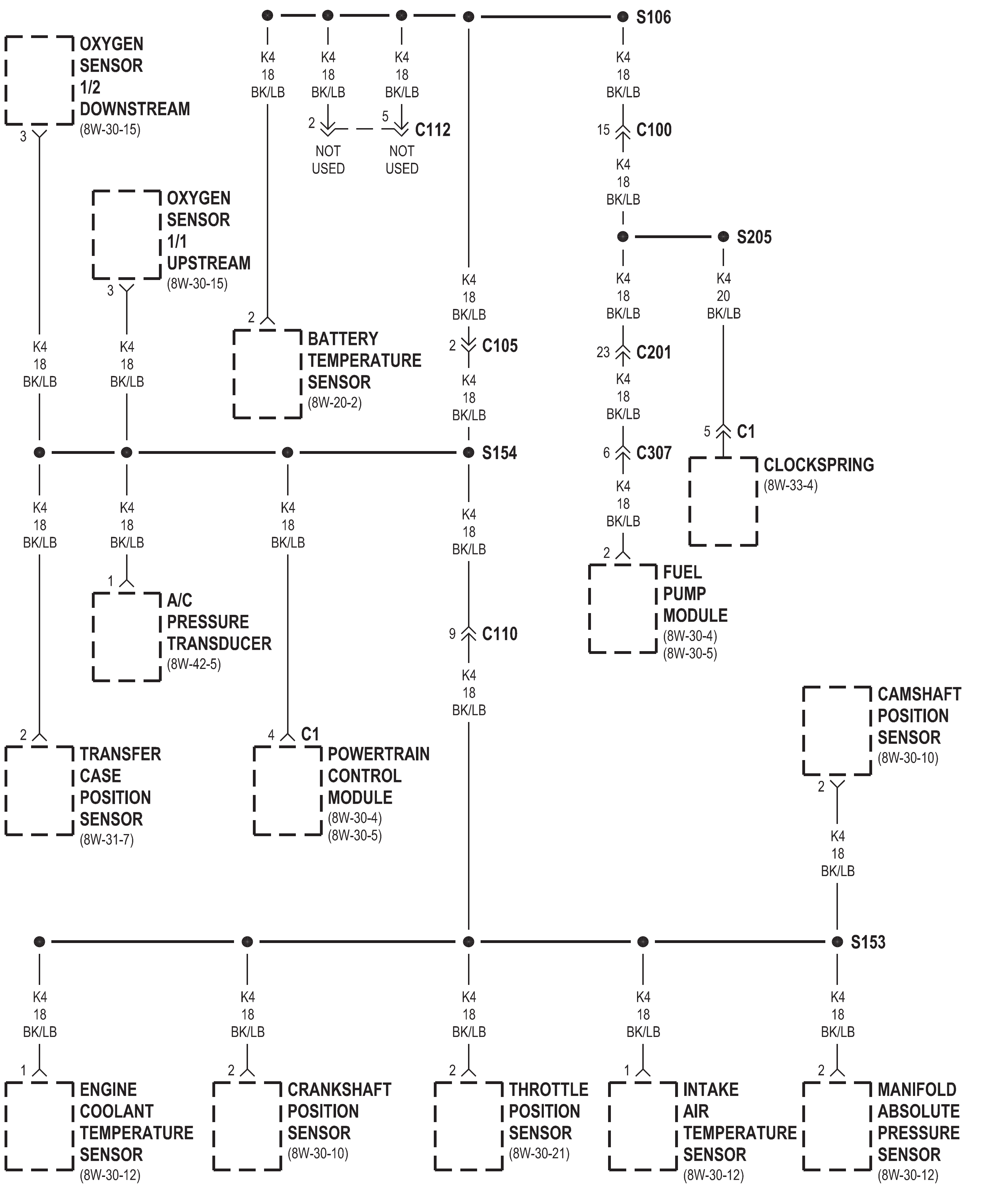
8W-70 SPLICE INFORMATION

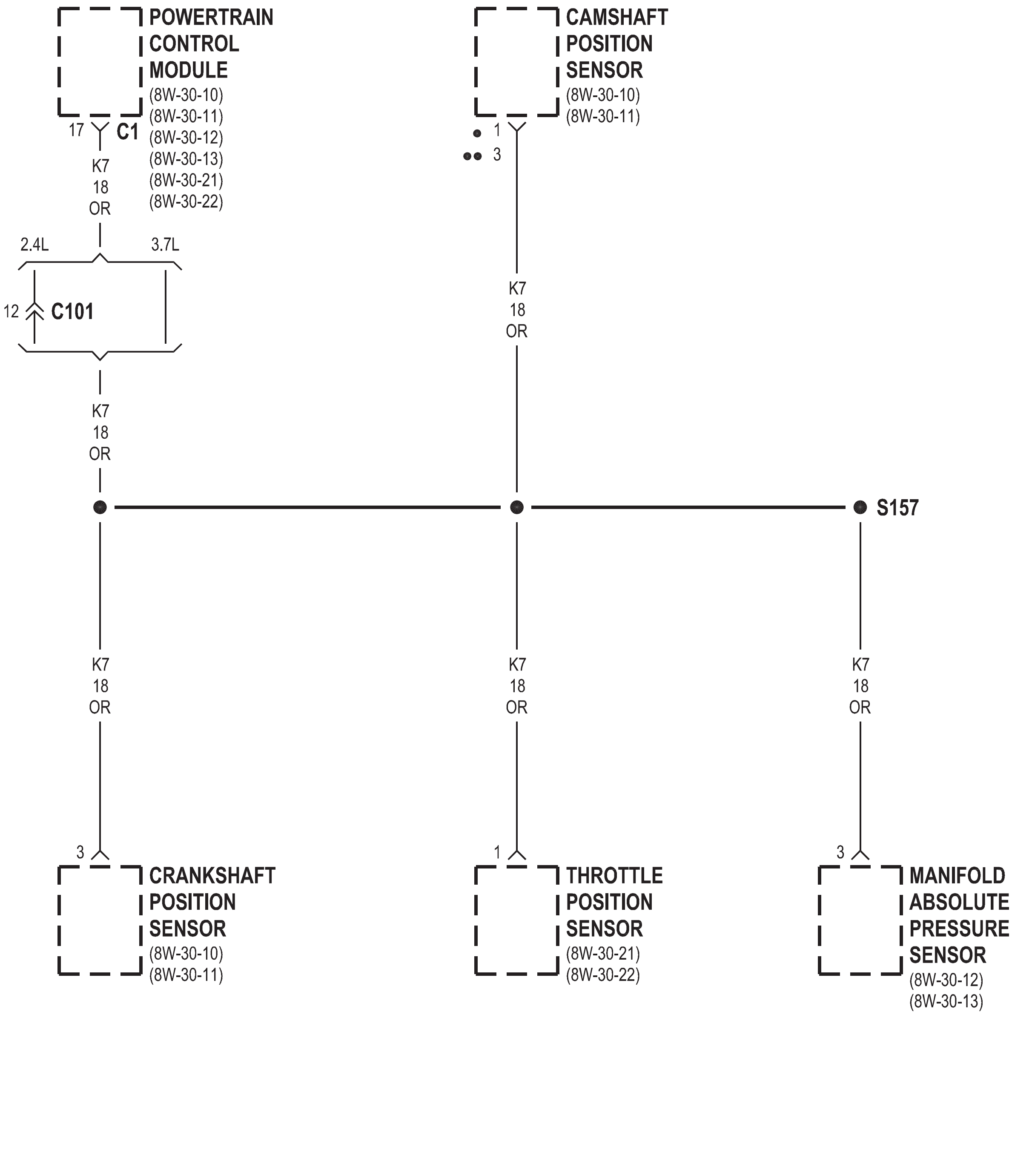
3.7L


K4
18
BK/LB
23 C201
6 C307
FROM
S155
(8W-70-3)
B
C
S205
K4
20
BK/LB
BATTERY
TEMPERATURE
SENSOR
(8W-20-2)
2 C112
5
15 C100
5 C1
CLOCKSPRING
(8W-33-4)
FUEL
PUMP
MODULE
(8W-30-4)
(8W-30-5)
S106
K4
18
B/LB
2 C105
INTAKE
AIR
TEMPERATURE
SENSOR
(8W-30-13)
ENGINE
COOLANT
TEMPERATURE
SENSOR
(8W-30-13)
TRANSFER
CASE
POSITION
SENSOR
(8W-31-7)
S153
OXYGEN
SENSOR
2/2
DOWNSTREAM
(8W-30-17)
A/C
PRESSURE
TRANSDUCER
(8W-42-5)
THROTTLE
POSITION
SENSOR
(8W-30-22)
KNOCK
SENSOR
(8W-30-9)
A
TO
S154
(8W-70-3)

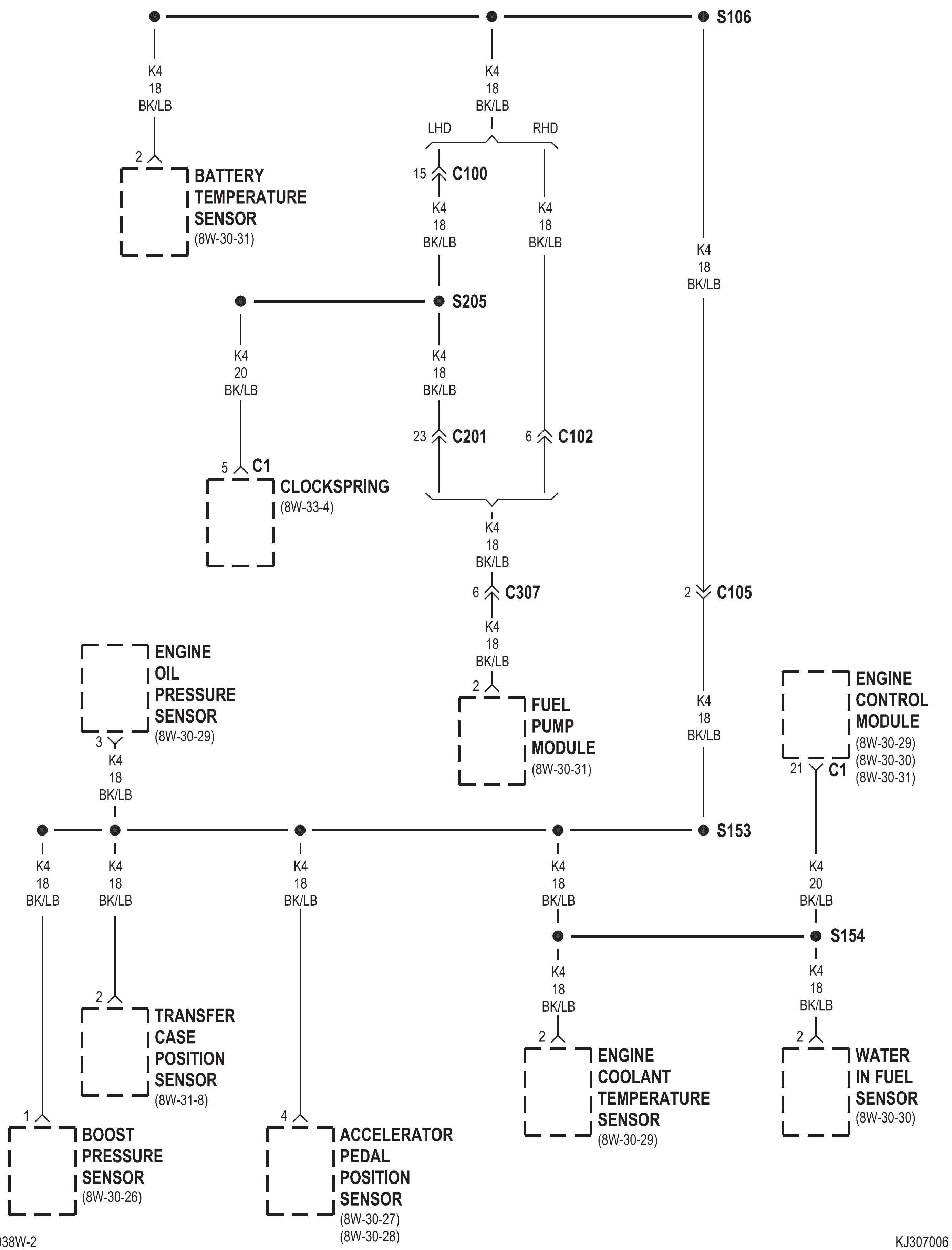
3.7L


POWERTRAIN CONTROL MODULE
(8W-30-16)
(8W-30-17)
4
C1
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-16)
3
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-16)
3
K4
18
BK/LB
S155
FROM
S153
(8W-70-2)
A
B
TO
S106
(8W-70-2)
C
TO
S106
(8W-70-2)
CAMSHAFT POSITION SENSOR
(8W-30-11)
2
S154
2
CRANKSHAFT POSITION SENSOR
(8W-30-11)
51
TRANSMISSION CONTROL MODULE
(8W-31-7)
3
OXYGEN SENSOR 2/1 UPSTREAM
(8W-30-17)
2
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-13)

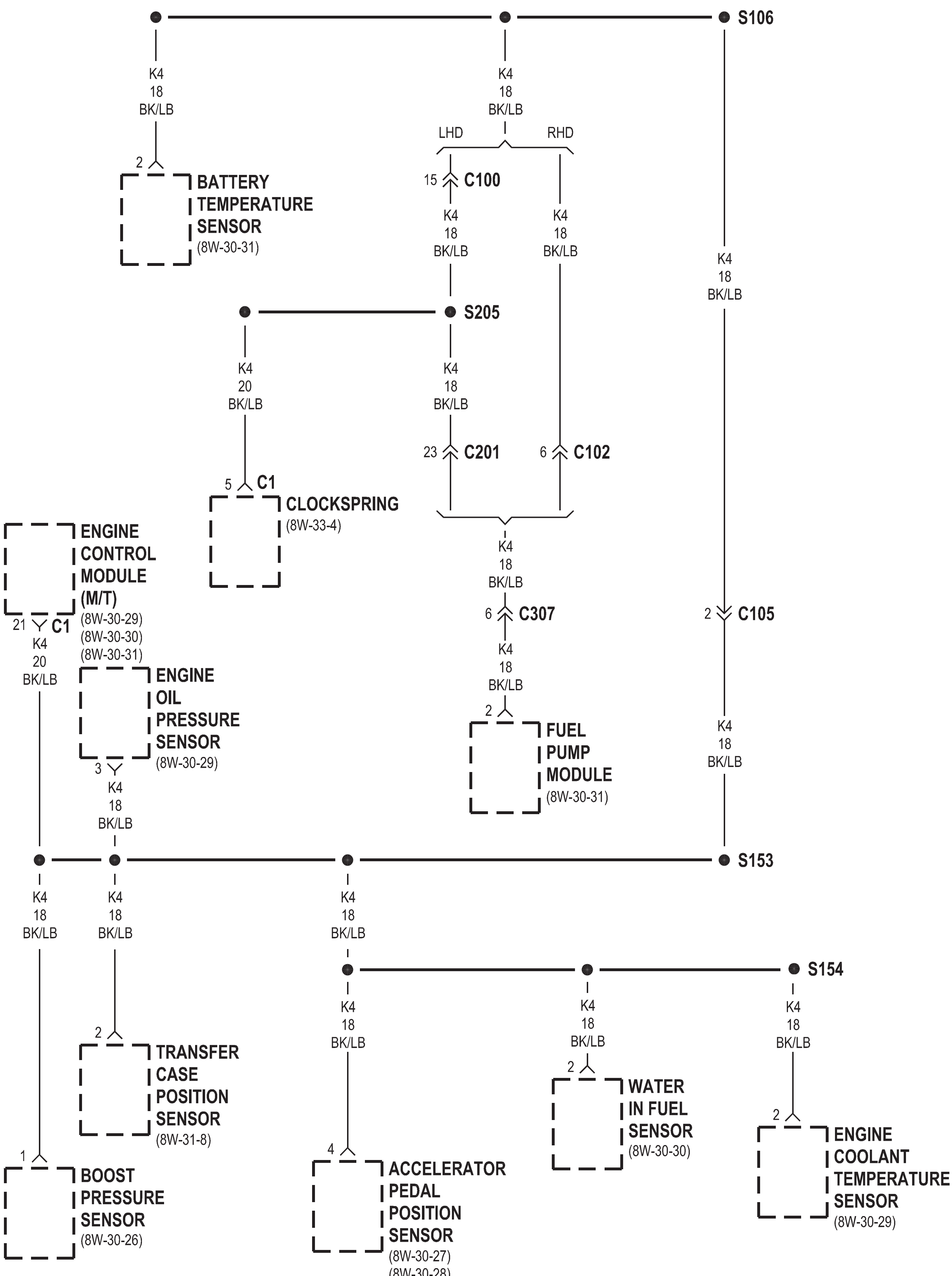

S106
K4
18
BK/LB
2
5
C112
NOT USED
NOT USED
15
C100
S205
K4
20
BK/LB
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-15)
3
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-15)
BATTERY TEMPERATURE SENSOR
(8W-20-2)
C105
23
C201
C1
C307
CLOCKSPRING
(8W-33-4)
S154
A/C PRESSURE TRANSDUCER
(8W-42-5)
FUEL PUMP MODULE
(8W-30-4)
(8W-30-5)
9
C110
CAMSHAFT POSITION SENSOR
(8W-30-10)
TRANSFER CASE POSITION SENSOR
(8W-31-7)
4
POWERTRAIN CONTROL MODULE
(8W-30-4)
(8W-30-5)
S153
1
ENGINE COOLANT TEMPERATURE SENSOR
(8W-30-12)
CRANKSHAFT POSITION SENSOR
(8W-30-10)
THROTTLE POSITION SENSOR
(8W-30-21)
INTAKE AIR TEMPERATURE SENSOR
(8W-30-12)
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-12)

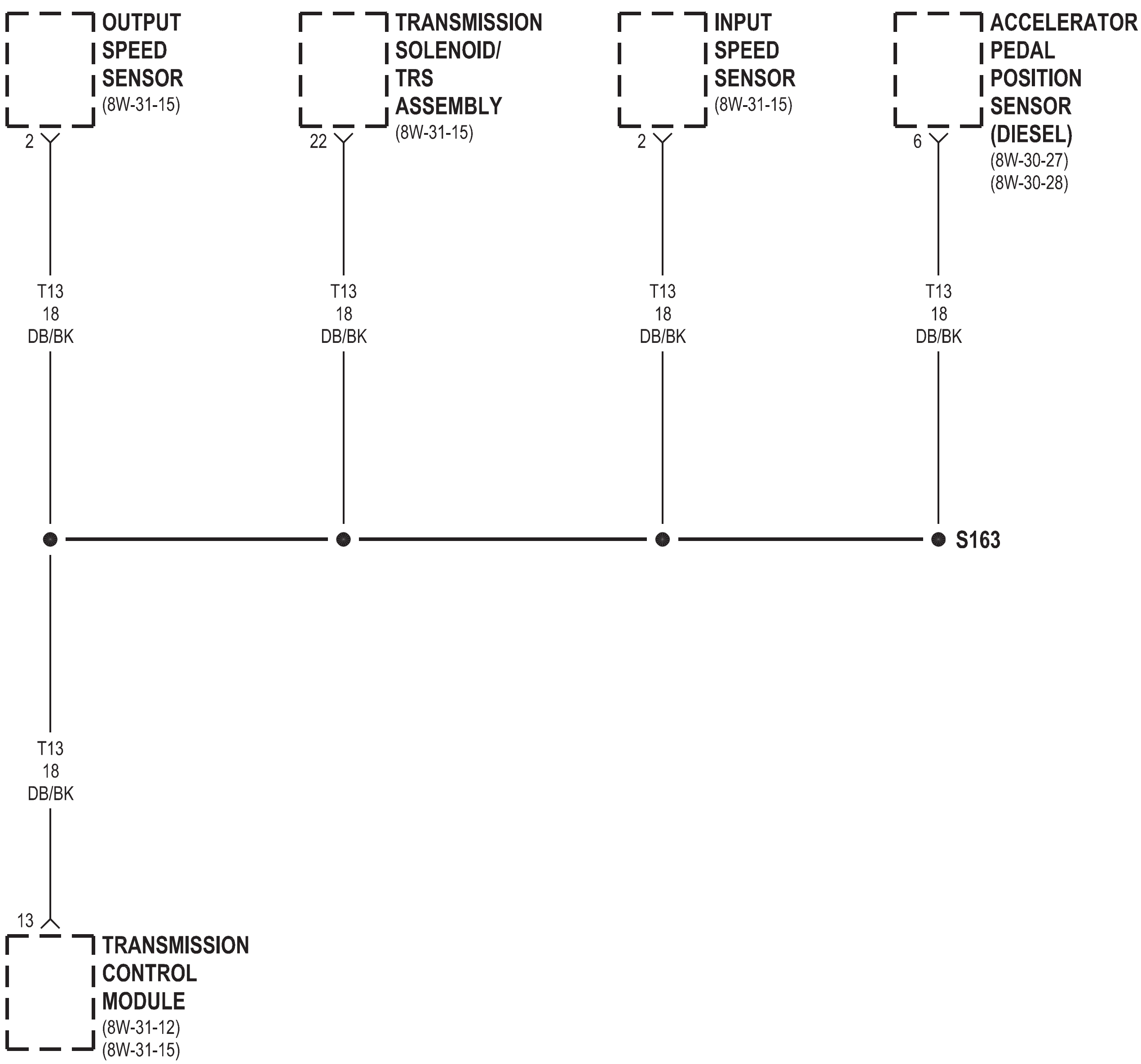

POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-11)
(8W-30-12)
(8W-30-13)
(8W-30-21)
(8W-30-22)
17 C1
K7 18 OR
2.4L
3.7L
12 C101
K7 18 OR
CAMSHAFT POSITION SENSOR
(8W-30-10)
(8W-30-11)
• 1
•• 3
K7 18 OR
S157
K7 18 OR
K7 18 OR
K7 18 OR
3
CRANKSHAFT POSITION SENSOR
(8W-30-10)
(8W-30-11)
1
THROTTLE POSITION SENSOR
(8W-30-21)
(8W-30-22)
3
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-12)
(8W-30-13)
• 2.4L
•• 3.7L

DIESEL A/T

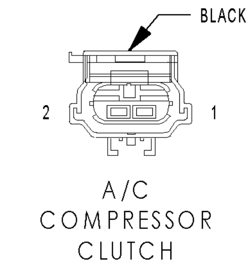

S106
K4
18
BK/LB
LHD
RHD
15 C100
BATTERY TEMPERATURE SENSOR
(8W-30-31)
S205
K4
20
BK/LB
23 C201
6 C102
5 C1
CLOCKSPRING
(8W-33-4)
6 C307
2 C105
FUEL PUMP MODULE
(8W-30-31)
ENGINE OIL PRESSURE SENSOR
(8W-30-29)
ENGINE CONTROL MODULE
(8W-30-29)
(8W-30-30)
(8W-30-31)
21 C1
S153
S154
TRANSFER CASE POSITION SENSOR
(8W-31-8)
BOOST PRESSURE SENSOR
(8W-30-26)
ACCELERATOR PEDAL POSITION SENSOR
(8W-30-27)
(8W-30-28)
ENGINE COOLANT TEMPERATURE SENSOR
(8W-30-29)
WATER IN FUEL SENSOR
(8W-30-30)

DIESEL M/T


S106
K4
18
BK/LB
LHD
RHD
15
C100
BATTERY
TEMPERATURE
SENSOR
(8W-30-31)
S205
K4
20
BK/LB
23
C201
6
C102
5
C1
CLOCKSPRING
(8W-33-4)
ENGINE
CONTROL
MODULE
(M/T)
(8W-30-29)
(8W-30-30)
(8W-30-31)
21
C1
6
C307
2
C105
ENGINE
OIL
PRESSURE
SENSOR
(8W-30-29)
FUEL
PUMP
MODULE
(8W-30-31)
S153
S154
TRANSFER
CASE
POSITION
SENSOR
(8W-31-8)
WATER
IN FUEL
SENSOR
(8W-30-30)
ENGINE
COOLANT
TEMPERATURE
SENSOR
(8W-30-29)
BOOST
PRESSURE
SENSOR
(8W-30-26)
ACCELERATOR
PEDAL
POSITION
SENSOR
(8W-30-27)
(8W-30-28)

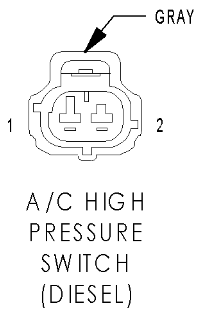

OUTPUT
SPEED
SENSOR
(8W-31-15)
2
TRANSMISSION
SOLENOID/
TRS
ASSEMBLY
(8W-31-15)
22
INPUT
SPEED
SENSOR
(8W-31-15)
2
ACCELERATOR
PEDAL
POSITION
SENSOR
(DIESEL)
(8W-30-27)
(8W-30-28)
6
T13
18
DB/BK
T13
18
DB/BK
T13
18
DB/BK
T13
18
DB/BK
S163
T13
18
DB/BK
13
TRANSMISSION
CONTROL
MODULE
(8W-31-12)
(8W-31-15)

8W-80 CONNECTOR PIN-OUTS



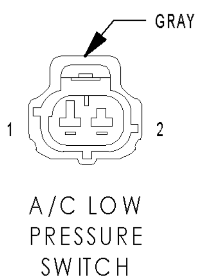
A/C COMPRESSOR CLUTCH - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C3 18DB/BK	A/C CLUTCH RELAY OUTPUT
2	Z246 18BK/GY	GROUND



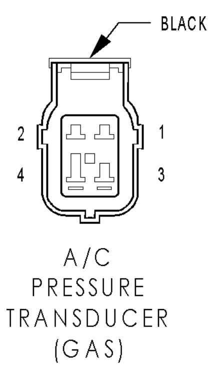
A/C HIGH PRESSURE SWITCH (DIESEL) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	C18 20DB	A/C HIGH PRESSURE SWITCH SIGNAL
2	C21 18DB/OR	A/C LOW PRESSURE SWITCH SIGNAL



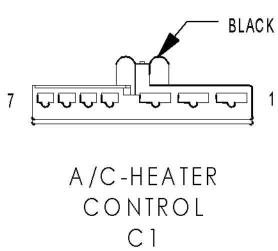
A/C LOW PRESSURE SWITCH - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	C21 18DB/OR (GAS)	A/C SWITCH SENSE
1	C21 18DB/OR (DIESEL)	A/C LOW PRESSURE SWITCH SIGNAL
2	Z142 18BK/WT (RHD)	GROUND
2	Z212 18BK/OR (LHD)	GROUND



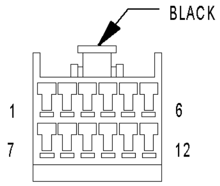
A/C PRESSURE TRANSDUCER (GAS) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K6 18VT/WT	5 VOLT SUPPLY
3	C18 18DB	A/C PRESSURE SIGNAL
4	-	-



A/C-HEATER CONTROL C1 - BLACK 7 WAY

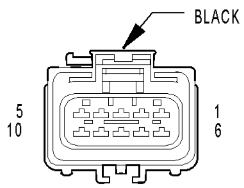
CAV	CIRCUIT	FUNCTION
1	Z8 12BK/VT	GROUND
2	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER
3	C6 12LB	BLOWER MOTOR M2 DRIVER
4	C5 14LG	BLOWER MOTOR M1 DRIVER
5	C4 14TN	BLOWER MOTOR LOW DRIVER
6	C19 18BR	A/C ON/OFF CONTROL
7	E2 20OR	PANEL LAMPS DRIVER



A/C-HEATER CONTROL C2

A/C-HEATER CONTROL C2 - BLACK 12 WAY

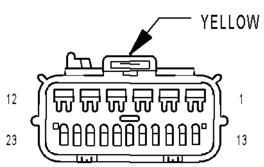
CAV	CIRCUIT	FUNCTION
1	C35 20DG/YL	MODE DOOR DRIVER (A)
2	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
3	-	-
4	-	-
5	-	-
6	C79 20VT/BK	REAR WINDOW DEFOGGER CONTROL
7	-	-
8	Z12 20BK/TN	GROUND
9	-	-
10	-	-
11	-	-
12	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT



ACCELERATOR PEDAL POSITION SENSOR (DIESEL)

ACCELERATOR PEDAL POSITION SENSOR (DIESEL) - BLACK 10 WAY

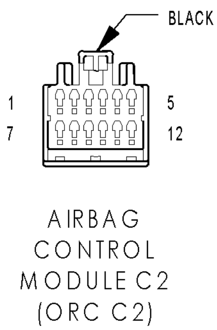
CAV	CIRCUIT	FUNCTION
1	-	-
2	T39 18GY/LB (A/T)	5 VOLT SUPPLY
3	K22 18OR/DB (A/T)	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
4	K4 18BK/LB	SENSOR GROUND
5	K151 20WT	LOW IDLE POSITION SWITCH SENSE
6	T13 18DB/BK (A/T)	SPEED SENSOR GROUND
7	K81 20VT/TN	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
8	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR GROUND
9	-	-
10	K852 20VT/WT	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY



AIRBAG CONTROL MODULE C1 (ORC C1)

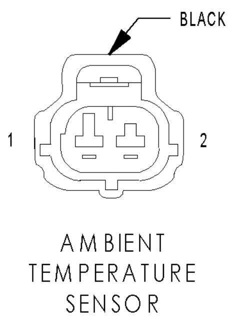
AIRBAG CONTROL MODULE C1 (ORC C1) - YELLOW 23 WAY

CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1
3	-	-
4	-	-
5	R53 18OR/YL	DRIVER SEAT BELT TENSIONER LINE 2
6	R55 18OR/BK	DRIVER SEAT BELT TENSIONER LINE 1
7	R61 18OR/LB	DRIVER SQUIB 2 LINE 1
8	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
9	R62 18OR/YL	PASSENGER SQUIB 2 LINE 2
10	R64 18TN/YL	PASSENGER SQUIB 2 LINE 1
11	R42 18BK/YL	PASSENGER SQUIB 1 LINE 1
12	R44 18DG/YL	PASSENGER SQUIB 1 LINE 2
13	-	-
14	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
15	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
16	Z6 18BK/PK	GROUND
17	-	-
18	-	-
19	-	-
20	-	-
21	D25 18YL/VT/OR	PCI BUS
22	-	-
23	-	-



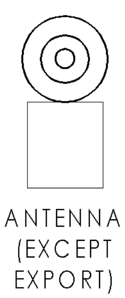
AIRBAG CONTROL MODULE C2 (ORC C2) - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	R59 20LB	DRIVER SEAT BELT SWITCH GROUND
3	R57 20DG	DRIVER SEAT BELT SWITCH SENSE
4	-	-
5	R60 20VT	PASSENGER SEAT BELT SWITCH GROUND
6	R58 20GY	PASSENGER SEAT BELT SWITCH SENSE
7	R48 20TN	RIGHT FRONT IMPACT SENSOR SIGNAL
8	R46 20BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
9	-	-
10	-	-
11	R47 20DB/LB	LEFT FRONT IMPACT SENSOR GROUND
12	R49 20LB/OR	LEFT FRONT IMPACT SENSOR SIGNAL



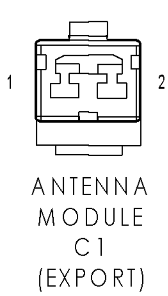
AMBIENT TEMPERATURE SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G31 18VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
2	G32 18DB/OR	AMBIENT TEMPERATURE SENSOR RETURN



ANTENNA (EXCEPT EXPORT) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



ANTENNA MODULE C1 (EXPORT) - 2 WAY

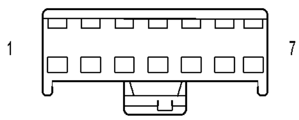
CAV	CIRCUIT	FUNCTION
1	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-

CONNECTOR VIEW NOT AVAILABLE

ANTENNA MODULE C2 (EXPORT)

ANTENNA MODULE C2 (EXPORT) - 2 WAY

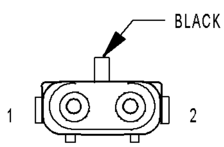
CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



AUTOMATIC DAY/NIGHT MIRROR

AUTOMATIC DAY/NIGHT MIRROR - 7 WAY

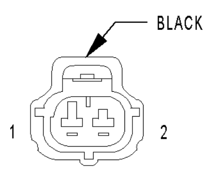
CAV	CIRCUIT	FUNCTION
1	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z2 20BK/LG	GROUND
3	L10 20BR/LG	BACK-UP LAMP FEED
4	P112 20TN/OR	AUTO DAY/NIGHT MIRROR (+)
5	P114 20YL/BK	AUTO DAY/NIGHT MIRROR (-)
6	-	-
7	-	-



BACK-UP LAMP SWITCH (M/T)

BACK-UP LAMP SWITCH (M/T) - BLACK 2 WAY

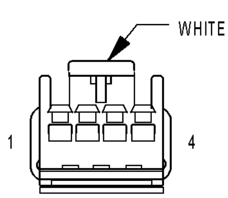
CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	L10 18BR/LG	BACK-UP LAMP FEED



BATTERY TEMPERATURE SENSOR

BATTERY TEMPERATURE SENSOR - BLACK 2 WAY

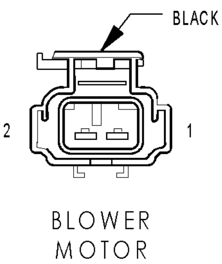
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



BLEND DOOR ACTUATOR

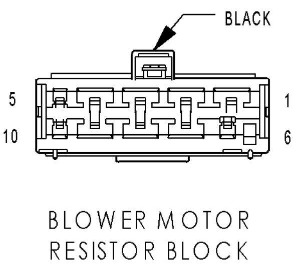
BLEND DOOR ACTUATOR - WHITE 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z12 18BK/TN	GROUND
2	C35 20DG/YL	MODE DOOR DRIVER (A)
3	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
4	-	-



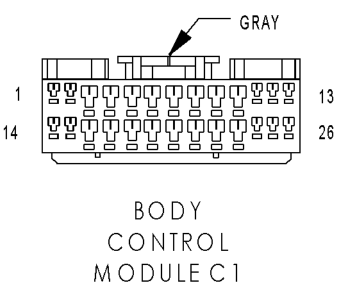
BLOWER MOTOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER
2	A111 12RD/LB	BLOWER MOTOR RELAY OUTPUT



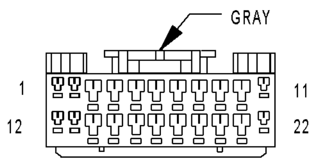
BLOWER MOTOR RESISTOR BLOCK - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER
2	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER
3	C6 12LB	BLOWER MOTOR M2 DRIVER
4	C5 14LG	BLOWER MOTOR M1 DRIVER
5	C4 14TN	BLOWER MOTOR LOW DRIVER
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-



BODY CONTROL MODULE C1 - GRAY 26 WAY

CAV	CIRCUIT	FUNCTION
1	Z103 16BK/OR	GROUND
2	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
3	Y98 20GY/DB	INSTRUMENT CLUSTER WAKE UP SIGNAL
4	G75 20TN	LEFT FRONT DOOR AJAR SWITCH SENSE
5	G74 20TN/RD	RIGHT FRONT DOOR AJAR SWITCH SENSE
6	G70 20BR/TN (EXCEPT BASE)	HOOD AJAR SWITCH SENSE
7	G78 20TN/BK	TAILGATE AJAR SWITCH SENSE
8	G26 20LB	KEY-IN IGNITION SWITCH SENSE
9	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
10	M3 20PK/DB	REAR COURTESY LAMP CONTROL
11	V10 18BR	WASHER PUMP DRIVER
12	L91 20DB/PK	HAZARD LAMP CONTROL
13	V21 20DB/RD	REAR WIPER ON DRIVER
14	Z231 16BK/WT	SIGNAL GROUND
15	D25 18YL/VT/WT	PCI BUS
16	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
17	P101 20OR/PK	FLIP-UP GLASS RELEASE SWITCH SENSE
18	-	-
19	L118 20BR/YL (RENEGADE)	LIGHTBAR SWITCH SENSE
20	B22 18LG/YL (DIESEL)	VEHICLE SPEED SIGNAL
20	B22 18LG/YL (GAS)	VEHICLE SPEED OUTPUT
21	G69 20BK/OR	VTSS INDICATOR DRIVER
22	G76 20TN/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
23	C79 20VT/BK	REAR WINDOW DEFOGGER CONTROL
24	C19 18BR	A/C ON/OFF CONTROL
25	Z3 16BK/OR	GROUND
26	P100 18OR/BR	FLIP-UP GLASS RELEASE MOTOR DRIVER



BODY CONTROL MODULE C2

BODY CONTROL MODULE C2 - GRAY 22 WAY

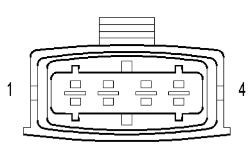
CAV	CIRCUIT	FUNCTION
1	Y66 20GY (EXCEPT BASE)	RKE ANTENNA
2	G910 20VT/BR	TAILGATE SWITCH GROUND
3	G77 20TN/OR	LEFT REAR DOOR AJAR SWITCH SENSE
4	L80 20WT/DG	HEADLAMP SWITCH RETURN
5	L307 20LG/OR	HEADLAMP SWITCH MUX
6	G73 18LG/OR (RHD)	LEFT CYLINDER LOCK SWITCH MUX
6	G72 18DG/OR (LHD EXCEPT BASE)	RIGHT CYLINDER LOCK SWITCH MUX
7	L27 20WT/TN (EXCEPT BASE)	FRONT FOG LAMP SWITCH SENSE
8	E21 20OR/RD	PANEL LAMPS DIMMER SWITCH MUX
9	G72 18DG/OR (RHD)	RIGHT CYLINDER LOCK SWITCH MUX
9	G73 18LG/OR (LHD EXCEPT BASE)	LEFT CYLINDER LOCK SWITCH MUX
10	V52 20DG/RD	FRONT WIPER SWITCH MUX
11	X10 20RD/DB (EXCEPT BASE)	RADIO CONTROL MUX RETURN
12	Y66 20GY (EXCEPT BASE)	RKE ANTENNA
13	-	-
14	-	-
15	G32 20DB/OR (EXCEPT BASE)	AMBIENT TEMPERATURE SENSOR RETURN
16	Z20 20BK/WT (RHD)	GROUND
17	G71 18VT/YL	TAILGATE CYLINDER LOCK SWITCH MUX
18	G31 20VT/LG (EXCEPT BASE)	AMBIENT TEMPERATURE SENSOR SIGNAL
19	L324 20WT/LG	HIGH BEAM SWITCH SENSE
20	F512 18PK/OR	VEHICLE SPEED SENSOR SUPPLY
21	B12 18DG/OR	VEHICLE SPEED SIGNAL
22	X20 20RD/BK (EXCEPT BASE)	RADIO CONTROL MUX

CONNECTOR VIEW NOT AVAILABLE

BODY CONTROL MODULE C3 (PREMIUM)

BODY CONTROL MODULE C3 (PREMIUM) - 6 WAY

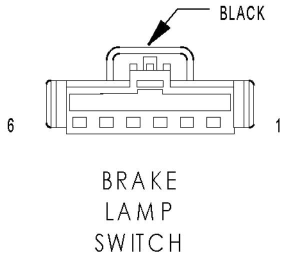
CAV	CIRCUIT	FUNCTION
1	Y60	RKE DATA
2	Y62	RKE SUPPLY
3	Y61	RKE PROGRAM
4	Y63	RKE GROUND
5	Y64	RKE ANTENNA (+)
6	Y65	RKE ANTENNA (-)



BOOST PRESSURE SENSOR (DIESEL)

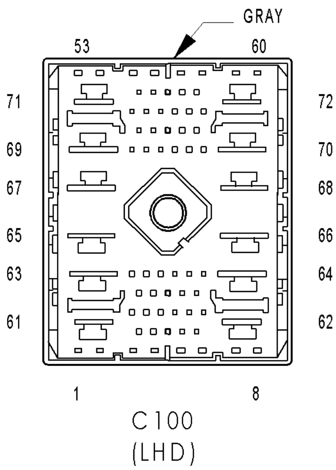
BOOST PRESSURE SENSOR (DIESEL) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
3	K6 18VT/WT	SENSOR REFERENCE VOLTAGE B
4	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL



BRAKE LAMP SWITCH - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN (DIESEL)	PRIMARY BRAKE SWITCH SIGNAL
2	L50 18WT/TN (GAS)	BRAKE LAMP SWITCH OUTPUT
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	V32 18YL/RD	SPEED CONTROL SUPPLY
5	Z3 18BK/OR	GROUND
6	K29 18WT/PK (DIESEL)	SECONDARY BRAKE SWITCH SIGNAL
6	K29 18WT/PK (GAS)	BRAKE SWITCH SENSE

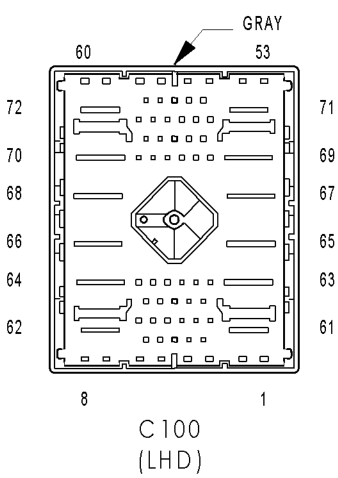


C100 (LHD) - GRAY (HEADLAMP AND DASH)

CAV	CIRCUIT
1	B1 18YL/DB
2	B2 18YL
3	K226 18DB/WT
4	B22 18DG/YL
5	K106 18WT/DG
6	K107 18OR
7	K125 18WT/DB
8	G32 18DB/OR
9	D20 18LG (GAS)
10	D25 18YL/VT
11	-
12	L13 18BR/YL (EXPORT)
13	G70 18BR/TN (EXPORT)
14	G11 18WT/BK
15	K4 18BK/LB
16	-
17	L62 18BR/RD
18	L63 18DG/RD
19	V30 18DB/RD (GAS)
20	D32 18LG (GAS)
21	V32 18YL/RD (GAS)
22	G29 18BK/TN
23	-
24	F15 18DB/WT
25	G18 18PK/BK (DIESEL)
26	D24 18WT/DG (ABS)
27	B12 18DG/OR (ABS)
28	B1 18YL/DB (EXCEPT ABS)
29	R48 18TN
30	R47 18DB/LB
31	R49 18LB
32	-
33	-
34	-
35	B2 18YL (EXCEPT ABS)
36	-
37	Z252 18BK/GY
38	Z252 18BK/GY
39	V10 18BR
40	T138 18GY/LB (DIESEL M/T)
41	T6 18VT/WT

C100 (LHD) - GRAY (HEADLAMP AND DASH)

CAV	CIRCUIT
42	V37 18RD/LG
43	V20 18BK/WT
44	K29 18WT/PK
45	D25 18YL/VT
46	-
47	X75 18DG (EXPORT)
48	L10 18BR/LG
49	D21 18PK
50	-
51	-
52	-
53	-
54	-
55	-
56	G31 18VT/LG
57	-
58	-
59	L43 18VT
60	A32 14RD/DB
61	A41 12YL
62	A21 12RD/DB
63	A1 12RD
64	A111 12RD/LB
65	A99 14RD/VT
66	-
67	-
68	-
69	A2 12PK/BK
70	A25 12DB
71	-
72	A141 16DG/WT (GAS)

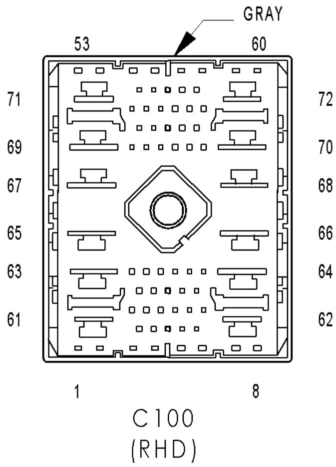


C100 (LHD) - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	B1 18YL/DB
2	B2 18YL
3	K226 18DB/WT
4	B22 18LG/YL
5	K106 18WT/DG
6	K107 18OR
7	K125 18WT/DB
8	G32 20DB/OR (EXCEPT BASE)
9	D20 20LG
10	D25 18YL/VT
11	-
12	L13 18BR/YL (EXPORT)
13	G70 20BR/TN (EXCEPT BASE)
14	G11 20WT/BK
15	K4 18BK/LB
16	-
17	L62 18BR/RD
18	L63 18DG/RD
19	V30 18DB/RD

C100 (LHD) - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
20	D32 20LG/DG
21	V32 18YL/RD
22	G29 20BK/TN
23	-
24	F15 18DB/WT
25	G18 20PK/BK
26	D24 18WT/DG
27	B12 18DG/OR
28	R46 20BR/LB
29	R48 20TN
30	R47 20DB/LB
31	R49 20LB/OR
32	-
33	-
34	-
35	F512 18PK/OR
36	-
37	Z252 18BK/GY
38	Z252 18BK/GY
39	V10 18BR
40	-
41	T6 20VT/WT
42	V37 20RD/LG
43	V20 18BK/VT
44	K29 18WT/PK
45	D25 18YL/VT
46	-
47	X75 18DG (EXCEPT BASE)
48	L10 18BR/LG
49	D21 20PK/RD
50	-
51	-
52	-
53	-
54	-
55	-
56	G31 20VT/LG (EXCEPT BASE)
57	-
58	-
59	L43 18VT (EXPORT)
60	A32 14RD/DB (RENEGADE)
61	A41 12YL
62	A21 12RD/DB
63	A1 12RD
64	A111 12RD/LB
65	A99 14RD/VT
66	-
67	-
68	-
69	A2 12PK/BK
70	A25 12DB
71	-
72	A141 16DG/WT

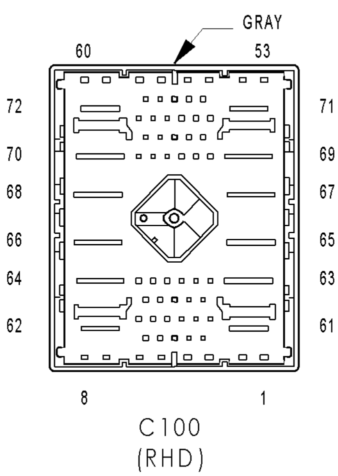


C100 (RHD) - GRAY (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	L43 18VT
2	F1 18DB
3	M1 18PK
4	B22 18DG/YL
5	L44 18VT/RD
6	V16 18VT/YL
7	V55 16TN/RD
8	G32 18DB/OR
9	D20 18LG
10	D25 18YL/VT
11	V14 18RD/VT
12	L13 18BR/YL
13	G70 18BR/TN
14	G11 18WT/BK
15	K4 18BK/LB
16	L50 18WT/TN (ABS)
17	L62 18BR/RD
18	L63 18DG/RD
19	V30 18DB/RD
20	D32 18LG
21	V32 18YL/RD
22	G29 18BK/TN
23	X2 18DG/RD
24	F15 18DB/WT
25	G18 18PK/BK (DIESEL)
26	D24 18WT/DG (ABS)
27	B12 18DG/OR (ABS)
27	B1 18YL/DB (EXCEPT ABS)
28	R46 18BR/LB
29	R48 18TN
30	R47 18DB/LB
31	R49 18LB
32	-
33	-
34	-
35	F512 18PK/OR (ABS)
35	B2 18YL (EXCEPT ABS)
36	-
37	Z252 18BK/GY
38	Z252 18BK/GY
39	V10 18BR
40	-
41	T6 18VT/WT
42	V37 18RD/LG
43	V20 18BK/WT
44	K29 18WT/PK
45	D25 18YL/VT
46	-
47	X75 18DG
48	L10 18BR/LG
49	D21 18PK
50	F22 18DB/PK (ABS)
51	L33 18LG/BR

C100 (RHD) - GRAY (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
52	L39 18LB
53	L78 18DG/YL
54	F20 18WT
55	V6 16DB/YL
56	G31 18VT/LG
57	-
58	L34 18RD/OR
59	L77 18BK/YL
60	A32 14RD/DB (A/T)
61	A41 12YL
62	A21 12RD/DB (M/T)
63	A1 12RD
64	A111 12RD/LB
65	A12 10RD/TN
66	A13 10PK/WT
67	A18 10PK
68	A7 10RD/BK
69	A2 12PK/BK
70	A25 12DB
71	A4 12BK/PK
72	A99 14RD/VT

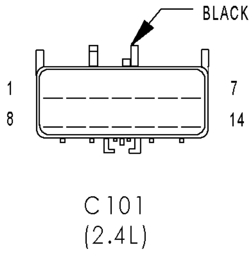


C100 (RHD) - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	L43 18VT
2	F1 20DB
3	M1 18PK
4	B22 18LG/YL
5	L44 18VT/RD
6	V16 18VT/YL
7	V55 16TN/RD
8	G32 20DB/OR
9	D20 20LG
10	D25 18YL/VT
11	V14 18RD/VT
12	L13 18BR/YL
13	G70 20 BR/TN
14	G11 20WT/BK
15	K4 20BK/LB
16	L50 18WT/TN
17	L62 18BR/RD
18	L63 18DG/RD
19	V30 18DB/RD
20	D32 20LG/DG
21	V32 18YL/RD
22	G29 20BK/TN
23	X2 18DG/RD
24	F15 18DB/WT
25	G18 20PK/BK
26	D24 18WT/DG
27	B12 18DG/OR
28	R46 20BR/LB
29	R48 20TN

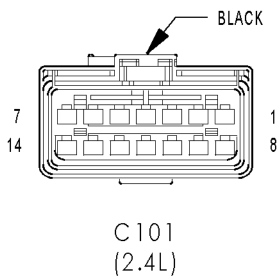
C100 (RHD) - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
30	R47 20DB/LB
31	R49 20LB/OR
32	-
33	-
34	-
35	F512 18PK/OR
36	-
37	Z252 18BK/GY
38	Z252 18BK/GY
39	V10 18BR
40	-
41	T6 20VT/WT
42	V37 20RD/LG
43	V20 18BK/WT
44	K29 18WT/PK
45	D25 18YL/VT/GY
46	-
47	X75 18DG
48	L10 18BR/LG
49	D21 20PK/RD
50	F22 18DB/PK
51	L33 18LG/BR
52	L39 18LB
53	L78 18DG/YL
54	F20 18WT
55	V6 14DB/YL
56	G31 20VT/LG
57	-
58	L34 18RD/OR
59	L77 18BK/YL
60	A32 14RD/DB
61	A41 12YL
62	A21 12RD/DB
63	A1 12RD
64	A111 12RD/LB
65	A12 10RD/TN
66	A13 10PK/WT
67	A18 10PK
68	A7 10RD/BK
69	A2 12PK/BK
70	A25 12DB
71	A4 12BK/PK
72	A99 14RD/VT



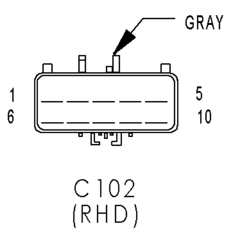
C101 (2.4L) - BLACK (ENGINE TO FUEL INJECTOR SIDE)

CAV	CIRCUIT
1	K59 18VT/BK
2	K40 18BR/WT
3	K60 18YL/BK
4	K39 18GY/RD
5	K21 18BK/RD
6	K2 18TN/BK
7	K1 18DG/RD
8	K22 18OR/DB
9	-
10	G60 18GY/YL
11	K24 18GY/BK
12	K7 18OR
13	-
14	-



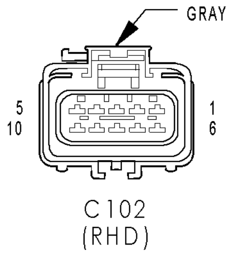
C101 (2.4L) - BLACK (ENGINE TO HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	K59 18VT/BK
2	K40 18BR/WT
3	K60 18YL/BK
4	K39 18GY/RD
5	K21 18BK/RD
6	K2 18TN/BK
7	K1 18DG/RD
8	K22 18OR/DB
9	K6 18VT/WT
10	G60 18GY/YL
11	K24 18GY/BK
12	K7 18OR
13	-
14	-



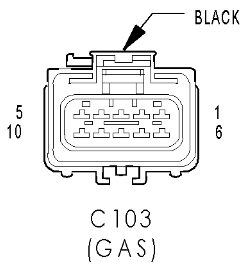
C102 (RHD) - GRAY (FRONT BODY SIDE)

CAV	CIRCUIT
1	K226 18DB/WT
2	F512 18PK/OR
3	A141 16DG/WT
4	B1 18YL/DB
5	B2 18YL
6	K4 18BK/LB
7	B12 18DG/OR
8	K125 18WT/DB
9	K107 18OR
10	K105 18WT/DG



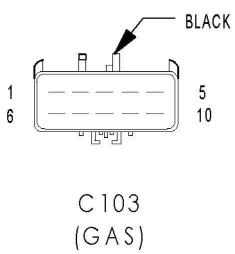
C102 (RHD) - GRAY (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	K226 18DB/WT
2	K512 18PK/OR
3	A141 16DG/WT (GAS)
4	B1 18YL/DB
5	B2 18YL
6	K4 18BK/LB
7	B12 18DG/OR
8	K125 18WT/DB (GAS)
9	K107 18OR (GAS)
10	K106 18WT/DG (GAS)



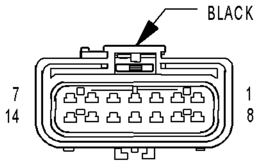
C103 (GAS) - BLACK (ENGINE SIDE)

CAV	CIRCUIT
1	F142 18OR/DG
2	-
3	K299 18BR/WT
4	-
5	K173 18LG
6	-
7	-
8	-
9	K99 18BR/OR
10	-



C103 (GAS) - BLACK (HEADLAMP AND DASH SIDE)

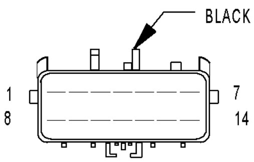
CAV	CIRCUIT
1	F142 18OR/DG
2	-
3	K299 18BR/WT
4	-
5	K173 18LG
6	-
7	-
8	-
9	K99 18BR/OR
10	-



C104
(DIESEL)

C104 (DIESEL) - BLACK (ENGINE SIDE)

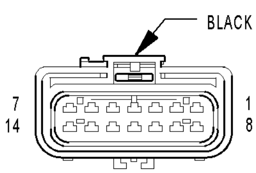
CAV	CIRCUIT
1	K90 20TN (M/T)
2	K132 20DG/LB
3	K152 20WT
4	C3 18DB/BK
5	-
6	D20 18LG (A/T)
7	D21 20PK
8	D25 20VT/YL
9	F15 18DB/WT
10	F45 18YL/RD (A/T)
11	F1 20DB
12	L50 20WT/TN
13	-
14	T6 18OR/WT (A/T)



C104
(DIESEL)

C104 (DIESEL) - BLACK (HEADLAMP AND DASH SIDE)

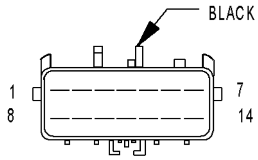
CAV	CIRCUIT
1	K90 18TN (M/T)
2	K132 18DG/LB
3	K152 18WT
4	C3 18DB/BK
5	-
6	D20 18LG (A/T)
7	D21 18PK
8	D25 18YL/VT
9	F15 18DB/WT
10	F45 18YL/BR (M/T)
11	F1 18DB
12	L50 18WT/TN
13	-
14	T6 18VT/WT (A/T)



C104
(GAS)

C104 (GAS) - BLACK (ENGINE SIDE)

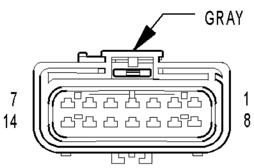
CAV	CIRCUIT
1	A14 16RD/WT
2	F18 18LG/BK (3.7L)
3	-
4	C3 18DB/BK
5	-
6	D20 18LG (A/T)
7	D21 18PK (A/T)
8	D25 18VT/YL (A/T)
9	F15 18DB/WT
10	F45 18YL/BR (A/T)
11	F1 18DB
12	T10 18YL/DG (A/T)
13	K20 18DG
14	T6 18OR/WT (A/T)



C104
(GAS)

C104 (GAS) - BLACK (HEADLAMP AND DASH SIDE)

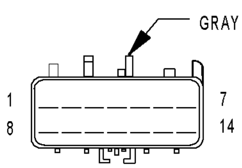
CAV	CIRCUIT
1	A14 16RD/WT
2	F18 18LG/BK
3	-
4	C3 18DB/BK
5	-
6	D20 18LG
7	D21 18PK
8	D25 18YL/VT
9	F15 18DB/WT
10	F45 18YL/BR
11	F1 18DB
12	T10 18YL/DG
13	K20 18DG
14	T6 18VT/WT



C105
(DIESEL)

C105 (DIESEL) - GRAY (ENGINE SIDE)

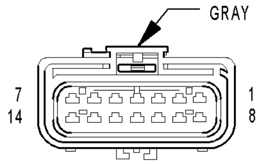
CAV	CIRCUIT
1	B22 20DG/YL
2	K4 18BK/LB
3	L10 18BR/LG
4	C21 18DB/OR
5	A71 18DG/RD
6	T16 14RD (A/T)
7	T41 18BK/WT (A/T)
8	K30 18PK (A/T)
9	A142 14DG/OR
10	-
11	A30 14RD/WT (A/T)
12	A93 16RD/BK
13	Z252 18BK/GY
14	Z252 18BK/GY



C105
(DIESEL)

C105 (DIESEL) - GRAY (HEADLAMP AND DASH SIDE)

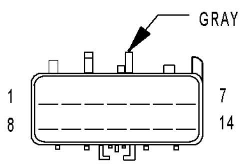
CAV	CIRCUIT
1	B22 18DG/YL
2	K4 18BK/LB
3	L10 18BR/LG
4	C21 18DB/OR
5	A71 18DG/RD
6	-
7	-
8	-
9	A142 16DG/OR
10	T138 18GY/LB
11	-
12	A93 16RD/BK
13	Z252 18BK/GY
14	Z252 18BK/GY



C105
(GAS)

C105 (GAS) - GRAY (ENGINE SIDE)

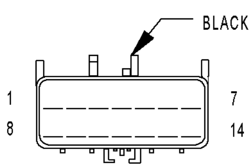
CAV	CIRCUIT
1	-
2	K4 18BK/LB
3	L10 18BR/LG (EXCEPT 42RLE)
3	L1 18VT/BK (42RLE)
4	-
5	A71 18DG/RD
6	T16 14RD (A/T)
7	T41 18BK/WT (A/T)
8	K30 18PK (A/T)
9	-
10	T141 18YL/RD (M/T)
11	-
12	A30 14RD/WT (A/T)
13	-
14	-



C105
(GAS)

C105 (GAS) - GRAY (HEADLAMP AND DASH SIDE)

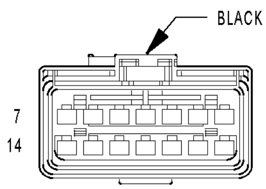
CAV	CIRCUIT
1	-
2	K4 18BK/LB
3	L10 18BR/LG
4	-
5	A71 18DG/RD
6	T16 14RD (A/T)
7	T41 18BK/WT (A/T)
8	K30 18PK (A/T)
9	-
10	T141 18YL/RD (M/T)
11	-
12	A30 14RD/WT (A/T)
13	-
14	-



C106

C106 - BLACK (FRONT END LIGHTING SIDE)

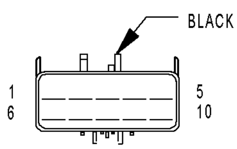
CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18DB/OR
3	L33 18LG/BR
4	L43 18VT
5	L63 18DG/RD
6	L39 18LB
7	L78 18DG/YL
8	Z141 18BK
9	-
10	L34 18RD/OR
11	L44 18VT/RD
12	L62 18BR/RD
13	L77 18BK/YL
14	Z142 18BK/WT



C106

C106 - BLACK (HEADLAMP AND DASH SIDE)

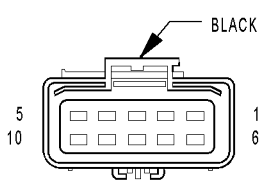
CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18DB/OR
3	L33 18LG/BR
4	L43 18VT
5	L63 18DG/RD
6	L39 18LB
7	L78 18DG/YL
8	Z141 18BK
9	L13 18BR/YL (EXPORT)
10	L34 18RD/OR
11	L44 18VT/RD
12	L62 18BR/RD
13	L77 18BK/YL
14	Z142 18BK/WT



C107

C107 - BLACK (FRONT END LIGHTING SIDE)

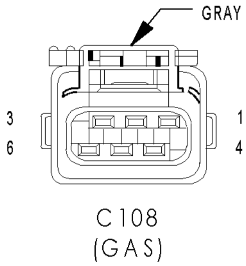
CAV	CIRCUIT
1	Z141 18BK
2	L77 18BK/YL
3	-
4	L78 18DG/YL
5	Z142 18BK/WT
6	L62 18BR/RD
7	-
8	L39 18LB (FOG LAMPS)
9	-
10	L63 18DG/RD



C107

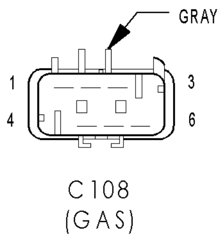
C107 - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	Z141 18BK
2	L77 18BK/YL
3	-
4	L78 18DG/YL
5	Z142 18BK/WT
6	L62 18BR/RD
7	-
8	L39 18LB
9	-
10	L63 18DG/RD



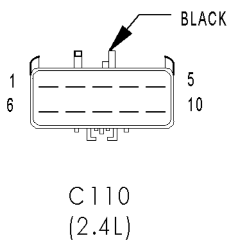
C108 (GAS) - GRAY (BATTERY SIDE)

CAV	CIRCUIT
1	K52 18PK/BK
2	K20 18DG
3	K125 18WT/DB
4	T40 12BR
5	F1 18DB
6	-



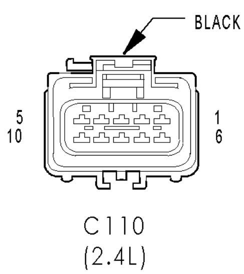
C108 (GAS) - GRAY (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	K52 18PK/BK
2	K20 18DG
3	K125 18WT/DB
4	T40 12BR
5	F1 18DB
6	-



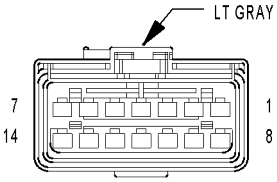
C110 (2.4L) - BLACK (ENGINE TO FUEL INJECTORS SIDE)

CAV	CIRCUIT
1	F142 18OR/DG
2	C3 18DB/BK
3	Z246 18BK/GY
4	K11 18WT/DB
5	K12 18TN
6	K13 18YL/WT
7	K14 18LB/BR
8	K44 18TN/YL
9	K4 18BK/LB
10	-



C110 (2.4L) - BLACK (ENGINE TO HEADLAMP AND DASH SIDE)

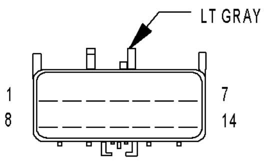
CAV	CIRCUIT
1	F142 18OR/DG
2	C3 18DB/BK
3	Z246 18BK/GY
4	K11 18WT/DB
5	K12 18TN
6	K13 18YL/WT
7	K14 18LB/BR
8	K44 18TN/YL
9	K4 18BK/LB
10	-



C111
(DIESEL)

C111 (DIESEL) - LT GRAY (ENGINE SIDE)

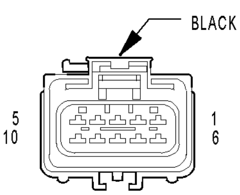
CAV	CIRCUIT
1	K51 20DB/YL
2	K118 20PK/YL
3	C13 20DB/OR
4	-
5	K226 20DB/WT
6	V37 20RD/LG
7	K35 20GY/YL
8	G18 18PK/BK
9	K29 20WT/PK
10	K236 20GY/PK
11	C151 18DB/WT
12	T40 12BR
13	F92 20YL/BR
14	-



C111
(DIESEL)

C111 (DIESEL) - LT GRAY (HEADLAMP AND DASH SIDE)

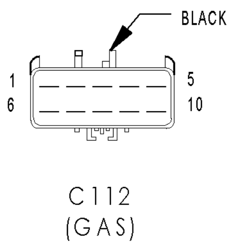
CAV	CIRCUIT
1	K51 18DB/YL
2	K118 18PK/YL
3	C13 18DG
4	-
5	K226 18DB/WT
6	V37 18RD/LG
7	K35 18GY/YL
8	G18 18PK/BK
9	K29 18WT/PK
10	K236 18GY/PK
11	C151 18DB/WT
12	T40 12BR
13	F92 18YL/BR
14	T141 14YL/RD



C112
(GAS)

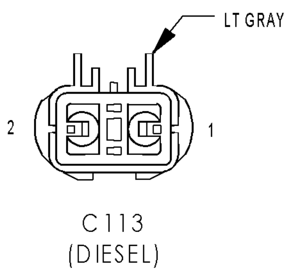
C112 (GAS) - BLACK (ENGINE SIDE)

CAV	CIRCUIT
1	K42 18DB/LB (3.7L)
2	K4 18BK/LB (3.7L)
3	Z252 18BK/GY
4	K142 18GY/BK (3.7L)
5	K4 18BK/LB (3.7L)
6	Z252 18BK/GY
7	-
8	-
9	-
10	A142 14DG/OR



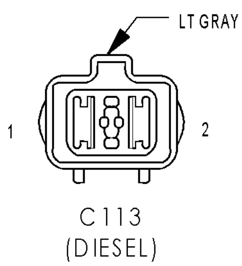
C112 (GAS) - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	K42 18DB/LB
2	K4 18BK/LB
3	Z252 18BK/GY
4	K142 18GY/BK
5	K4 18BK/LB
6	Z252 18BK/GY
7	-
8	-
9	-
10	A142 14DG/OR



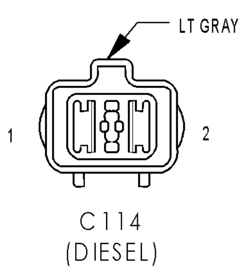
C113 (DIESEL) - LT GRAY (BATTERY SIDE)

CAV	CIRCUIT
1	K154 10GY
2	K104 10RD/WT



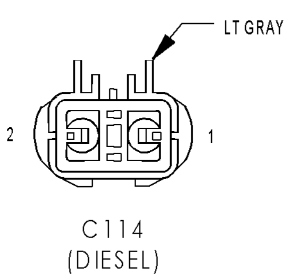
C113 (DIESEL) - LT GRAY (GLOW PLUG SIDE)

CAV	CIRCUIT
1	K154 10GY
2	K104 10RD/WT



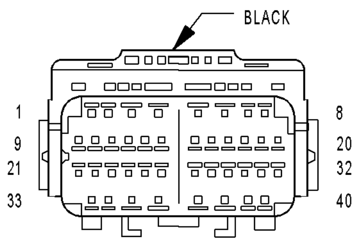
C114 (DIESEL) - LT GRAY (BATTERY SIDE)

CAV	CIRCUIT
1	K154 10GY
2	K104 10RD/WT



C114 (DIESEL) - LT GRAY (GLOW PLUG SIDE)

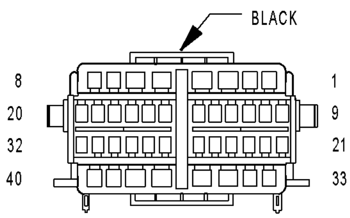
CAV	CIRCUIT
1	K154 10GY
2	K104 10RD/WT



C201

C201 - BLACK (FRONT BODY SIDE)

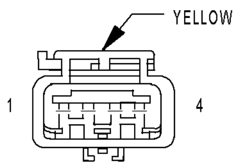
CAV	CIRCUIT
1	R57 18DG
2	R59 18LB
3	X75 18DG (HIGHLINE)
4	A99 14RD/VT (MIDLINE/HIGHLINE)
5	B12 18DG/OR (RHD)
6	F81 12TN (MIDLINE/HIGHLINE)
7	V21 20DB/RD
8	V22 20BR/YL
9	R58 18GY
10	R60 18VT
11	K226 18DB/WT (LHD)
12	G74 20TN/RD
13	G71 18VT/YL
14	T6 20VT/WT
15	G9 20GY/BK
16	B1 18YL/DB (LHD)
17	K29 20WT/PK
18	L62 18BR/RD
19	M3 20PK/DB
20	K125 18WT/DB (LHD)
21	G76 20TN/YL
22	G77 20TN/OR
23	K4 18BK/LB (LHD)
24	G910 20VT/BR
25	G78 20TN/BK
26	P101 20OR/PK
27	G80 20YL/WT
28	B2 18YL (LHD)
29	Z9 16BK
30	L63 18DG/RD
31	K106 18WT/DG (LHD)
32	K107 18OR (LHD)
33	D25 18YL/VT
34	G75 20TN (LHD)
35	G72 18DG/OR (MIDLINE/HIGHLINE)
36	G73 18LG/OR (MIDLINE/HIGHLINE)
37	F512 18PK/OR (RHD)
38	A141 16DG/WT (LHD)
39	L10 18BR/LG
40	P100 18OR/BR



C201

C201 - BLACK (INSTRUMENT PANEL SIDE)

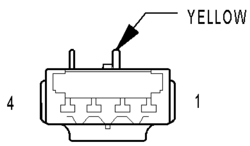
CAV	CIRCUIT
1	R57 20DG
2	R59 20LB
3	X75 18DG (EXCEPT BASE)
4	A99 14RD/VT
5	B12 18DG/OR
6	F81 12TN
7	V21 20DB/RD
8	V22 20BR/YL
9	R58 20GY
10	R60 20VT
11	K226 18DB/WT (LHD)
12	G74 20TN/RD
13	G71 18VT/YL
14	T6 20VT/WT
15	G9 20GY/BK
16	B1 18YL/DB (LHD)
17	K29 18WT/PK
18	L62 18BR/RD
19	M3 20PK/DB
20	K125 18WT/DB (LHD)
21	G76 20TN/YL
22	G77 20TN/OR
23	K4 18BK/LB (LHD)
24	G910 20VT/BR
25	G78 20TN/BK
26	P101 20OR/PK
27	G80 20YL/WT
28	B2 18YL (LHD)
29	Z9 16BK
30	L63 18DG/RD
31	K106 18WT/DG (LHD)
32	K107 18OR (LHD)
33	D25 18YL/VT/DB
34	G75 20TN
35	G72 18DG/OR (EXCEPT BASE)
36	G73 18LG/OR (EXCEPT BASE)
37	F512 18PK/OR
38	A141 16DG/WT (LHD)
39	L10 18BR/LG
40	P100 18OR/BR



C202

C202 - YELLOW (FRONT BODY SIDE)

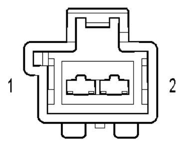
CAV	CIRCUIT
1	-
2	-
3	R53 18OR/YL
4	R55 18OR/BK



C202

C202 - YELLOW (INSTRUMENT PANEL SIDE)

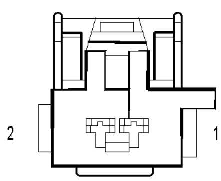
CAV	CIRCUIT
1	-
2	-
3	R53 18OR/YL
4	R55 18OR/BK



C203
(RENEGADE)

C203 (RENEGADE) - (INSTRUMENT PANEL SIDE)

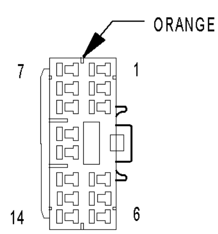
CAV	CIRCUIT
1	Z144 14BK
2	L8 14WT/TN



C203
(RENEGADE)

C203 (RENEGADE) - (LIGHT BAR JUMPER SIDE)

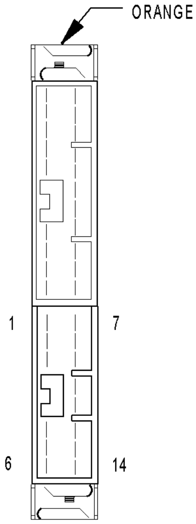
CAV	CIRCUIT
1	Z144 14BK
2	L8 14WT/TN



C300
(LHD
MIDLINE/HIGHLINE)

C300 (LHD MIDLINE/HIGHLINE) - ORANGE
(FRONT BODY SIDE)

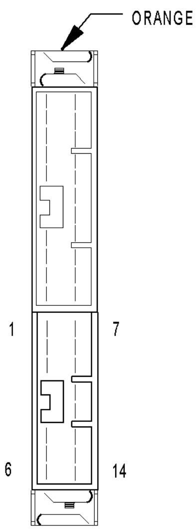
CAV	CIRCUIT
1	X57 18BR/LB
2	X91 18WT/BK
3	X81 18YL/BK
4	X13 16BK/RD
5	-
6	-
7	X51 18BR/YL
8	X93 18WT/RD
9	X83 18YL/RD
10	-
11	-
12	-
13	-
14	Z9 16BK



C300
(LHD)

C300 (LHD) - ORANGE (DRIVER DOOR SIDE)

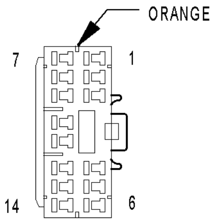
CAV	CIRCUIT
1	X57 18BR/LB
2	X57 18BR/LB (BASE SPEAKER)
2	X91 18WT/BK (PREMIUM SPEAKER)
3	X55 18BR/RD (BASE SPEAKER)
3	X81 18YL/BK (PREMIUM SPEAKER)
4	X13 16BK/RD (PREMIUM SPEAKER)
5	-
6	-
7	X51 18BR/YL
8	X51 18BR/YL (BASE SPEAKER)
8	X93 18WT/RD (PREMIUM SPEAKER)
9	X53 18DG (BASE SPEAKER)
9	X83 18YL/RD (PREMIUM SPEAKER)
10	-
11	-
12	-
13	-
14	Z9 16BK (PREMIUM SPEAKER)



C300
(RHD)

C300 (RHD) - ORANGE (DRIVER DOOR SIDE)

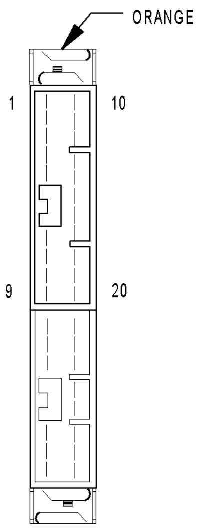
CAV	CIRCUIT
1	X58 18DB/OR
2	X58 18DB/OR (BASE SPEAKER)
2	X92 18TN/BK (PREMIUM SPEAKER)
3	X56 18DB/RD (BASE SPEAKER)
3	X86 18OR/RD (PREMIUM SPEAKER)
4	X13 16BK/RD (PREMIUM SPEAKER)
5	-
6	-
7	X52 18DB/WT
8	X52 18DB/WT (BASE SPEAKER)
8	X94 18TN/VT (PREMIUM SPEAKER)
9	X54 18VT (BASE SPEAKER)
9	X84 18TN/BK (PREMIUM SPEAKER)
10	-
11	P99 18GY
12	P110 18YL
13	-
14	Z9 16BK (PREMIUM SPEAKER)



C300
(RHD)

C300 (RHD) - ORANGE (FRONT BODY SIDE)

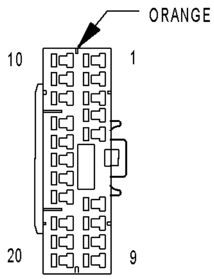
CAV	CIRCUIT
1	X58 18DB/OR
2	X92 18TN/BK
3	X86 18OR/RD
4	X13 16BK/RD
5	-
6	-
7	X52 18DB/WT
8	X94 18TN/VT
9	X84 18TN/BK
10	-
11	P99 18GY
12	P110 18YL
13	-
14	Z9 16BK



C301
(LHD)

C301 (LHD) - ORANGE (DRIVER DOOR SIDE)

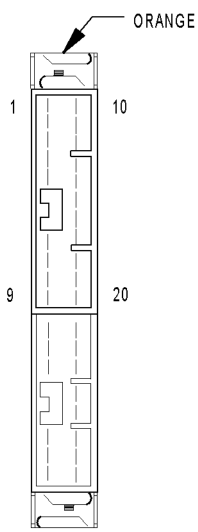
CAV	CIRCUIT
1	Q11 16LB (POWER WINDOWS)
2	F89 20OR/RD (EXCEPT BASE)
3	P33 18OR/BK (EXCEPT BASE)
4	C16 20LB/YL (EXCEPT BASE)
5	P72 18YL/BK (EXCEPT BASE)
6	P112 20TN/OR (EXCEPT BASE)
7	G73 18LG/OR (EXCEPT BASE)
8	P37 18LG (EXCEPT BASE)
9	X55 18BR/RD
10	Q21 16WT (POWER WINDOWS)
11	V23 20BR/PK (EXCEPT BASE)
12	P34 18PK/BK (EXCEPT BASE)
13	P74 18DB (EXCEPT BASE)
14	P76 18OR/YL (EXCEPT BASE)
15	G75 20TN
16	-
17	Z350 20BK/LG
18	P114 20YL/BK (EXCEPT BASE)
19	P36 20PK/VT (EXCEPT BASE)
20	X53 18DG



C301
(LHD)

C301 (LHD) - ORANGE (FRONT BODY SIDE)

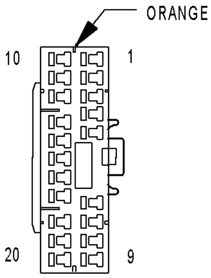
CAV	CIRCUIT
1	Q11 14LB (MIDLINE/HIGHLINE)
2	F89 18OR/RD (EXCEPT BASE)
3	P33 18OR/BK (EXCEPT BASE)
4	C16 18LB/YL (EXCEPT BASE)
5	P72 18YL/BK (EXCEPT BASE)
6	P112 18YL/LB (EXCEPT BASE)
7	G73 18LG/OR (MIDLINE/HIGHLINE)
8	P37 20LG (EXCEPT BASE)
9	X55 18BR/RD
10	Q21 14WT (MIDLINE/HIGHLINE)
11	V23 20BR/PK (EXCEPT BASE)
12	P34 18PK/BK (EXCEPT BASE)
13	P74 18DB (EXCEPT BASE)
14	P76 18OR/YL (EXCEPT BASE)
15	G75 20TN
16	Z21 20BK/LG (MIDLINE/HIGHLINE)
17	Z350 20BK/LG
18	P114 18YL/RD (EXCEPT BASE)
19	P36 20PK/VT (EXCEPT BASE)
20	X53 18DG



C301
(RHD)

C301 (RHD) - ORANGE (DRIVER DOOR SIDE)

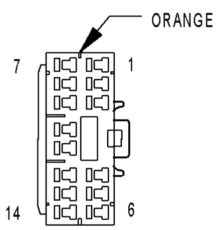
CAV	CIRCUIT
1	Q12 16BR
2	F89 20OR/RD
3	P33 18OR/BK
4	C16 20LB/YL
5	P71 20YL/DG
6	-
7	-
8	P37 20LG
9	X56 18BR/RD
10	Q22 16VT/WT
11	V23 20BR/PK
12	P34 18PK/BK
13	P75 20LB/WT
14	P76 18OR/YL
15	G74 20TN/RD
16	-
17	Z351 18BK/LG
18	-
19	P36 20PK/VT
20	X54 18VT



C301
(RHD)

C301 (RHD) - ORANGE (FRONT BODY SIDE)

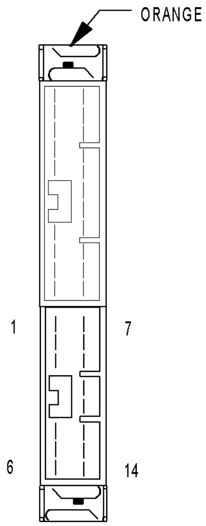
CAV	CIRCUIT
1	Q12 14BR
2	F89 18OR/RD
3	P33 18OR/BK
4	C16 18LB/YL
5	P71 18YL/DG
6	-
7	G73 18LG/OR
8	P37 20LG
9	X56 18DB/RD
10	Q22 14VT/WT
11	V23 20BR/PK
12	P34 18PK/BK
13	P75 18LB/WT
14	P76 18OR/YL
15	G74 20TN/RD
16	-
17	Z351 18BK/LG
18	-
19	P36 20PK/VT
20	X54 18VT



C302
(LHD
MIDLINE/HIGHLINE)

C302 (LHD MIDLINE/HIGHLINE) - ORANGE (FRONT BODY SIDE)

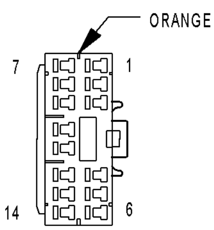
CAV	CIRCUIT
1	X58 18DB/OR
2	X92 18TN/BK
3	X86 18OR/RD
4	X13 16BK/RD
5	-
6	-
7	X52 18DB/WT
8	X94 18TN/VT
9	X84 18TN/BK
10	-
11	-
12	-
13	-
14	Z9 16BK



C302
(LHD)

C302 (LHD) - ORANGE (PASSENGER DOOR SIDE)

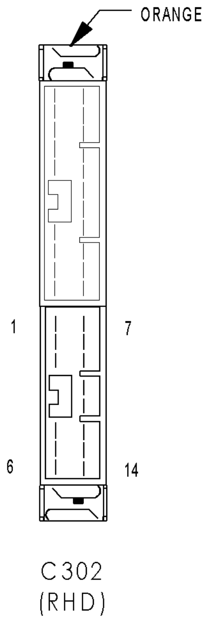
CAV	CIRCUIT
1	X58 18DB/OR
2	X58 18DB/OR (BASE SPEAKER)
2	X92 18TN/BK (PREMIUM SPEAKER)
3	X56 18DB/RD (BASE SPEAKER)
3	X86 18OR/RD (PREMIUM SPEAKER)
4	X13 16BK/RD (PREMIUM SPEAKER)
5	-
6	-
7	X52 18DB/WT
8	X52 18DB/WT (BASE SPEAKER)
8	X94 18TN/VT (PREMIUM SPEAKER)
9	X54 18VT (BASE SPEAKER)
9	X84 18TN/BK (PREMIUM SPEAKER)
10	-
11	-
12	-
13	-
14	Z9 16BK (PREMIUM SPEAKER)



C302
(RHD)

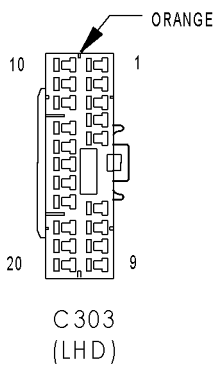
C302 (RHD) - ORANGE (FRONT BODY SIDE)

CAV	CIRCUIT
1	X57 18BR/LB
2	X91 18WT/BK
3	X81 18YL/BK
4	X13 16BK/RD
5	-
6	-
7	X51 18BR/YL
8	X93 18WT/RD
9	X83 18YL/RD
10	-
11	P99 18GY
12	P110 18YL
13	-
14	Z9 16BK



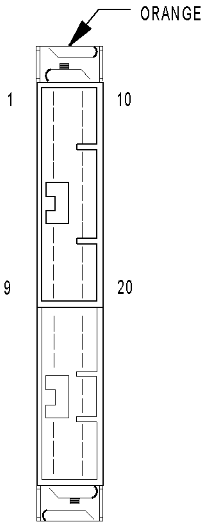
C302 (RHD) - ORANGE (PASSENGER DOOR SIDE)

CAV	CIRCUIT
1	X57 18BR/LB
2	X57 18BR/LB (BASE SPEAKER)
2	X91 18WT/BK (PREMIUM SPEAKER)
3	X55 18BR/RD (BASE SPEAKER)
3	X81 18YL/BK (PREMIUM SPEAKER)
4	X13 16BK/RD (PREMIUM SPEAKER)
5	-
6	-
7	X51 18BR/YL
8	X51 18BR/YL (BASE SPEAKER)
8	X93 18WT/RD (PREMIUM SPEAKER)
9	X53 18DG (BASE SPEAKER)
9	X83 18YL/RD (PREMIUM SPEAKER)
10	-
11	P99 20GY
12	P110 20YL
13	-
14	Z9 16BK (PREMIUM SPEAKER)



C303 (LHD) - ORANGE (FRONT BODY SIDE)

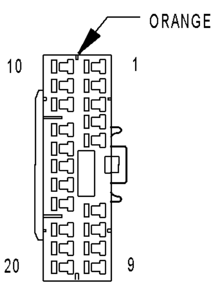
CAV	CIRCUIT
1	Q12 14BR (MIDLINE/HIGHLINE)
2	F89 18OR/RD (EXCEPT BASE)
3	P33 18OR/BK (EXCEPT BASE)
4	C16 18LB/YL (EXCEPT BASE)
5	P72 18YL/BK (EXCEPT BASE)
6	-
7	G72 18DG/OR (MIDLINE/HIGHLINE)
8	P37 20LG (EXCEPT BASE)
9	X56 18DB/RD
10	Q22 14VT/WT (MIDLINE/HIGHLINE)
11	-
12	P35 18OR/VT (EXCEPT BASE)
13	P74 18DB (EXCEPT BASE)
14	P76 18OR/YL (EXCEPT BASE)
15	G74 20TN/RD
16	-
17	Z351 18BK/LG
18	-
19	P36 20PK/VT (EXCEPT BASE)
20	X54 18VT



C303
(LHD)

C303 (LHD) - ORANGE (PASSENGER DOOR SIDE)

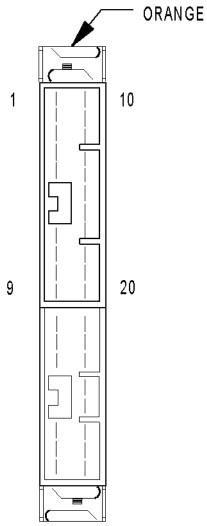
CAV	CIRCUIT
1	Q12 16BR (POWER WINDOWS)
2	F89 20OR/RD (EXCEPT BASE)
3	P33 18OR/BK (EXCEPT BASE)
4	C16 20LB/YL (EXCEPT BASE)
5	P72 20YL/BK (EXCEPT BASE)
6	-
7	G72 18DG/OR (EXCEPT BASE)
8	P37 18LG (EXCEPT BASE)
9	X56 18DB/RD
10	Q22 16VT/WT (POWER WINDOWS)
11	-
12	P35 18OR/VT (EXCEPT BASE)
13	P74 20DB (EXCEPT BASE)
14	P76 20OR/YL (EXCEPT BASE)
15	G74 20TN/WT
16	-
17	Z351 20BK/LG (PREMIUM SPEAKER)
17	Z351 18BK/LG (BASE SPEAKER)
18	-
19	P36 20PK/VT (EXCEPT BASE)
20	X54 18VT



C303
(RHD)

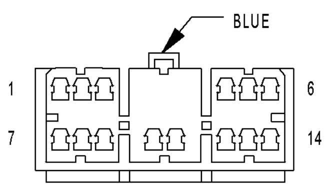
C303 (RHD) - ORANGE (FRONT BODY SIDE)

CAV	CIRCUIT
1	Q11 14LB
2	F89 18OR/RD
3	P33 18OR/BK
4	C16 18LB/YL
5	P71 18YL/DG
6	-
7	G72 18DG/OR
8	P37 20LG
9	X55 18BR/RD
10	Q21 14WT
11	-
12	P35 18OR/VT
13	P75 18LB/WT
14	P76 18OR/YL
16	Z21 20BK/LG
17	Z350 18BK/LG
18	-
19	P36 20PK/VT
20	X53 18DG



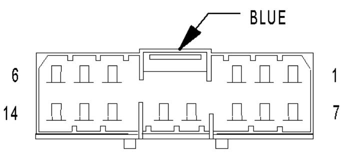
C303 (RHD) - ORANGE (PASSENGER DOOR SIDE)

CAV	CIRCUIT
1	Q11 16LB
2	F89 20OR/RD
3	P33 18OR/BK
4	C16 20LB/YL
5	P71 20YL/DG
6	-
7	-
8	P37 20LG
9	X55 18BR/RD
10	Q21 16WT
11	-
12	P35 18OR/VT
13	P75 20LB/WT
14	P76 20OR/YL
15	G75 20TN/WT
16	-
17	Z350 20BK/LB (PREMIUM SPEAKER)
17	Z350 18BK/LB (BASE SPEAKER)
18	-
19	P36 20PK/VT
20	X53 18DG



C304 - BLUE (FRONT BODY SIDE)

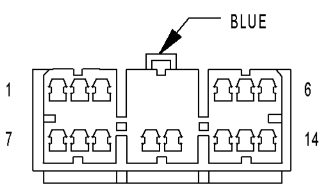
CAV	CIRCUIT
1	Q14 14GY (MIDLINE/HIGHLINE)
2	P33 18OR/BK (EXCEPT BASE)
3	-
4	-
5	-
6	X58 18DB/OR (BASE/LOWLINE)
6	X92 18TN/BK (MIDLINE/HIGHLINE)
7	Q24 14DG (MIDLINE/HIGHLINE)
8	P35 18OR/VT (EXCEPT BASE)
9	-
10	Z351 20BK/LG
11	-
12	G76 20TN/YL
13	-
14	X52 18DB/WT (BASE/LOWLINE)
14	X94 18TN/VT (MIDLINE/HIGHLINE)



C304

C304 - BLUE (RIGHT REAR DOOR SIDE)

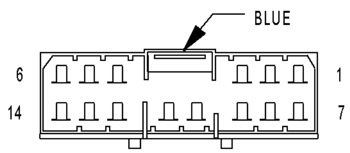
CAV	CIRCUIT
1	Q14 16GY (MIDLINE/HIGHLINE)
2	P33 18OR/BK (EXCEPT BASE)
3	-
4	-
5	-
6	X58 18DB/OR (BASE)
6	X92 18TN/BK (PREMIUM)
7	Q24 16DG (MIDLINE/HIGHLINE)
8	P35 18OR/VT (EXCEPT BASE)
9	-
10	Z351 20BK/LG
11	-
12	G74 20TN/WT
13	-
14	X52 18DB/WT (BASE)
14	X94 18TN/VT (PREMIUM)



C305

C305 - BLUE (FRONT BODY SIDE)

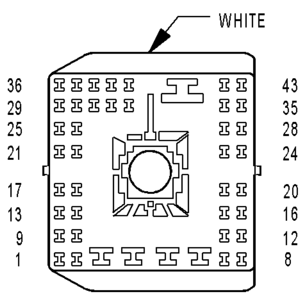
CAV	CIRCUIT
1	Q13 14DB (MIDLINE/HIGHLINE)
2	P33 18OR/BK (EXCEPT BASE)
3	-
4	-
5	-
6	X57 18BR/LB (BASE/LOWLINE)
6	X91 18WT/BK (MIDLINE/HIGHLINE)
7	Q23 14RD/WT (MIDLINE/HIGHLINE)
8	P35 18OR/VT (EXCEPT BASE)
9	-
10	Z350 18BK/LG (LHD)
10	Z350 20BK/LG (RHD)
11	-
12	G77 20TN/OR
13	-
14	X51 18BR/YL (BASE/LOWLINE)
14	X93 18WT/RD (MIDLINE/HIGHLINE)



C305

C305 - BLUE (LEFT REAR DOOR SIDE)

CAV	CIRCUIT
1	Q13 16GY (MIDLINE/HIGHLINE)
2	P33 18OR/BK (EXCEPT BASE)
3	-
4	-
5	-
6	X57 18DB/OR (BASE)
6	X91 18TN/BK (PREMIUM)
7	Q23 16DG (MIDLINE/HIGHLINE)
8	P35 18OR/VT (EXCEPT BASE)
9	-
10	Z350 20BK/LG
11	-
12	G74 20TN/WT
13	-
14	X51 18DB/WT (BASE)
14	X93 18TN/VT (PREMIUM)



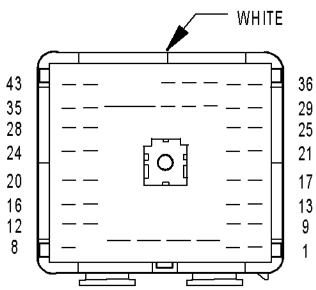
C306

C306 - WHITE (FRONT BODY SIDE)

CAV	CIRCUIT
1	A6 16RD/BK (MIDLINE/HIGHLINE)
2	-
3	F85 16VT/WT (MIDLINE/HIGHLINE)
4	F70 18PK/BK
5	F41 16PK/VT
6	A99 14RD/VT (MIDLINE/HIGHLINE)
7	-
8	F87 20WT/BK (MIDIN/HIGHLINE)
9	L77 18BK/YL
10	V23 20BR/PK (MIDLINE/HIGHLINE)
11	L10 18BR/LG
12	M3 20PK/DB
13	L50 18WT/TN
14	-
15	L63 18DG/RD
16	L78 18DG/YL
17	V21 20DB/RD
18	P112 18YL/LB (LHD EXCEPT BASE)
19	P114 18YL/RD (LHD EXCEPT BASE)
20	M1 20PK
21	M2 18YL
22	M20 20BR
23	P30 16OR/WT
24	P31 16PK/WT
25	-
26	-
27	P100 18OR/BR
28	L38 18BR/WT (HIGHLINE)
29	X75 18DG (HIGHLINE)
30	P101 20OR/PK
31	G80 20YL/WT
32	G910 20VT/BR
33	-
34	-
35	L62 18BR/RD
36	-

C306 - WHITE (FRONT BODY SIDE)

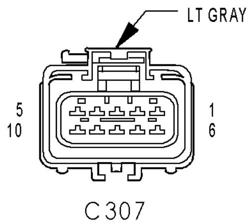
CAV	CIRCUIT
37	G78 20TN/BK
38	G71 18VT/YL
39	D25 18YL/VT (MIDLINE/HIGHLINE)
40	-
41	C15 12BK/WT
42	V22 20BR/YL
43	B40 14LB (MIDLINE/HIGHLINE)



C306

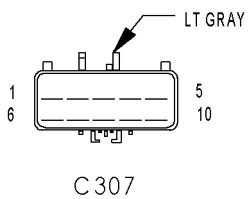
C306 - WHITE (REAR BODY SIDE)

CAV	CIRCUIT
1	A6 16RD/BK (EXCEPT BASE)
2	-
3	F85 16VT/WT (EXCEPT BASE)
4	F70 18PK/BK
5	F41 16PK/VT
6	A99 14RD/VT (EXCEPT BASE)
7	-
8	F87 20WT/BK (EXCEPT BASE)
9	L77 18BK/YL
10	V23 20BR/PK (RHD EXPORT)(EXCEPT EXPORT EXCEPT BASE)
10	V23 20BR/WT (LHD EXPORT)
11	L10 18BR/LG
12	M3 20PK/DB
13	L50 18WT/TN
14	-
15	L63 18DG/RD
16	L78 18DG/YL
17	V21 20DB/RD
18	P112 18YL/LB (LHD)
19	P114 18YL/RD (LHD)
20	M1 20PK
21	M2 18YL
22	M20 20BR
23	P30 16OR/WT
24	P31 16PK/WT
25	-
26	-
27	P100 18OR/BR
28	L38 18BR/WT (EXPORT)
29	X75 18DG (EXCEPT BASE)
30	P101 20OR/PK
31	G80 20YL/WT
32	G910 20VT/BR
33	-
34	-
35	L62 18BR/RD
36	-
37	G78 20TN/BK
38	G71 18VT/YL
39	D25 18YL/VT (EXCEPT BASE)
40	-
41	C15 12BK/WT
42	V22 20BR/YL
43	B40 14LB (EXCEPT BASE)



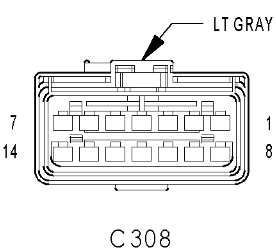
C307 - LT GRAY (FRONT BODY SIDE)

CAV	CIRCUIT
1	K226 18DB/WT
2	-
3	A141 16DG/WT
4	B1 18YL/DB
5	B2 18YL
6	K4 18BK/LB
7	-
8	K125 18WT/DB
9	K107 18OR
10	K106 18WT/DG



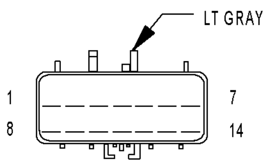
C307 - LT GRAY (FUEL TANK SIDE)

CAV	CIRCUIT
1	K226 18DB/WT
2	-
3	A141 16DG/WT (GAS)
4	B1 18YL/DB
5	B2 18YL
6	K4 18BK/LB
7	-
8	K125 18WT/DB (GAS)
9	K107 18OR (GAS)
10	K106 18WT/DG (GAS)



C308 - LT GRAY (OVERHEAD SIDE)

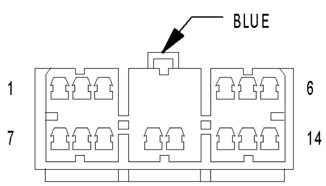
CAV	CIRCUIT
1	F85 16VT/WT (SUNROOF)
2	L10 20BR/LG (AUTOMATIC DAY/NIGHT MIRROR)
3	M1 20PK
4	M3 20PK/DB (EXCEPT BASE)
5	Z111 16BK (SUNROOF)
6	P112 20TN/OR (AUTOMATIC DAY/NIGHT MIRROR)
7	X75 20DG (EXPORT)
8	F87 20WT/BK (HIGHLINE)
9	-
10	M20 20BR (EXCEPT BASE)
11	M2 20YL
12	Z2 20BK/LG (HIGHLINE)
13	P114 20YL/BK (AUTOMATIC DAY/NIGHT MIRROR)
14	D25 20YL/VT (HIGHLINE)



C308

C308 - LT GRAY (REAR BODY SIDE)

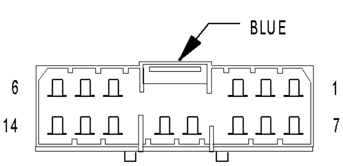
CAV	CIRCUIT
1	F85 16VT/WT (EXCEPT BASE)
2	L10 18BR/LG
3	M1 20PK
4	M3 20PK/DB
5	Z111 16BK (EXCEPT BASE)
6	P112 18YL/LB (LHD)
7	X75 18DG (EXCEPT BASE)
8	F87 20WT/BK (EXCEPT BASE)
9	-
10	M20 20BR
11	M2 18YL
12	Z2 18BK/LG (EXCEPT BASE)
13	P114 18YL/RD (LHD)
14	D25 18YL/VT (EXCEPT BASE)



C309

C309 - BLUE (REAR BODY SIDE)

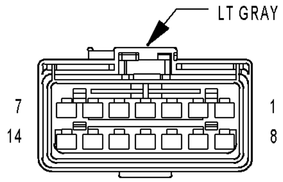
CAV	CIRCUIT
1	V21 20DB/RD
2	P31 16PK/WT
3	F70 18PK/BK
4	P100 18OR/BR
5	P101 20OR/PK
6	G71 18VT/YL
7	V22 20BR/YL
8	P30 16OR/WT
9	L77 18BK/YL
10	-
11	G80 20YL/WT
12	Z235 16BK
13	G78 20TN/BK
14	G910 20VT/BR



C309

C309 - BLUE (SPLITGATE SIDE)

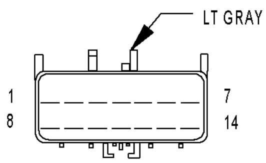
CAV	CIRCUIT
1	V21 20DB/RD
2	P31 16PK/WT
3	F70 18PK/BK
4	P100 18OR/BR
5	P101 20OR/PK
6	G71 18VT/YL
7	V22 20BR/YL
8	P30 16OR/WT
9	L77 18BK/YL (EXPORT)
10	-
11	G80 20YL/WT
12	Z235 16BK
13	G78 20TN/BK
14	G910 20VT/BR



C310

C310 - LT GRAY (REAR BODY SIDE)

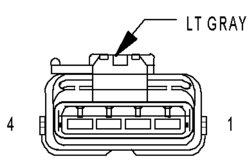
CAV	CIRCUIT
1	A6 16RD/BK (EXPORT)
2	L10 18BR/LG
3	L77 18BK/YL
4	L63 18DG/RD
5	L38 18BR/WT (EXPORT)
6	L50 18WT/TN
7	A99 14RD/VT (EXPORT)
8	V23 20BR/PK (RHD)
8	V23 20BR/WT (LHD EXPORT)
9	Z151 16BK/WT (LHD)
9	Z151 18BK/WT (RHD)
10	Z151 18BK/WT (RHD)
10	Z151 16BK/WT (LHD)
11	L78 18DG/YL
12	L62 18BR/RD
13	-
14	B40 14LB (EXPORT)



C310

C310 - LT GRAY (REAR LIGHTING SIDE)

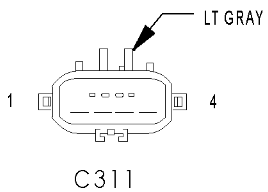
CAV	CIRCUIT
1	-
2	L10 18BR/LG
3	L77 18BK/YL
4	L63 18DG/RD
5	L38 18BR/WT (EXPORT)
6	L50 18WT/TN
7	-
8	-
9	Z151 18BK/WT
10	Z151 18BK/WT
11	L78 18DG/YL
12	L62 18BR/RD
13	-
14	-



C311

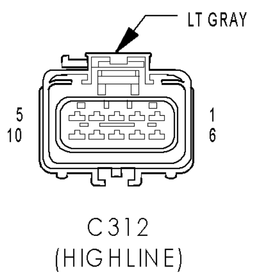
C311 - LT GRAY (FRONT BODY SIDE)

CAV	CIRCUIT
1	F37 14RD/LB (MIDLINE/HIGHLINE)
2	R57 18DG (LHD)
2	R58 18GY (RHD)
3	Z238 14BK/WT (MIDLINE/HIGHLINE)
4	R59 18LB (LHD)
4	R60 18VT (RHD)



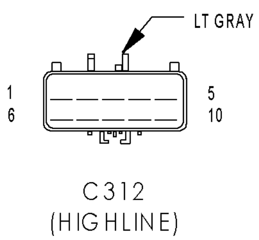
C311 - LT GRAY (LEFT FRONT SEAT SIDE)

CAV	CIRCUIT
1	F37 18RD/LB (EXCEPT BASE)
2	R57 18DG (LHD)
2	R58 18GY (RHD)
3	Z238 14BK/WT (EXCEPT BASE)
4	R59 18LB (LHD)
4	R60 18VT (RHD)



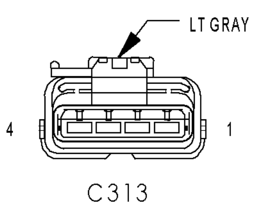
C312 (HIGHLINE) - LT GRAY (FRONT BODY SIDE)

CAV	CIRCUIT
1	-
2	P86 20PK/BK
3	F98 14RD/WT
4	V23 20BR/PK
5	A3 16RD/WT
6	P142 20TN/DB
7	P134 20TN/LG
8	P138 20VT/LG
9	P140 20VT/BK
10	Z238 14BK/WT



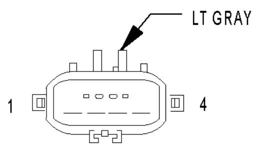
C312 (HIGHLINE) - LT GRAY (LEFT FRONT SEAT SIDE)

CAV	CIRCUIT
1	P141 20TN/LB
2	P86 20PK/BK
3	F98 16RD/WT
4	V23 1BR/PK
5	A3 20RD/WT
6	P142 20TN/DB
7	P134 20TN/LG
8	P138 20VT/LG
9	P140 20VT/BK
10	Z238 14BK/WT



C313 - LT GRAY (FRONT BODY SIDE)

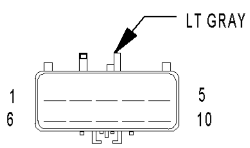
CAV	CIRCUIT
1	F37 14RD/LB (HIGHLINE)
2	R58 18GY (LHD)
2	R57 18DG (RHD)
3	Z238 14BK/WT (HIGHLINE)
4	R60 18VT (LHD)
4	R59 18LB (RHD)



C313

C313 - LT GRAY (RIGHT FRONT SEAT SIDE)

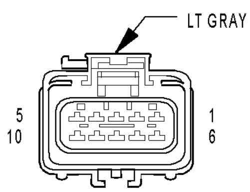
CAV	CIRCUIT
1	F34 14RD/LB (HIGHLINE)
2	R58 18GY (LHD EXCEPT BASE)
2	R57 DG (RHD)
2	R58 18DG (LHD BASE)
3	Z238 14BK/WT (HIGHLINE)
4	R60 18LB (LHD BASE)
4	R60 18VT (LHD EXCEPT BASE)
4	R59 18LB (RHD)



C314
(HIGHLINE)

C314 (HIGHLINE) - LT GRAY

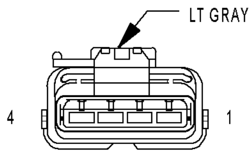
CAV	CIRCUIT
1	F98 16RD/WT
2	Z238 14BK/WT
3	P86 20PK/BK
4	P142 20TN/DB
5	V23 20BR/PK
6	P134 20TN/LG
7	P140 20VT/BK
8	P138 20VT/LG
9	-
10	-



C314
(HIGHLINE)

C314 (HIGHLINE) - LT GRAY (FRONT BODY SIDE)

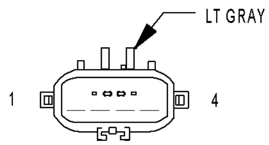
CAV	CIRCUIT
1	F98 14RD/WT
2	Z238 14BK/WT
3	P86 18PK/BK
4	P142 20TN/DB
5	V23 20BR/PK
6	P134 20TN/LG
7	P140 20VT/BK
8	P138 20VT/LG
9	-
10	-



C315
(MIDLINE/HIGHLINE)

C315 (MIDLINE/HIGHLINE) - LT GRAY

CAV	CIRCUIT
1	Q12 14BR
2	Q22 14VT/WT
3	Q14 14GY
4	Q24 14DG



C315
(MIDLINE/HIGHLINE)

C315 (MIDLINE/HIGHLINE) - LT GRAY (FRONT BODY SIDE)

CAV	CIRCUIT
1	Q11 14LB (RHD)
1	Q12 14BR (LHD)
2	Q21 14WT (RHD)
2	Q22 14VT/WT (LHD)
3	Q14 14GY (LHD)
3	Q13 14DB (RHD)
4	Q24 14DG (LHD)
4	Q23 14RD/WT (RHD)

CONNECTOR VIEW NOT AVAILABLE

C316
(EXPORT)

C316 (EXPORT) - (FRONT BODY SIDE)

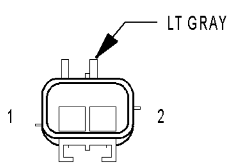
CAV	CIRCUIT
1	X30 10BK
2	X31 10BK

CONNECTOR VIEW NOT AVAILABLE

C316
(EXPORT)

C316 (EXPORT) - (REAR BODY SIDE)

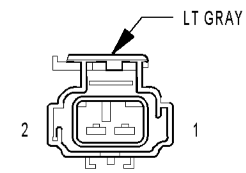
CAV	CIRCUIT
1	X30 BK
2	X31 BK



C317
(EXCEPT EXPORT)

C317 (EXCEPT EXPORT) - LT GRAY (LICENSE LAMP SIDE)

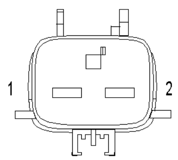
CAV	CIRCUIT
1	L77 18BR/YL
2	Z151 18BK/WT



C317
(EXCEPT EXPORT)

C317 (EXCEPT EXPORT) - LT GRAY (REAR LIGHTING SIDE)

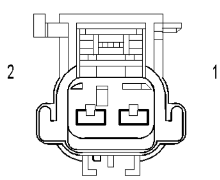
CAV	CIRCUIT
1	L77 18BK/YL
2	Z151 18BK/WT



C318
(RENEGADE)

C318 (RENEGADE) - (LIGHT BAR JUMPER SIDE)

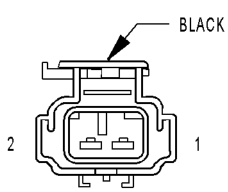
CAV	CIRCUIT
1	Z144 14BK
2	L8 14WT/TN



C318
(RENEGADE)

C318 (RENEGADE) - (LIGHT BAR SIDE)

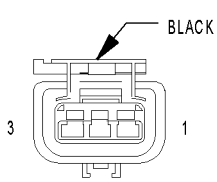
CAV	CIRCUIT
1	Z144 14BK
2	L8 14WT/TN



CABIN
HEATER
(DIESEL)

CABIN HEATER (DIESEL) - BLACK 2 WAY

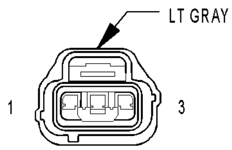
CAV	CIRCUIT	FUNCTION
1	C151 18DB/WT	CABIN HEATER RELAY OUTPUT
2	Z186 12BK/OR	GROUND



CAMSHAFT
POSITION
SENSOR
(2.4L)

CAMSHAFT POSITION SENSOR (2.4L) - BLACK 3 WAY

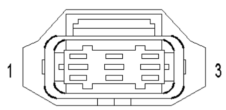
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL



CAMSHAFT POSITION SENSOR (3.7L)

CAMSHAFT POSITION SENSOR (3.7L) - LT GRAY 3 WAY

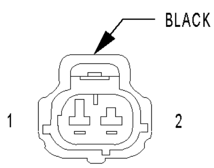
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CAMSHAFT POSITION SENSOR (DIESEL)

CAMSHAFT POSITION SENSOR (DIESEL) - 3 WAY

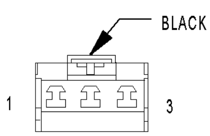
CAV	CIRCUIT	FUNCTION
1	K944 20BK/LB	CAMSHAFT POSITION SENSOR GROUND
2	K44 20TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
3	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT



CAPACITOR (2.4L)

CAPACITOR (2.4L) - BLACK 2 WAY

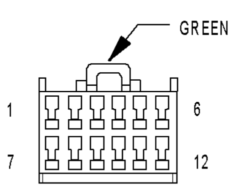
CAV	CIRCUIT	FUNCTION
1	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
2	Z55 14BK/WT	GROUND



CARGO LAMP (EXCEPT BASE)

CARGO LAMP (EXCEPT BASE) - BLACK 3 WAY

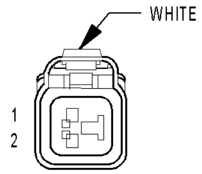
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M3 20PK/DB	REAR COURTESY LAMP CONTROL
3	M2 20YL	COURTESY LAMP DRIVER



CD CHANGER

CD CHANGER - GREEN 12 WAY

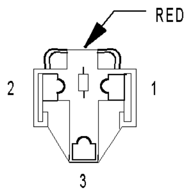
CAV	CIRCUIT	FUNCTION
1	X41 20WT/DG	AUDIO OUT LEFT
2	-	-
3	-	-
4	Z17 20BK	GROUND
5	X112 20RD	IGNITION SWITCH OUTPUT
6	X160 20YL	B(+)
7	X40 20WT/RD	AUDIO OUT RIGHT
8	Z30 20WT/BK	GROUND
9	-	-
10	-	-
11	Z9 20BK/DB	GROUND
12	D25 20YL/VT	PCI BUS



CENTER HIGH MOUNTED STOP LAMP

CENTER HIGH MOUNTED STOP LAMP - WHITE 2 WAY

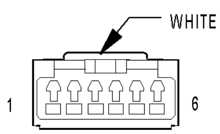
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	Z309 18BK	GROUND



CIGAR LIGHTER

CIGAR LIGHTER - RED 3 WAY

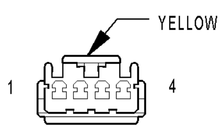
CAV	CIRCUIT	FUNCTION
1	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-
3	Z3 16BK/OR	GROUND



CLOCKSPRING C1

CLOCKSPRING C1 - WHITE 6 WAY

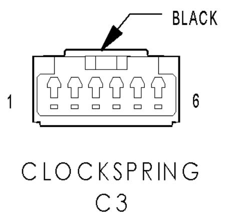
CAV	CIRCUIT	FUNCTION
1	-	-
2	X3 20BK/RD	HORN RELAY CONTROL
3	X20 20RD/BK (PREMIUM)	RADIO CONTROL MUX
4	X10 20RD/DB (PREMIUM)	RADIO CONTROL MUX RETURN
5	K4 20BK/LB	SENSOR GROUND
6	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL



CLOCKSPRING C2

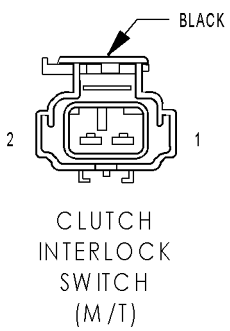
CLOCKSPRING C2 - YELLOW 4 WAY

CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1
3	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
4	R61 18OR/LB	DRIVER SQUIB 2 LINE 1



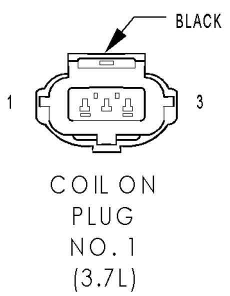
CLOCKSPRING C3 - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	X3 20BK/RD	HORN RELAY CONTROL
3	X20 20RD/BK (PREMIUM)	RADIO CONTROL MUX
4	X10 20RD/DB (PREMIUM)	RADIO CONTROL MUX RETURN
5	K4 20BK/LB (EXCEPT BASE)	SENSOR GROUND
6	V37 20RD/LG (EXCEPT BASE)	SPEED CONTROL SWITCH SIGNAL



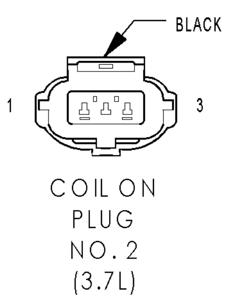
CLUTCH INTERLOCK SWITCH (M/T) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT
2	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)



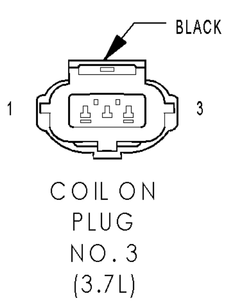
COIL ON PLUG NO. 1 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



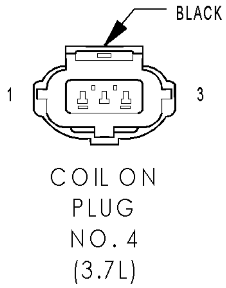
COIL ON PLUG NO. 2 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K92 14TN/PK	COIL ON PLUG DRIVER NO. 2
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



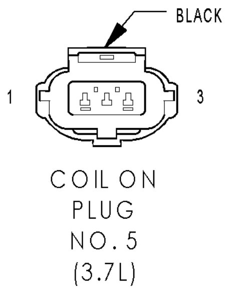
COIL ON PLUG NO. 3 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



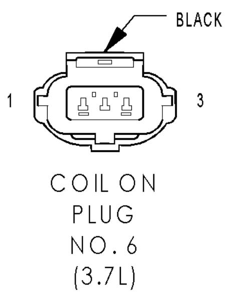
COIL ON PLUG NO. 4 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



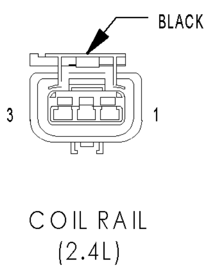
COIL ON PLUG NO. 5 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



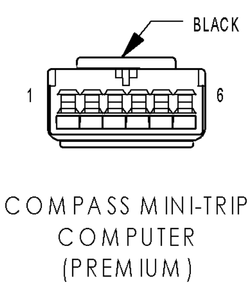
COIL ON PLUG NO. 6 (3.7L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



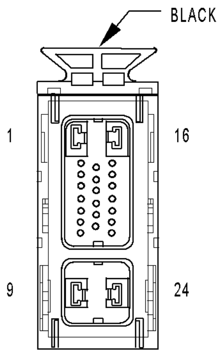
COIL RAIL (2.4L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER



COMPASS MINI-TRIP COMPUTER (PREMIUM) - BLACK 6 WAY

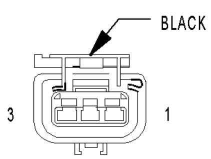
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20YL/VT	PCI BUS
3	M1 20PK	FUSED B(+)
4	Z2 20BK/LG	CLEAN GROUND
5	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	-	-



CONTROLLER ANTILOCK BRAKE

CONTROLLER ANTILOCK BRAKE - LT GRAY 24 WAY

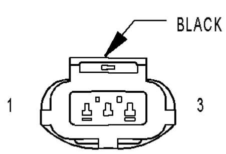
CAV	CIRCUIT	FUNCTION
1	Z101 12BK/OR	GROUND
2	-	-
3	-	-
4	-	-
5	D25 18YL/VT	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	D24 18WT/DG	FLASH ABS
9	A20 12RD/DB	FUSED B(+)
10	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
11	-	-
12	-	-
13	B12 18DG/OR	VEHICLE SPEED SIGNAL
14	-	-
15	-	-
16	Z102 12BK/OR	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL
20	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)



CRANKSHAFT POSITION SENSOR (2.4L)

CRANKSHAFT POSITION SENSOR (2.4L) - BLACK 3 WAY

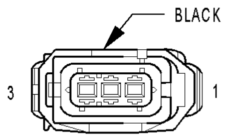
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CRANKSHAFT POSITION SENSOR (3.7L)

CRANKSHAFT POSITION SENSOR (3.7L) - BLACK 3 WAY

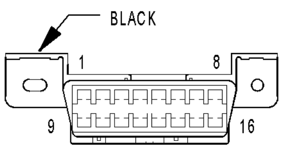
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CRANKSHAFT POSITION SENSOR (DIESEL)

CRANKSHAFT POSITION SENSOR (DIESEL) - BLACK 3 WAY

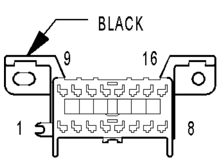
CAV	CIRCUIT	FUNCTION
1	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL 2
2	K3 20LB/BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
3	Y101 18BK/OR	CRANKSHAFT POSITION SENSOR SHIELD



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK 16 WAY

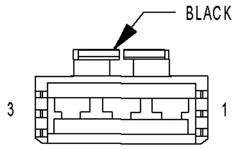
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



DIAGNOSTIC JUNCTION PORT

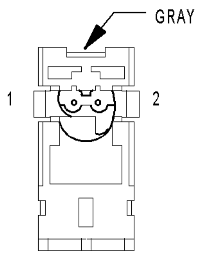
DIAGNOSTIC JUNCTION PORT - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	D25 18YL/VT/BR	PCI BUS (PCM TCM CAB SKIM)
2	D25 18YL/VT/GY	PCI BUS (PCM TCM CAB SKIM)
3	D25 18YL/VT/DB	PCI BUS (O/C RADIO LSIACM RSIACM)
4	D25 18YL/VT/OR	PCI BUS (ACM)
5	D25 20YL/VT/RD	PCI BUS (EMIC)
6	D25 18YL/VT/WT	PCI BUS (BCM)
7	D25 18YL/VT	PCI BUS (DLC)
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-



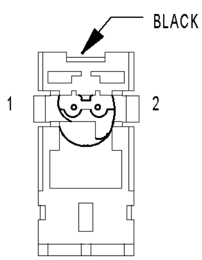
DOME LAMP (BASE) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	M1 20PK	FUSED B(+)
3	M2 20YL	COURTESY LAMP DRIVER



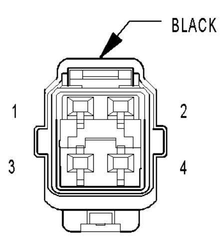
DRIVER AIRBAG SQUIB 1 - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1



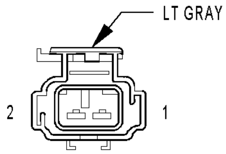
DRIVER AIRBAG SQUIB 2 - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
2	R61 18OR/LB	DRIVER SQUIB 2 LINE 1



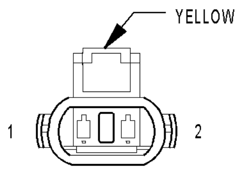
DRIVER DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	G75 20TN (LHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
1	G74 20TN/RD (RHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG (LHD)	GROUND
2	Z351 20BK/LG (RHD)	GROUND
3	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



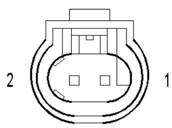
DRIVER SEAT BELT SWITCH - LT GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	R57 18DG	DRIVER SEAT BELT SWITCH SENSE
2	R59 18LB	DRIVER SEAT BELT SWITCH GROUND



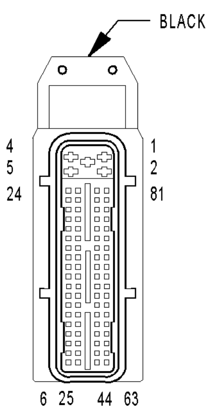
DRIVER SEAT BELT TENSIONER - YELLOW 2 WAY

CAV	CIRCUIT	FUNCTION
1	R55 18OR/BK	DRIVER SEAT BELT TENSIONER LINE 1
2	R53 18OR/YL	DRIVER SEAT BELT TENSIONER LINE 2



EGR SOLENOID (DIESEL) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K35 18GY/YL	EGR SOLENOID CONTROL

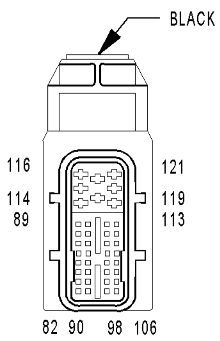


ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

CAV	CIRCUIT	FUNCTION
1	Z108 14BK/DG	GROUND
2	Z108 14BK/DG	GROUND
3	K20 18DG	GENERATOR FIELD CONTROL
4	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
5	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
6	-	-
7	D25 20VT/YL	PCI BUS
8	K944 20BK/LB	CAMSHAFT POSITION SENSOR GROUND
9	K44 20TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL
12	-	-
13	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
14	-	-
15	K81 20VT/TN	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
16	K80 20BK/VT	FUEL PRESSURE SENSOR GROUND
17	-	-
18	-	-
19	F92 20YL/BR	FUSED B(+)
20	Z109 20BK/DB	GROUND
21	K4 20BK/LB	SENSOR GROUND
22	F1 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	K6 20VT/WT	SENSOR REFERENCE VOLTAGE B
24	K3 20LB/BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
25	-	-
26	-	-

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

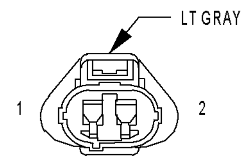
CAV	CIRCUIT	FUNCTION
27	-	-
28	-	-
29	K77 20BR/WT	TRANSFER CASE POSITION SENSOR INPUT
30	G60 20GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
31	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
32	K118 20PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR GROUND
35	K852 20VT/WT	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
36	-	-
37	-	-
38	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
39	K226 20DB/WT	FUEL LEVEL SENSOR SIGNAL
40	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K21 20BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
42	Y101 18BK/OR	CRANKSHAFT POSITION SENSOR SHIELD
43	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL 2
44	-	-
45	-	-
46	-	-
47	L50 20WT/TN	PRIMARY BRAKE SWITCH SIGNAL
48	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
49	-	-
50	-	-
51	-	-
52	-	-
53	-	-
54	-	-
55	B22 20DG/YL	VEHICLE SPEED SIGNAL
56	-	-
57	T10 20/YL/DG (A/T)	TORQUE MANAGEMENT REQUEST SENSE
58	-	-
59	-	-
60	K7 20OR	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL
62	-	-
63	-	-
64	K151 20WT	LOW IDLE POSITION SWITCH SENSE
65	-	-
66	-	-
67	-	-
68	-	-
69	C13 20DB/OR	A/C CLUTCH RELAY CONTROL
70	-	-
71	-	-
72	K236 20GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
73	-	-
74	K90 20TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
75	K132 20DG/LB	CABIN HEATER RELAY CONTROL
76	-	-
77	K152 20WT	GLOW PLUG RELAY NO. 1 CONTROL
78	-	-
79	-	-
80	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL
81	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL) - BLACK 40 WAY

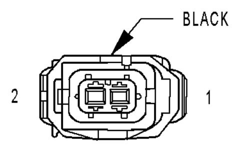
CAV	CIRCUIT	FUNCTION
100	-	-
101	C18 20DB	A/C HIGH PRESSURE SWITCH SIGNAL
102	-	-
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	-
109	-	-
110	-	-
111	-	-
112	T411 18WT/PK (A/T)	TRS T41 SENSE (P/N)
113	-	-
114	-	-
115	K14 2.5mmLB/BR	FUEL INJECTOR NO. 4 CONTROL
116	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
117	-	-
118	K11 2.5mmWT/DB	FUEL INJECTOR NO. 1 CONTROL
119	K12 2.5mmTN	FUEL INJECTOR NO. 2 CONTROL
120	K13 2.5mmYL/WT	FUEL INJECTOR NO. 3 CONTROL
121	-	-
82	D21 20PK	SCI TRANSMIT
83	K244 20BR/WT (A/T)	ENGINE SPEED SIGNAL
84	-	-
85	-	-
86	-	-
87	-	-
88	-	-
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-



ENGINE COOLANT LEVEL SENSOR (DIESEL)

ENGINE COOLANT LEVEL SENSOR (DIESEL) - LT GRAY 2 WAY

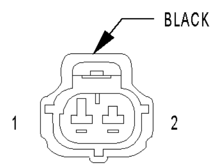
CAV	CIRCUIT	FUNCTION
1	G18 18PK/BK	LOW COOLANT FLUID LEVEL SENSE
2	Z246 18BK/GY	GROUND



ENGINE COOLANT TEMP SENSOR (DIESEL)

ENGINE COOLANT TEMP SENSOR (DIESEL) - BLACK 2 WAY

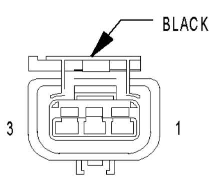
CAV	CIRCUIT	FUNCTION
1	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



ENGINE COOLANT TEMPERATURE SENSOR (GAS)

ENGINE COOLANT TEMPERATURE SENSOR (GAS) - BLACK 2 WAY

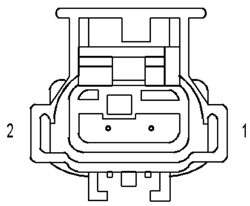
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE OIL PRESSURE SENSOR

ENGINE OIL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

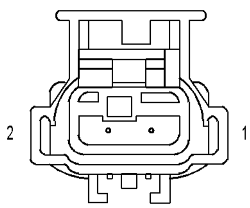
CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	SENSOR REFERENCE VOLTAGE B
2	G60 20GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



ENGINE OIL PRESSURE SWITCH

ENGINE OIL PRESSURE SWITCH (GAS) - 2 WAY

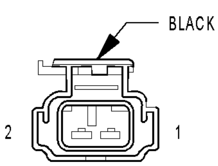
CAV	CIRCUIT	FUNCTION
1	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
2	-	-



ENGINE OIL PRESSURE SWITCH (GAS)

EVAP/PURGE SOLENOID - BLACK 2 WAY

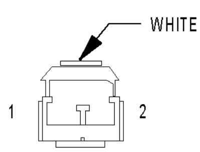
CAV	CIRCUIT	FUNCTION
1	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)



FLIP-UP GLASS RELEASE MOTOR

FLIP-UP GLASS RELEASE MOTOR - BLACK 2 WAY

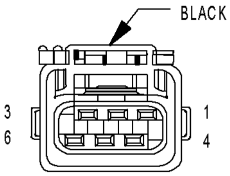
CAV	CIRCUIT	FUNCTION
1	Z235 18BK	GROUND
2	P100 18OR/BR	FLIP-UP GLASS RELEASE MOTOR DRIVER



FLIP-UP GLASS RELEASE SWITCH

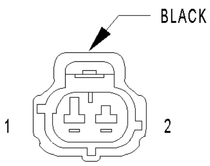
FLIP-UP GLASS RELEASE SWITCH - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	G910 20VT/BR	TAILGATE SWITCH GROUND
2	P101 20OR/PK	FLIP-UP GLASS RELEASE SWITCH SENSE



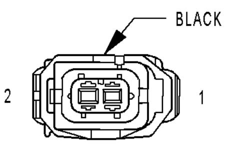
FRONT WIPER MOTOR - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
3	-	-
4	Z141 14BK	GROUND
5	V3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
6	V4 14RD/YL	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT



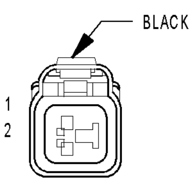
FUEL HEATER (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	A93 16RD/BK	FUEL HEATER RELAY OUTPUT
2	Z246 16BK/GY	GROUND



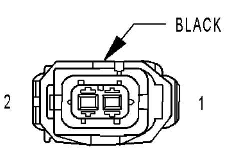
FUEL INJECTOR NO. 1 (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
2	K11 2.5mmWT/DB	FUEL INJECTOR NO. 1 CONTROL



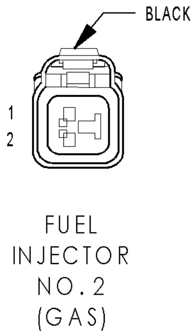
FUEL INJECTOR NO. 1 (GAS) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER



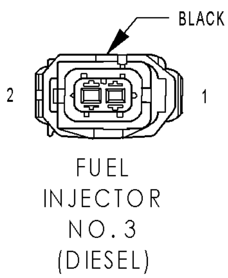
FUEL INJECTOR NO. 2 (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
2	K12 2.5mmTN	FUEL INJECTOR NO. 2 CONTROL



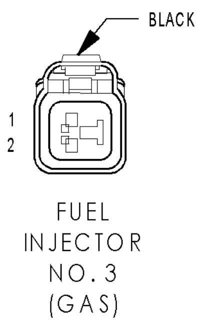
FUEL INJECTOR NO. 2 (GAS) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER



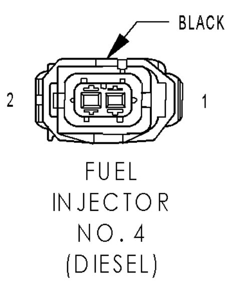
FUEL INJECTOR NO. 3 (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
2	K13 2.5mmYL/WT	FUEL INJECTOR NO. 3 CONTROL



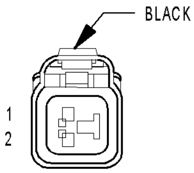
FUEL INJECTOR NO. 3 (GAS) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER



FUEL INJECTOR NO. 4 (DIESEL) - BLACK 2 WAY

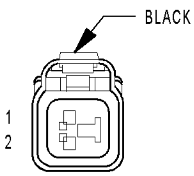
CAV	CIRCUIT	FUNCTION
1	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
2	K14 2.5mmLB/BR	FUEL INJECTOR NO. 4 CONTROL



FUEL INJECTOR NO. 4 (GAS)

FUEL INJECTOR NO. 4 (GAS) - BLACK 2 WAY

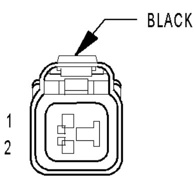
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER



FUEL INJECTOR NO. 5 (3.7L)

FUEL INJECTOR NO. 5 (3.7L) - BLACK 2 WAY

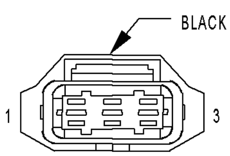
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K38 18GY	FUEL INJECTOR NO. 5 DRIVER



FUEL INJECTOR NO. 6 (3.7L)

FUEL INJECTOR NO. 6 (3.7L) - BLACK 2 WAY

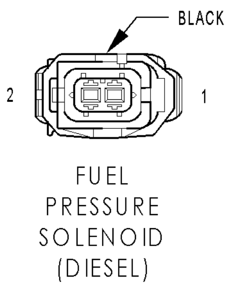
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K58 18BR/DB	FUEL INJECTOR NO. 6 DRIVER



FUEL PRESSURE SENSOR (DIESEL)

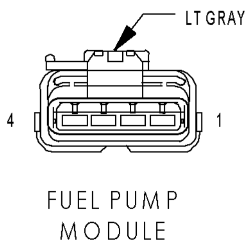
FUEL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K80 20BK/VT	FUEL PRESSURE SENSOR GROUND
2	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
3	K7 20OR	FUEL PRESSURE SENSOR 5 VOLT SUPPLY



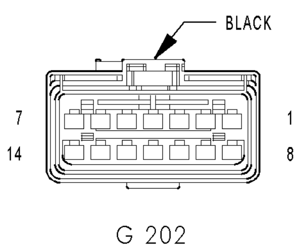
FUEL PRESSURE SOLENOID (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
2	K46 18OR/BK	FUEL PRESSURE SOLENOID CONTROL



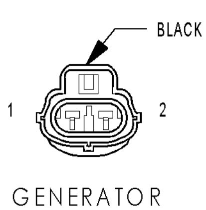
FUEL PUMP MODULE - LT GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z211 16BK (GAS)	GROUND
2	K4 18BK/LB	SENSOR GROUND
3	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
4	A141 16DG/WT (GAS)	FUEL PUMP RELAY OUTPUT



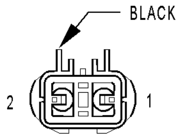
G202 - BLACK 14 WAY

CAV	CIRCUIT	FUNCTION
1	Z12 16BK/TN	GROUND
2	Z3 14BK/OR (EXCEPT BASE)	GROUND
2	Z3 18BK/OR (BASE)	GROUND
3	Z11 20BK/WT (EXCEPT BASE)	GROUND
4	-	-
5	-	-
6	Z105 20BK/LG	GROUND
7	Z231 16BK/WT	GROUND
8	Z103 16BK/OR	GROUND
9	Z131 10BK/GY	GROUND
10	Z300 16BK	GROUND
11	Z232 16BK/LB	GROUND
12	-	-
13	Z158 20BK/GY	GROUND
14	Z110 20BK/TN (EXCEPT BASE)	GROUND



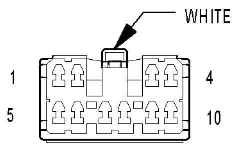
GENERATOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K20 18DG (GAS)	GENERATOR FIELD DRIVER
1	A71 18DG/RD (DIESEL)	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K20 18DG (DIESEL)	GENERATOR FIELD CONTROL
2	K125 18WT/DB (GAS)	GENERATOR SOURCE



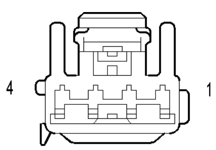
GLOW PLUG ASSEMBLY (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K154 10GY	GLOW PLUG RELAY NO. 1 OUTPUT
2	K104 10RD/WT	GLOW PLUG RELAY NO. 2 OUTPUT



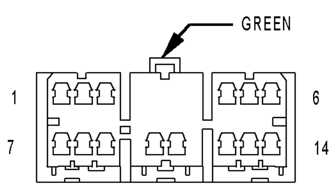
HAZARD SWITCH/COMBINATION FLASHER - WHITE 10 WAY

CAV	CIRCUIT	FUNCTION
1	A15 18PK/OR	FUSED B(+)
2	Z3 18BK/OR	GROUND
3	L62 18BR/RD	RIGHT TURN SIGNAL
4	L91 20DB/PK	HAZARD LAMP CONTROL
5	L305 20LB/WT	LEFT TURN SWITCH SENSE
6	-	-
7	L63 18DG/RD	LEFT TURN SIGNAL
8	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
9	L302 20LB/YL	RIGHT TURN SWITCH SENSE
10	E2 20OR	PANEL LAMPS DRIVER



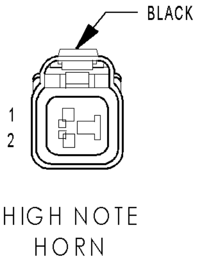
HEADLAMP LEVELING SWITCH (EXPORT) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	L13 18BR/YL	HEADLAMP ADJUST SIGNAL
2	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
3	Z12 18BK/TN	GROUND
4	-	-



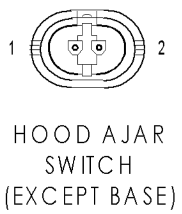
HEATED SEAT MODULE (HIGHLINE) - GREEN 14 WAY

CAV	CIRCUIT	FUNCTION
1	P133 20TN/DG	LEFT SEAT HEATER SWITCH MUX
2	P86 20PK/BK	HEATED SEAT TEMPERATURE SENSOR SIGNAL
3	F98 16RD/WT	PASSENGER HEATED SEAT FEED
4	A3 16RD/WT	FUSED B(+)
5	F99 16RD/YL	DRIVER HEATED SEAT FEED
6	A3 16RD/WT	FUSED B(+)
7	P142 20TN/DB	PASSENGER HEATED SEAT TEMPERATURE SENSOR GROUND
8	P141 20TN/LB	DRIVER HEATED SEAT TEMPERATURE SENSOR GROUND
9	P134 20TN/LG	RIGHT SEAT HEATER SWITCH MUX
10	P138 20VT/LG	RIGHT SEAT LOW HEAT LED DRIVER
11	P140 20VT/BK	RIGHT SEAT HIGH HEAT LED DRIVER
12	P137 20VT/DG	LEFT SEAT LOW HEAT LED DRIVER
13	Z238 16BK/WT	GROUND
14	P139 20VT/WT	LEFT SEAT HIGH HEAT LED DRIVER



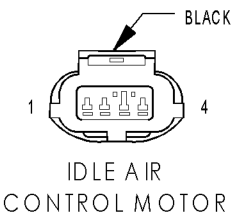
HIGH NOTE HORN - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	X2 18DG/RD	HORN RELAY OUTPUT
2	Z141 18BK	GROUND



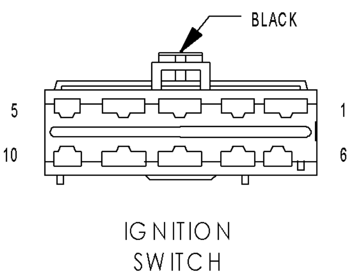
HOOD AJAR SWITCH (EXCEPT BASE) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	G70 18BR/TN	HOOD AJAR SWITCH SENSE
2	Z142 18BK/WT	GROUND



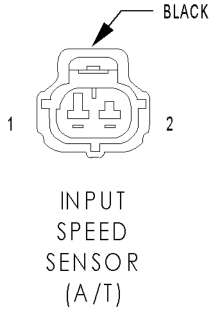
IDLE AIR CONTROL MOTOR - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
4	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER



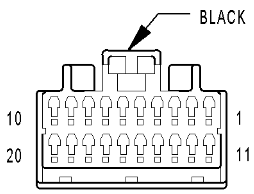
IGNITION SWITCH - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	A1 12RD	FUSED B(+)
2	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
3	F81 12TN	IGNITION SWITCH OUTPUT (RUN-ACC)
4	A25 12DB	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	A41 12YL	IGNITION SWITCH OUTPUT (START)
7	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
8	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
9	A2 12PK/BK	FUSED B(+)
10	Z232 16BK/LB	GROUND



INPUT SPEED SENSOR (A/T) - BLACK 2 WAY

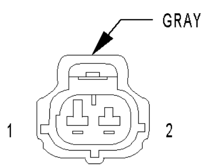
CAV	CIRCUIT	FUNCTION
1	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND



INSTRUMENT CLUSTER

INSTRUMENT CLUSTER - BLACK 20 WAY

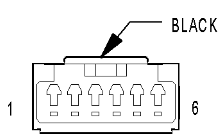
CAV	CIRCUIT	FUNCTION
1	Z105 20BK/LG	GROUND
2	-	-
3	Y98 20GY/DB	INSTRUMENT CLUSTER WAKE UP SIGNAL
4	-	-
5	G18 20PK/BK	LOW COOLANT FLUID LEVEL SENSE
6	L63 20DG/RD	LEFT TURN SIGNAL
7	G9 20GY/BK	PARK BRAKE SWITCH SENSE
8	G69 20BK/OR	VTSS INDICATOR DRIVER
9	-	-
10	M1 20PK	FUSED B(+)
11	L78 20DG/YL	FUSED PARK LAMP RELAY OUTPUT
12	E2 20OR	PANEL LAMPS DRIVER
13	-	-
14	D25 20YL/VT/RD	PCI BUS
15	-	-
16	L62 20BR/RD	RIGHT TURN SIGNAL
17	G11 20WT/BK	RED BRAKE WARNING INDICATOR DRIVER
18	G29 20BK/TN	LOW WASHER FLUID SENSE
19	F87 20TN/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
20	-	-



INTAKE AIR TEMPERATURE SENSOR (GAS)

INTAKE AIR TEMPERATURE SENSOR (GAS) - GRAY 2 WAY

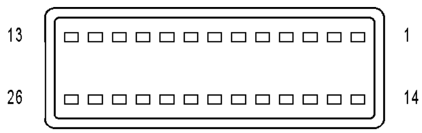
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



INTRUSION TRANSCEIVER MODULE (EXPORT)

INTRUSION TRANSCEIVER MODULE (EXPORT) - BLACK 6 WAY

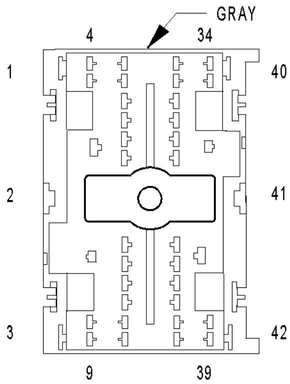
CAV	CIRCUIT	FUNCTION
1	Z2 20BK/LG	GROUND
2	-	-
3	X75 20DG	SIREN SIGNAL CONTROL
4	-	-
5	D25 20YL/VT	PCI BUS
6	M1 20PK	FUSED B(+)



JUNCTION BLOCK
BODY CONTROL MODULE-JB

JUNCTION BLOCK BODY CONTROL MODULE-JB - 26 WAY

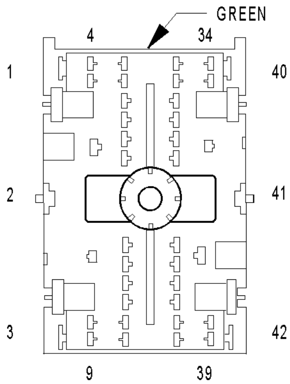
CAV	CIRCUIT	FUNCTION
1	X3	HORN RELAY CONTROL
2	P334	DOOR UNLOCK RELAY CONTROL
3	L308	PARK LAMP RELAY CONTROL
4	L96 (PREMIUM)	REAR FOG LAMP RELAY CONTROL
5	P109 (EXCEPT BASE)	DRIVER DOOR UNLOCK RELAY CONTROL
6	C80	REAR WINDOW DEFOGGER RELAY CONTROL
7	-	-
8	Z300	GROUND
9	F35	FUSED B(+)
10	L309	HIGH BEAM RELAY CONTROL
11	P31	TAILGATE UNLOCK DRIVER
12	P37	DOOR LOCK SWITCH GROUND
13	L94	LOW BEAM RELAY CONTROL
14	F89	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
15	M1	FUSED B(+)
16	F87	FUSED IGNITION SWITCH OUTPUT (RUN-START)
17	L26 (EXCEPT BASE)	FRONT FOG LAMP RELAY CONTROL
18	P333	DOOR LOCK RELAY CONTROL
19	V16	FRONT WIPER HIGH/LOW RELAY CONTROL
20	V55	FRONT WIPER PARK SWITCH SENSE
21	V14	FRONT WIPER ON/OFF RELAY CONTROL
22	P30	TAILGATE LOCK DRIVER
23	P36	DOOR LOCK SWITCH MUX
24	M2	COURTESY LAMP DRIVER
25	Z131	GROUND
26	M20	COURTESY LAMP LOAD SHED



JUNCTION BLOCK C1

JUNCTION BLOCK C1 - GRAY 42 WAY

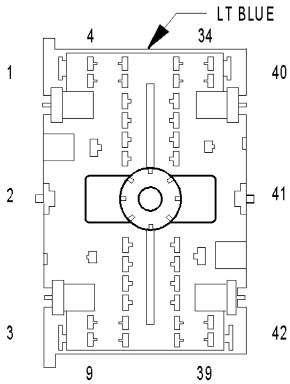
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
4	E2 20OR	PANEL LAMPS DRIVER
5	E2 20OR	PANEL LAMPS DRIVER
6	-	-
7	X3 20BK/RD	HORN RELAY CONTROL
8	L78 20DG/YL (EXCEPT EXPORT)	FUSED PARK LAMP RELAY OUTPUT
8	L78 18DG/YL (EXPORT)	FUSED PARK LAMP RELAY OUTPUT
9	F1 20DB (PREMIUM)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
10	E2 20OR	PANEL LAMPS DRIVER
11	E2 20OR	PANEL LAMPS DRIVER
12	M1 20PK	FUSED B(+)
13	F33 20PK/RD	FUSED B(+)
14	-	-
15	M1 20PK	FUSED B(+)
16	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
17	Z300 16BK	GROUND
18	-	-
19	-	-
20	Z131 10BK/GY	GROUND
21	L309 20LG/WT	HIGH BEAM RELAY CONTROL
22	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	M2 20YL	COURTESY LAMP DRIVER
24	M2 20YL	COURTESY LAMP DRIVER
25	F33 20PK/RD (PREMIUM)	FUSED B(+)
26	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
27	M1 20PK	FUSED B(+)
28	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
29	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
30	-	-
31	F87 20TN/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
32	-	-
33	F38 16RD/WT	FUSED B(+)
34	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
35	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
36	-	-
37	F32 18PK/DB	FUSED B(+)
38	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
39	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
40	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
41	A15 18PK/OR	FUSED B(+)
42	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)



JUNCTION BLOCK C2

JUNCTION BLOCK C2 - GREEN 42 WAY

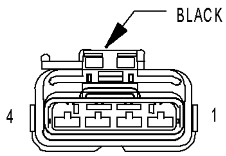
CAV	CIRCUIT	FUNCTION
1	F37 14RD/LB (MIDLINE/HIGHLINE)	FUSED B(+)
2	-	-
3	C15 12BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
4	F89 18OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P37 20LG (EXCEPT BASE)	DOOR LOCK SWITCH GROUND
6	P33 18OR/BK (EXCEPT BASE)	LOCK RELAY OUTPUT
7	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
8	P34 18PK/BK (EXCEPT BASE)	DRIVER DOOR UNLOCK RELAY OUTPUT
9	P35 18OR/VT (EXCEPT BASE)	UNLOCK RELAY OUTPUT
10	P36 20PK/VT (EXCEPT BASE)	DOOR LOCK SWITCH MUX
11	P37 20LG (EXCEPT BASE)	DOOR LOCK SWITCH GROUND
12	M20 20BR	COURTESY LAMP LOAD SHED
13	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
14	P36 20PK/VT (EXCEPT BASE)	DOOR LOCK SWITCH MUX
15	P30 16OR/WT	TAILGATE LOCK DRIVER
16	F70 18PK/BK	FUSED B(+)
17	L77 18BK/YL	FUSED LEFT INBOARD TAIL LAMP
18	M1 20PK	FUSED B(+)
19	M1 20PK	FUSED B(+)
20	E2 20OR	PANEL LAMPS DRIVER
21	E2 20OR	PANEL LAMPS DRIVER
22	-	-
23	V23 20BR/PK (HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN)
24	V23 20BR/PK (EXCEPT BASE)	FUSED IGNITION SWITCH OUTPUT (RUN)
25	V23 20BR/PK (MIDLINE/HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN)
26	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
27	-	-
28	A6 16RD/BK (MIDLINE/HIGHLINE)	FUSED B(+)
29	-	-
30	M2 18YL	COURTESY LAMP DRIVER
31	C16 18LB/YL (EXCEPT BASE)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
32	F14 18LG/YL (SIDE AIRBAG)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
33	F14 18LG/YL (SIDE AIRBAG)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
34	L38 18BR/WT (HIGHLINE)	REAR FOG LAMP RELAY OUTPUT
35	P31 16PK/WT	TAILGATE UNLOCK DRIVER
36	-	-
37	F60 16DG/RD (MIDLINE/HIGHLINE)	FUSED B(+)
38	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
39	C16 18LB/YL (EXCEPT BASE)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
40	F85 16VT/WT (MIDLINE/HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
41	F41 16PK/VT	FUSED B(+)
42	A3 16RD/WT (HIGHLINE)	FUSED B(+)



JUNCTION BLOCK C3

JUNCTION BLOCK C3 - LT BLUE 42 WAY

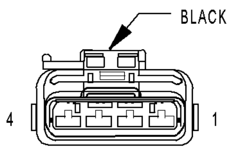
CAV	CIRCUIT	FUNCTION
1	A12 10RD/TN	FUSED B(+)
2	A13 10PK/WT	FUSED B(+)
3	A4 12BK/PK	FUSED B(+)
4	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
5	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
6	-	-
7	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
8	F1 20DB (RHD)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	F1 18DB (LHD)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
9	V6 16DB/YL (LHD)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	V6 14DB/YL (RHD)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	-	-
11	A12 10RD/TN	FUSED B(+)
12	-	-
13	-	-
14	-	-
15	V14 18RD/VT	FRONT WIPER ON/OFF RELAY CONTROL
16	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
17	-	-
18	V16 18VT/YL	FRONT WIPER HIGH/LOW RELAY CONTROL
19	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
20	-	-
21	-	-
22	-	-
23	-	-
24	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
25	-	-
26	-	-
27	-	-
28	L77 18BK/YL	FUSED LEFT INBOARD TAIL LAMP
29	M1 18PK	FUSED B(+)
30	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
31	-	-
32	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
33	L39 18LB	FRONT FOG LAMP RELAY OUTPUT
34	A18 10PK	FUSED B(+)
35	-	-
36	-	-
37	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
38	F22 18DB/PK (ABS)	FUSED IGNITION SWITCH OUTPUT (RUN)
39	X2 18DG/RD	HORN RELAY OUTPUT
40	A18 10PK	FUSED B(+)
41	-	-
42	A7 10RD/BK	FUSED B(+)



KNOCK SENSOR (3.7L)

KNOCK SENSOR (3.7L) - BLACK 4 WAY

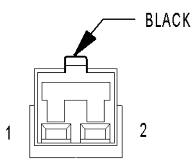
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K42 18DB/OR	KNOCK SENSOR NO. 1 SIGNAL
3	K4 18BK/LB	SENSOR GROUND
4	K142 18GY/BK	KNOCK SENSOR NO. 2 SIGNAL



LEAK DETECTION PUMP

LEAK DETECTION PUMP - BLACK 4 WAY

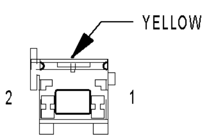
CAV	CIRCUIT	FUNCTION
1	-	-
2	K125 18WT/DB	GENERATOR SOURCE
3	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE



LEFT COURTESY LAMP

LEFT COURTESY LAMP - BLACK 2 WAY

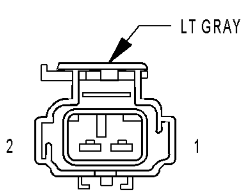
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



LEFT CURTAIN AIRBAG SQUIB

LEFT CURTAIN AIRBAG SQUIB - YELLOW 2 WAY

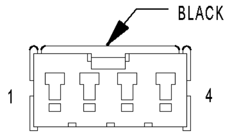
CAV	CIRCUIT	FUNCTION
1	R77 18YL/RD	LEFT CURTAIN SQUIB 1 LINE 2
2	R75 18YL/BK	LEFT CURTAIN SQUIB 1 LINE 1



LEFT CYLINDER LOCK SWITCH (LHD EXCEPT BASE)

LEFT CYLINDER LOCK SWITCH (LHD EXCEPT BASE) - LT GRAY 2 WAY

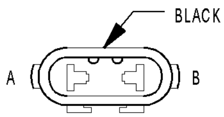
CAV	CIRCUIT	FUNCTION
1	P37 18LG	DOOR LOCK SWITCH GROUND
2	G73 18LG/OR	LEFT CYLINDER LOCK SWITCH MUX



LEFT DOOR LOCK SWITCH (EXCEPT BASE)

LEFT DOOR LOCK SWITCH (EXCEPT BASE) - BLACK 4 WAY

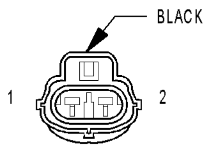
CAV	CIRCUIT	FUNCTION
1	P36 20PK/VT	DOOR LOCK SWITCH MUX
2	Z350 20BK/LG	GROUND
3	F89 20OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	P37 20LG	DOOR LOCK SWITCH GROUND



LEFT FOG LAMP

LEFT FOG LAMP - BLACK 2 WAY

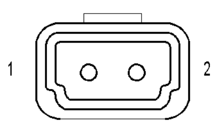
CAV	CIRCUIT	FUNCTION
A	Z141 18BK	GROUND
B	L39 18LB	FRONT FOG LAMP RELAY OUTPUT



LEFT FRONT DOOR AJAR SWITCH (BASE)

LEFT FRONT DOOR AJAR SWITCH (BASE) - BLACK 2 WAY

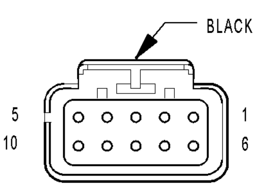
CAV	CIRCUIT	FUNCTION
1	G75 20TN	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND



LEFT FRONT DOOR SPEAKER (BASE)

LEFT FRONT DOOR SPEAKER (BASE) - 2 WAY

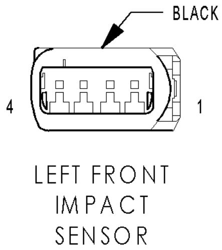
CAV	CIRCUIT	FUNCTION
1	X53 18DG	LEFT FRONT SPEAKER (+)
2	X55 18BR/RD	LEFT FRONT SPEAKER (-)



LEFT FRONT DOOR SPEAKER (PREMIUM)

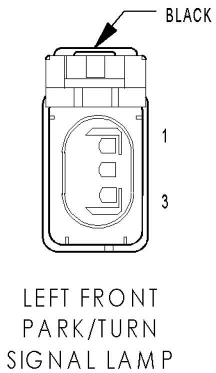
LEFT FRONT DOOR SPEAKER (PREMIUM) - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	X53 18DG	LEFT FRONT SPEAKER (+)
2	X55 18BR/RD	LEFT FRONT SPEAKER (-)
3	Z9 16BK	GROUND
4	X81 18YL/BK	AMPLIFIED HIGH LEFT FRONT SPEAKER (-)
5	X91 18WT/BK	AMPLIFIED LOW LEFT REAR SPEAKER (-)
6	X57 18BR/LB	LEFT REAR SPEAKER (-)
7	X51 18BR/YL	LEFT REAR SPEAKER (+)
8	X13 16BK/RD	RADIO CHOKE OUTPUT
9	X83 18YL/RD	AMPLIFIED HIGH LEFT FRONT SPEAKER (+)
10	X93 18WT/RD	AMPLIFIED LOW LEFT REAR SPEAKER (+)



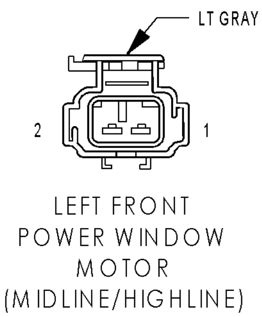
LEFT FRONT IMPACT SENSOR - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R47 18DB/LB	LEFT FRONT IMPACT SENSOR GROUND
4	R49 18LB	LEFT FRONT IMPACT SENSOR SIGNAL



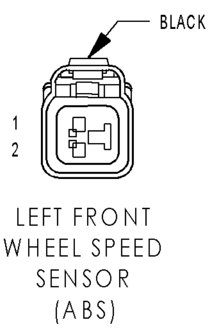
LEFT FRONT PARK/TURN SIGNAL LAMP - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	L63 18DG/RD	LEFT TURN SIGNAL
2	L77 18BK/YL (EXCEPT EXPORT)	PARK LAMP RELAY OUTPUT
3	Z141 18BK	GROUND



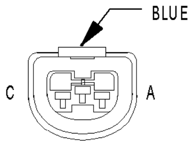
LEFT FRONT POWER WINDOW MOTOR (MIDLINE/HIGHLINE) - LT GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q21 16WT	LEFT FRONT WINDOW DRIVER DOWN
2	Q11 16LB	LEFT FRONT WINDOW DRIVER UP



LEFT FRONT WHEEL SPEED SENSOR (ABS) - BLACK 2 WAY

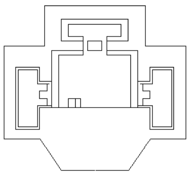
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



LEFT HEADLAMP (EXCEPT EXPORT)

LEFT HEADLAMP (EXCEPT EXPORT) - BLUE 3 WAY

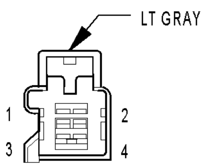
CAV	CIRCUIT	FUNCTION
A	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
B	Z141 18BK	GROUND
C	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT



LEFT HEADLAMP (EXPORT)

LEFT HEADLAMP (EXPORT) - 3 WAY

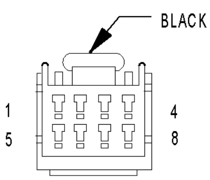
CAV	CIRCUIT	FUNCTION
1	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
2	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
3	Z141 18BK	GROUND



LEFT HEATED SEAT ASSEMBLY (HIGHLINE)

LEFT HEATED SEAT ASSEMBLY (HIGHLINE) - LT GRAY 4 WAY

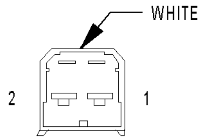
CAV	CIRCUIT	FUNCTION
1	F99 16RD/YL	DRIVER HEATED SEAT FEED
2	Z238 16BK/WT	GROUND
3	P86 20PK/BK	HEATED SEAT TEMPERATURE SENSOR SIGNAL
4	P141 20TN/LB	DRIVER HEATED SEAT TEMPERATURE SENSOR GROUND



LEFT HEATED SEAT SWITCH (HIGHLINE)

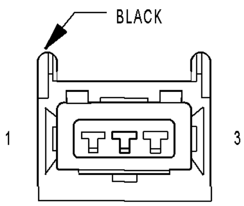
LEFT HEATED SEAT SWITCH (HIGHLINE) - BLACK 8 WAY

CAV	CIRCUIT	FUNCTION
1	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	P139 20VT/WT	LEFT SEAT HIGH HEAT LED DRIVER
3	P133 20TN/DG	LEFT SEAT HEATER SWITCH MUX
4	P137 20VT/DG	LEFT SEAT LOW HEAT LED DRIVER
5	Z238 20BK/WT	GROUND
6	-	-
7	-	-
8	-	-



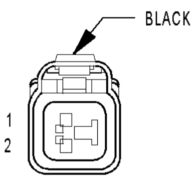
LEFT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	X53 18DG (BASE/LOWLINE)	LEFT FRONT SPEAKER (+)
1	X83 18YL/RD (MIDLINE/PREMIUM)	AMPLIFIED HIGH LEFT FRONT SPEAKER (+)
2	X81 18YL/BK (MIDLINE/PREMIUM)	AMPLIFIED HIGH LEFT FRONT SPEAKER (-)
2	X55 18BR/RD (BASE/LOWLINE)	LEFT FRONT SPEAKER (-)



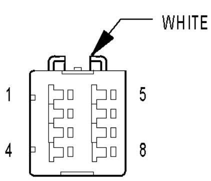
LEFT LEVELING MOTOR (EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	Z141 18BK	GROUND
2	L13 18BR/YL	HEADLAMP ADJUST SIGNAL
3	L77 18BK/YL	FUSED PARK LAMP RELAY OUTPUT



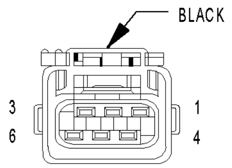
LEFT POSITION LAMP (EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	L77 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
2	Z141 18BK	GROUND



LEFT POWER MIRROR (EXCEPT BASE) - WHITE 8 WAY

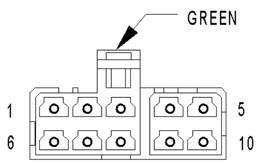
CAV	CIRCUIT	FUNCTION
1	P71 20YL/DG	LEFT MIRROR UP DRIVER
2	P76 20OR/YL	MIRROR COMMON DRIVER
3	P75 20LB/WT	LEFT MIRROR LEFT DRIVER
4	P112 20TN/OR (EXCEPT EXPORT)	AUTO DAY/NIGHT MIRROR (+)
5	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z350 20BK/LG	GROUND
7	P99 20GY (RHD)	FOLDING MIRROR FEED
8	P114 20YL/BK (EXCEPT EXPORT)	AUTO DAY/NIGHT MIRROR (-)
8	P110 20YL (RHD)	FOLDING MIRROR RETURN



LEFT
POWER SEAT
MOTORS
(MIDLINE/HIGHLINE)

LEFT POWER SEAT MOTORS (MIDLINE/HIGHLINE) - BLACK 6 WAY

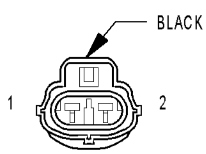
CAV	CIRCUIT	FUNCTION
1	P11 14YL/WT	DRIVER SEAT REAR UP DRIVER
2	P13 14RD/WT	DRIVER SEAT REAR DOWN DRIVER
3	P19 14YL/LG	DRIVER SEAT FRONT UP DRIVER
4	P21 14RD/LG	DRIVER SEAT FRONT DOWN DRIVER
5	P17 14RD/YL	DRIVER SEAT HORIZONTAL REARWARD DRIVER
6	P15 14YL/LB	DRIVER SEAT HORIZONTAL FORWARD DRIVER



LEFT
POWER SEAT
SWITCH
(MIDLINE/HIGHLINE)

LEFT POWER SEAT SWITCH (MIDLINE/HIGHLINE) - GREEN 10 WAY

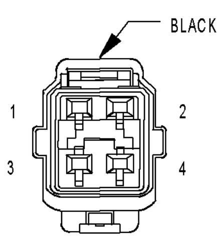
CAV	CIRCUIT	FUNCTION
1	Z238 14BK/WT	GROUND
2	-	-
3	P15 14YL/LB	DRIVER SEAT HORIZONTAL FORWARD DRIVER
4	-	-
5	F37 14RD/LB	FUSED B(+)
6	P17 14RD/YL	DRIVER SEAT HORIZONTAL REARWARD DRIVER
7	P13 14RD/WT	DRIVER SEAT REAR DOWN DRIVER
8	P21 14RD/LG	DRIVER SEAT FRONT DOWN DRIVER
9	P19 14YL/LG	DRIVER SEAT FRONT UP DRIVER
10	P11 14YL/WT	DRIVER SEAT REAR UP DRIVER



LEFT REAR
DOOR AJAR
SWITCH
(BASE)

LEFT REAR DOOR AJAR SWITCH (BASE) - BLACK 2 WAY

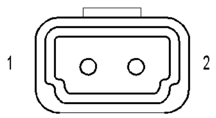
CAV	CIRCUIT	FUNCTION
1	G77 20TN/WT	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND



LEFT REAR
DOOR LOCK MOTOR/
AJAR SWITCH
(EXCEPT BASE)

LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE) - BLACK 4 WAY

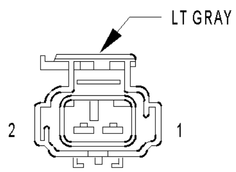
CAV	CIRCUIT	FUNCTION
1	G77 20TN/WT	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



LEFT REAR DOOR SPEAKER

LEFT REAR DOOR SPEAKER - 2 WAY

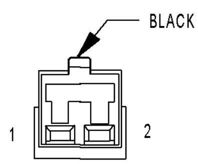
CAV	CIRCUIT	FUNCTION
1	X93 18WT/RD (PREMIUM)	AMPLIFIED LOW LEFT REAR SPEAKER (+)
1	X51 18BR/YL (BASE)	LEFT REAR DOOR SPEAKER (+)
2	X57 18BR/LB (BASE)	LEFT REAR DOOR SPEAKER (-)
2	X91 18WT (PREMIUM)	AMPLIFIED LOW LEFT REAR SPEAKER (-)



LEFT REAR POWER WINDOW MOTOR (MIDLINE/HIGHLINE)

LEFT REAR POWER WINDOW MOTOR (MIDLINE/HIGHLINE) - LT GRAY 2 WAY

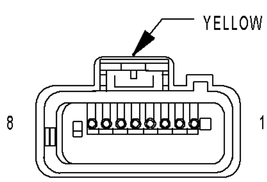
CAV	CIRCUIT	FUNCTION
1	Q23 16DG	LEFT REAR WINDOW DRIVER DOWN
2	Q13 16GY	LEFT REAR WINDOW DRIVER UP



LEFT REMOTE RADIO SWITCH (PREMIUM)

LEFT REMOTE RADIO SWITCH (PREMIUM) - BLACK 2 WAY

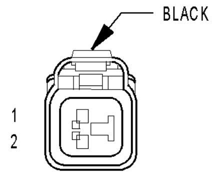
CAV	CIRCUIT	FUNCTION
1	X10 20RD/DB	RADIO CONTROL MUX RETURN
2	X20 20RD/BK	RADIO CONTROL MUX



LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM)

LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM) - YELLOW 8 WAY

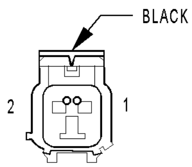
CAV	CIRCUIT	FUNCTION
1	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R77 18YL/RD	LEFT CURTAIN SQUIB 1 LINE 2
4	R75 18YL/BK	LEFT CURTAIN SQUIB 1 LINE 1
5	Z104 18BK/YL	GROUND
6	-	-
7	-	-
8	D25 18YL/VT	PCI BUS



LEFT SIDE MARKER LAMP (EXCEPT EXPORT)

LEFT SIDE MARKER LAMP (EXCEPT EXPORT) - BLACK 2 WAY

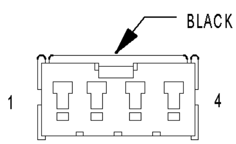
CAV	CIRCUIT	FUNCTION
1	L77 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
2	L63 18DG/RD	LEFT TURN SIGNAL



LEFT SIDE REPEATER LAMP (EXPORT)

LEFT SIDE REPEATER LAMP (EXPORT) - BLACK 2 WAY

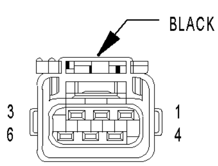
CAV	CIRCUIT	FUNCTION
1	L63 18DG/RD	LEFT TURN SIGNAL
2	Z141 18BK	GROUND



LEFT SPEED CONTROL SWITCH (EXCEPT BASE)

LEFT SPEED CONTROL SWITCH (EXCEPT BASE) - BLACK 4 WAY

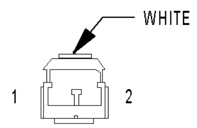
CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



LEFT TAIL/ STOP LAMP

LEFT TAIL/STOP LAMP - BLACK 6 WAY

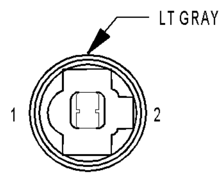
CAV	CIRCUIT	FUNCTION
1	L38 18BR/WT (EXPORT)	REAR FOG LAMP RELAY OUTPUT
2	L77 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
4	L10 18BR/LG	BACK-UP LAMP FEED
5	Z151 18BK/WT	GROUND
6	L63 18DG/RD	LEFT TURN SIGNAL



LEFT VISOR/
VANITY LAMP
(EXCEPT BASE)

LEFT VISOR/VANITY LAMP (EXCEPT BASE) - WHITE 2 WAY

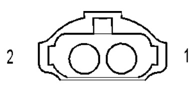
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M20 20BR	COURTESY LAMP LOAD SHED



LICENSE
LAMP
(EXCEPT EXPORT)

LICENSE LAMP (EXCEPT EXPORT) - LT GRAY 2 WAY

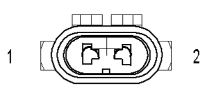
CAV	CIRCUIT	FUNCTION
1	L77 18BR/YL	FUSED PARK LAMP RELAY OUTPUT
2	Z151 18BK/WT	GROUND



LICENSE LAMP
(EXPORT)

LICENSE LAMP (EXPORT) - 2 WAY

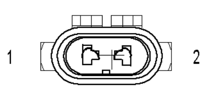
CAV	CIRCUIT	FUNCTION
1	L77 18BK/YL	FUSED LEFT INBOARD TAIL LAMP
2	Z235 18BK	GROUND



LIGHT BAR
LAMP
NO. 1
(RENEGADE)

LIGHTBAR LAMP NO.1 (RENEGADE) - 2 WAY

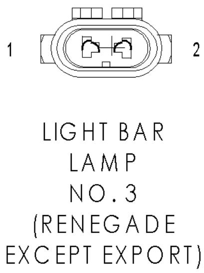
CAV	CIRCUIT	FUNCTION
1	Z144 14BK	GROUND
2	L8 14WT/TN	LIGHTBAR SWITCH OUTPUT



LIGHT BAR
LAMP
NO. 2
(RENEGADE)

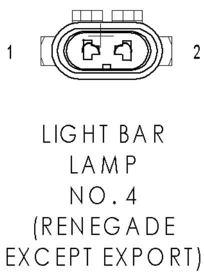
LIGHTBAR LAMP NO.2 (RENEGADE) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z144 14BK	GROUND
2	L8 14WT/TN	LIGHTBAR SWITCH OUTPUT



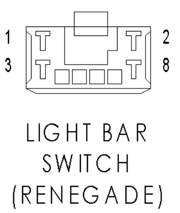
LIGHTBAR LAMP NO.3 (RENEGADE EXCEPT EXPORT) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z144 14BK	GROUND
2	L8 14WT/TN	LIGHTBAR SWITCH OUTPUT



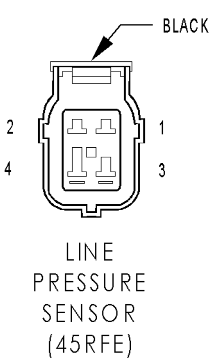
LIGHTBAR LAMP NO.4 (RENEGADE EXCEPT EXPORT) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z144 14BK	GROUND
2	L8 14WT/TN	LIGHTBAR SWITCH OUTPUT



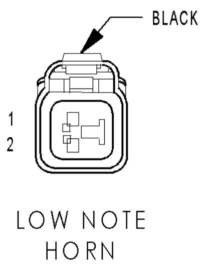
LIGHTBAR SWITCH (RENEGADE) - 8 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	A32 14RD/DB	FUSED B(+)
3	L8 14WT/TN	LIGHTBAR SWITCH OUTPUT
4	Z3 20BK/OR	GROUND
5	L78 20DG/YL (EXPORT)	FUSED PARK LAMP RELAY OUTPUT
5	F87 20TN/BK (EXCEPT EXPORT)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	E2 20OR	PANEL LAMPS FEED
7	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
8	L118 20BR/YL	LIGHTBAR SWITCH SENSE



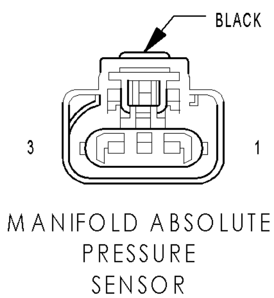
LINE PRESSURE SENSOR (45RFE) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z112 18BK/LB (GAS)	GROUND
1	Z112 14BK (DIESEL)	GROUND
2	T39 18GY/LB	5 VOLT SUPPLY
3	T38 18VT/TN	LINE PRESSURE SENSOR SIGNAL
4	-	-



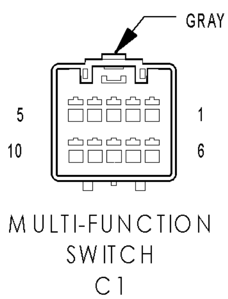
LOW NOTE HORN - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	X2 18DG/RD	HORN RELAY OUTPUT
2	Z141 18BK	GROUND



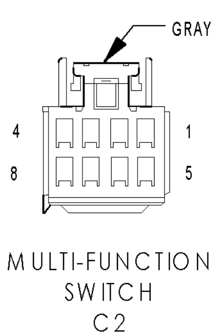
MANIFOLD ABSOLUTE PRESSURE SENSOR - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



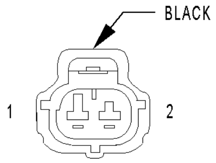
MULTI-FUNCTION SWITCH C1 - GRAY 10 WAY

CAV	CIRCUIT	FUNCTION
1	E21 20OR/RD	PANEL LAMPS DIMMER SWITCH MUX
2	L27 20WT/TN (EXCEPT BASE)	FRONT FOG LAMP SWITCH SENSE
3	-	-
4	L80 20WT/DG	HEADLAMP SWITCH RETURN
5	L307 20LG/OR	HEADLAMP SWITCH MUX
6	L305 20LB/WT	LEFT TURN SWITCH SENSE
7	L309 20LG/WT	HIGH BEAM RELAY CONTROL
8	Z12 18BK/TN	GROUND
9	L324 20WT/LG	HIGH BEAM SWITCH SENSE
10	L302 20LB/YL	RIGHT TURN SWITCH SENSE



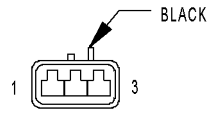
MULTI-FUNCTION SWITCH C2 - GRAY 8 WAY

CAV	CIRCUIT	FUNCTION
1	V21 20DB/RD	REAR WIPER ON DRIVER
2	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
3	V20 18BK/WT	WASHER MOTOR SENSE
4	V52 20DG/RD	FRONT WIPER SWITCH MUX
5	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
6	-	-
7	V10 18BR	WASHER PUMP DRIVER
8	-	-



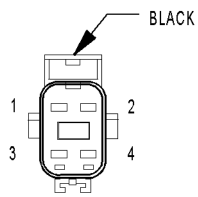
OUTPUT SPEED SENSOR (A/T) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND



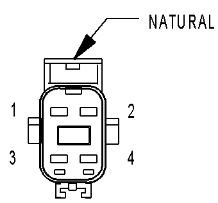
OVERHEAD MAP/ READING LAMP (EXCEPT BASE) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER
3	M20 20BR	COURTESY LAMP LOAD SHED



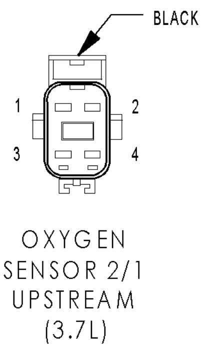
OXYGEN SENSOR 1/1 UPSTREAM - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL



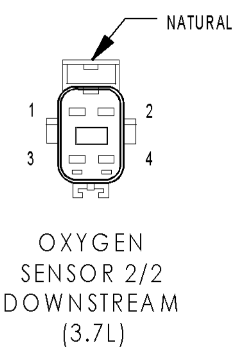
OXYGEN SENSOR 1/2 DOWNSTREAM - NATURAL 4 WAY

CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD (2.4L)	FUSED AUTO SHUT DOWN RELAY OUTPUT
1	F18 18LG/BK (3.7L)	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	Z186 18BK/OR (3.7L)	GROUND
2	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL



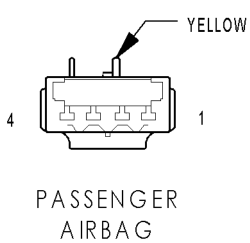
OXYGEN SENSOR 2/1 UPSTREAM (3.7L) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K299 18BR/WT	OXYGEN SENSOR 2/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL



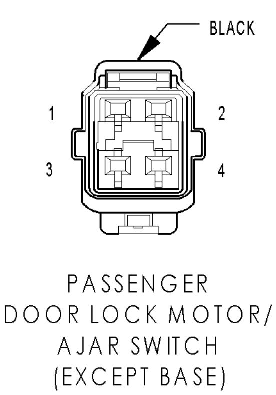
OXYGEN SENSOR 2/2 DOWNSTREAM (3.7L) - NATURAL 4 WAY

CAV	CIRCUIT	FUNCTION
1	F18 18LG/BK	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	Z186 18BK/OR	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL



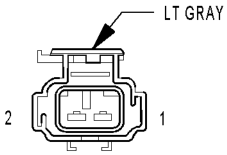
PASSENGER AIRBAG - YELLOW 4 WAY

CAV	CIRCUIT	FUNCTION
1	R62 18OR/YL	PASSENGER SQUIB 2 LINE 2
2	R64 18TN/YL	PASSENGER SQUIB 2 LINE 1
3	R42 18BK/YL	PASSENGER SQUIB 1 LINE 1
4	R44 18DG/YL	PASSENGER SQUIB 1 LINE 2



PASSENGER DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE) - BLACK 4 WAY

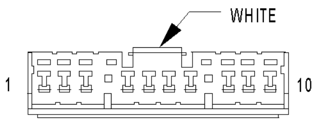
CAV	CIRCUIT	FUNCTION
1	G74 20TN/WT (LHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
1	G75 20TN/WT (RHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG (RHD)	GROUND
2	Z351 20BK/LG (LHD)	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



PASSENGER SEAT BELT SWITCH

PASSENGER SEAT BELT SWITCH - LT GRAY 2 WAY

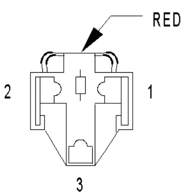
CAV	CIRCUIT	FUNCTION
1	R58 18GY (EXCEPT BASE)	PASSENGER SEAT BELT SWITCH SENSE
1	R58 18DG (BASE)	PASSENGER SEAT BELT SWITCH SENSE
2	R60 18LB (BASE)	PASSENGER SEAT BELT SWITCH GROUND
2	R60 18VT (EXCEPT BASE)	PASSENGER SEAT BELT SWITCH GROUND



POWER MIRROR SWITCH (EXCEPT BASE)

POWER MIRROR SWITCH (EXCEPT BASE) - WHITE 10 WAY

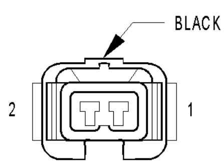
CAV	CIRCUIT	FUNCTION
1	P75 20LB/WT	LEFT MIRROR LEFT DRIVER
2	P71 20YL/DG	LEFT MIRROR UP DRIVER
3	Z350 20BK/LG (LHD)	GROUND
3	Z351 20BK/LG (RHD)	GROUND
4	P110 18YL (FOLD)	FOLDING MIRROR RETURN
5	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
6	P76 18OR/YL	MIRROR COMMON DRIVER
7	P99 18GY (FOLD)	FOLDING MIRROR FEED
8	-	-
9	P72 18YL/BK (EXCEPT FOLD)	RIGHT MIRROR UP DRIVER
9	P72 20YL/BK (FOLD)	RIGHT MIRROR UP DRIVER
10	P74 18DB (EXCEPT FOLD)	RIGHT MIRROR LEFT DRIVER
10	P74 20DB (FOLD)	RIGHT MIRROR LEFT DRIVER



POWER OUTLET

POWER OUTLET - RED 3 WAY

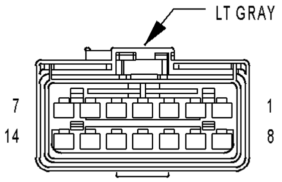
CAV	CIRCUIT	FUNCTION
1	F38 16RD/WT	FUSED B(+)
2	-	-
3	Z3 16BK/OR	GROUND



POWER STEERING PRESSURE SWITCH

POWER STEERING PRESSURE SWITCH - BLACK 2 WAY

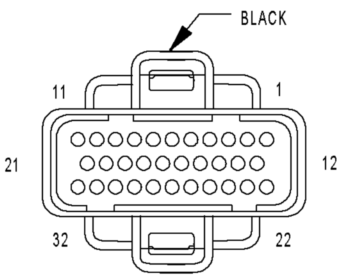
CAV	CIRCUIT	FUNCTION
1	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
2	Z246 18BK/GY	GROUND



POWER WINDOW MASTER SWITCH (MIDLINE/HIGHLINE)

POWER WINDOW MASTER SWITCH (MIDLINE/HIGHLINE) - LT GRAY 14 WAY

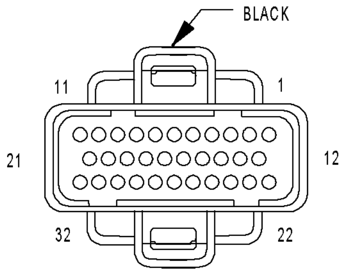
CAV	CIRCUIT	FUNCTION
1	-	-
2	Q1 12YL	POWER WINDOW SWITCH FEED
3	-	-
4	Q27 14RD/BK	LEFT REAR WINDOW DRIVER DOWN
5	Q17 14DB/WT	LEFT REAR WINDOW DRIVER UP
6	Q28 14DG/WT	RIGHT REAR WINDOW DRIVER DOWN
7	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER UP
8	-	-
9	Q21 14WT	LEFT FRONT WINDOW DRIVER DOWN
10	F81 12TN	IGNITION SWITCH OUTPUT (RUN-ACC)
11	Q11 14LB	LEFT FRONT WINDOW DRIVER UP
12	Q12 14BR	RIGHT FRONT WINDOW DRIVER UP
13	Q22 14VT/WT	RIGHT FRONT WINDOW DRIVER DOWN
14	Z238 12BK/WT	GROUND



POWERTRAIN CONTROL MODULE C1 (2.4L)

POWERTRAIN CONTROL MODULE C1 (2.4L) - BLACK 32 WAY

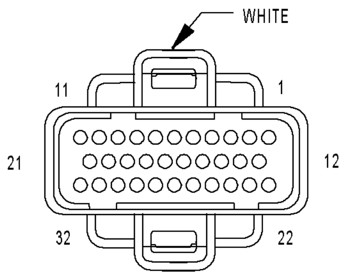
CAV	CIRCUIT	FUNCTION
1	-	-
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	K4 18BK/LB	SENSOR GROUND
5	-	-
6	-	-
7	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	T141 18YL/RD	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	-	-
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	-	-
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	-	-
30	-	-
31	Z107 14BK/DB	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C1 (3.7L)

POWERTRAIN CONTROL MODULE C1 (3.7L) - BLACK 32 WAY

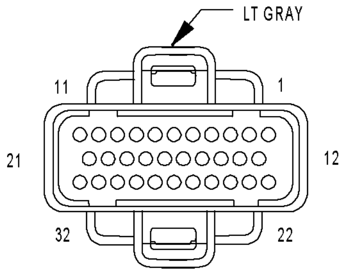
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
4	K4 18BK/LB	SENSOR GROUND
5	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
6	T41 18BK/WT (A/T)	PARK/NEUTRAL POSITION SWITCH SENSE
7	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	F45 18YL/BR (A/T)	FUSED IGNITION SWITCH OUTPUT (START)
13	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z107 14BK/DB	GROUND
31	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN
CONTROL
MODULE C2
(GAS)

POWERTRAIN CONTROL MODULE C2 (GAS) - WHITE 32 WAY

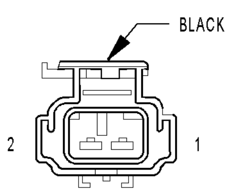
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K38 18GY (3.7L)	FUEL INJECTOR NO. 5 DRIVER
7	-	-
8	-	-
9	K17 18DB/TN (2.4L)	IGNITION COIL NO. 2 DRIVER
9	K92 14TN/PK (3.7L)	COIL ON PLUG DRIVER NO. 2
10	K20 18DG	GENERATOR FIELD
11	-	-
12	K58 18BR/DB (3.7L)	FUEL INJECTOR NO. 6 DRIVER
13	-	-
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	K173 18LG	RADIATOR FAN RELAY CONTROL
18	-	-
19	C18 18DB	A/C PRESSURE SIGNAL
20	-	-
21	-	-
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	K6 18VT/WT	5 VOLT SUPPLY
32	-	-



POWERTRAIN CONTROL MODULE C3 (GAS)

POWERTRAIN CONTROL MODULE C3 (GAS) - LT GRAY 32 WAY

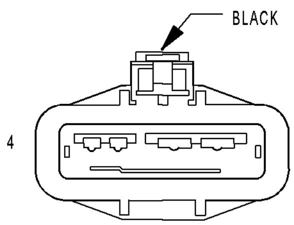
CAV	CIRCUIT	FUNCTION
1	C13 18DG	A/C CLUTCH RELAY CONTROL
2	-	-
3	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	K90 18TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
7	K42 18DB/LB (3.7L)	KNOCK SENSOR NO. 1 SIGNAL
7	K42 18DB/LB (2.4L)	NOT USED
8	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
9	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18YL/RD	SPEED CONTROL SUPPLY
12	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY SENSE INPUT
13	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
14	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE
15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
16	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
16	K299 18BR/WT (3.7L)	OXYGEN SENSOR 2/1 HEATER CONTROL
17	B22 18DG/YL	VEHICLE SPEED OUTPUT
18	K142 18GY/BK (3.7L)	KNOCK SENSOR NO. 2 SIGNAL
18	K142 18GY/BK (2.4L)	NOT USED
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
21	-	-
22	C21 18DB/OR	A/C SWITCH SENSE
23	-	-
24	K29 18WT/PK	BRAKE SWITCH SENSE
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG	SCI RECEIVE (PCM)
30	D25 18YL/VT	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL



RADIATOR FAN MOTOR

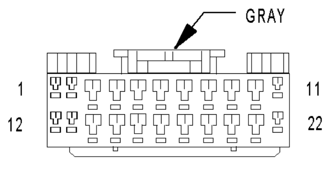
RADIATOR FAN MOTOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	C25 12YL	RADIATOR FAN RELAY OUTPUT
2	Z212 12BK/OR	GROUND



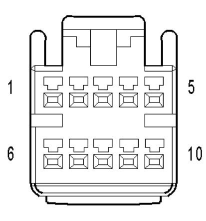
RADIATOR FAN RELAY - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	C24 12DB/PK	FUSED B(+)
2	C25 12YL	RADIATOR FAN RELAY OUTPUT
3	Z212 18BK/OR	GROUND
4	K173 18LG	RADIATOR FAN RELAY CONTROL



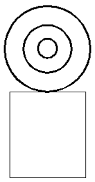
RADIO C1 - GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	F89 18OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	E2 20OR	PANEL LAMPS DRIVER
4	-	-
5	-	-
6	-	-
7	X54 18VT	RIGHT FRONT SPEAKER (+)
8	X56 18DB/RD	RIGHT FRONT SPEAKER (-)
9	X55 18BR/RD	LEFT FRONT SPEAKER (-)
10	X53 18DG	LEFT FRONT SPEAKER (+)
11	Z9 16BK	GROUND
12	M1 20PK	FUSED B(+)
13	X16 18LG (MIDLINE/PREMIUM)	ANTENNA RELAY OUTPUT
14	D25 18YL/VT	PCI BUS
15	-	-
16	-	-
17	-	-
18	X51 18BR/YL	LEFT REAR SPEAKER (+)
19	X57 18BR/LB	LEFT REAR SPEAKER (-)
20	X58 18DB/OR	RIGHT REAR SPEAKER (-)
21	X52 18DB/WT	RIGHT REAR SPEAKER (+)
22	Z9 16BK	GROUND



RADIO C2 - 10 WAY

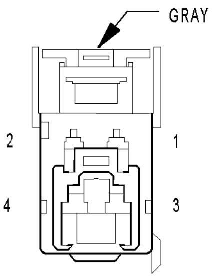
CAV	CIRCUIT	FUNCTION
1	X40 20WT/RD	AUDIO OUT RIGHT
2	Z30 20WT/BK	GROUND
3	Z9 20BK/DB	GROUND
4	D25 20YL/VT	PCI BUS
5	X112 20RD	IGNITION SWITCH OUTPUT
6	X41 20WT/DG	AUDIO OUT LEFT
7	Z17 20BK	GROUND
8	-	-
9	-	-
10	X160 20YL	B(+)



RADIO C3

RADIO C3 - 2 WAY

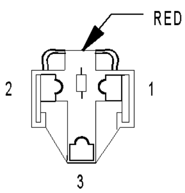
CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



RADIO CHOKE (MIDLINE/PREMIUM)

RADIO CHOKE (MIDLINE/PREMIUM) - GRAY 4 WAY

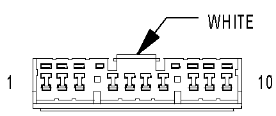
CAV	CIRCUIT	FUNCTION
1	F60 16DG/RD	FUSED B(+)
2	X13 16BK/RD	RADIO CHOKE OUTPUT
3	X16 18LG	ANTENNA RELAY OUTPUT
4	Z140 16BK/LG	GROUND



REAR POWER OUTLET

REAR POWER OUTLET - RED 3 WAY

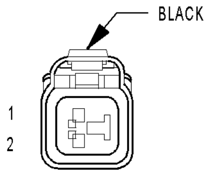
CAV	CIRCUIT	FUNCTION
1	F41 16PK/VT	FUSED B(+)
2	-	-
3	Z151 16BK/WT	GROUND



REAR POWER WINDOW SWITCH (MIDLINE/HIGHLINE)

REAR POWER WINDOW SWITCH (MIDLINE/HIGHLINE) - WHITE 10 WAY

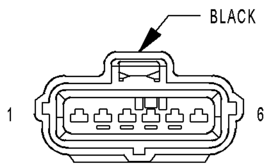
CAV	CIRCUIT	FUNCTION
1	Q28 14DG/WT	RIGHT REAR WINDOW DRIVER DOWN
2	Q14 14GY	RIGHT REAR WINDOW DRIVER UP
3	Q24 14DG	RIGHT REAR WINDOW DRIVER DOWN
4	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER UP
5	Q1 16YL	POWER WINDOW SWITCH FEED
6	Q1 16YL	POWER WINDOW SWITCH FEED
7	Q17 14DB/WT	LEFT REAR WINDOW DRIVER UP
8	Q23 14RD/WT	LEFT REAR WINDOW DRIVER DOWN
9	Q27 14RD/BK	LEFT REAR WINDOW DRIVER DOWN
10	Q13 14DB	LEFT REAR WINDOW DRIVER UP



REAR
WHEEL SPEED
SENSOR

REAR WHEEL SPEED SENSOR - 2 WAY

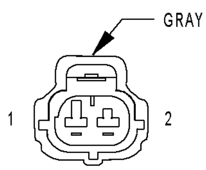
CAV	CIRCUIT	FUNCTION
1	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL



REAR
WIPER
MOTOR

REAR WIPER MOTOR - 6 WAY

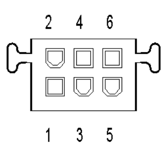
CAV	CIRCUIT	FUNCTION
1	Z235 18BK	GROUND
2	V21 20DB/RD	REAR WIPER ON DRIVER
3	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
4	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
5	F70 18PK/BK	FUSED B(+)
6	-	-



RED BRAKE
WARNING INDICATOR
SWITCH

RED BRAKE WARNING INDICATOR SWITCH - GRAY 2 WAY

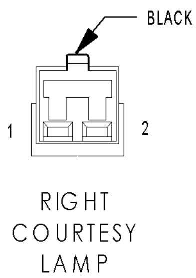
CAV	CIRCUIT	FUNCTION
1	G11 18WT/BK	RED BRAKE WARNING INDICATOR DRIVER
2	Z142 18BK/WT	GROUND



REMOTE KEYLESS
ENTRY MODULE
(EXCEPT BASE)

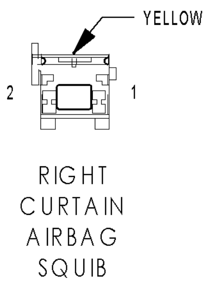
REMOTE KEYLESS ENTRY MODULE (EXCEPT BASE) - 6 WAY

CAV	CIRCUIT	FUNCTION
1	Y60	RKE DATA
2	Y62	RKE SUPPLY
3	Y61	RKE PROGRAM
4	Y63	RKE GROUND
5	Y64	RKE ANTENNA (+)
6	Y65	RKE ANTENNA (-)



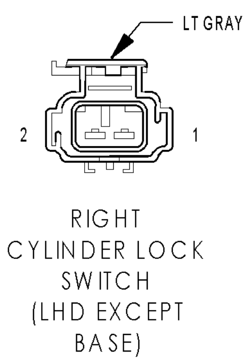
RIGHT COURTESY LAMP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



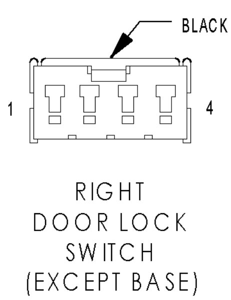
RIGHT CURTAIN AIRBAG SQUIB - YELLOW 2 WAY

CAV	CIRCUIT	FUNCTION
1	R76 18YL/DB	RIGHT CURTAIN SQUIB 1 LINE 2
2	R74 18YL/BR	RIGHT CURTAIN SQUIB 1 LINE 1



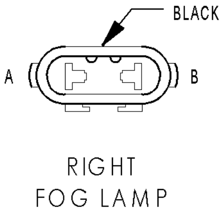
RIGHT CYLINDER LOCK SWITCH (LHD EXCEPT BASE) - LT GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	P37 18LG	DOOR LOCK SWITCH GROUND
2	G72 18DG/OR	RIGHT CYLINDER LOCK SWITCH MUX



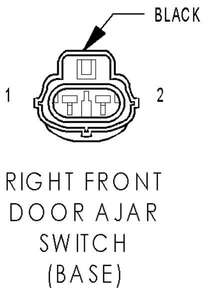
RIGHT DOOR LOCK SWITCH (EXCEPT BASE) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	P36 20PK/VT	DOOR LOCK SWITCH MUX
2	Z351 20BK/LG	GROUND
3	F89 20OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	P37 20LG	DOOR LOCK SWITCH GROUND



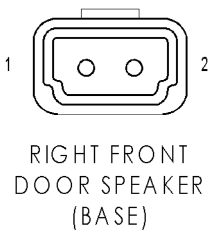
RIGHT FOG LAMP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
A	Z142 18BK/WT	GROUND
B	L39 18LB	FRONT FOG LAMP RELAY OUTPUT



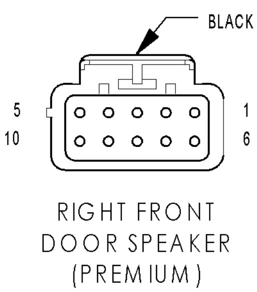
RIGHT FRONT DOOR AJAR SWITCH (BASE) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G74 20TN/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND



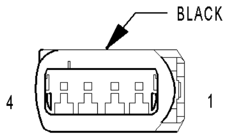
RIGHT FRONT DOOR SPEAKER (BASE) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	X54 18VT	RIGHT FRONT SPEAKER (+)
2	X56 18DB/RD	RIGHT FRONT SPEAKER (-)



RIGHT FRONT DOOR SPEAKER (PREMIUM) - BLACK 10 WAY

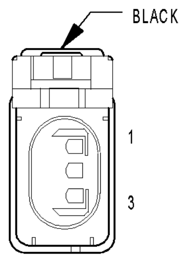
CAV	CIRCUIT	FUNCTION
1	X54 18VT	RIGHT FRONT SPEAKER (+)
2	X56 18DB/RD	RIGHT FRONT SPEAKER (-)
3	Z9 16BK	GROUND
4	X86 18OR/RD	AMPLIFIED HIGH RIGHT FRONT SPEAKER (-)
5	X92 18TN/BK	AMPLIFIED LOW RIGHT REAR SPEAKER (-)
6	X58 18DB/OR	RIGHT REAR DOOR SPEAKER (-)
7	X52 18DB/WT	RIGHT REAR DOOR SPEAKER (+)
8	X13 16BK/RD	RADIO CHOKE OUTPUT
9	X84 18TN/BK	AMPLIFIED HIGH RIGHT FRONT SPEAKER (+)
10	X94 18TN/VT	AMPLIFIED LOW RIGHT REAR SPEAKER (+)



RIGHT FRONT IMPACT SENSOR

RIGHT FRONT IMPACT SENSOR - BLACK 4 WAY

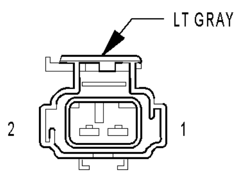
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R46 18BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
4	R48 18TN	RIGHT FRONT IMPACT SENSOR SIGNAL



RIGHT FRONT PARK/TURN SIGNAL LAMP

RIGHT FRONT PARK/ TURN SIGNAL LAMP - BLACK 3 WAY

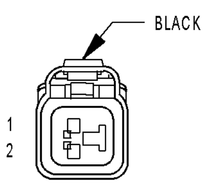
CAV	CIRCUIT	FUNCTION
1	L62 18BR/RD	RIGHT TURN SIGNAL
2	L78 18DG/YL (EXCEPT EXPORT)	FUSED PARK LAMP RELAY OUTPUT
3	Z142 18BK/WT	GROUND



RIGHT FRONT POWER WINDOW MOTOR (MIDLINE/HIGHLINE)

RIGHT FRONT POWER WINDOW MOTOR (MIDLINE/HIGHLINE) - LT GRAY 2 WAY

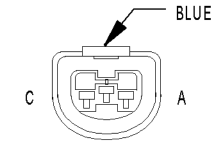
CAV	CIRCUIT	FUNCTION
1	Q22 16VT/WT	RIGHT FRONT WINDOW DRIVER DOWN
2	Q12 16BR	RIGHT FRONT WINDOW DRIVER UP



RIGHT FRONT WHEEL SPEED SENSOR (ABS)

RIGHT FRONT WHEEL SPEED SENSOR (ABS) - BLACK 2 WAY

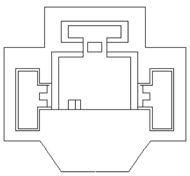
CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



RIGHT HEADLAMP (EXCEPT EXPORT)

RIGHT HEADLAMP (EXCEPT EXPORT) - BLUE 3 WAY

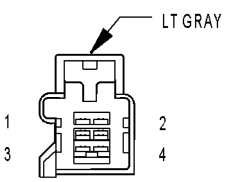
CAV	CIRCUIT	FUNCTION
A	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
B	Z142 18BK/WT	GROUND
C	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT



RIGHT HEADLAMP (EXPORT)

RIGHT HEADLAMP (EXPORT) - 3 WAY

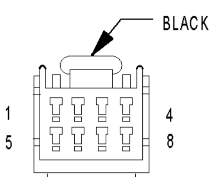
CAV	CIRCUIT	FUNCTION
1	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
2	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
3	Z142 18BK/WT	GROUND



RIGHT HEATED SEAT ASSEMBLY (HIGHLINE)

RIGHT HEATED SEAT ASSEMBLY (HIGHLINE) - LT GRAY 4 WAY

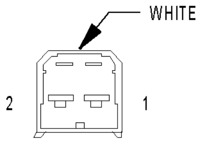
CAV	CIRCUIT	FUNCTION
1	F98 16RD/WT	PASSENGER HEATED SEAT FEED
2	Z238 16BK/WT	GROUND
3	P86 20PK/BK	HEATED SEAT TEMPERATURE SENSOR SIGNAL
4	P142 20TN/DB	PASSENGER HEATED SEAT TEMPERATURE SENSOR GROUND



RIGHT HEATED SEAT SWITCH (HIGHLINE)

RIGHT HEATED SEAT SWITCH (HIGHLINE) - BLACK 8 WAY

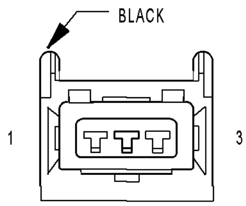
CAV	CIRCUIT	FUNCTION
1	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	P140 20VT/BK	RIGHT SEAT HIGH HEAT LED DRIVER
3	P134 20TN/LG	RIGHT SEAT HEATER SWITCH MUX
4	P138 20VT/LG	RIGHT SEAT LOW HEAT LED DRIVER
5	Z238 20BK/WT	GROUND
6	-	-
7	-	-
8	-	-



RIGHT INSTRUMENT PANEL SPEAKER

RIGHT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

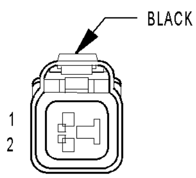
CAV	CIRCUIT	FUNCTION
1	X54 18VT (BASE/LOWLINE)	RIGHT FRONT SPEAKER (+)
1	X84 18TN/BK (MIDLINE/PREMIUM)	AMPLIFIED HIGH RIGHT FRONT SPEAKER (+)
2	X86 18OR/RD (MIDLINE/PREMIUM)	AMPLIFIED HIGH RIGHT FRONT SPEAKER (-)
2	X56 18DB/RD (BASE/LOWLINE)	RIGHT FRONT SPEAKER (-)



RIGHT LEVELING MOTOR (EXPORT)

RIGHT LEVELING MOTOR (EXPORT) - BLACK 3 WAY

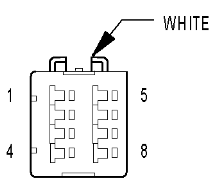
CAV	CIRCUIT	FUNCTION
1	Z142 18BK/WT	GROUND
2	L13 18BR/YL	HEADLAMP ADJUST SIGNAL
3	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT



RIGHT POSITION LAMP (EXPORT)

RIGHT POSITION LAMP (EXPORT) - BLACK 2 WAY

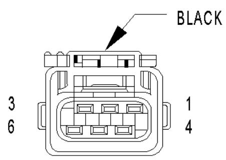
CAV	CIRCUIT	FUNCTION
1	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
2	Z142 18BK/WT	GROUND



RIGHT POWER MIRROR (EXCEPT BASE)

RIGHT POWER MIRROR (EXCEPT BASE) - WHITE 8 WAY

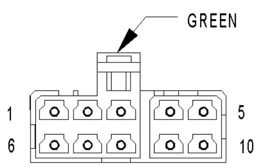
CAV	CIRCUIT	FUNCTION
1	P72 20YL/BK	RIGHT MIRROR UP DRIVER
2	P76 20OR/YL	MIRROR COMMON DRIVER
3	P74 20DB	RIGHT MIRROR LEFT DRIVER
4	-	-
5	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z351 20BK/LG	GROUND
7	P99 20GY (WITH FOLD)	FOLDING MIRROR FEED
8	P110 20YL (WITH FOLD)	FOLDING MIRROR RETURN



RIGHT POWER SEAT MOTORS (MIDLINE/HIGHLINE)

RIGHT POWER SEAT MOTORS (MIDLINE/HIGHLINE) - BLACK 6 WAY

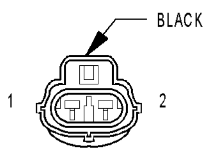
CAV	CIRCUIT	FUNCTION
1	P10 14YL/WT	PASSENGER SEAT REAR UP DRIVER
2	P12 14RD/WT	PASSENGER SEAT REAR DOWN DRIVER
3	P18 14YL/LG	PASSENGER SEAT FRONT UP DRIVER
4	P20 14RD/LG	PASSENGER SEAT FRONT DOWN DRIVER
5	P16 14RD/YL	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
6	P14 14YL/LB	PASSENGER SEAT HORIZONTAL FORWARD DRIVER



RIGHT POWER SEAT SWITCH (MIDLINE/HIGHLINE)

RIGHT POWER SEAT SWITCH (MIDLINE/HIGHLINE) - GREEN 10 WAY

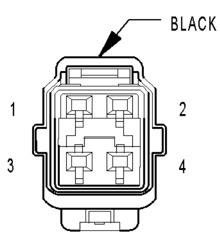
CAV	CIRCUIT	FUNCTION
1	Z238 14BK/WT	GROUND
2	-	-
3	P14 14YL/LB	PASSENGER SEAT HORIZONTAL FORWARD DRIVER
4	-	-
5	F37 14RD/LB	FUSED B(+)
6	P16 14RD/YL	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
7	P10 14YL/WT	PASSENGER SEAT REAR UP DRIVER
8	P18 14YL/LG	PASSENGER SEAT FRONT UP DRIVER
9	P20 14RD/LG	PASSENGER SEAT FRONT DOWN DRIVER
10	P12 14RD/WT	PASSENGER SEAT REAR DOWN DRIVER



RIGHT REAR DOOR AJAR SWITCH (BASE)

RIGHT REAR DOOR AJAR SWITCH (BASE) - BLACK 2 WAY

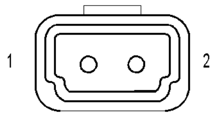
CAV	CIRCUIT	FUNCTION
1	G76 20TN/WT	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND



RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH (EXCEPT BASE)

RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE) - BLACK 4 WAY

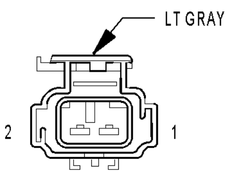
CAV	CIRCUIT	FUNCTION
1	G76 20TN/WT	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



RIGHT REAR
DOOR SPEAKER

RIGHT REAR DOOR SPEAKER - 2 WAY

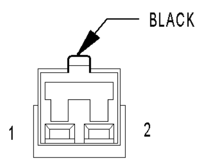
CAV	CIRCUIT	FUNCTION
1	X94 18TN/VT (PREMIUM)	AMPLIFIED LOW RIGHT REAR SPEAKER (+)
1	X52 18DB/WT (BASE)	RIGHT REAR DOOR SPEAKER (+)
2	X58 18DB/OR (BASE)	RIGHT REAR DOOR SPEAKER (-)
2	X92 18TN/BK (PREMIUM)	AMPLIFIED LOW RIGHT REAR SPEAKER (-)



RIGHT REAR
POWER WINDOW
MOTOR
(MIDLINE/HIGHLINE)

RIGHT REAR POWER WINDOW MOTOR (MIDLINE/HIGHLINE) - LT GRAY 2 WAY

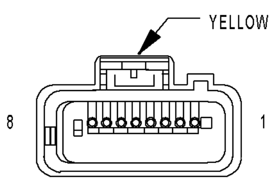
CAV	CIRCUIT	FUNCTION
1	Q24 16DG	RIGHT REAR WINDOW DRIVER DOWN
2	Q14 16GY	RIGHT REAR WINDOW DRIVER UP



RIGHT
REMOTE RADIO
SWITCH
(PREMIUM)

RIGHT REMOTE RADIO SWITCH (PREMIUM) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	X10 20RD/DB	RADIO CONTROL MUX RETURN
2	X20 20RD/BK	RADIO CONTROL MUX



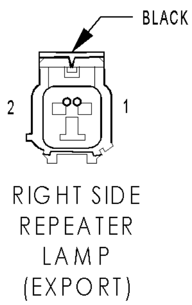
RIGHT SIDE IMPACT
AIRBAG CONTROL
MODULE (RSIACM)

RIGHT SIDE IMPACT AIRBAG CONTROL MODULE (RSIACM) - YELLOW 8 WAY

CAV	CIRCUIT	FUNCTION
1	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R76 18YL/DB	RIGHT CURTAIN SQUIB 1 LINE 2
4	R74 18YL/BR	RIGHT CURTAIN SQUIB 1 LINE 1
5	Z100 18BK/YL	GROUND
6	-	-
7	-	-
8	D25 18YL/VT	PCI BUS

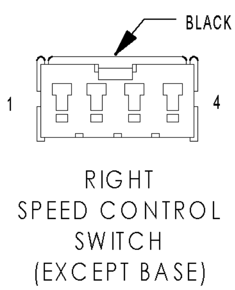
RIGHT SIDE MARKER LAMP (EXCEPT EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
2	L62 18BR/RD	RIGHT TURN SIGNAL



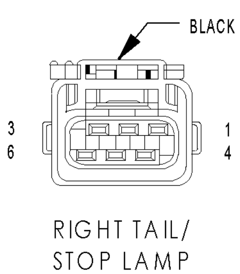
RIGHT SIDE REPEATER LAMP (EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	L62 18BR/RD	RIGHT TURN SIGNAL
2	Z142 18BK/WT	GROUND



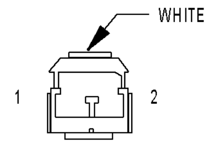
RIGHT SPEED CONTROL SWITCH (EXCEPT BASE) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



RIGHT TAIL/STOP LAMP - BLACK 6 WAY

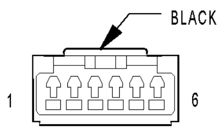
CAV	CIRCUIT	FUNCTION
1	L38 18BR/WT (EXPORT)	REAR FOG LAMP RELAY OUTPUT
2	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
4	L10 18BR/LG	BACK-UP LAMP FEED
5	Z151 18BK/WT	GROUND
6	L62 18BR/RD	RIGHT TURN SIGNAL



RIGHT VISOR/
VANITY LAMP
(EXCEPT BASE)

RIGHT VISOR/VANITY LAMP (EXCEPT BASE) - WHITE 2 WAY

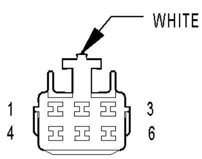
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M20 20BR	COURTESY LAMP LOAD SHED



SENTRY KEY
IMMOBILIZER
MODULE
(EXCEPT BASE)

SENTRY KEY IMMOBILIZER MODULE (EXCEPT BASE) - BLACK 6 WAY

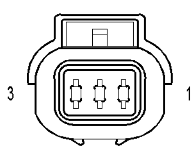
CAV	CIRCUIT	FUNCTION
1	F33 20PK/RD	FUSED B(+)
2	Z11 20BK/WT	GROUND
3	F1 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	Z110 20BK/TN	GROUND
5	D25 20YL/VT/BK	PCI BUS
6	-	-



SHIFTER
ASSEMBLY

SHIFTER ASSEMBLY - WHITE 6 WAY

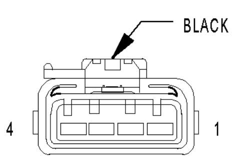
CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z21 20BK/LG	GROUND
3	T6 20VT/WT	OVERDRIVE OFF SWITCH SENSE
4	Z21 20BK/LG	GROUND
5	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
6	K29 20WT/PK	BRAKE SWITCH SENSE



SIREN
(EXPORT)

SIREN (EXPORT) - 3 WAY

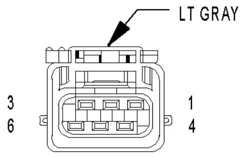
CAV	CIRCUIT	FUNCTION
1	Z142 18BK/WT	GROUND
2	X75 18DG	SIREN SIGNAL CONTROL
3	M1 18PK	FUSED B(+)



SPEED
CONTROL
SERVO

SPEED CONTROL SERVO - BLACK 4 WAY

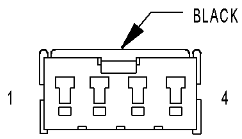
CAV	CIRCUIT	FUNCTION
1	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	Z212 18BK/OR	GROUND



SUNROOF MOTOR

SUNROOF MOTOR - LT GRAY 6 WAY

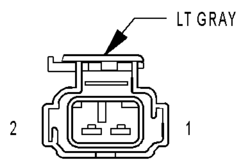
CAV	CIRCUIT	FUNCTION
1	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	Z111 16BK	GROUND
3	Q44 20BR	SUNROOF SWITCH GROUND
4	Q43 20VT	SUNROOF VENT
5	Q42 20LB	SUNROOF CLOSE
6	Q41 20WT	SUNROOF OPEN



SUNROOF SWITCH

SUNROOF SWITCH - BLACK 4 WAY

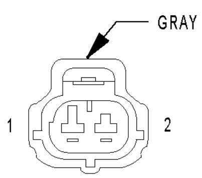
CAV	CIRCUIT	FUNCTION
1	Q41 20WT	SUNROOF OPEN
2	Q42 20LB	SUNROOF CLOSE
3	Q43 20VT	SUNROOF VENT
4	Q44 20BR	SUNROOF SWITCH GROUND



TAILGATE CYLINDER LOCK SWITCH

TAILGATE CYLINDER LOCK SWITCH - LT GRAY 2 WAY

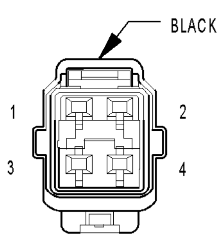
CAV	CIRCUIT	FUNCTION
1	G910 20VT/BR	TAILGATE SWITCH GROUND
2	G71 18VT/YL	TAILGATE CYLINDER LOCK SWITCH MUX



TAILGATE FLIP-UP AJAR SWITCH

TAILGATE FLIP-UP AJAR SWITCH - GRAY 2 WAY

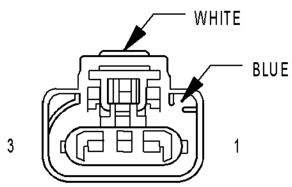
CAV	CIRCUIT	FUNCTION
1	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
2	Z235 18BK	GROUND



TAILGATE LOCK MOTOR/ AJAR SWITCH

TAILGATE LOCK MOTOR/ AJAR SWITCH - BLACK 4 WAY

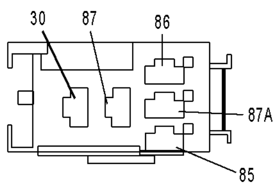
CAV	CIRCUIT	FUNCTION
1	P31 16PK/WT	TAILGATE UNLOCK DRIVER
2	P30 16OR/WT	TAILGATE LOCK DRIVER
3	G78 20TN/BK	TAILGATE AJAR SWITCH SENSE
4	G910 20VT/BR	TAILGATE SWITCH GROUND



THROTTLE POSITION SENSOR (GAS)

THROTTLE POSITION SENSOR (GAS) - WHITE/BLUE 3 WAY

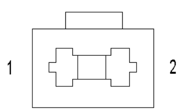
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL



TRAILER TOW BRAKE LAMP RELAY

TRAILER TOW BRAKE LAMP RELAY - 5 WAY

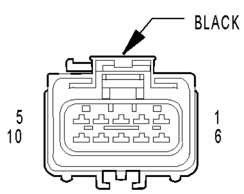
CAV	CIRCUIT	FUNCTION
30	A6 16RD/BK	FUSED B(+)
85	Z149 18BK/LB	GROUND
86	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
87	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	L76 16BK/OR	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRAILER TOW CIRCUIT BREAKER

TRAILER TOW CIRCUIT BREAKER - 2 WAY

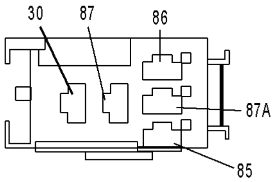
CAV	CIRCUIT	FUNCTION
1	A99 14RD/VT	FUSED B(+)
2	F71 14RD	FUSED B(+)



TRAILER TOW CONNECTOR

TRAILER TOW CONNECTOR - BLACK 10 WAY

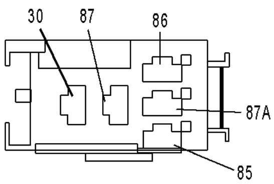
CAV	CIRCUIT	FUNCTION
1	-	-
2	L74 16PK/BK	RIGHT TURN SIGNAL
3	L10 18BR/LG	BACK-UP LAMP FEED
4	F73 14YL	TRAILER TOW RELAY OUTPUT
5	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
6	-	-
7	B40 14LB	TRAILER TOW BRAKE B(+)
8	Z149 16BK/LB	GROUND
9	Z149 16BK/LB	GROUND
10	L73 16PK/WT	LEFT TURN SIGNAL



TRAILER TOW LEFT TURN RELAY

TRAILER TOW LEFT TURN RELAY - 5 WAY

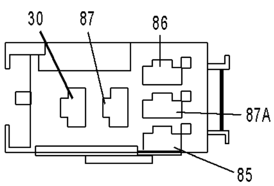
CAV	CIRCUIT	FUNCTION
30	L73 16PK/WT	LEFT TURN SIGNAL
85	Z149 18BK/LB	GROUND
86	L63 18DG/RD	LEFT TURN SIGNAL
87	L76 16BK/OR	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87	L76 16BK/OR	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRAILER TOW RELAY

TRAILER TOW RELAY - 5 WAY

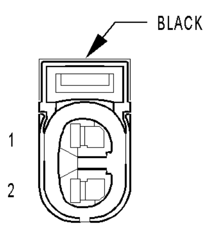
CAV	CIRCUIT	FUNCTION
30	F71 14RD	FUSED B(+)
85	Z149 18BK/LB	GROUND
86	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
87	F73 14YL	TRAILER TOW RELAY OUTPUT
87A	-	-



TRAILER TOW RIGHT TURN RELAY

TRAILER TOW RIGHT TURN RELAY - 5 WAY

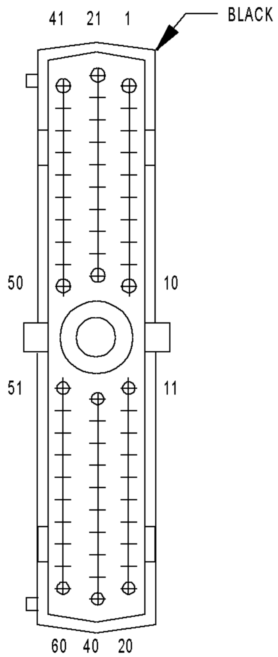
CAV	CIRCUIT	FUNCTION
30	L74 16PK/BK	RIGHT TURN SIGNAL
85	Z149 18BK/LB	GROUND
86	L62 18BR/RD	RIGHT TURN SIGNAL
87	L76 16BK/OR	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRANSFER CASE POSITION SENSOR

TRANSFER CASE POSITION SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K77 18BR/WT (GAS)	TRANSFER CASE POSITION SENSOR INPUT
1	K77 20BR/WT (DIESEL)	TRANSFER CASE POSITION SENSOR INPUT
2	K4 18BK/LB	SENSOR GROUND



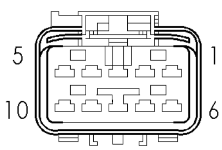
TRANSMISSION CONTROL MODULE

TRANSMISSION CONTROL MODULE - BLACK 60 WAY

CAV	CIRCUIT	FUNCTION
1	T1 18LG/BK	TRS T1 SENSE
2	T4 18PK/OR (EXCEPT 42RLE)	TRS T2 SENSE
3	T3 18VT	TRS T3 SENSE
4	-	-
5	-	-
6	K24 18GY/BK (3.7L)	CRANKSHAFT POSITION SENSOR SIGNAL
6	K244 20BR/WT (DIESEL)	ENGINE SPEED SIGNAL
7	D21 20PK (DIESEL)	SCI TRANSMIT
7	D21 18PK (3.7L)	SCI TRANSMIT
8	F45 18YL/BR (3.7L)	FUSED IGNITION SWITCH OUTPUT (START)
8	F45 18YL/RD (DIESEL)	FUSED IGNITION SWITCH OUTPUT (START)
9	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 18YL/DG (3.7L)	TORQUE MANAGEMENT REQUEST SENSE
10	T10 20YL/DG (DIESEL)	TORQUE MANAGEMENT REQUEST SENSE
11	F1 18DB (3.7L)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	F1 20DB (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	K22 18OR/DB (GAS)	THROTTLE POSITION SENSOR SIGNAL
12	K22 18OR/DB (DIESEL)	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
13	T13 18DB/BK	SPEED SENSOR GROUND
14	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
15	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
16	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
17	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
18	T591 18YL/DB (EXCEPT 42RLE)	PRESSURE CONTROL SOLENOID CONTROL
19	T119 18WT/DB	2C SOLENOID CONTROL
20	T20 18LB	LOW/REVERSE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	B22 20DG/YL (DIESEL)	VEHICLE SPEED OUTPUT
29	T29 18GY (EXCEPT 42RLE)	UNDERDRIVE PRESSURE SWITCH SENSE
30	T38 18VT/TN (EXCEPT 42RLE)	LINE PRESSURE SENSOR SIGNAL
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	T16 14RD (EXCEPT 42RLE)	TRANSMISSION CONTROL RELAY OUTPUT
37	Z113 14BK/YL (EXCEPT 42RLE)	GROUND
38	T39 18GY/LB (EXCEPT 42RLE)	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
39	Z113 14BK/YL (EXCEPT 42RLE)	GROUND
40	T140 18VT/LG (EXCEPT 42RLE)	PRESSURE CONTROL SOLENOID CONTROL
41	T411 18WT/PK	TRS T41 SENSE (P/N)
42	T42 18VT/WT	TRS T42 SENSE
43	D25 18VT/YL	PCI BUS
43	D25 20VT/YL	PCI BUS
44	-	-
45	-	-
46	D20 18LG	SCI RECEIVE

TRANSMISSION CONTROL MODULE - BLACK 60 WAY

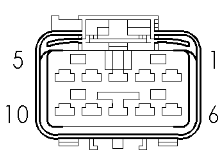
CAV	CIRCUIT	FUNCTION
47	T147 18LB (EXCEPT 42RLE)	2C PRESSURE SWITCH SENSE
47	T47 18DB (42RLE)	
48	T48 18DB	4C PRESSURE SWITCH SENSE
49	T6 18OR/WT	OVERDRIVE OFF SWITCH SENSE
50	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
51	K4 18BK/LB (3.7L)	SENSOR GROUND
52	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
53	Z112 14BK/LB (3.7L)	GROUND
53	Z112 14BK (DIESEL)	GROUND
54	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	T59 18PK (EXCEPT 42RLE)	UNDERDRIVE SOLENOID CONTROL
56	A30 14RD/WT	FUSED B(+)
57	Z113 14BK/YL	GROUND
58	-	-
59	T159 18DG/WT (EXCEPT 42RLE)	4C SOLENOID CONTROL
59	T59 18PK (42RLE)	
60	T60 18BR	OVERDRIVE SOLENOID CONTROL



TRANSMISSION RANGE SENSOR (42RLE)

TRANSMISSION RANGE SENSOR (42RLE) - 10 WAY

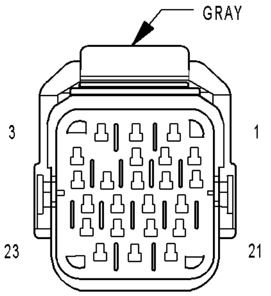
CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-
3	T13 18DB/BK	SPEED SENSOR GROUND
4	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
6	L1 18VT/BK	BACK-UP LAMP FEED
7	T1 18LG/BK	TRS T1 SENSE
8	T3 18VT	TRS T3 SENSE
9	T42 18VT/WT	TRS T42 SENSE
10	T411 18WT/PK	PARK/NEUTRAL SWITCH SIGNAL



TRANSMISSION SOLENOID/ PRESSURE SWITCH ASSEMBLY (42RLE)

TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY (42RLE) - 10 WAY

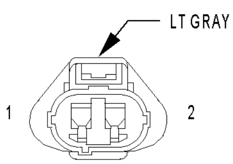
CAV	CIRCUIT	FUNCTION
1	T60 18BR	OVERDRIVE SOLENOID CONTROL
2	T59 18PK	UNDERDRIVE SOLENOID CONTROL
3	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
4	T19 18YL/DB	2-4 SOLENOID CONTROL
5	T47 18DB	2-4 PRESSURE SWITCH SENSE
6	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
7	T20 18LB	LOW/REVERSE SOLENOID CONTROL
8	-	-
9	-	-
10	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE



TRANSMISSION SOLENOID/TRS ASSEMBLY (A/T EXCEPT 42RLE)

TRANSMISSION SOLENOID/TRS ASSEMBLY (A/T EXCEPT 42RLE) - GRAY 23 WAY

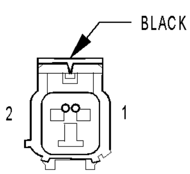
CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	T20 18LB	LOW/REVERSE SOLENOID CONTROL
3	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
4	T411 18WT/PK	TRS T41 SENSE (P/N)
5	T42 18VT/WT	TRS T42 SENSE
6	L10 18BR/LG	BACK-UP LAMP FEED
7	T60 18BR	OVERDRIVE SOLENOID CONTROL
8	T3 18VT	TRS T3 SENSE
9	T1 18LG/BK	TRS T1 SENSE
10	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
11	T48 18DB	4C PRESSURE SWITCH SENSE
12	T591 18YL/DB	PRESSURE CONTROL SOLENOID CONTROL
13	T4 18PK/OR	TRS T2 SENSE
14	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
15	T147 18LB	2C PRESSURE SWITCH SENSE
16	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
17	T59 18PK	UNDERDRIVE SOLENOID CONTROL
18	T29 18GY	UNDERDRIVE PRESSURE SWITCH SENSE
19	T159 18DG/WT	4C SOLENOID CONTROL
20	T119 18WT/DB	2C SOLENOID CONTROL
21	T140 18VT/LG	PRESSURE CONTROL SOLENOID CONTROL
22	T13 18DB/BK	SPEED SENSOR GROUND
23	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL



WASHER FLUID LEVEL SWITCH

WASHER FLUID LEVEL SWITCH - LT GRAY 2 WAY

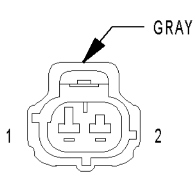
CAV	CIRCUIT	FUNCTION
1	G29 18BK/TN	LOW WASHER FLUID SENSE
2	Z141 18BK	GROUND



WASHER PUMP

WASHER PUMP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	V20 18BK/WT	WASHER MOTOR SENSE
2	V10 18BR	WASHER PUMP DRIVER



WATER IN FUEL SENSOR (DIESEL)

WATER IN FUEL SENSOR (DIESEL) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND

8W-91 CONNECTOR/GROUND/SPLICE LOCATION

TABLE OF CONTENTS

CONNECTOR/GROUND/SPLICE LOCATION

DESCRIPTION

This section provides illustrations identifying connector, ground, and splice locations in the vehicle. Connector, ground, and splice indexes are provided. Use the wiring diagrams in each section for connector, ground, and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
A/C Compressor Clutch	BK	At A/C Compressor	2, 20
A/C Heater Control C1	BK	Center of Dash, Behind A/C-Heater Controls	N/S
A/C Heater Control C2	WT	Center of Dash, Behind A/C-Heater Controls	N/S
A/C High Pressure Switch (Diesel)	GY	Left Front Side of Engine Compartment	20
A/C Low Pressure Switch (LHD)	GY	Left Rear Side of Engine Compartment	31
A/C Low Pressure Switch (RHD)	GY	Right Rear Side of Engine Compartment	24
A/C Pressure Transducer (2.4L)	BK	Front Side of Engine	12, 15
A/C Pressure Transducer (3.7L)	BK	Front Side of Engine	2
Accelerator Pedal Position Sensor (Diesel)	BK	Left Rear Side of Engine Compartment	19
Airbag Control Module C1 (ORC C1)	YL	Under Center Console	33, 37
Airbag Control Module C2 (ORC C2)	BK	Under Center Console	33, 37
Ambient Temperature Sensor	BK	Front of Engine Compartment	N/S
Antenna Module C1 (Export)		Above Right Quarter Window	44, 45
Antenna Module C2 (Export)		Above Right Quarter Window	N/S
Ash Receiver Lamp		Center of Dash	N/S
Back-Up Lamp Switch (2.4L)	BK	Right Side of Transmission	12
Back-Up Lamp Switch (M/T) (3.7L) (Diesel)	BK	Left Side of Transmission	7, 22
Battery Temperature Sensor	BK	Left Side of Engine Compartment	30

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Blend Door Actuator	BK	Behind Right Side of Instrument Panel	N/S
Blower Motor	BK	Behind Right Side of Instrument Panel	N/S
Blower Motor Resistor Block	BK	Behind Right Side of Instrument Panel	N/S
Body Control Module C1	GY	Under Left Side of Instrument Panel	N/S
Body Control Module C2	GY	Under Left Side of Instrument Panel	N/S
Body Control Module C3 (Premium)		Under Left Side of Instrument Panel	N/S
Boost Pressure Sensor (Diesel)		Left Side of Engine	22
Brake Lamp Switch	BK	At Brake Pedal	N/S
Brake Pressure Switch (ABS)	BK	On Master Cylinder	N/S
C100	GY	Left Kick Panel	32, 33, 37
C101 (2.4L)	BK	Left Side of Engine Compartment	11, 12
C102 (RHD)		Left Kick Panel	32
C103 (Gas)	BK	Right Rear Side of Engine Compartment	8, 9, 10, 13, 14, 16
C104	BK	Right Rear Side of Engine Compartment	8, 9, 10, 13, 14, 16, 17, 18
C105	GY	Right Rear Side of Engine Compartment	8, 9, 10, 13, 14, 16, 17, 18
C106	BK	Left Front Side of Engine Compartment	29
C107	BK	Left Front Side of Engine Compartment	N/S
C108 (Gas)	GY	Left Front Side of Engine	30
C110 (2.4L)	BK	Left Side of Engine	11, 12
C111 (Diesel)	LG	Right Rear Side of Engine Compartment	17, 18
C112 (Gas)	BK	Right Side of Engine Compartment	8, 9, 10, 13, 14, 31
C113 (Diesel)	LG	Left Rear Side of Engine Compartment	N/S
C114 (Diesel)	LG	Top of Engine	N/S
C201	BK	Behind Center of Instrument Panel	N/S
C202	YL	Behind Center of Instrument Panel	N/S
C300 (LHD)	OR	Left A-Pillar	35, 41
C300 (RHD)	OR	Right A-Pillar	39, 41
C301 (LHD)	OR	Left A-Pillar	35, 41
C301 (RHD)	OR	Right A-Pillar	39, 41

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
C302 (LHD)	OR	Right A-Pillar	34, 41, 42
C302 (RHD)	OR	Left A-Pillar	38, 41
C303 (LHD)	OR	Right A-Pillar	34, 41, 42
C303 (RHD)	OR	Left A-Pillar	38, 41
C304	DB	Right Mid B-Pillar	34, 39
C305	DB	Left Mid B-Pillar	35, 38
C306 (LHD)	WT	Left Lower B-Pillar	35, 43
C306 (RHD)	WT	Right Lower B-Pillar	39, 45
C307 (LHD)	LG	Left Lower B-Pillar	35, 38, 44
C308	LG	Left Rear Quarter Panel	43
C309	DB	Left Rear Quarter Panel	43, 46
C310	LG	Right Rear Quarter Panel	44, 45, 47
C311	LG	Left Front Seat	35, 38
C312 (Highline)	LG	Left Front Seat	35, 38
C313	LG	Right Front Seat	36, 39, 40
C314	LG	Right Front Seat	36, 39, 40
C315 (Midline/Highline) (LHD)	LG	Right Front Seat	34
C315 (Midline/Highline) (RHD)	LG	Left Front Seat	38
C317 (Except Export)	LG	On Rear Bumper	45
C318		Front of Roof in Light Bar Harness	49
Cabin Heater (Diesel)	BK	Right Front Side of Engine	21
Camshaft Position Sensor (2.4L)	BK	Top of Engine	N/S
Camshaft Position Sensor (3.7L)	LG	Right Side of Engine	4
Camshaft Position Sensor (Diesel)		Top of Engine	22
Capacitor (3.7L)	BK	Rear Side of Engine Compartment	9, 10
Capacitor (2.4L)	BK	Left Rear Side of Engine	11, 12
CD Changer	GN	At CD Changer	N/S
Center High Mounted Stop Lamp	WT	At Lamp	46
Cigar Lighter	RD	Behind Cigar Lighter	N/S
Clockspring C1	WT	Behind Steering Wheel	N/S
Clockspring C2	YL	Behind Steering Wheel	N/S
Clockspring C3	BK	At Steering Wheel	N/S
Clutch Interlock Switch (LHD)	BK	Left Rear Side of Engine Compartment	31
Clutch Interlock Switch (RHD)	BK	Right Rear Side of Engine Compartment	26
Coil On Plug No.1 (3.7L)	BK	Left Side of Engine Near Fuel Injector No.1	1
Coil On Plug No.2 (3.7L)	BK	Right Side of Engine Near Fuel Injector No.2	2
Coil On Plug No.3 (3.7L)	BK	Left Side of Engine Near Fuel Injector No.3	1

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Coil On Plug No.4 (3.7L)	BK	Right Side of Engine Near Fuel Injector No.4	2
Coil On Plug No.5 (3.7L)	BK	Left Side of Engine Near Fuel Injector No.5	1
Coil On Plug No.6 (3.7L)	BK	Right Side of Engine Near Fuel Injector No.6	2
Coil Rail (2.4L)	BK	Right Side of Engine	11, 12
Combination Flasher	WT	Under Left Side of Instrument Panel	N/S
Compass Mini-Trip Computer	BK	At Overhead Console	N/S
Controller Antilock Brake	BK	Left Side of Engine Compartment	30
Crankshaft Position Sensor (2.4L)	BK	Top of Engine	N/S
Crankshaft Position Sensor (3.7L)	BK	Right Lower Side of Engine	4
Crankshaft Position Sensor (Diesel)	BK	Right Rear Side of Engine	17
Data Link Connector	BK	Under Center of Instrument Panel	N/S
Dome Lamp (Base)	BK	On Headliner	N/S
Driver Airbag Squib 1	GY	In Steering Wheel	N/S
Driver Airbag Squib 2	BK	In Steering Wheel	N/S
Driver Seat Belt Switch	LG	At Drive Seat	N/S
Driver Seat Belt Tensioner (LHD)	YL	Lower Left B-Pillar	35
Driver Seat Belt Tensioner (RHD)	YL	Lower Right B-Pillar	39
EGR Solenoid		Right Rear Side of Engine Compartment	27
Engine Control Module C1	BK	Left Rear Side of Engine Compartment	19
Engine Control Module C2	BK	Left Rear Side of Engine Compartment	19
Engine Coolant Level Sensor (Diesel)	LG	Rear Side of Engine Compartment	18
Engine Coolant Temperature Sensor (Diesel)	BK	Left Side of Engine	20
Engine Coolant Temperature Sensor (Gas)	BK	Front Side of Engine	2
Engine Oil Pressure Sensor (2.4L)	BK	Top of Engine	N/S
Engine Oil Pressure Sensor (3.7L)	BK	Left Front Side of Engine	3
Engine Oil Pressure Sensor (Diesel)	BK	Right Rear Side of Engine	17
Engine Starter Motor		Right Front Side of Engine	20
Evap/Purge Solenoid	BK	At Solenoid	N/S
Flip-Up Glass Release Motor	BK	In Tailgate	46
Flip-Up Glass Release Switch	WT	In Tailgate	46
Front Washer Pump	BK	Right Front Side of Engine Compartment	28
Front Wiper Motor (LHD)	BK	Left Side of Cowl	24

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Front Wiper Motor (RHD)	BK	Right Side of Cowl	24
Fuel Heater (Diesel)	BK	Left Rear Side of Engine Compartment	19
Fuel Injector No.1 (Diesel)	BK	At Fuel Injector	23
Fuel Injector No.1 (Gas)	BK	At Fuel Injector	1
Fuel Injector No.2 (Diesel)	BK	At Fuel Injector	23
Fuel Injector No.2 (Gas)	BK	At Fuel Injector	2
Fuel Injector No.3 (Diesel)	BK	At Fuel Injector	23
Fuel Injector No.3 (Gas)	BK	At Fuel Injector	1
Fuel Injector No.4 (Diesel)	BK	At Fuel Injector	22
Fuel Injector No.4 (Gas)	BK	At Fuel Injector	2
Fuel Injector No.5 (3.7L)	BK	At Fuel Injector	1
Fuel Injector No.6 (3.7L)	BK	At Fuel Injector	2
Fuel Pressure Sensor (Diesel)		Left Side of Engine	22
Fuel Pressure Solenoid (Diesel)	BK	Left Side of Engine	20
Fuel Pump Module	LG	At Fuel Tank	N/S
Generator	BK	Left Front Side of Engine	20
Glow Plug Assembly (Diesel)		Top of Engine	N/S
Headlamp Leveling Switch (Export)	BK	Center of Instrument Panel	N/S
Heated Seat Module (Highline)	GN	At Left Seat	N/S
High Note Horn	BK	Left Front Side of Engine Compartment	29
Hood Ajar Switch		Right Side of Engine Compartment	25
Idle Air Control Motor	BK	On Throttle Body	1
Ignition Switch		At Steering Column	N/S
Input Speed Sensor (3.7L)	BK	Left Side of Transmission	5
Instrument Cluster	BK	Rear of Cluster	N/S
Intake Air Temperature Sensor	GY	Left Side of Intake Manifold	1
Intrusion Sensor (Export)	BK	Overhead Console	N/S
Junction Block Body Control Module - JB		Under Left Side of Instrument Panel	N/S
Junction Block C1	GY	Under Left Side of Instrument Panel	N/S
Junction Block C2	GN	Under Left Side of Instrument Panel	N/S
Junction Block C3	LB	Under Left Side of Instrument Panel	N/S
Knock Sensor (3.7L)	BK	Near Fuel Injector No.5	1
Leak Detection Pump	BK	Near Fuel Tank	N/S
Left Curtain Airbag	YL	Left Mid B-Pillar	35, 38
Left Cylinder Lock Switch	LG	In Left Front Door	41
Left Door Lock Switch	BK	In Left Front Door	41
Left Fog Lamp	BK	Left Side of Front Bumper	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Left Front Door Ajar Switch (Base)	BK	In Left Front Door	N/S
Left Front Door Lock Motor/Ajar Switch (Except Base)	BK	In Left Front Door	41
Left Front Door Speaker	BK	Behind Left Front Door Panel	41
Left Front Impact Sensor	BK	Front Side of Engine Compartment	28
Left Front Park/Turn Signal Lamp	BK	Behind Left Turn Signal Lamp	N/S
Left Front Power Window Motor	LG	In Left Front Door	41
Left Front Wheel Speed Sensor	BK	Left Side of Engine Compartment	30
Left Headlamp (Export)		Behind Left Headlamp	N/S
Left Headlamp (Except Export)	DB	Behind Left Headlamp	N/S
Left Heated Seat Assembly	LG	At Left Seat	N/S
Left Heated Seat Switch	BK	At Left Seat	N/S
Left Instrument Panel Lamp	BK	Left Side of Instrument Panel	N/S
Left Instrument Panel Speaker	BK	Left Side of Instrument Panel	33, 37
Left Leveling Motor (Export)	BK	At Left Headlamp	N/S
Left Position Lamp (Export)	BK	Left Front Side of Vehicle	N/S
Left Power Mirror	WT	In Left Front Door	41
Left Power Seat Motors	BK	At Left Seat	N/S
Left Power Seat Switch	GN	At Left Seat	N/S
Left Rear Door Ajar Switch (Base)	BK	In Left Rear Door	N/S
Left Rear Door Lock Motor/Ajar Switch (Except Base)	BK	In Left Rear Door	N/S
Left Rear Door Speaker		In Left Rear Door	
Left Rear Power Window Motor	LG	In Left Rear Door	N/S
Left Remote Radio Switch	BK	On Steering Wheel	N/S
Left Side Impact Airbag Control Module (LSIACM)	YL	Left Lower B-Pillar	35, 38
Left Side Marker Lamp	BK	Left Front Fender	N/S
Left Side Repeater Lamp (Export)	BK	Left Front Fender	N/S
Left Speed Control Switch	BK	On Steering Wheel	N/S
Left Tail/Stop Lamp	BK	Left Rear Quarter Panel	45
Left Visor/Vanity Lamp	WT	Left Front of Headliner	N/S
License Lamp (Export)	LG	In Tailgate	46
License Lamp (Except Export)	LG	On Bumper	N/S
Light Bar Lamp No.1		Front of Roof in Light Bar Harness	49
Light Bar Lamp No.2		Front of Roof in Light Bar Harness	49
Light Bar Lamp No.3		Front of Roof in Light Bar Harness	49

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Light Bar Lamp No. 4		Front of Roof in Light Bar Harness	49
Light Bar Switch		Near Instrument Cluster	N/S
Line Pressure Sensor (3.7L)	BK	Right Side of Transmission	6
Low Note Horn	BK	Left Front Side of Engine Compartment	29
Manifold Absolute Pressure Sensor	BK	Front Side of Engine	2
Mass Air Flow Sensor (Diesel)		Top of Engine	21
Multi-Function Switch C1	GY	At Steering Column	N/S
Multi-Function Switch C2	GY	At Steering Column	N/S
Output Speed Sensor	BK	Left Side of Transmission	5
Overhead Map/Courtesy Lamp	BK	Overhead Console	N/S
Oxygen Sensor 1/1 Upstream (2.4L)	BK	Right Side of Engine	12
Oxygen Sensor 1/1 Upstream (3.7L)	BK	Lower Left Side of Engine	3
Oxygen Sensor 1/2 Downstream (2.4L)	NAT	Right Side of Transmission	11, 12
Oxygen Sensor 1/2 Downstream (3.7L)	NAT	Left Side of Transmission	5, 7
Oxygen Sensor 2/1 Upstream (3.7L)	BK	Lower Right Side of Engine	4
Oxygen Sensor 2/2 Downstream (3.7L)	NAT	Right Side of Transmission	6
Park Brake Switch	BK	Center Console	36, 40
Passenger Airbag	YL	Right Side Instrument Panel	N/S
Passenger Seat Belt Switch	LG	At Passenger Seat	N/S
Power Mirror Switch	WT	In Left Front Door	41
Power Outlet	RD	Center of Instrument Panel	N/S
Power Steering Pressure Switch	BK	Left Front Side of Engine	3, 15
Power Window Master Switch	LG	Center Console	36, 40
Powertrain Control Module C1 (2.4L)	BK	At Powertrain Control Module	13, 14
Powertrain Control Module C1 (3.7L)	BK	At Powertrain Control Module	8, 9, 10
Powertrain Control Module C2	WT	At Powertrain Control Module	8, 9, 10, 13, 14
Powertrain Control Module C3	GY	At Powertrain Control Module	31
Radiator Fan Motor	BK	Right Front Side of Engine Compartment	28
Radiator Fan Relay	BK	Left Front Side of Engine Compartment	29
Radio C1	GY	Rear of Radio	N/S
Radio C2		Rear of Radio	N/S
Radio C3		Rear of Radio	N/S
Radio Choke	GY	Center of Instrument Panel	N/S
Rear Map/Reading Lamp	BK	Overhead Console	N/S
Rear Power Outlet	RD	Right Rear Quarter Panel	44, 45, 48
Rear Power Window Switch	WT	Center Console	36, 40
Rear Wheel Speed Sensor	BK	On Rear Axle	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Rear Window Defogger	BK	At Rear Window	46
Rear Wiper Motor	BK	In Tailgate	46
Red Brake Warning Indicator Switch (LHD)	GY	Left Rear Side of Engine Compartment	31
Red Brake Warning Indicator Switch (RHD)	GY	Right Rear Side of Engine Compartment	26
Right Curtain Airbag	YL	Right Mid B-Pillar	34, 39
Right Cylinder Lock Switch (Except Base)	LG	In Right Front Door	41
Right Door Lock Switch (Except Base)	BK	In Right Front Door	41
Right Fog Lamp	BK	Right Side of Bumper	N/S
Right Front Door Ajar Switch (Base)	BK	In Right Front Door	N/S
Right Front Door Lock Motor/Ajar Switch (Except Base)	BK	In Right Front Door	41
Right Front Door Speaker	BK	In Right Front Door	41
Right Front Impact Sensor	BK	Right Front Side of Engine Compartment	28
Right Front Park/Turn Signal Lamp	BK	At Lamp	N/S
Right Front Power Window Motor	LG	In Right Front Door	41
Right Front Wheel Speed Sensor	BK	Right Rear Lower Side of Engine Compartment	25
Right Headlamp (Export)		Right Front Side of Engine Compartment	N/S
Right Headlamp (Except Export)	DB	Right Front Side of Engine Compartment	N/S
Right Heated Seat Assembly	LG	At Right Seat	N/S
Right Heated Seat Switch	BK	At Right Seat	N/S
Right Instrument Panel Lamp	BK	Right Side of Instrument Panel	N/S
Right Instrument Panel Speaker	WT	Right Side of Instrument Panel	33, 37
Right Leveling Motor (Export)	BK	At Right Headlamp	N/S
Right Position Lamp (Export)	BK	Right Front Corner of Vehicle	N/S
Right Power Mirror	WT	In Right Front Door	41
Right Power Seat Motors	BK	At Right Seat	N/S
Right Power Seat Switch	GN	At Right Seat	N/S
Right Rear Door Ajar Switch (Base)	BK	In Right Rear Door	N/S
Right Rear Door Lock Motor/Ajar Switch (Except Base)	BK	In Right Rear Door	42
Right Rear Door Speaker		At Speaker	42
Right Rear Power Window Motor	LG	In Right Rear Door	42
Right Remote Radio Switch	BK	On Steering Wheel	N/S
Right Side Impact Airbag Control Module (RSIACM)	YL	Lower Right B-Pillar	34, 39

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/NUMBER	COLOR	LOCATION	FIG.
Right Side Marker Lamp	BK	Right Front Fender	N/S
Right Side Repeater Lamp (Export)	BK	Right Front Fender	N/S
Right Speed Control Switch	WT	On Steering Wheel	N/S
Right Tail/Stop Lamp	BK	Right Rear Quarter Panel	45
Right Visor/Vanity Lamp	WT	On Visor	N/S
Sentry Key Immobilizer Module	BK	Under Left Side of Instrument Panel	N/S
Shifter Assembly	WT	Center Console	36, 40
Siren (Export)		Right Front Side of Engine Compartment	28
Speed Control Servo	BK	Right Rear Side of Engine Compartment	27
Sunroof Motor	LG	Overhead Console	N/S
Sunroof Switch	BK	Overhead Console	N/S
Tailgate Cylinder Lock Switch	LG	In Tailgate	46
Tailgate Flip-Up Ajar Switch	GY	In Tailgate	46
Tailgate Lock Motor/Ajar Switch	BK	In Tailgate	46
Throttle Position Sensor	WT	On Throttle Body	1
Trailer Tow Brake Lamp Relay		Right Quarter Panel	47
Trailer Tow Circuit Breaker		Right Quarter Panel	N/S
Trailer Tow Connector	BK	At Trailer Hitch	47, 48
Trailer Tow Right Turn Relay		Right Quarter Panel	47
Trailer Tow Relay		Right Quarter Panel	47
Trailer Tow Left Turn Relay		Right Quarter Panel	47
Transfer Case Position Sensor	BK	Rear Side of Transmission	5, 7, 11, 12, 22
Transmission Control Module (3.7L) (LHD)	BK	Right Rear Side of Engine Compartment	8, 9
Transmission Control Module (3.7L) (RHD)	BK	Left Rear Side of Engine Compartment	10
Transmission Solenoid/TRS Assembly (3.7L)	GY	Left Side of Transmission	5
Under Hood Lamp	BK	Underside of Hood	24
Washer Fluid Level Switch	LG	At Washer Fluid Reservoir	28
Water In Fuel Sensor (Diesel)		Left Rear Side of Engine Compartment	19

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

GROUNDS

GROUND NUMBER	LOCATION	FIG.
G100	Left Side of Engine Compartment	8, 9, 10, 14, 19
G101 (2.4L)	Left Side of Engine Compartment	11
G102 (LHD)	Right Rear Side of Engine Compartment	9
G102 (RHD)	Left Rear Side of Engine Compartment	10
G103 (3.7L)	Right Front Side of Engine	4
G103 (Diesel)	Right Front Side of Engine	20
G104	Near Engine Control Module C2	19
G105	Left Side of Engine Compartment	N/S
G106	Left Side of Engine Compartment	N/S
G110	Left Side of Engine Compartment	30
G111	Left Front Side of Engine Compartment	29
G112	Left Front Side of Engine Compartment	29
G200	Near Body Control Module	N/S
G201	Under Center Console	33, 37
G202	Left Kick Panel (Black Connector)	N/S
G203	Under Center of Instrument Panel	N/S
G300	Left Front Seat	35
G301	Under Center Console	N/S
G302	Right Front Seat	39
G303	Quarter Panel	43, 44, 45
G320	At Fuel Tank	N/S

SPLICES

SPLICE NUMBER	LOCATION	FIG.
S101	Near T/O to Power Distribution Center	N/S
S104	Near T/O to Power Distribution Center	N/S
S106	Near T/O for G112	N/S
S107 (Diesel)	In T/O for C100	32
S108	Near T/O for C106	29
S109	In Trough Near T/O for Radiator Fan Relay	N/S
S110	Near T/O for C106	29
S111	In Trough Near T/O for Radiator Fan Relay	N/S
S112	Near T/O to Power Distribution Center	N/S
S113 (LHD)	In T/O for C100	32
S114	In T/O for C100	N/S
S115	Near T/O for Engine Control Module	N/S
S118	In T/O for C100	32
S121	Near T/O to Power Distribution Center	N/S
S122	In T/O for Controller Antilock Brake	30
S123	In Trough, Front of Engine Compartment	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S124	In T/O for Junction Block C3	N/S
S125	In T/O for Junction Block C3	N/S
S130	Near T/O for Left Headlamp	N/S
S131	In T/O for Right Headlamp	N/S
S140	Near T/O for Left Front Park/Turn Signal Lamp	N/S
S141	Near T/O for Left Fog Lamp	N/S
S142	Near T/O for Left Front Park/Turn Signal Lamp	N/S
S143	Near T/O for Right Front Park/Turn Signal Lamp	N/S
S144	Near T/O for Left Fog Lamp	N/S
S145	Near T/O for Right Front Park/Turn Signal Lamp	N/S
S146	Near T/O for Right Front Park/Turn Signal Lamp	N/S
S147	Front Lighting Harness	N/S
S148	Front Lighting Harness	N/S
S149	Front Lighting Harness	N/S
S151 (2.4L)	Near T/O for C110	11, 12
S151 (3.7L)	In Trough Near T/O for Fuel Injector No.3	1
S151 (Diesel)	In Trough Near T/O for Accelerator Pedal Position Sensor	19
S152	In Trough Near T/O for Fuel Injector No.4	2
S153 (2.4L)	Near T/O for Coil Rail	11, 12
S153 (3.7L)	Near T/O for Idle Air Control Motor	1
S153 (Diesel)	In Trough Near T/O for Generator	20, 23
S154	Near T/O for Engine Starter Motor	2, 4, 20
S155	Near T/O for Knock Sensor	1
S156 (2.4L)	In Trough Near T/O for C112	13, 14
S156 (3.7L)	Near T/O for Powertrain Control Module C1	8
S156 (Diesel)	Near T/O for A/C Compressor Clutch	20
S157	Near T/O for Oxygen Sensor 2/2 Downstream	N/S
S158	In Trough Near T/O for C112	8
S159	Near T/O for Knock Sensor	1, 8
S160	In T/O for C104	10
S161	Near T/O for Oxygen Sensor 1/2 Downstream	5, 7
S163	In T/O for Transmission Control Module	10
S164	In Trough on Right Rear Side of Engine Compartment	10
S165	In Trough on Right Rear Side of Engine Compartment	10
S167	In T/O for Transmission Control Module	10
S168	Near T/O for Fuel Injector No.6	2
S169 (2.4L)	Near T/O for C101	11
S169 (3.7L)	Near T/O for Oxygen Sensor 1/1 Upstream	1, 3
S169 (Diesel)	Near T/O for Generator	20
S170	Near T/O for C103	8, 13, 16
S175	In Trough on Top of Engine	22, 23
S177	In Trough Near T/O for G100	19

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S178	Near T/O for Oxygen Sensor 2/2 Downstream	6
S180	Near T/O for C103	8
S181	In Trough Near T/O for G100	19
S184	Near T/O for Powertrain Control Module C1	8
S185	Near T/O for Fuel Pressure Solenoid	20
S186	In T/O for Engine Control Module C1	19
S194	In T/O for Junction Block C3	32
S199	Neat T/O for Accelerator Pedal Position Sensor	19
S200	Near T/O for C201	N/S
S201	Near T/O for Left Instrument Panel Lamp	N/S
S204	Near T/O for Data Link Connector	N/S
S205	In T/O for C100	N/S
S206	Near T/O for Multifunction Switch C2	N/S
S207	In T/O for C100	N/S
S208	Near T/O for G202	N/S
S210	Near T/O for Left Instrument Panel Lamp	N/S
S212	Near T/O for Diagnostic Junction Port	N/S
S213	Near T/O for Diagnostic Junction Port	N/S
S214	Near T/O for Airbag Control Module C1 (ORC C1)	N/S
S215	Near T/O for Multifunction Switch C2	N/S
S216	In T/O for Instrument Cluster	N/S
S217	Near T/O for Multifunction Switch C2	N/S
S218	Near T/O for Multifunction Switch C2	N/S
S219	In T/O for Junction Block C3	N/S
S220	In T/O for Junction Block C3	N/S
S221	Near T/O for Left Speed Control Switch	N/S
S222	Near T/O for Right Speed Control Switch	N/S
S223	Near T/O for Left Remote Radio Switch	N/S
S224	Near T/O for Right Remote Radio Switch	N/S
S225	Near T/O for G203	32
S230	In T/O for A/C Heater Control C1	N/S
S300 (LHD)	Near T/O for C309	43
S300 (RHD)	Near T/O for C310	45
S301	In T/O For Radio C1	N/S
S302	Near T/O for Rear Power Outlet	45
S303	Near T/O for Shifter Assembly	36
S304	Near T/O for License Lamp	45
S306 (LHD)	Near T/O for G315	44
S306 (RHD)	In T/O for C319	45
S308 (LHD)	Near T/O for C309	43
S308 (RHD)	Near T/O for Rear Power Outlet	45
S310	Near T/O for C310	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S312	Near T/O for G315	N/S
S313	In T/O for Trailer Tow Relays	47
S314	In T/O for Trailer Tow Relays	47
S318 (LHD)	Near T/O for G309	35
S318 (RHD)	In T/O for C201	39
S319 (LHD)	Near T/O for C201	33
S319 (RHD)	Near T/O for Left Instrument Panel	37
S322	Near T/O for Left Instrument Panel	33, 37
S323 (LHD)	Near T/O for Left Instrument Panel	33
S323 (RHD)	Near T/O for Right Instrument Panel Speaker	37
S324 (Premium)	Near T/O for Right Instrument Panel Speaker	33, 37
S325	Near T/O for C201	33, 37
S326	Near T/O for Heated Seat Module	N/S
S327	Near T/O for Left Heated Seat Assembly	N/S
S328	In T/O for Heated Seat Module	N/S
S329	Near T/O for Right Heated Seat Switch	N/S
S331	Near T/O for Shifter Assembly	N/S
S333 (LHD)	Near T/O for G300	35
S333 (RHD)	Near T/O for C307	38
S334	Near T/O for G302	34, 39
S336 (LHD)	Near T/O for Left Instrument Panel	33
S336 (RHD)	Near T/O for Right Instrument Panel Speaker	37
S338	Near T/O for C201	33, 37
S340	Near T/O for C201	33
S341	Near T/O for C201	33
S342 (Base)	Near T/O for Right Instrument Panel Speaker	33
S344	Near T/O for Right Instrument Panel Speaker	33
S346	In T/O for Trailer Tow Relays	47
S347	Near T/O for Right Tail/Stop Lamp	45
S348	Near T/O for Right Tail/Stop Lamp	45
S349	Near T/O for License Lamp	45
S350	Near T/O for License Lamp	45
S351	In T/O for Rear Window Defogger	46
S352	In T/O for Rear Window Defogger	N/S
S353	Between T/O for Light Bar Lamp No.2 and Light Bar Lamp No.3	49
S354	Near T/O for Light Bar Lamp No.3	49
S356	Near T/O for Center High Mounted Stop Lamp	N/S
S358	Near T/O for Light Bar Lamp No.3	49
S359	Near T/O for Light Bar Lamp No.2	49
S360	Near T/O for Left Power Mirror	41
S361	Near T/O for Left Power Mirror	41

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S362	Near T/O for Power Mirror Switch	41
S363	Near T/O for Left Front Door Speaker	N/S
S364	Near T/O for Left Front Door Speaker	N/S
S370	Near T/O for Right Power Mirror	41
S371	Near T/O for Right Door Lock Switch	41
S372	Near T/O for Right Front Door Speaker	N/S
S373	Near T/O for Right Front Door Speaker	N/S
S377 (RHD)	Near T/O for Right Door Lock Switch	41
S378 (RHD)	Near T/O for Right Front Power Window Motor	41
S379 (RHD)	In Rear Body Harness near T/O for C310	45
S380	Near T/O for Rear Wiper Motor	N/S
S381	Near T/O for Tailgate Cylinder Lock Switch	N/S
S382	Near T/O for License Lamp	N/S
S390	Near T/O for Intrusion Sensor	N/S
S391	Near T/O for Left Visor/Vanity Lamp	N/S
S392	Near T/O for Left Visor/Vanity Lamp	N/S
S393	Near T/O for Intrusion Sensor	N/S
S394	Near T/O for Rear Map/Reading Lamp	N/S
S395	Neat T/O for Rear Map/Reading Lamp	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

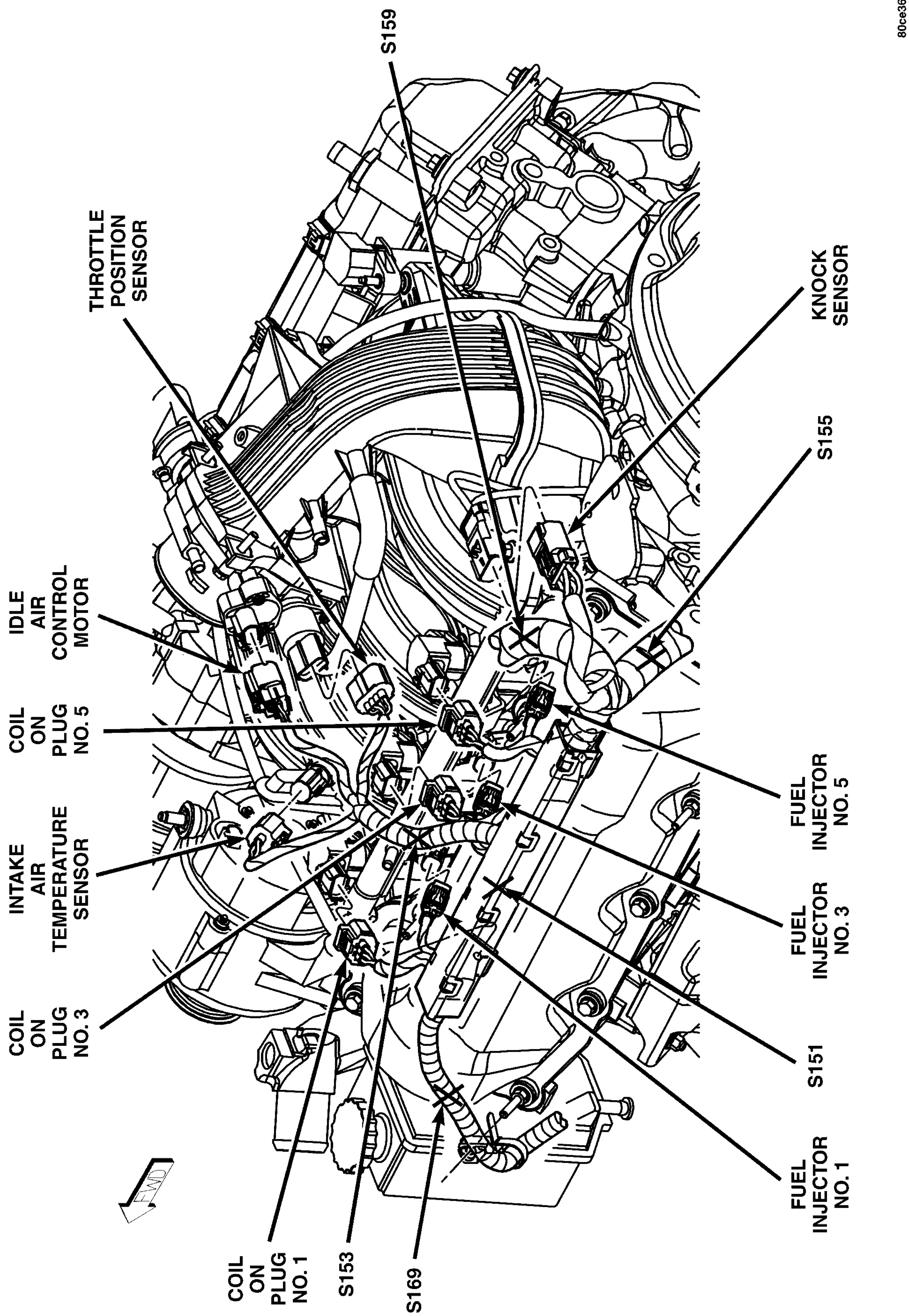


Fig. 1 LEFT SIDE ENGINE, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

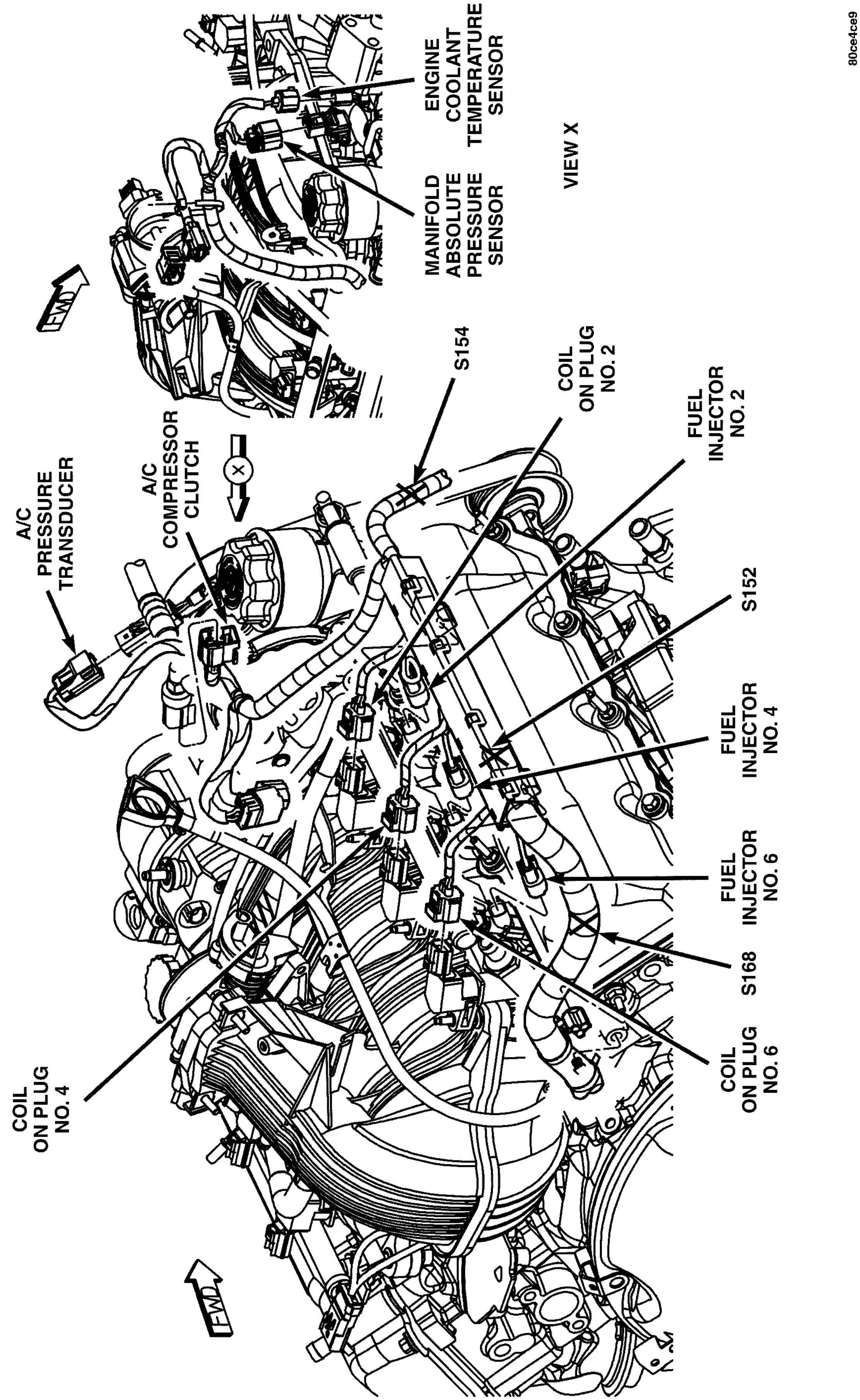


Fig. 2 RIGHT SIDE ENGINE, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

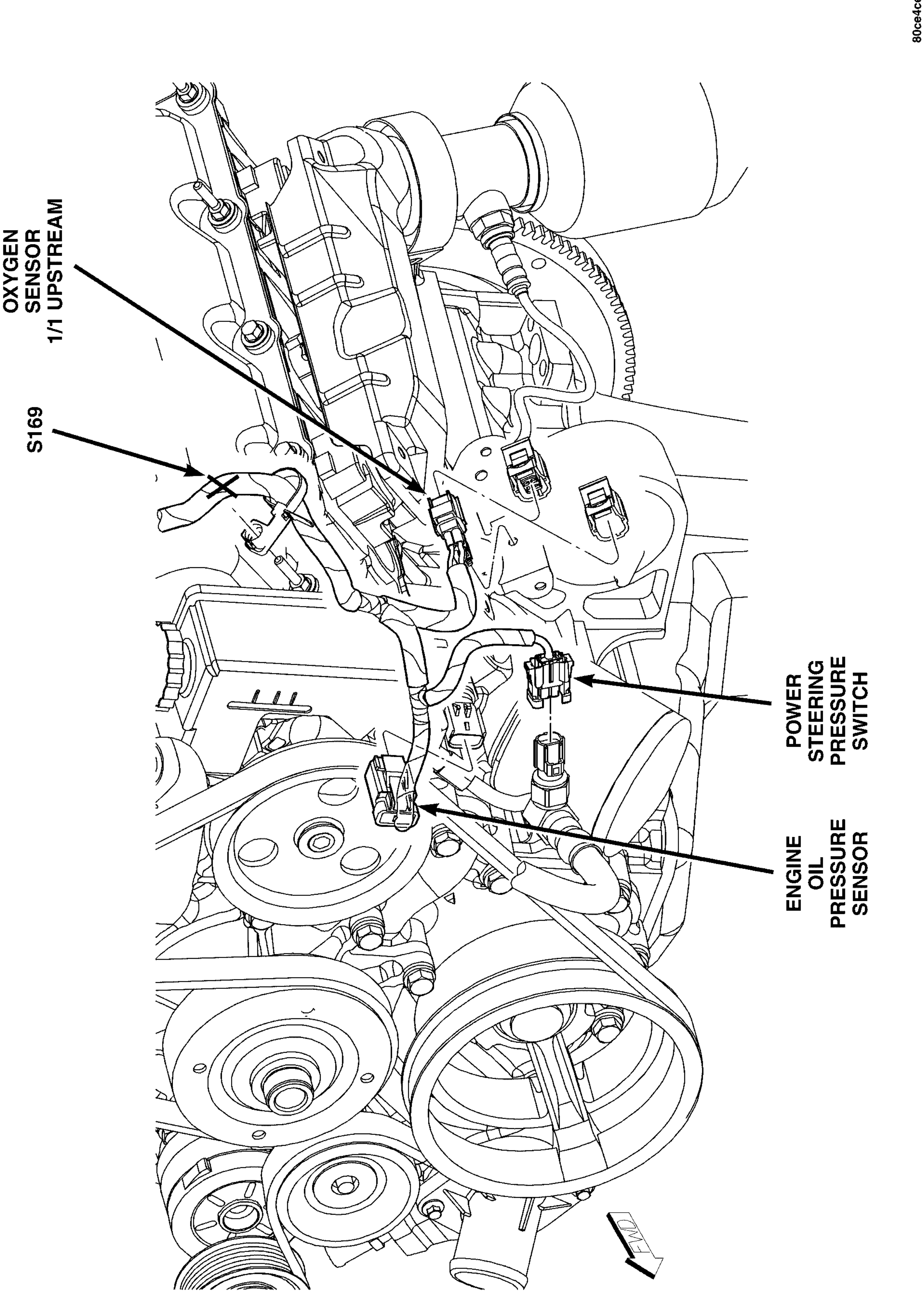


Fig. 3 LOWER LEFT ENGINE, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

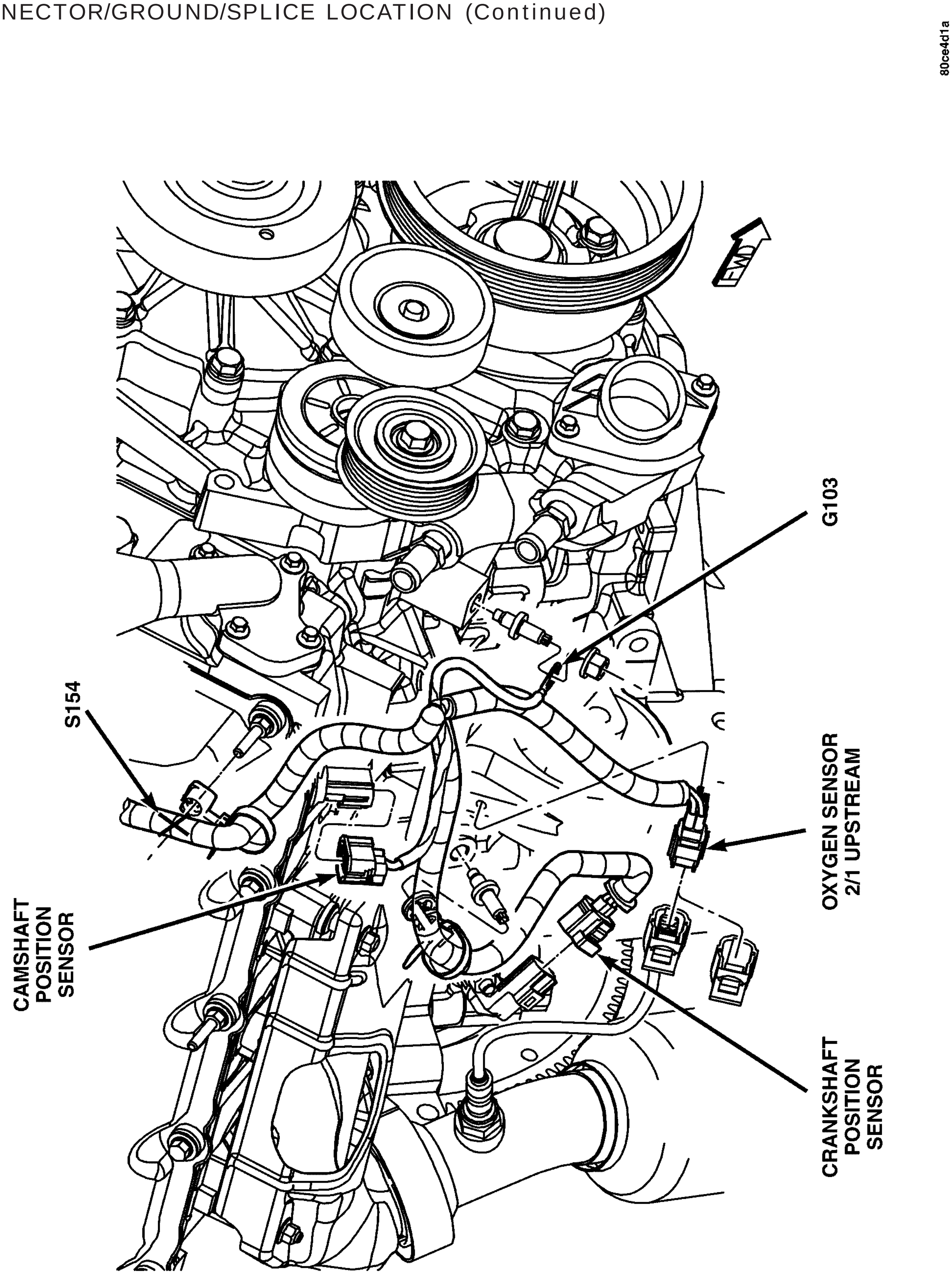


Fig. 4 LOWER RIGHT ENGINE, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

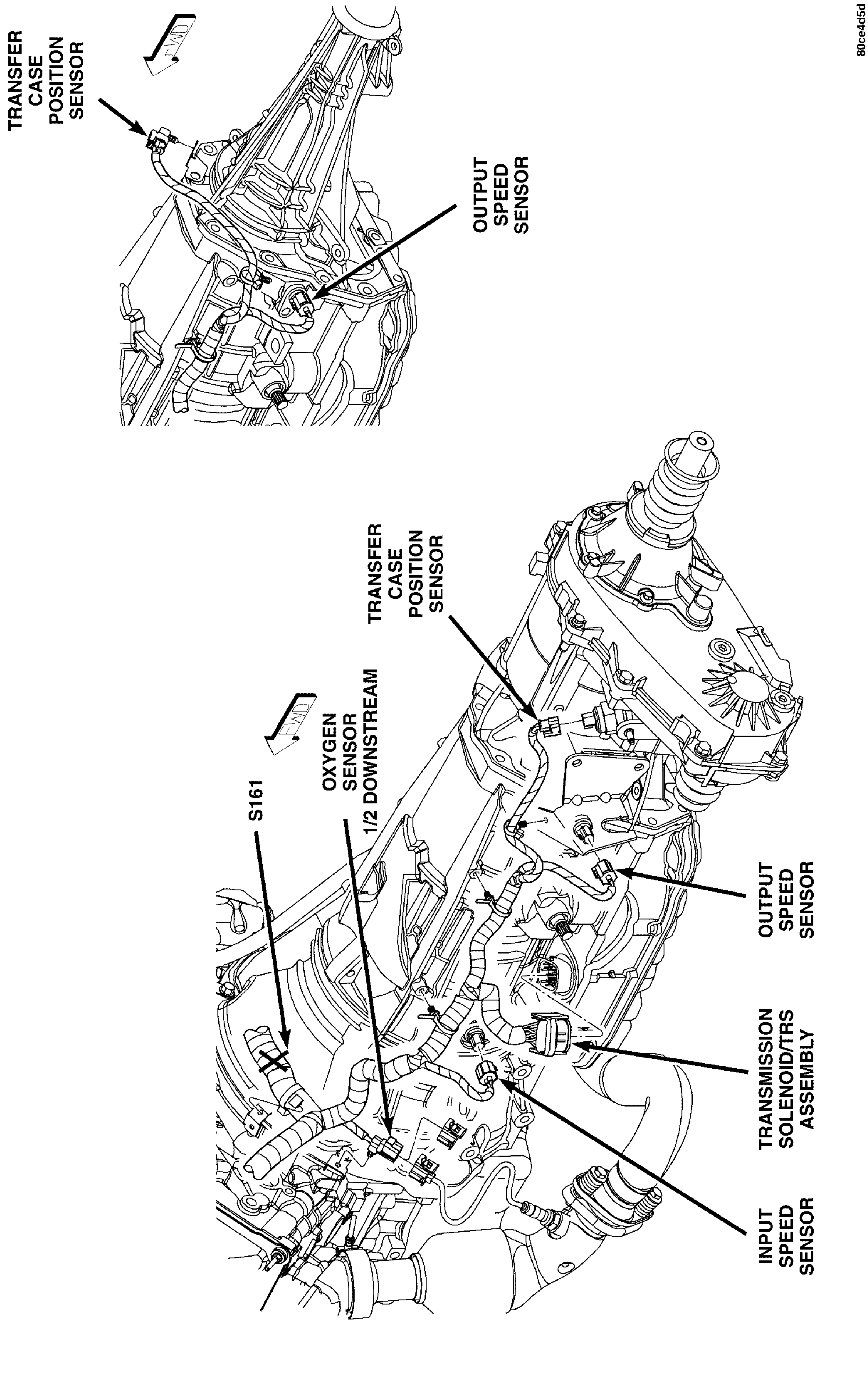


Fig. 5 LEFT SIDE TRANSMISSION, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

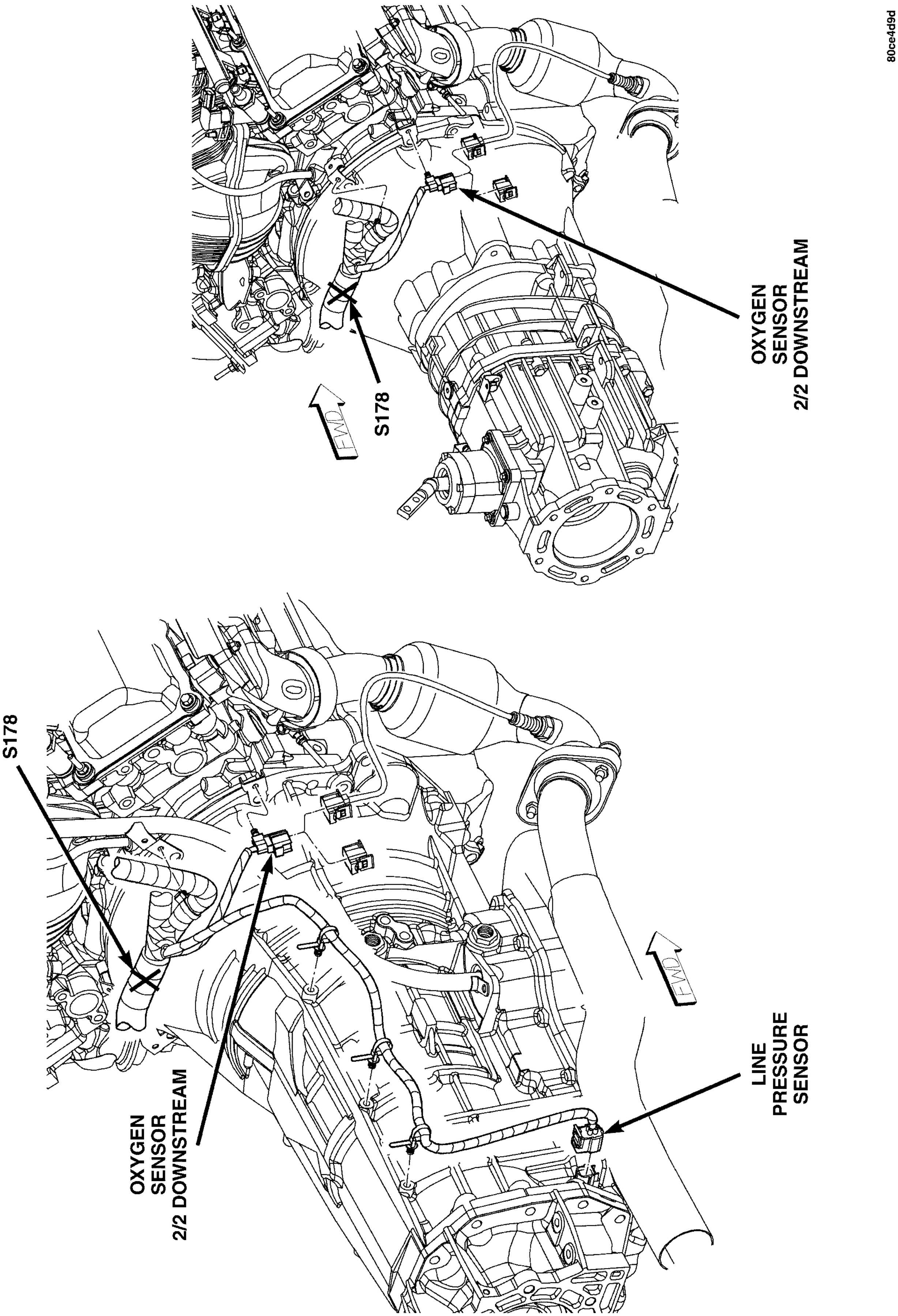


Fig. 6 RIGHT SIDE TRANSMISSION, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

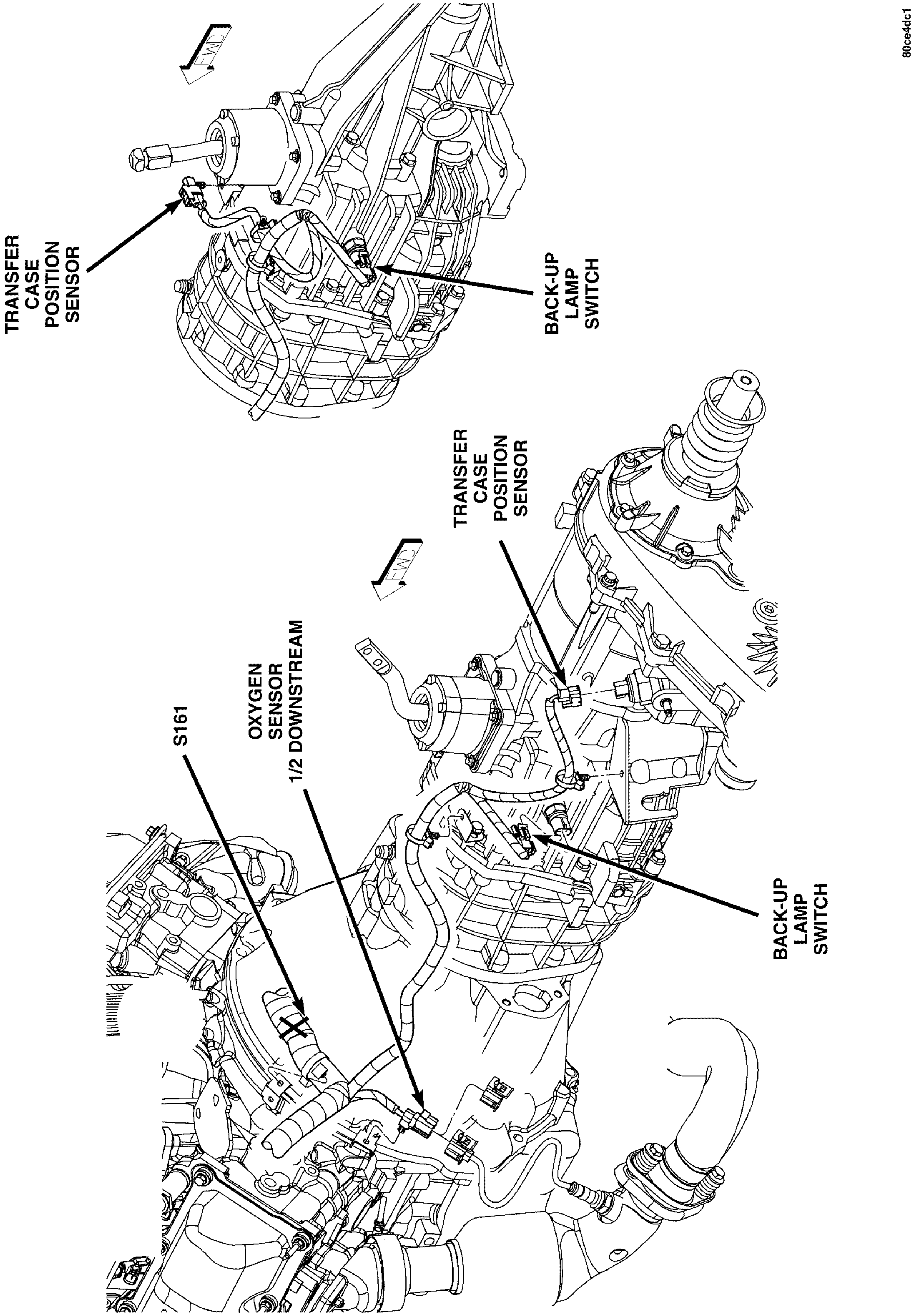


Fig. 7 MANUAL TRANSMISSION, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

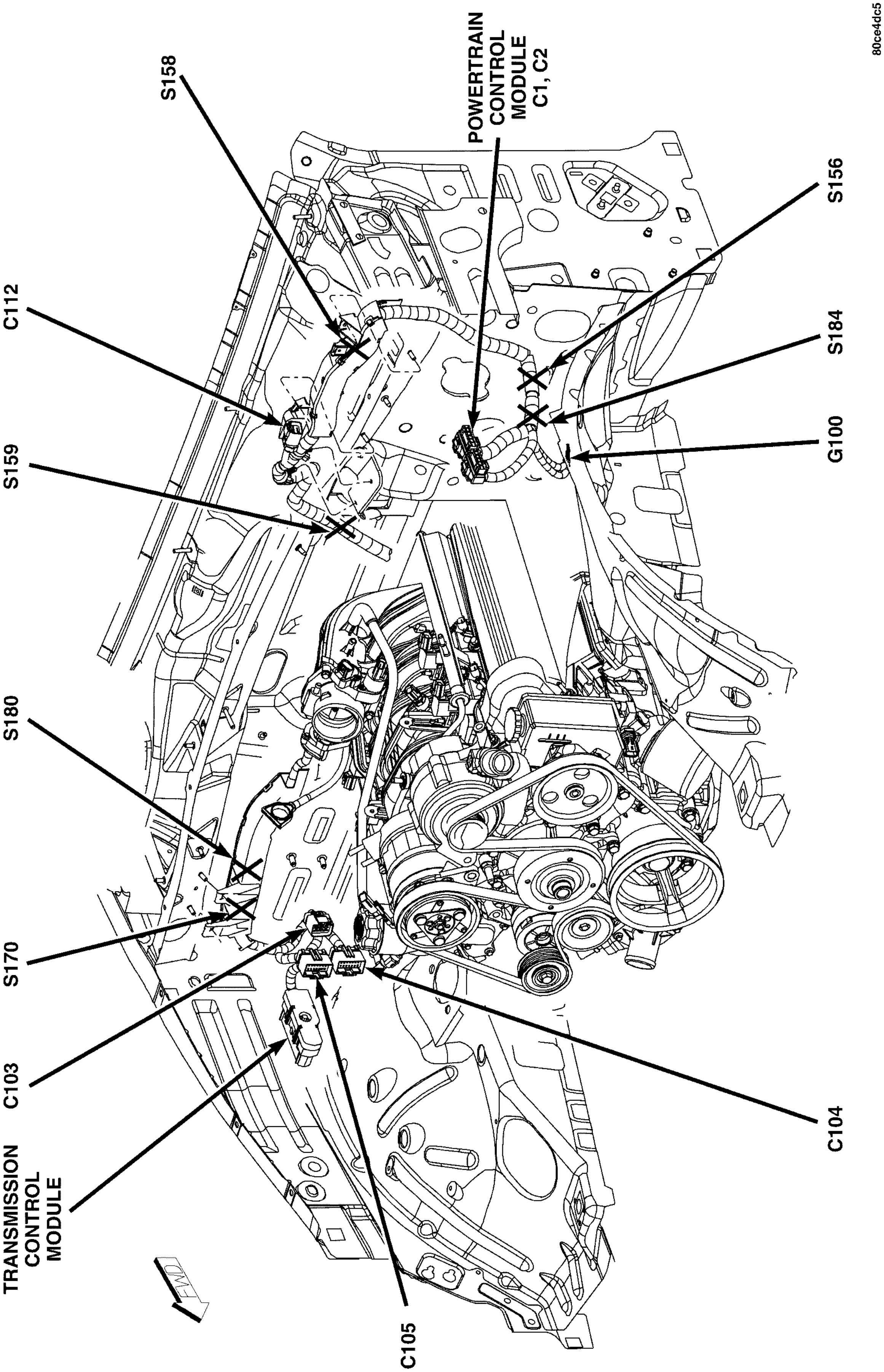


Fig. 8 RIGHT SIDE ENGINE COMPARTMENT, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

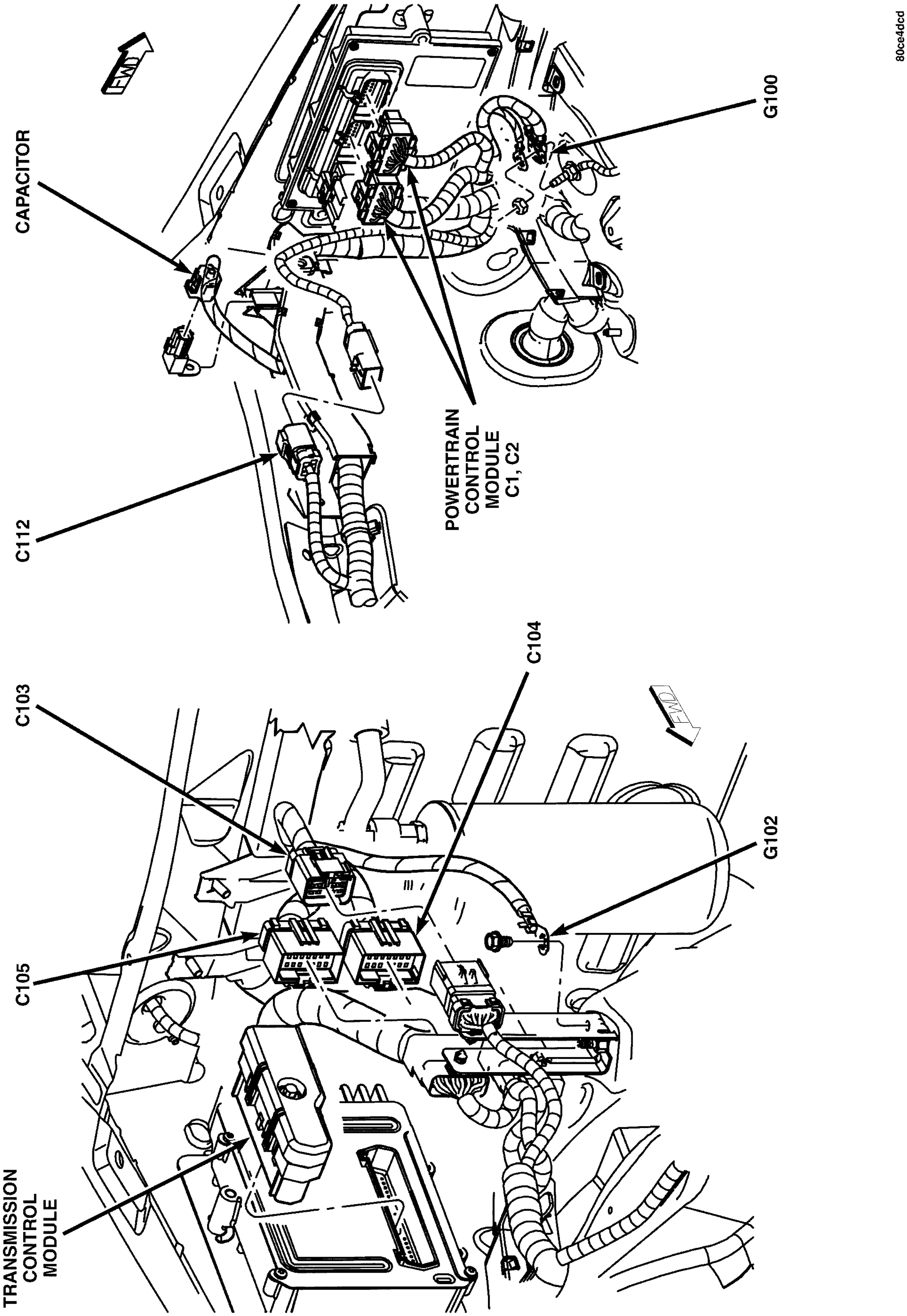


Fig. 9 LEFT SIDE ENGINE COMPARTMENT, 3.7L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

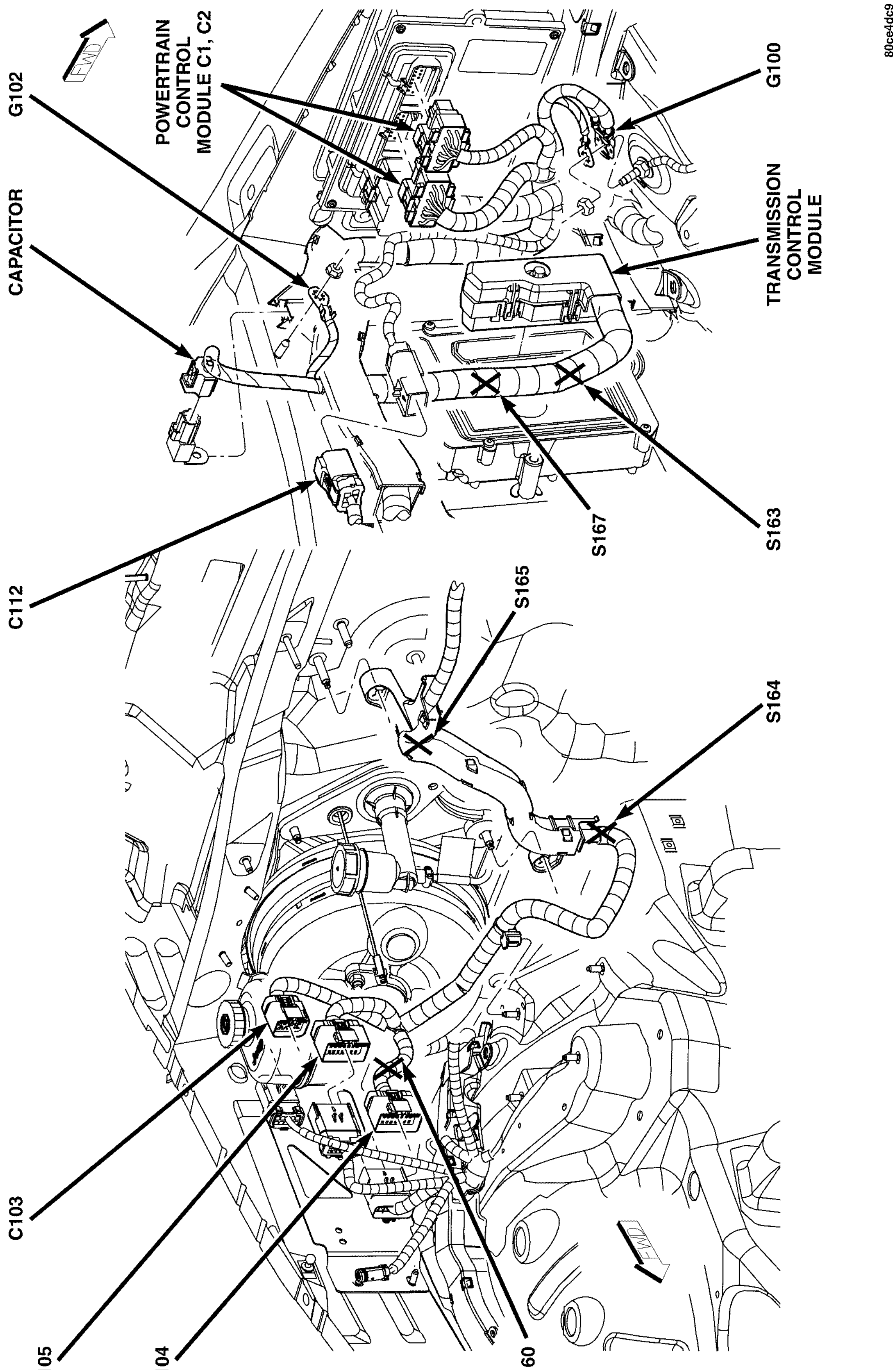


Fig. 10 RIGHT SIDE ENGINE COMPARTMENT, 3.7L, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

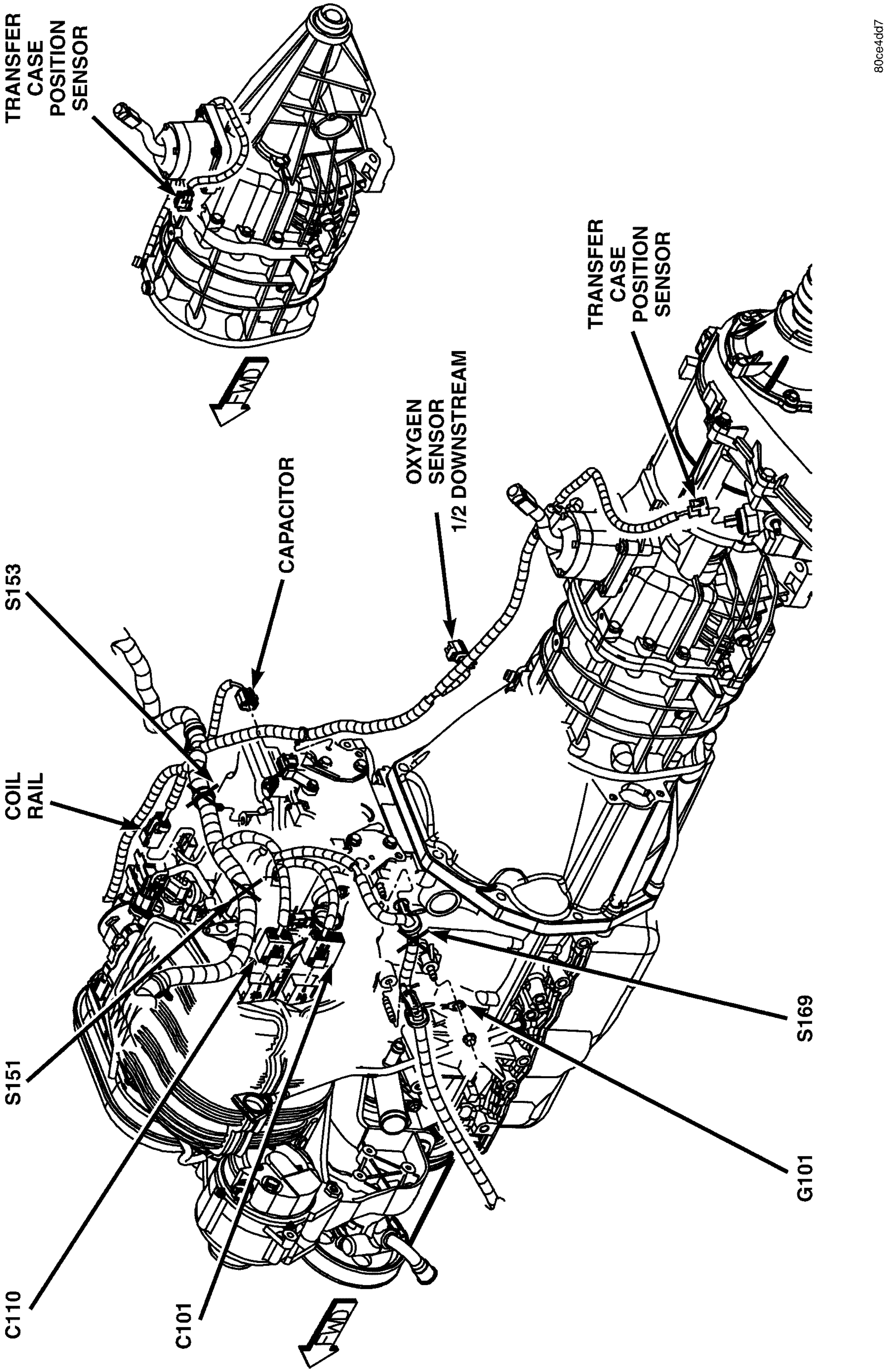


Fig. 11 ENGINE/TRANSMISSION, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

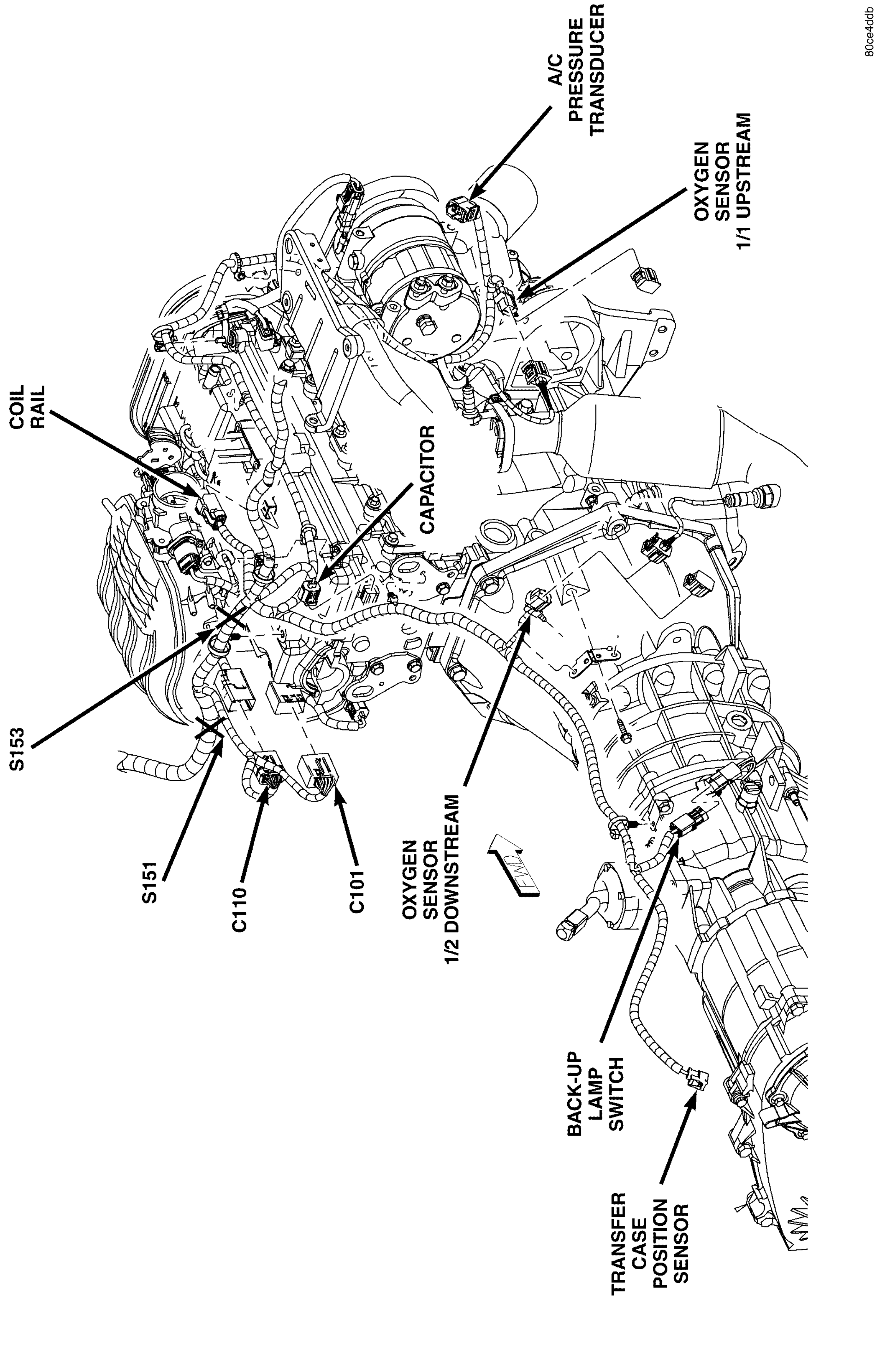


Fig. 12 ENGINE/TRANSMISSION, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

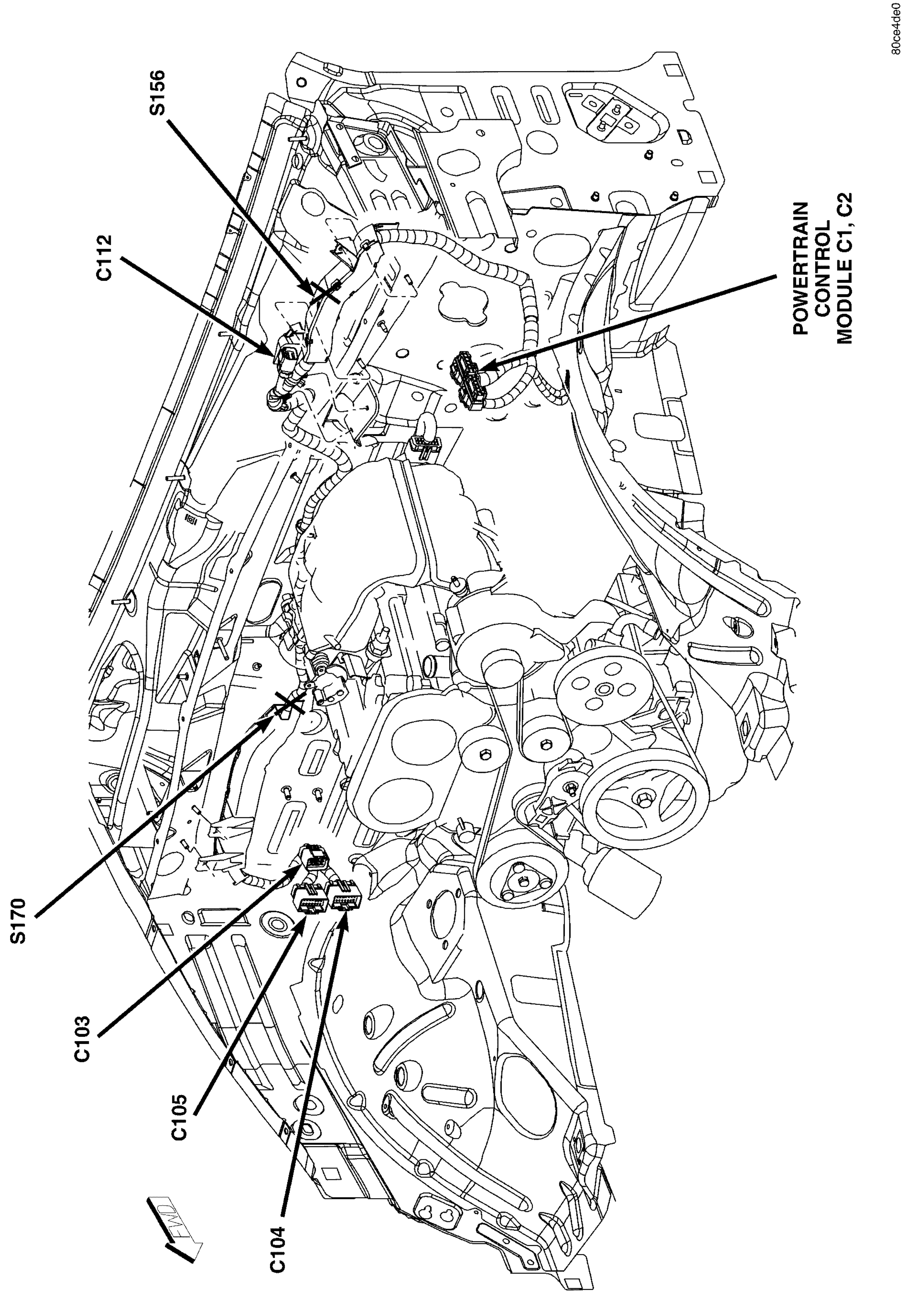


Fig. 13 ENGINE COMPARTMENT, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

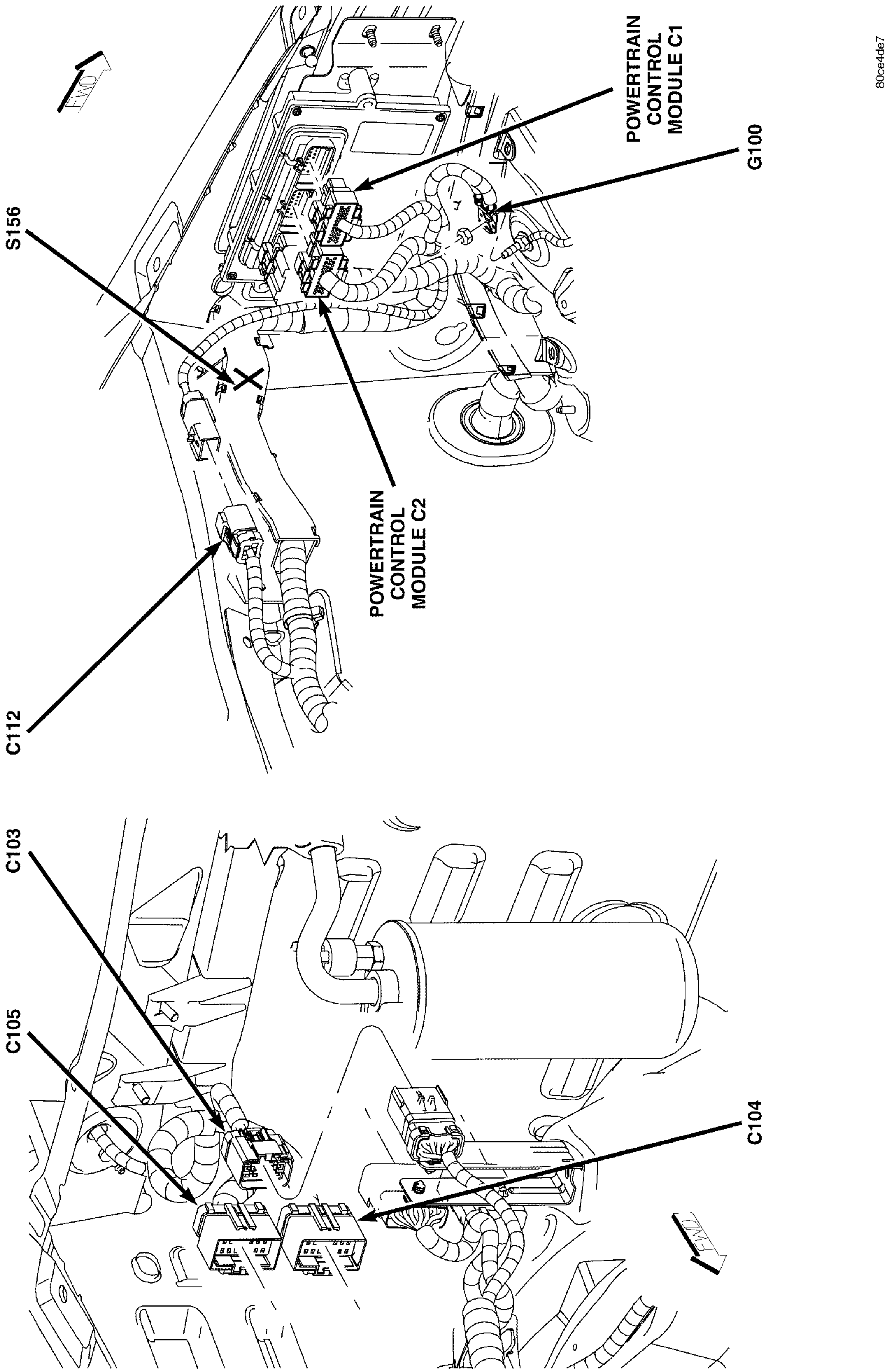


Fig. 14 RIGHT REAR ENGINE COMPARTMENT, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

80fc55e7

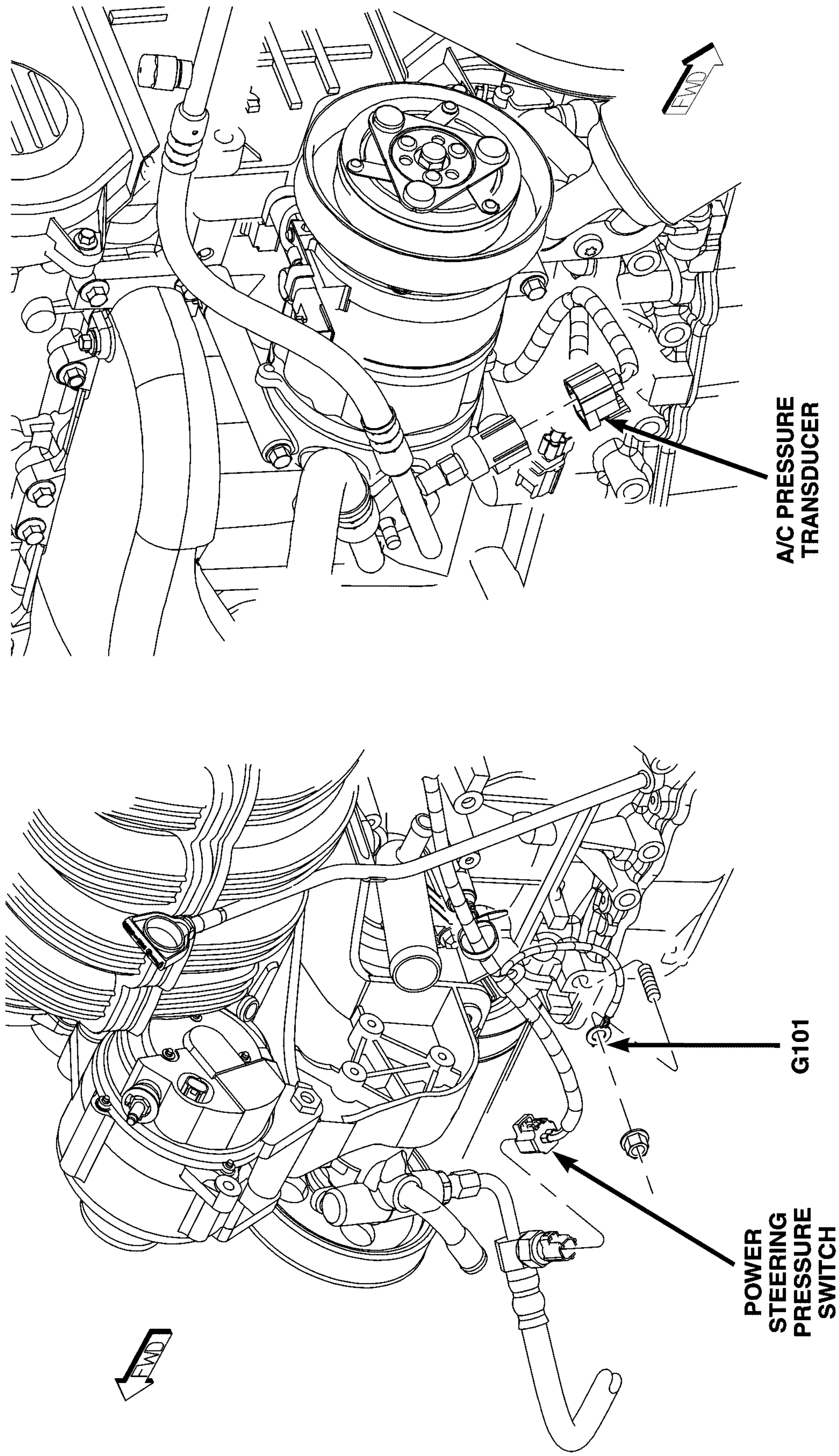


Fig. 15 ENGINE, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

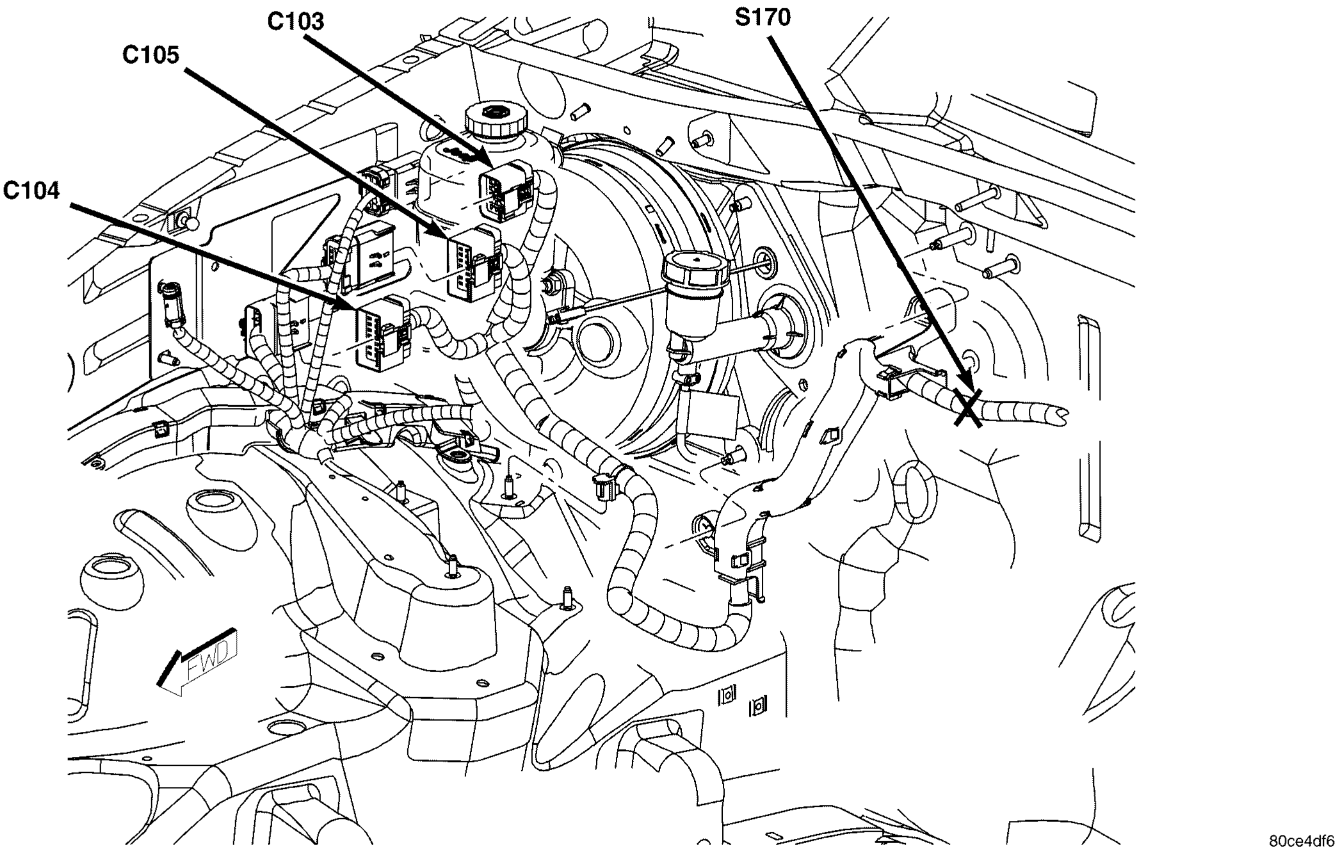


Fig. 16 RIGHT REAR ENGINE COMPARTMENT, 2.4L

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

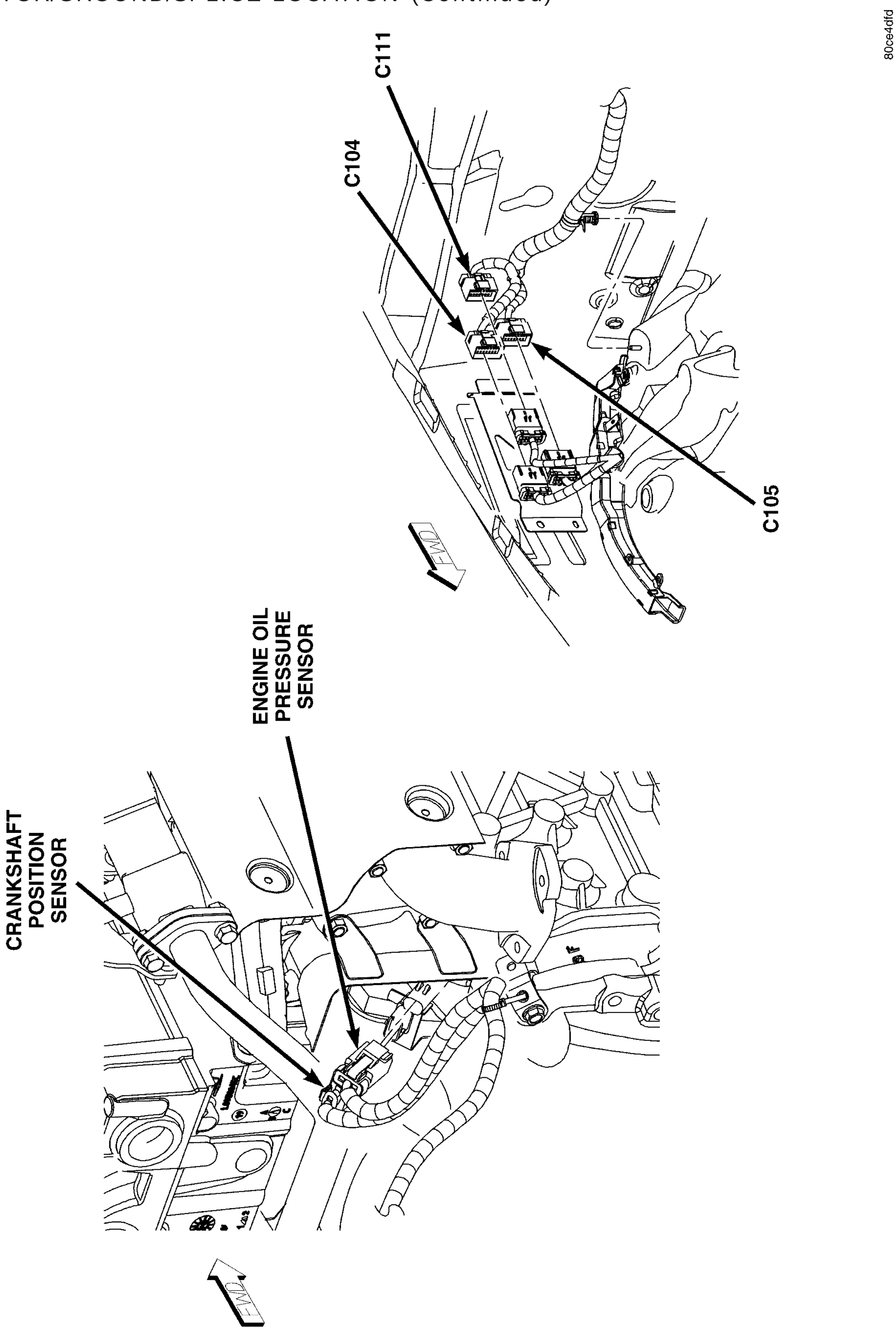


Fig. 17 DIESEL ENGINE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

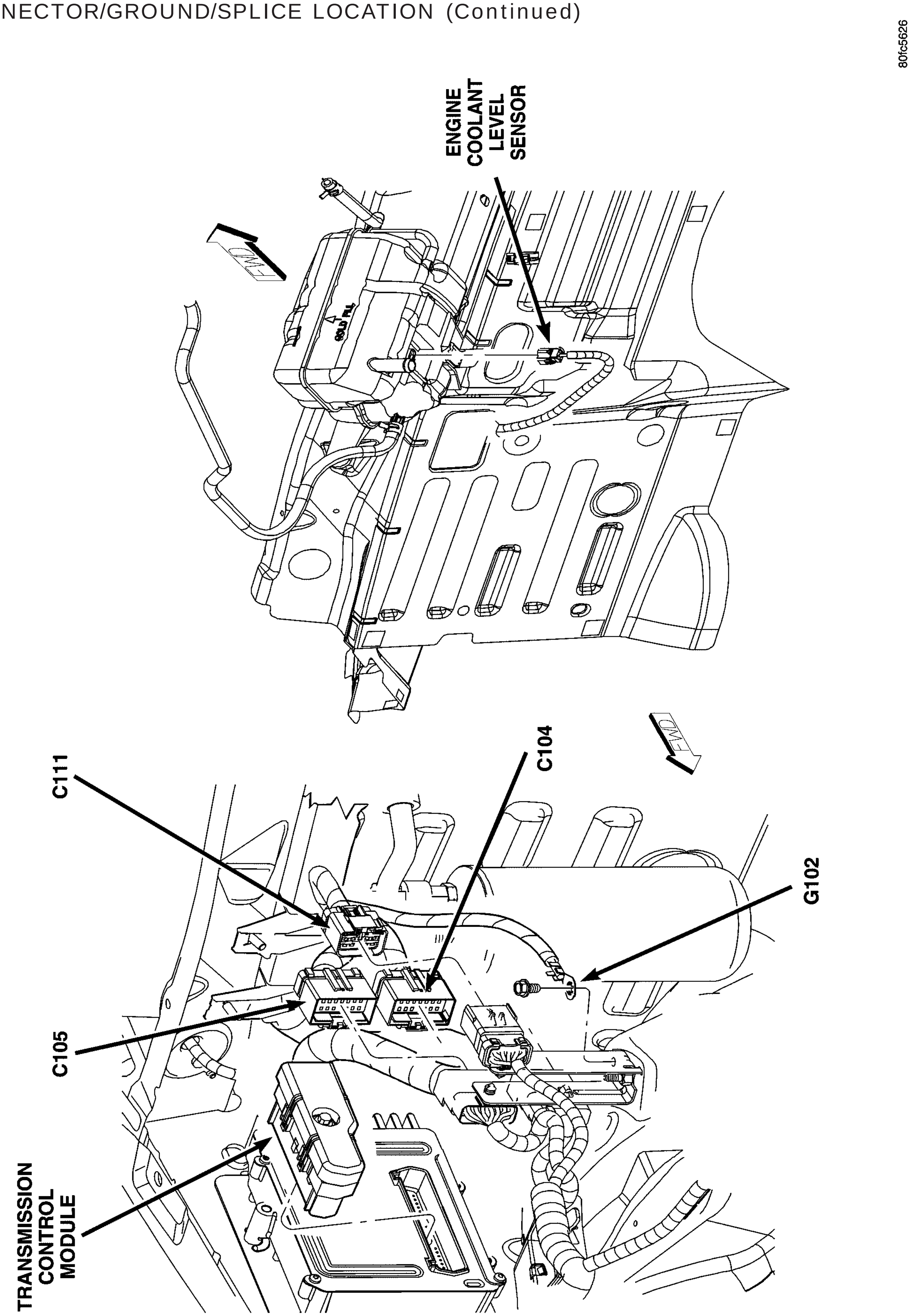


Fig. 18 DIESEL ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

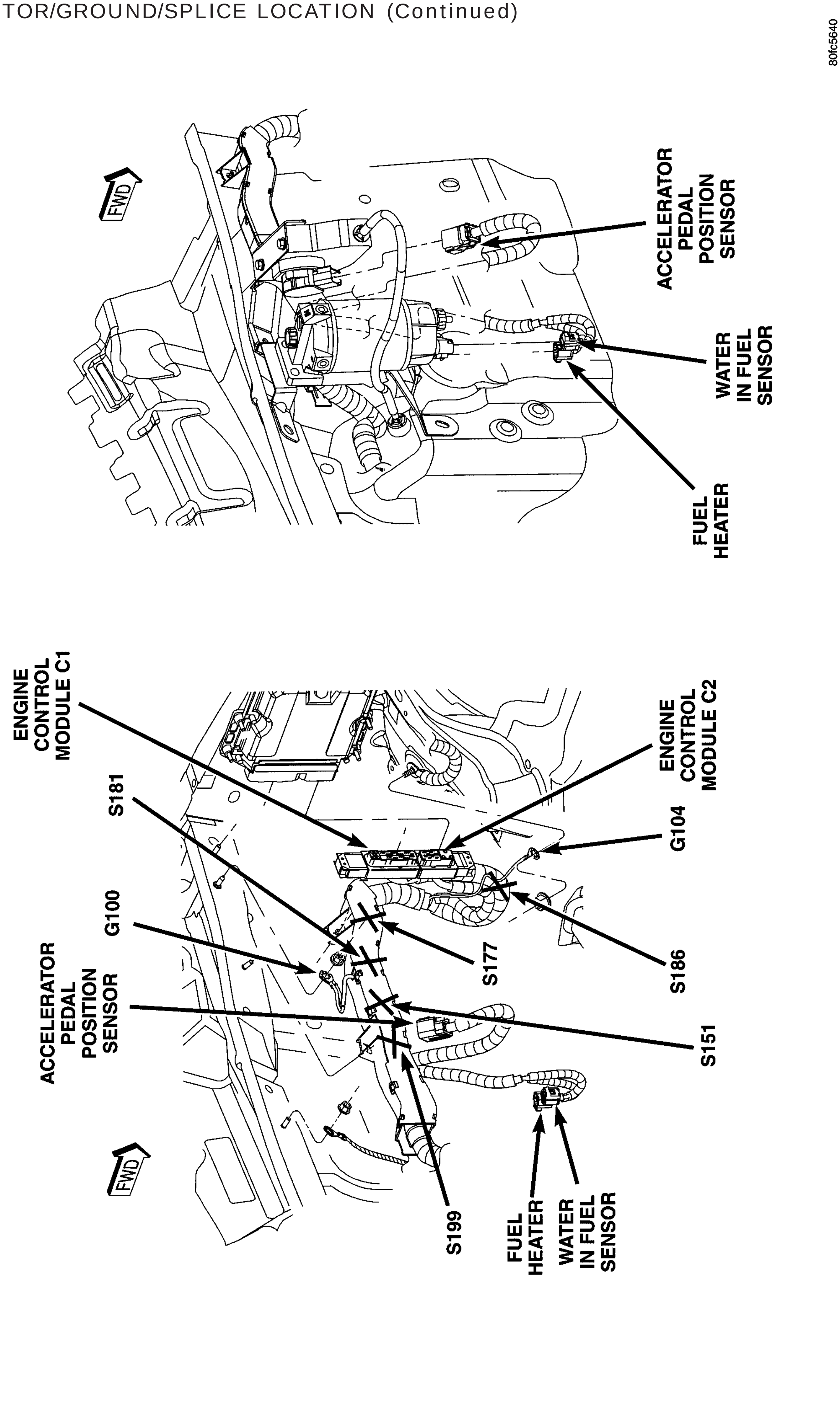


Fig. 19 DIESEL ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

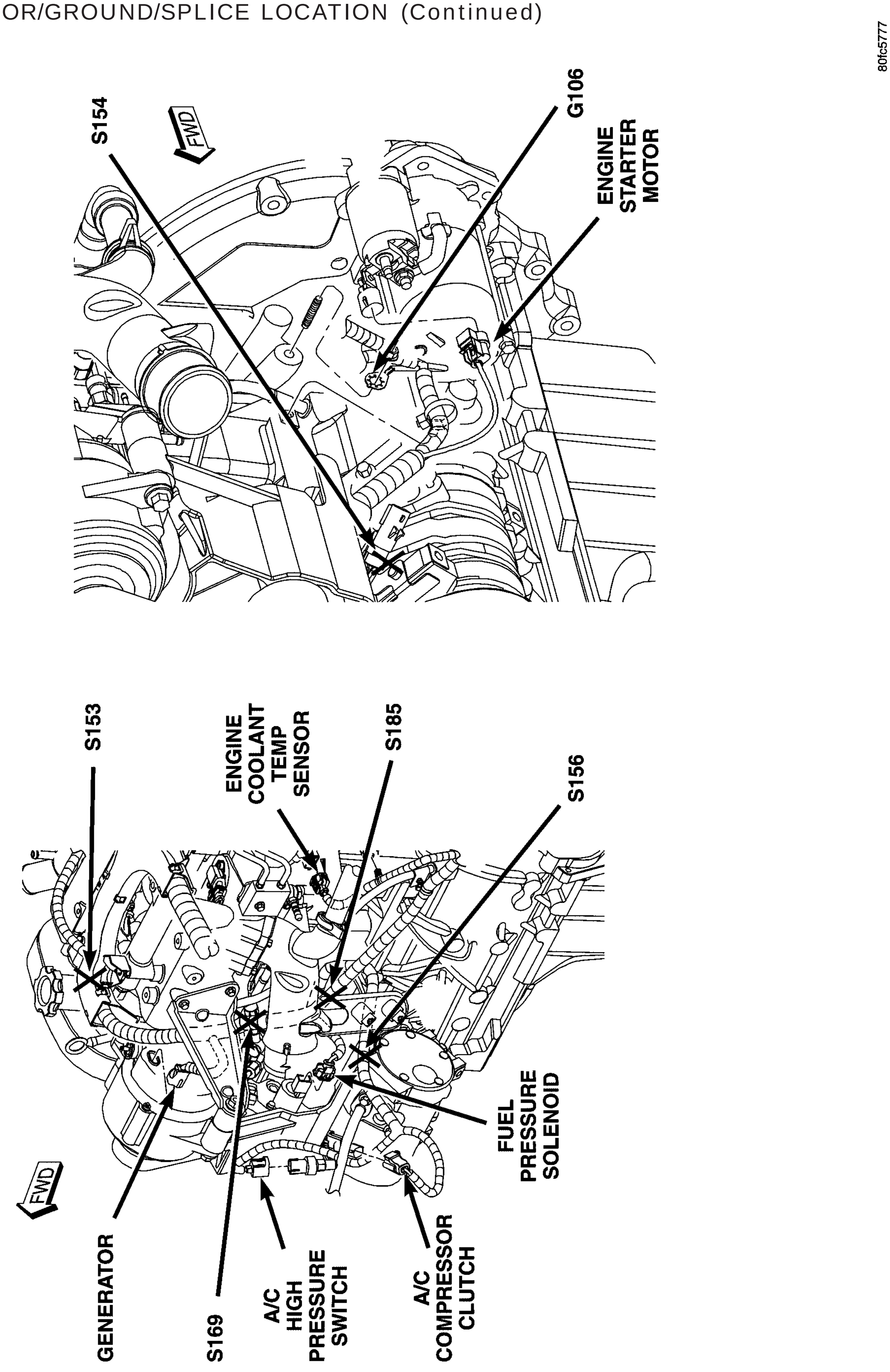


Fig. 20 LEFT SIDE DIESEL ENGINE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

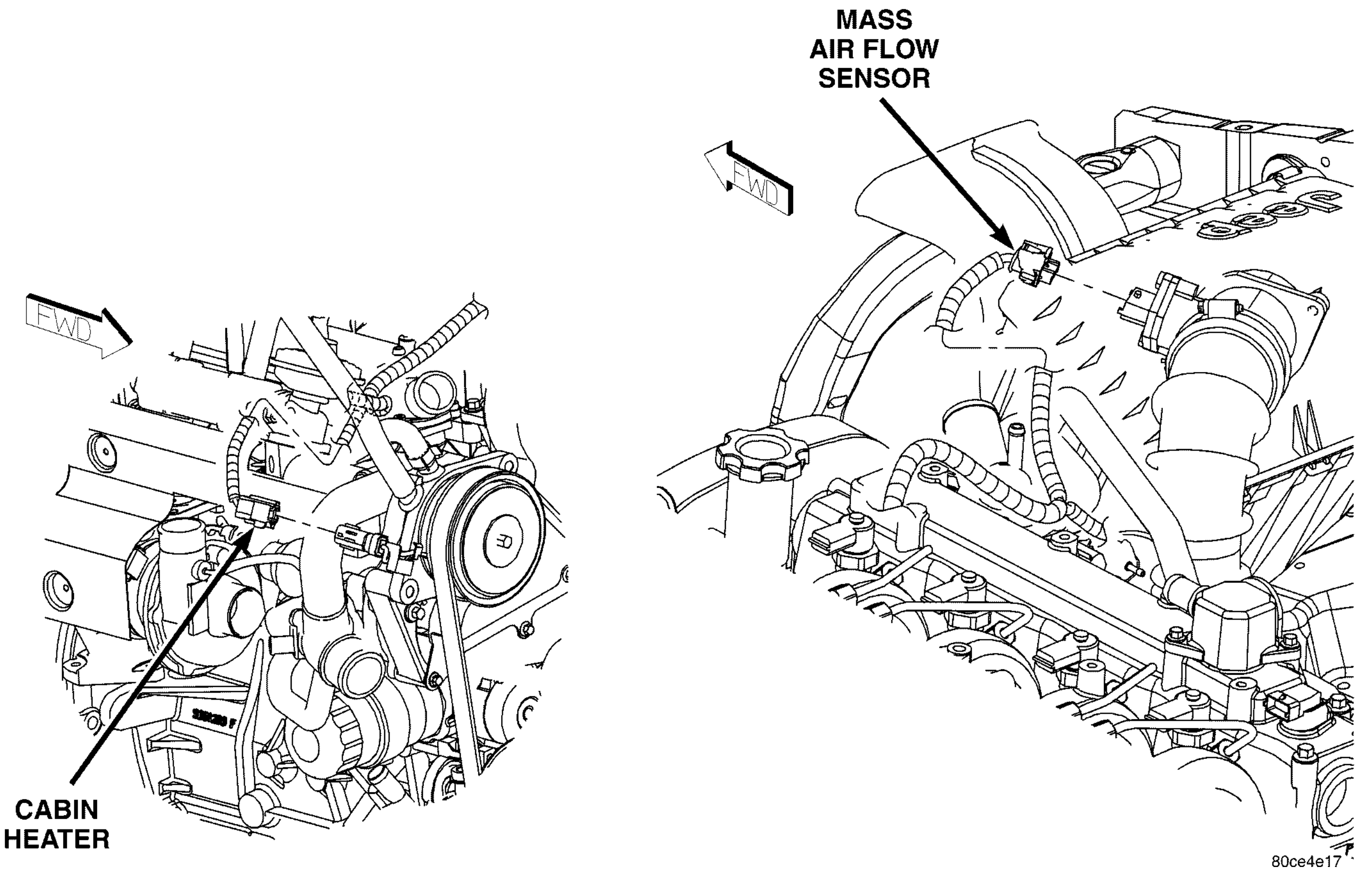


Fig. 21 FRONT DIESEL ENGINE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

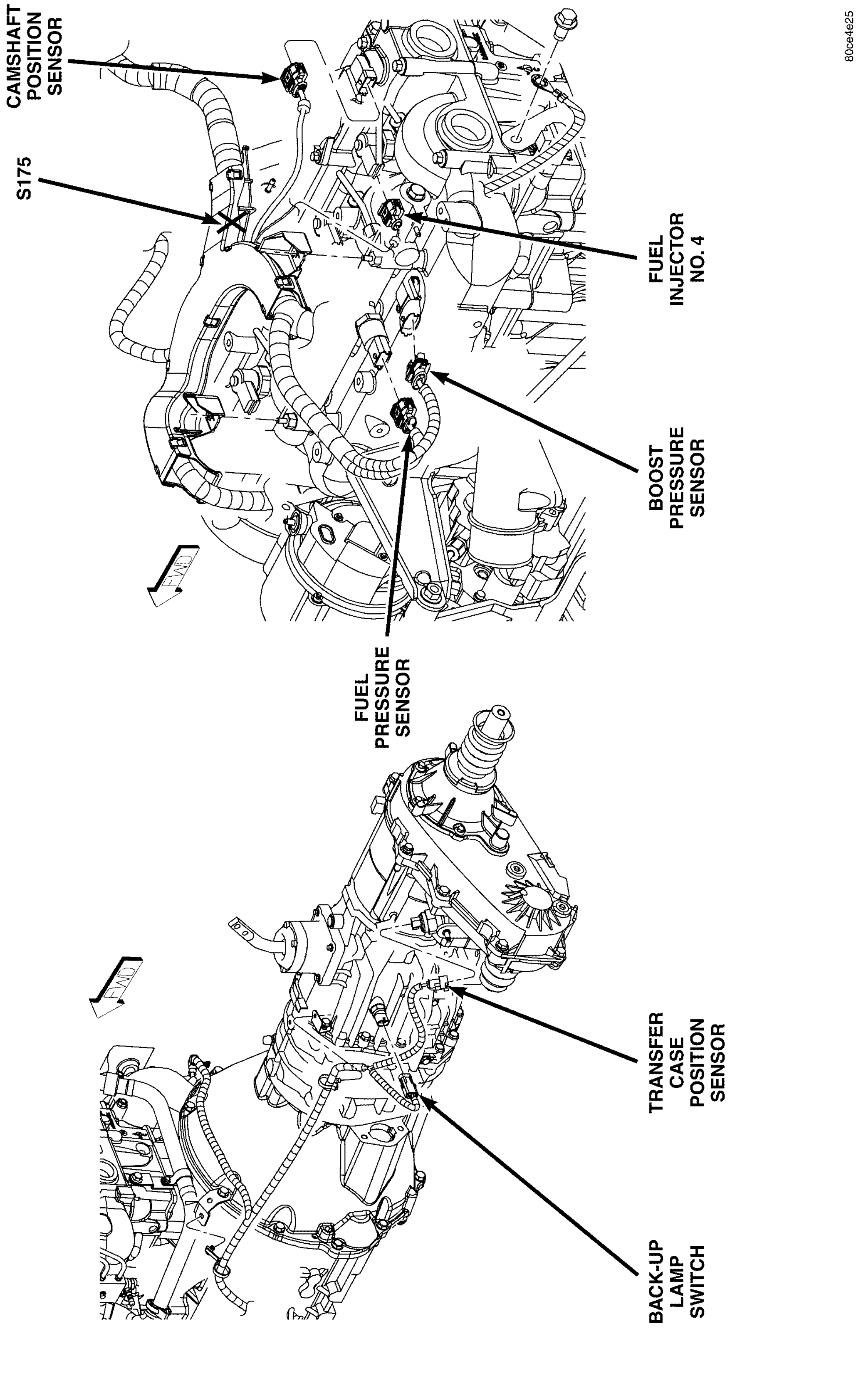


Fig. 22 REAR DIESEL ENGINE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

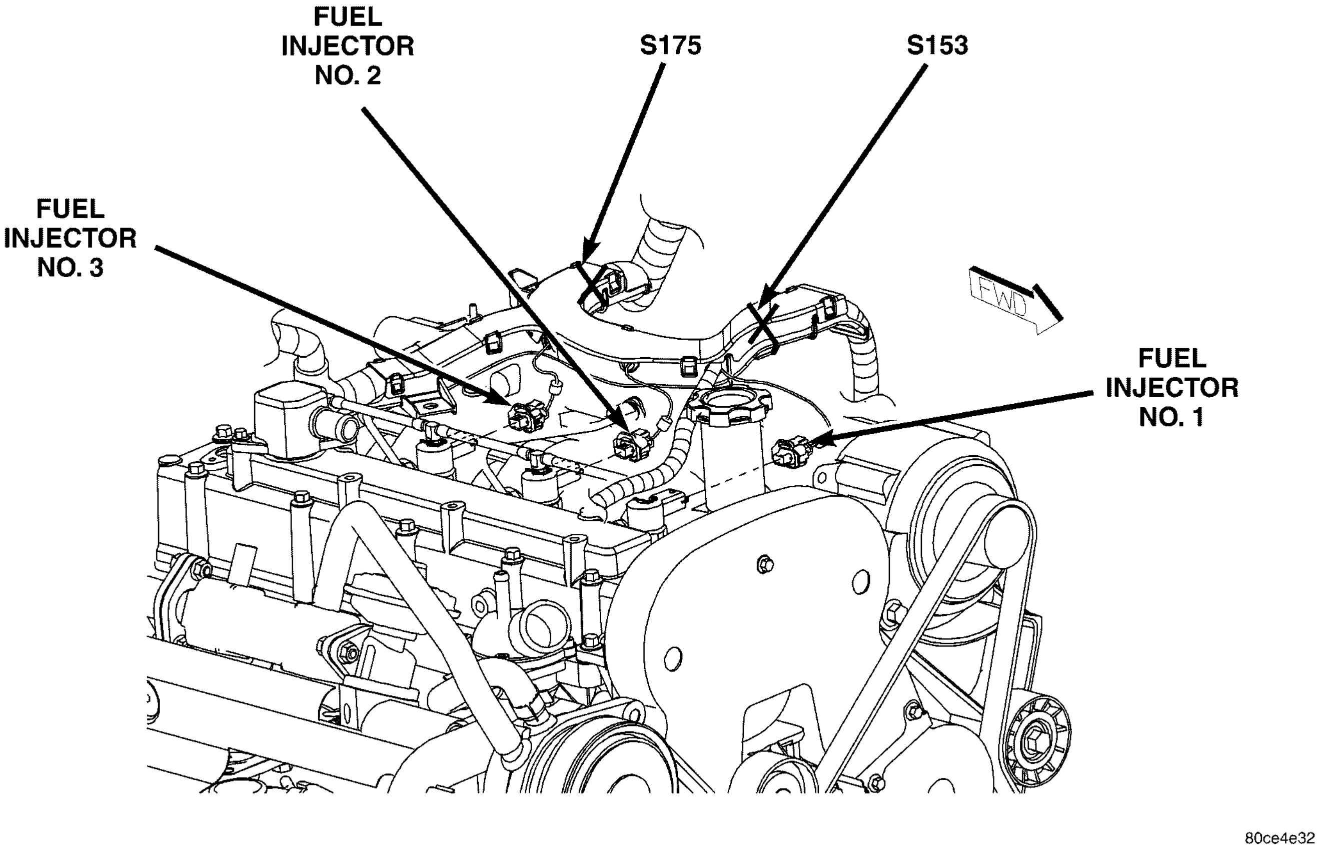


Fig. 23 TOP DIESEL ENGINE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

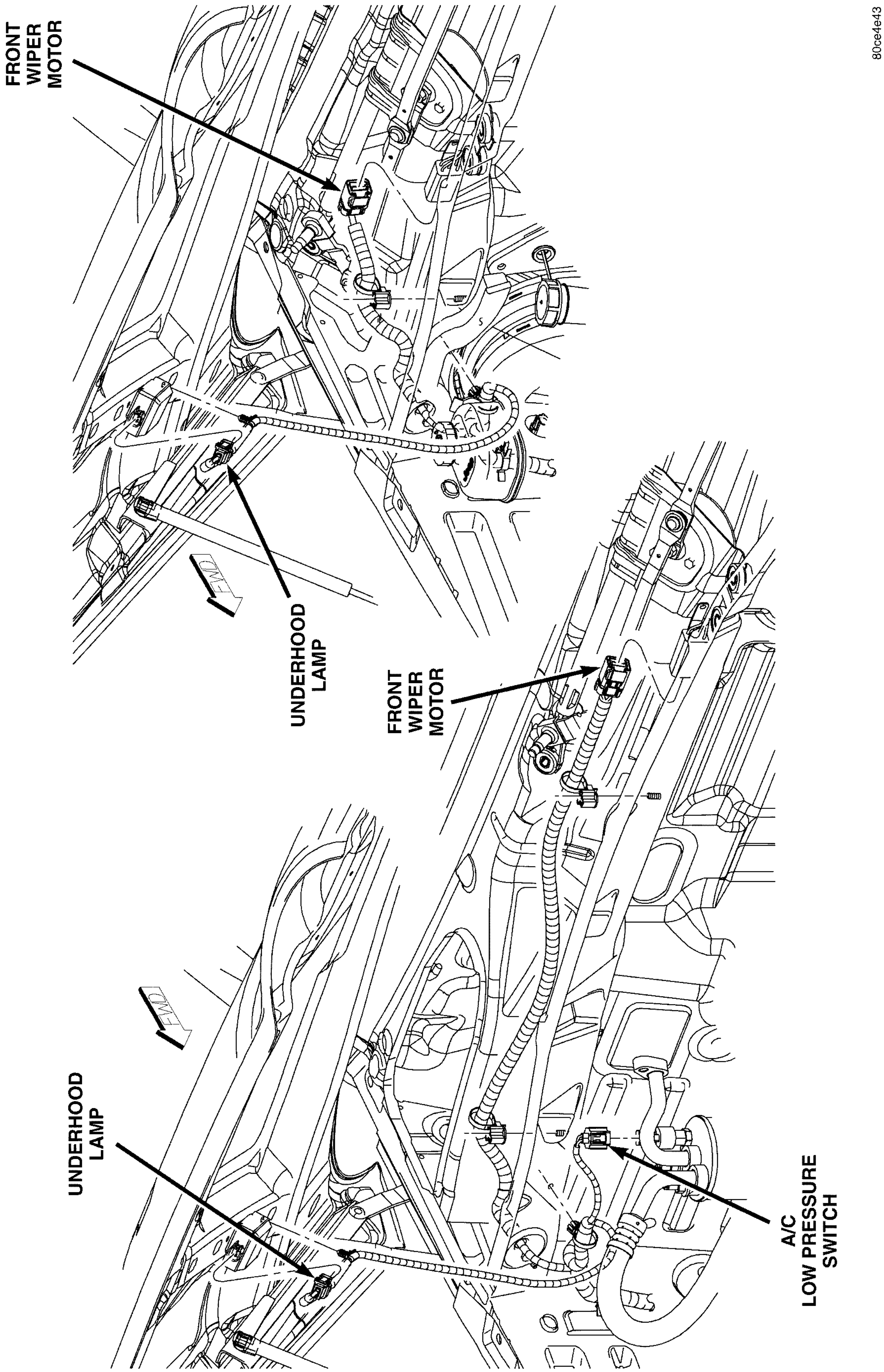


Fig. 24 LEFT SIDE ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

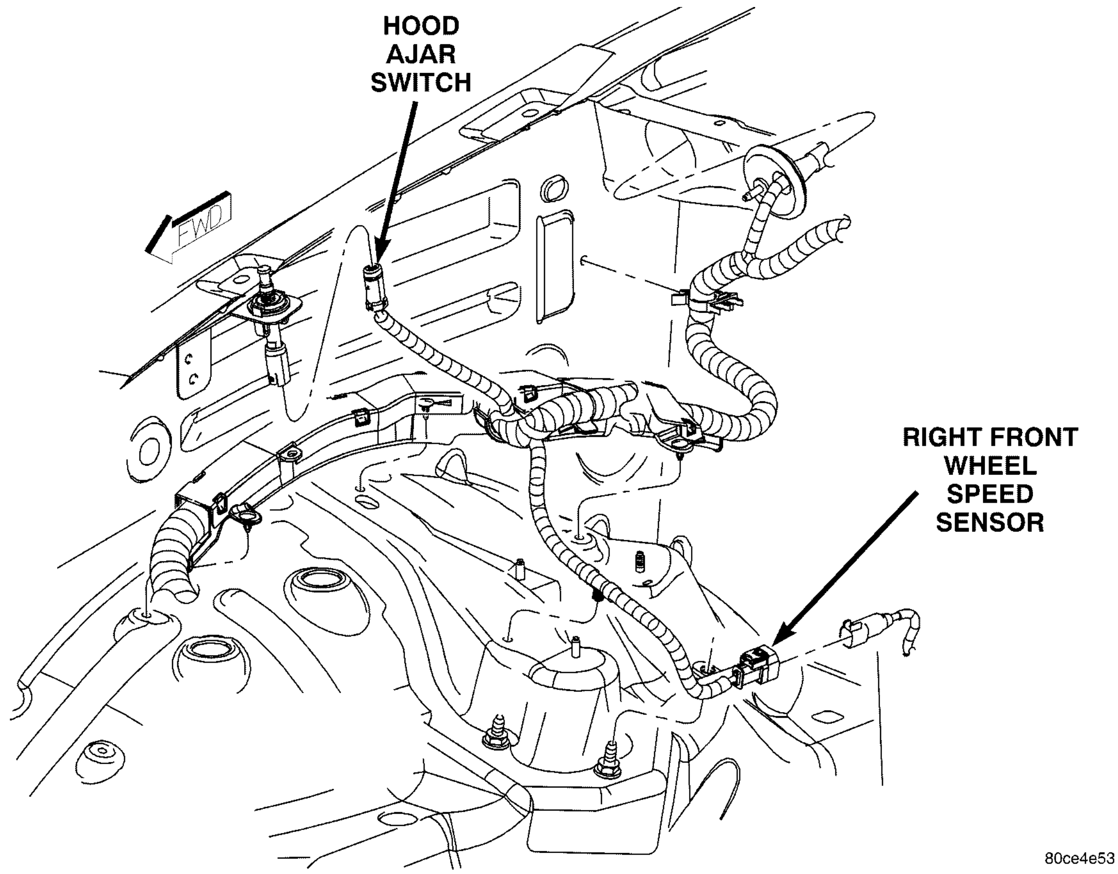


Fig. 25 RIGHT SIDE ENGINE COMPARTMENT

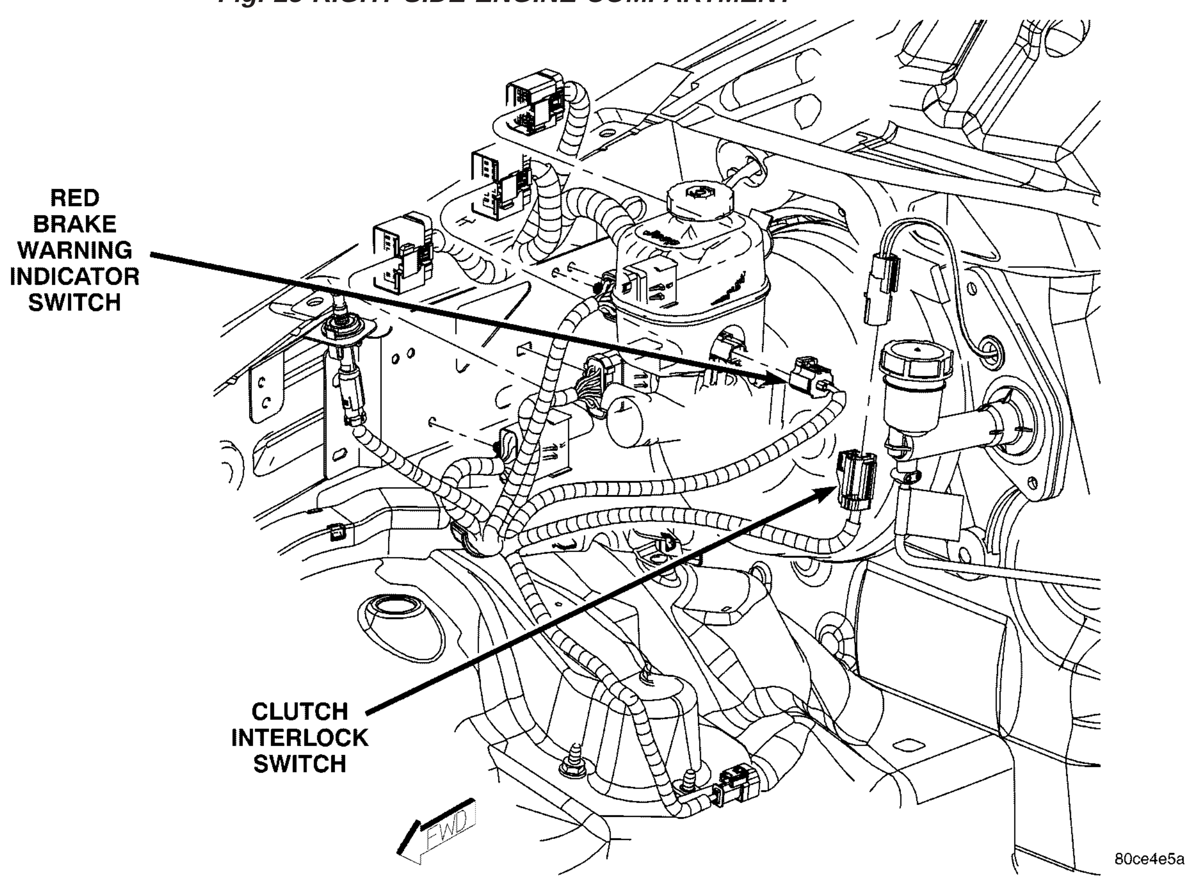


Fig. 26 RIGHT SIDE ENGINE COMPARTMENT, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

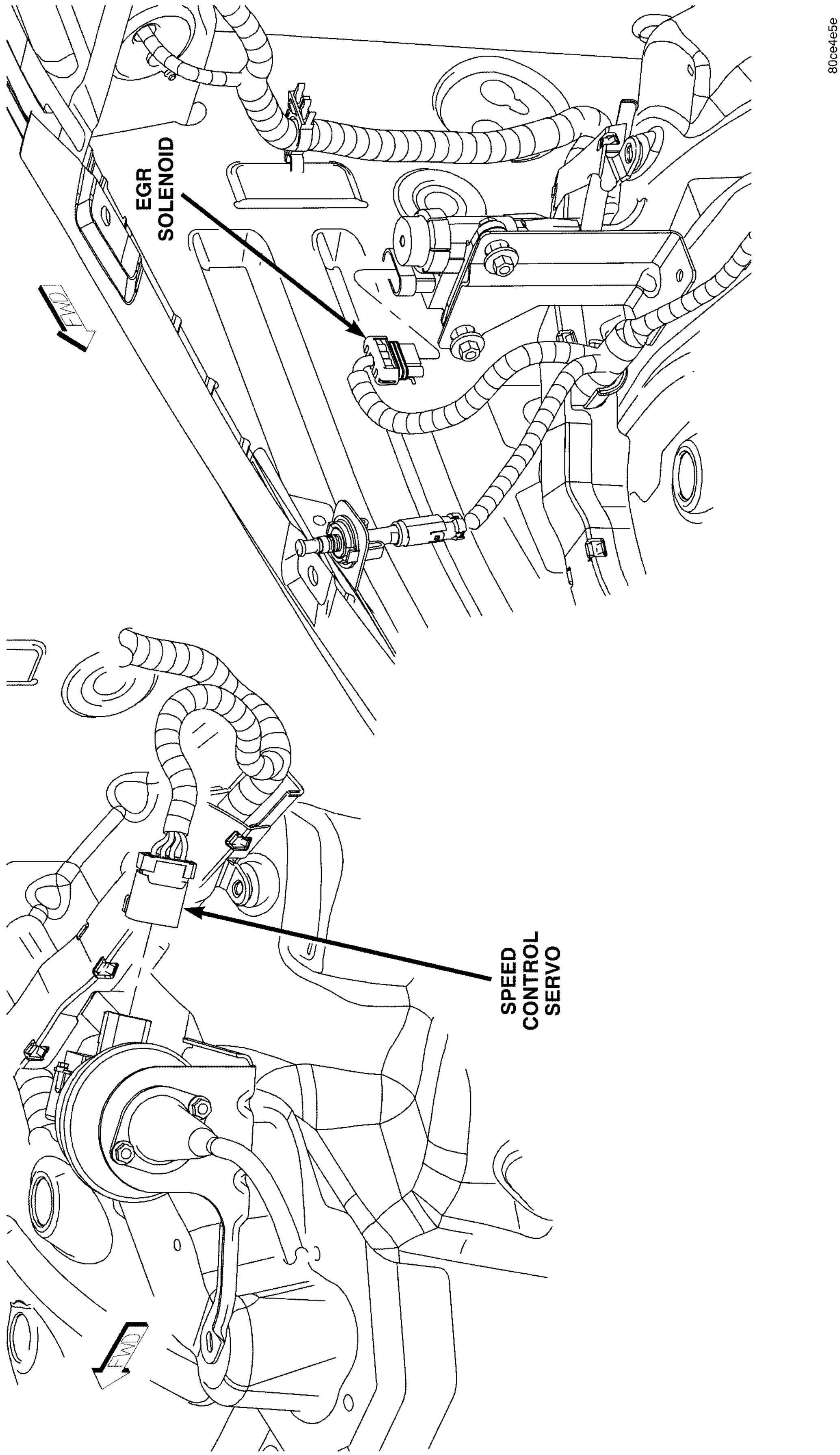


Fig. 27 ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

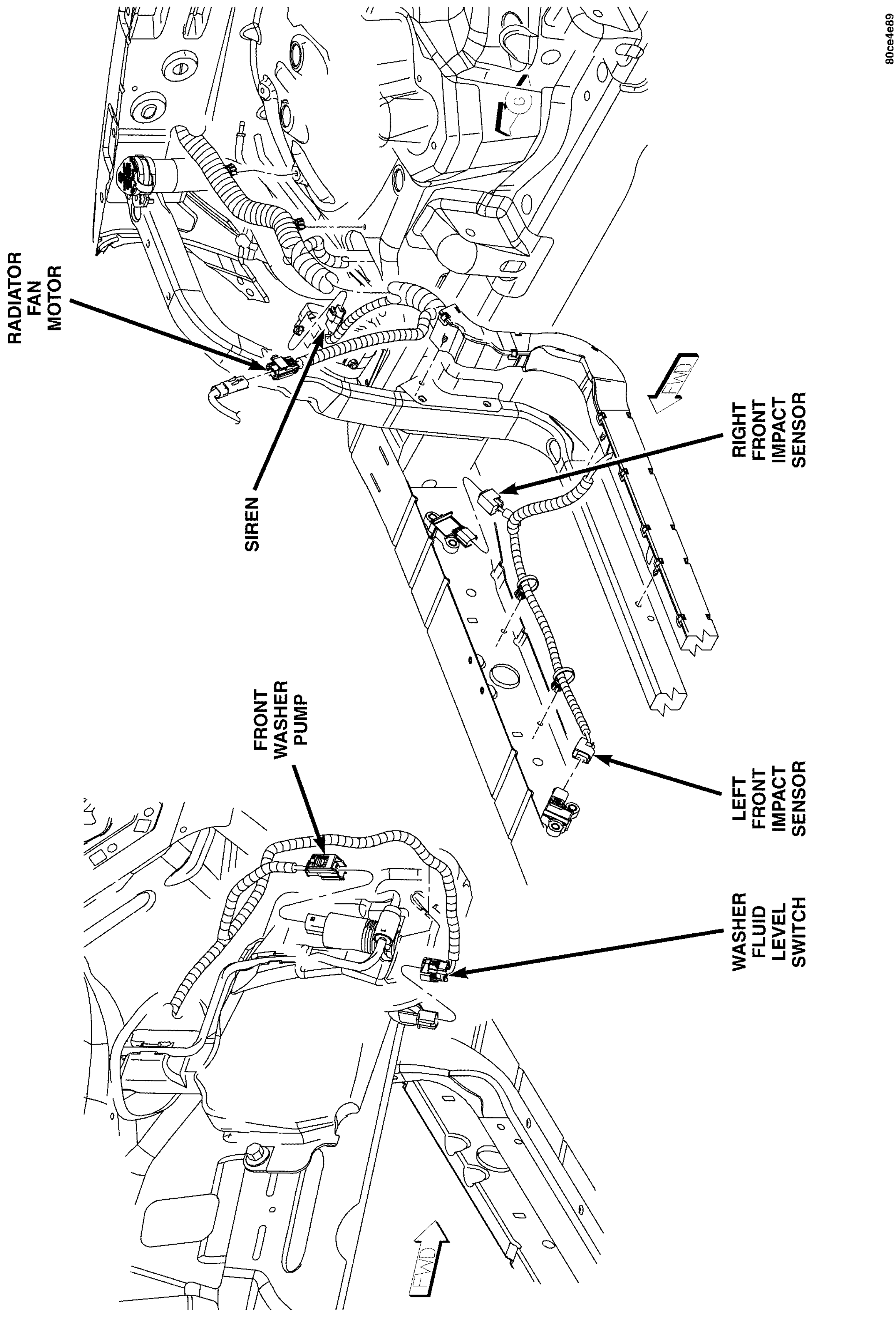


Fig. 28 ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

80ce4e96

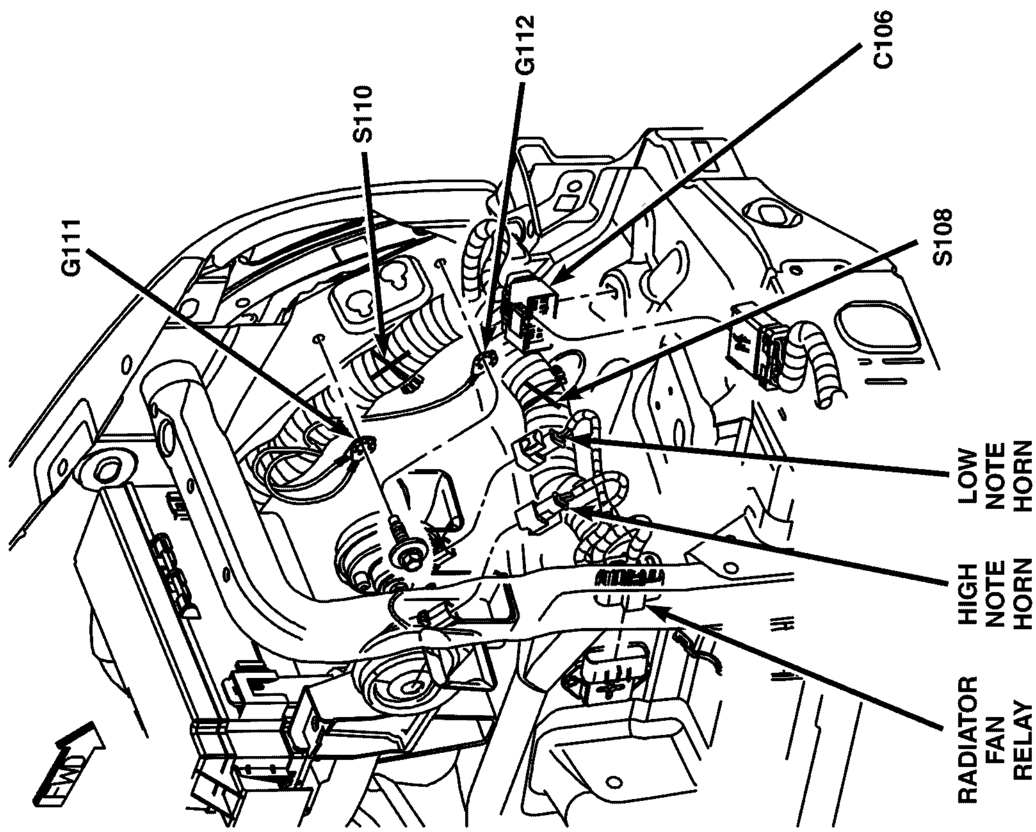


Fig. 29 FRONT ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

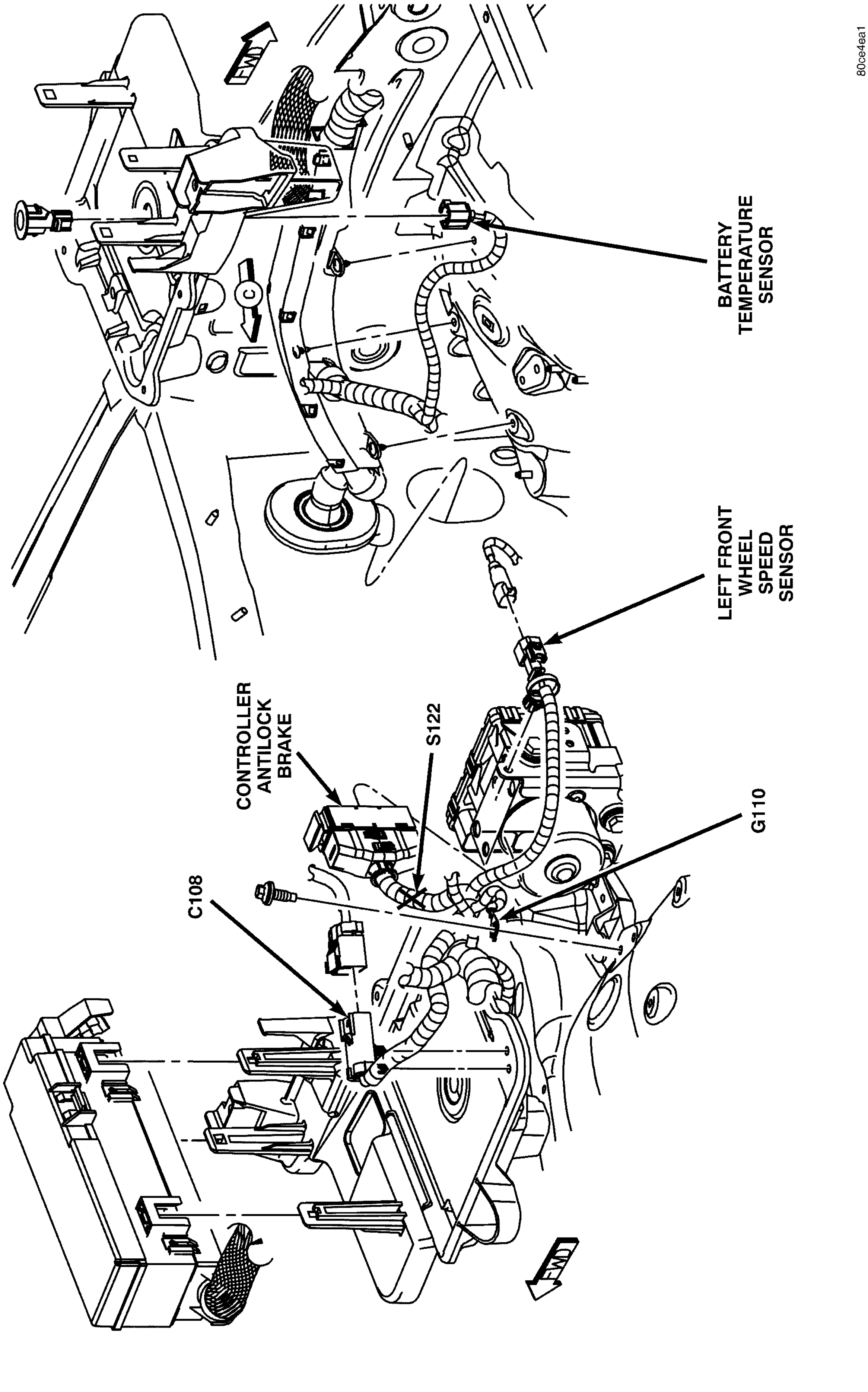


Fig. 30 LEFT SIDE ENGINE COMPARTMENT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

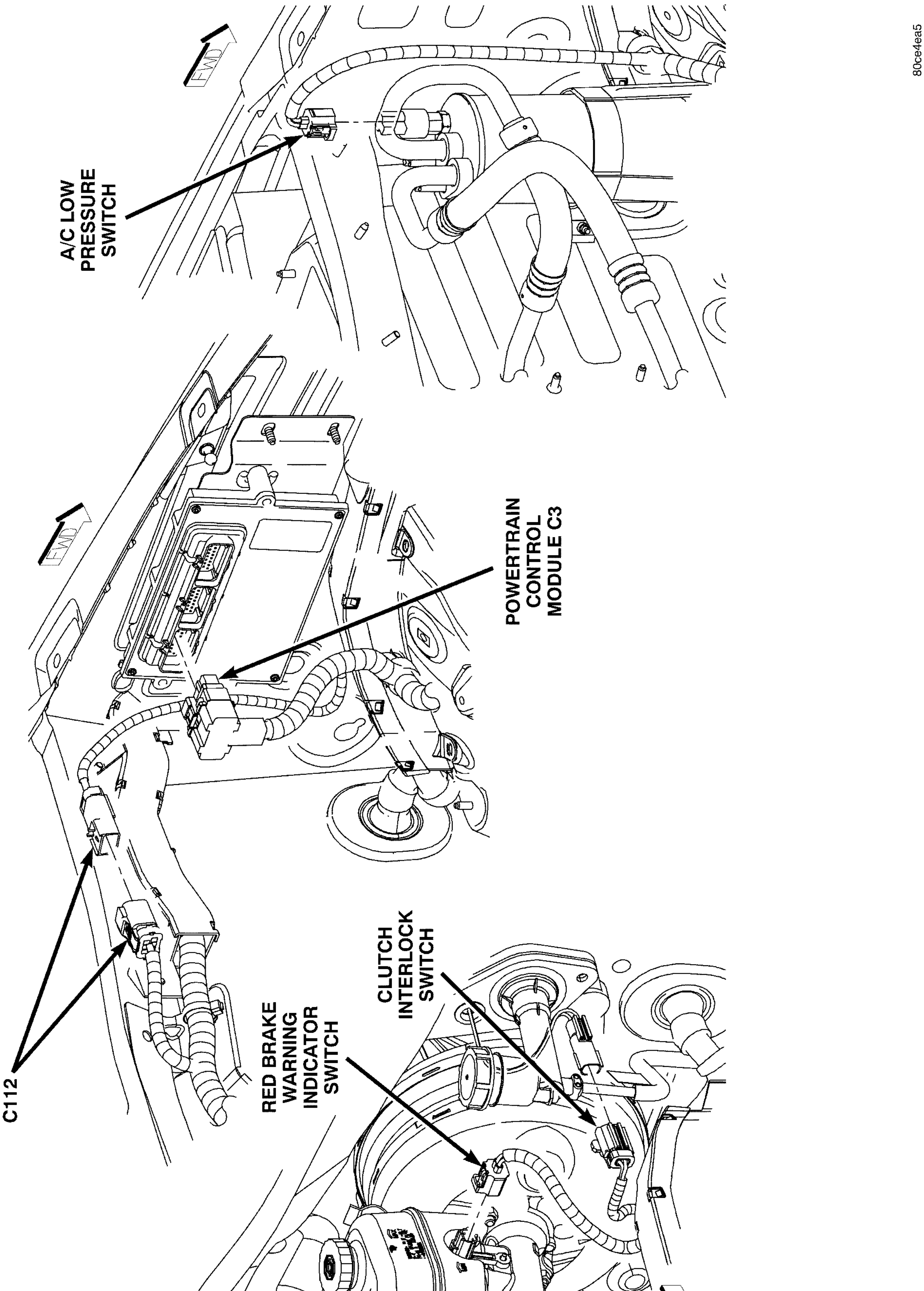


Fig. 31 REAR ENGINE COMPARTMENT, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

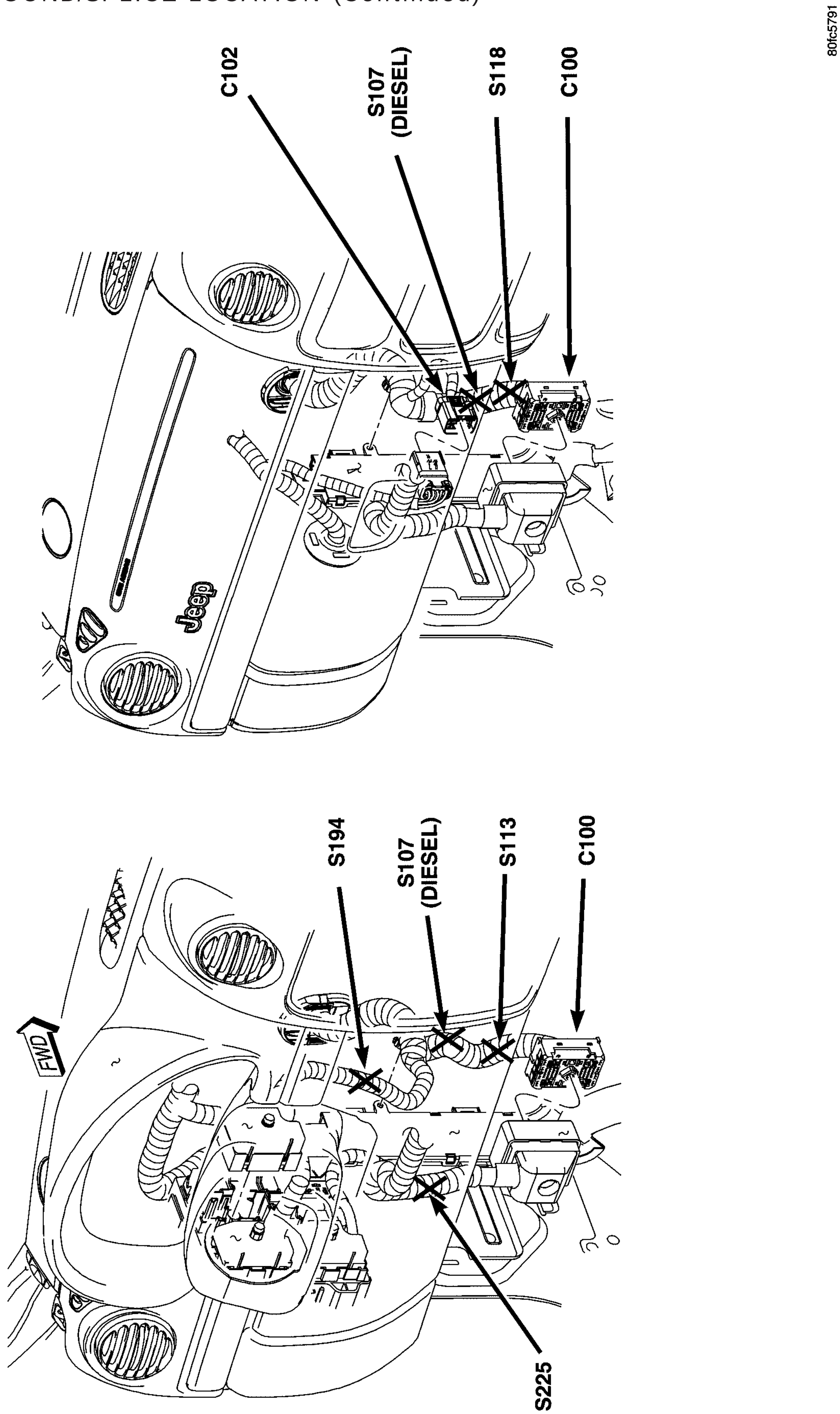


Fig. 32 ENGINE TO INSTRUMENT PANEL

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

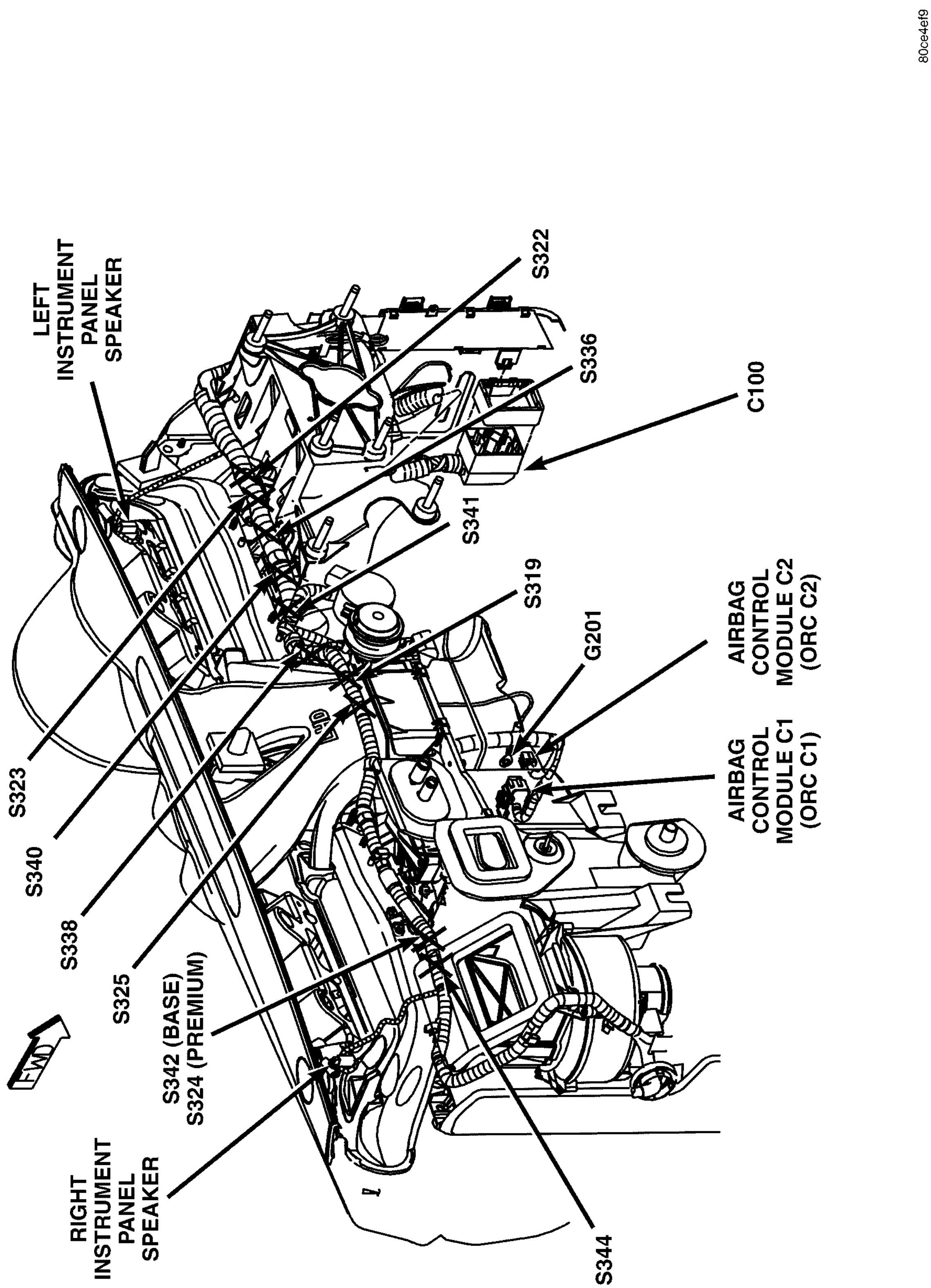


Fig. 33 INSTRUMENT PANEL, LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

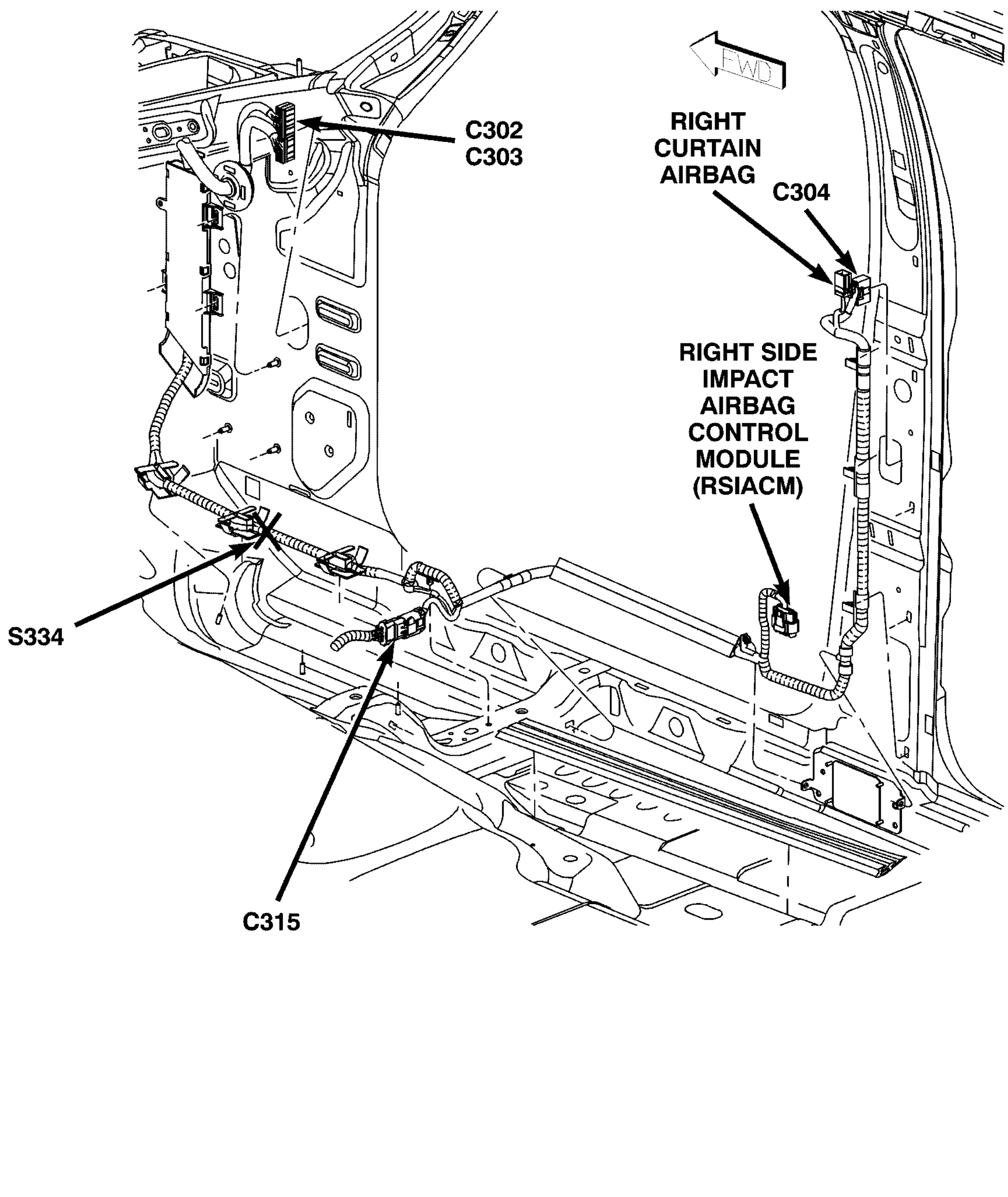


Fig. 34 RIGHT FRONT BODY, LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

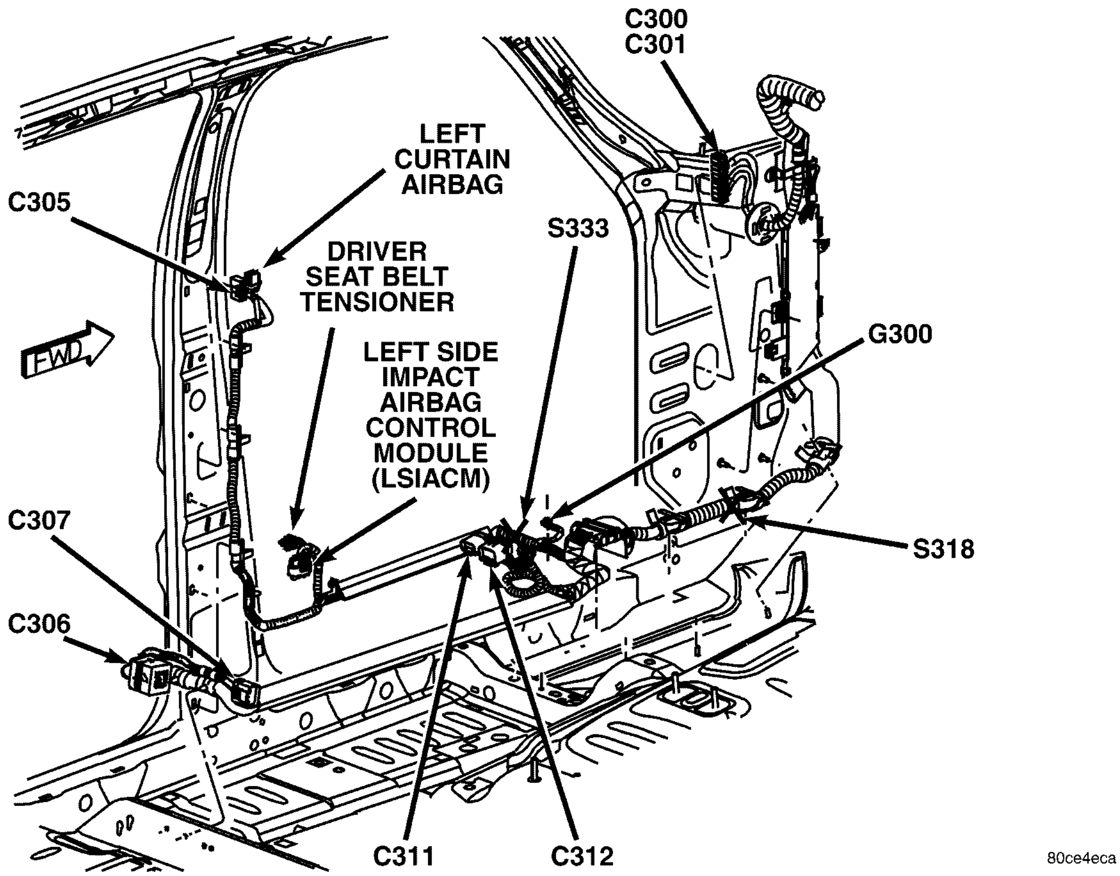


Fig. 35 LEFT FRONT BODY, LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

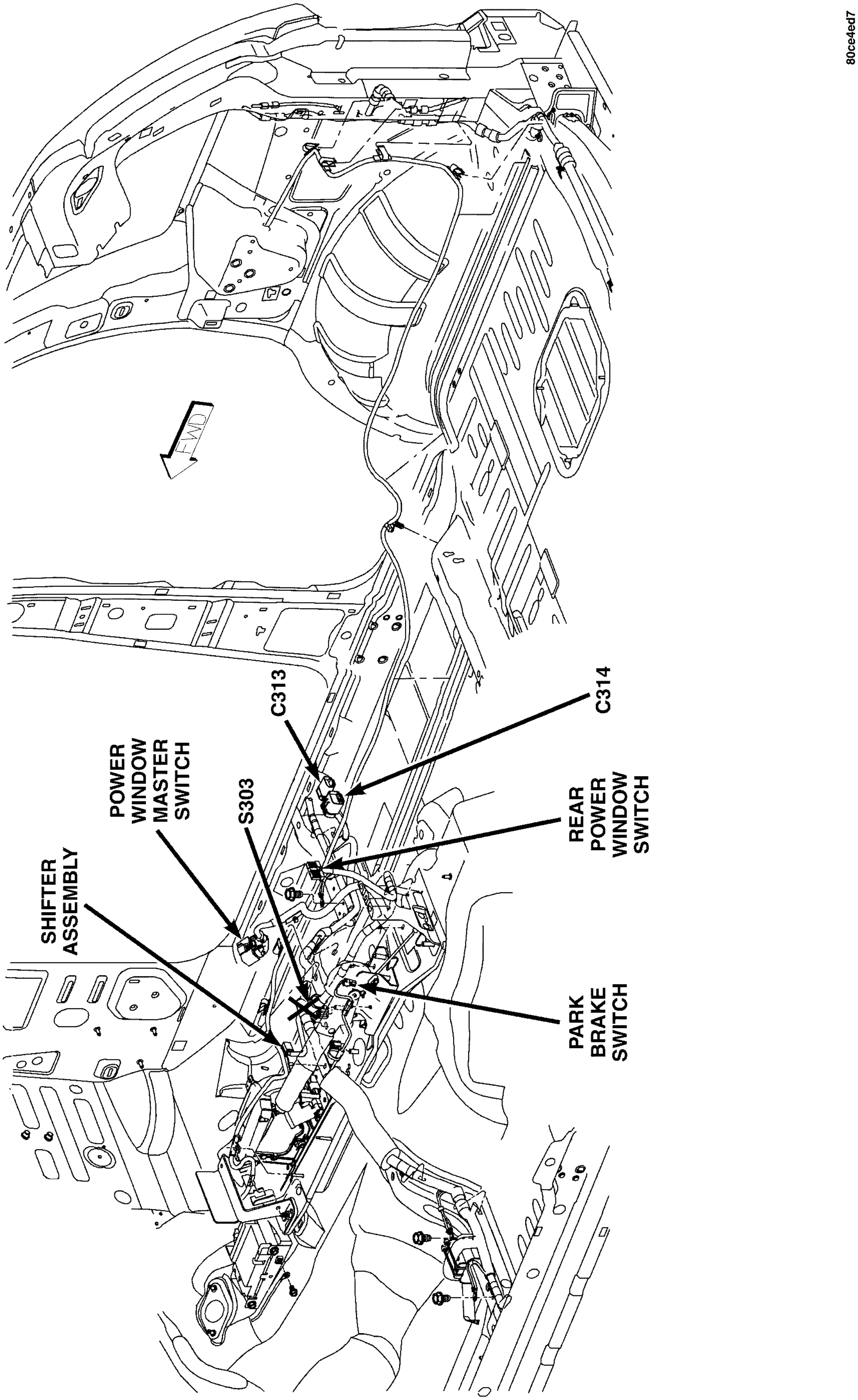


Fig. 36 RIGHT FRONT BODY, LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

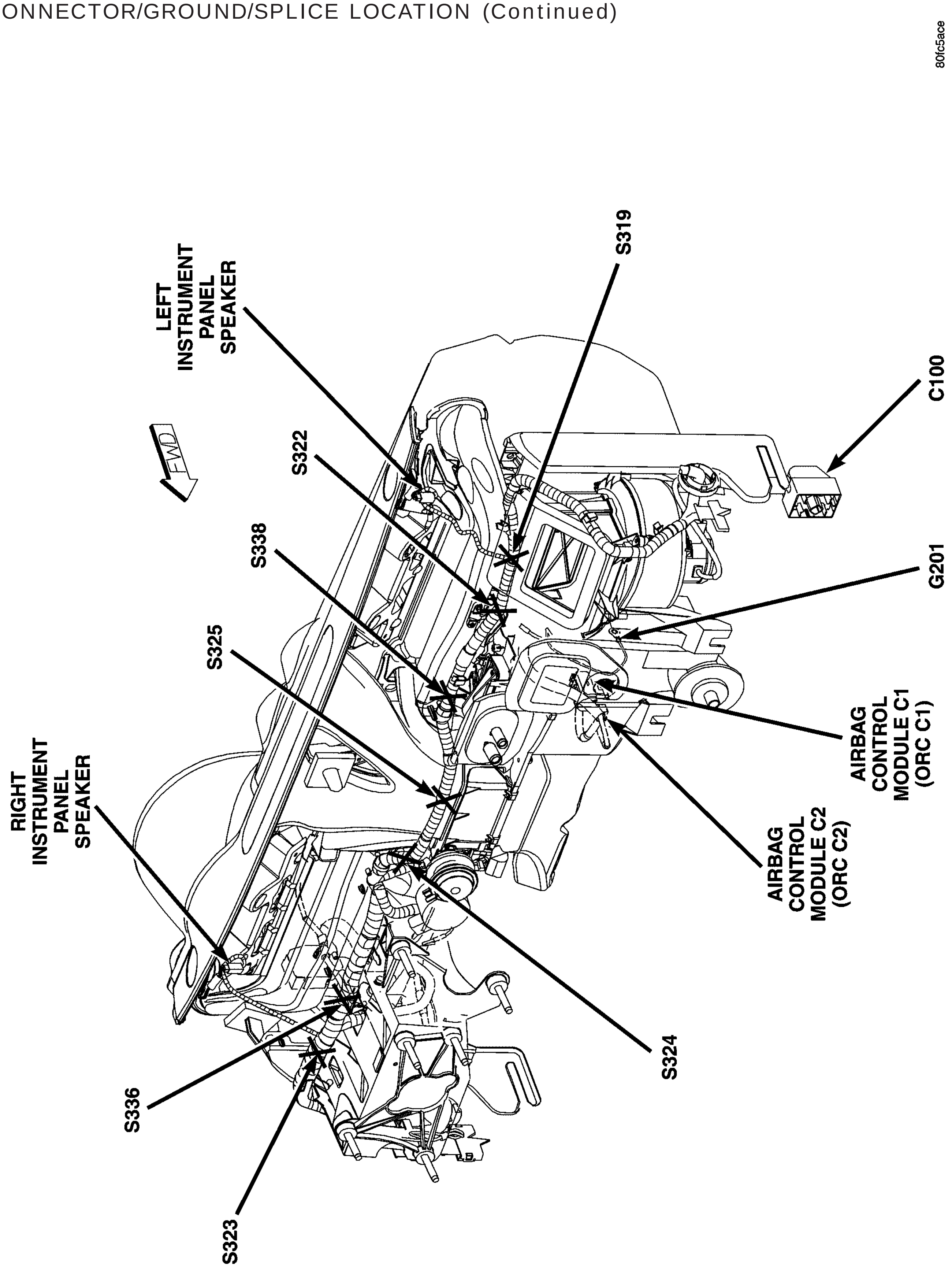


Fig. 37 INSTRUMENT PANEL, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

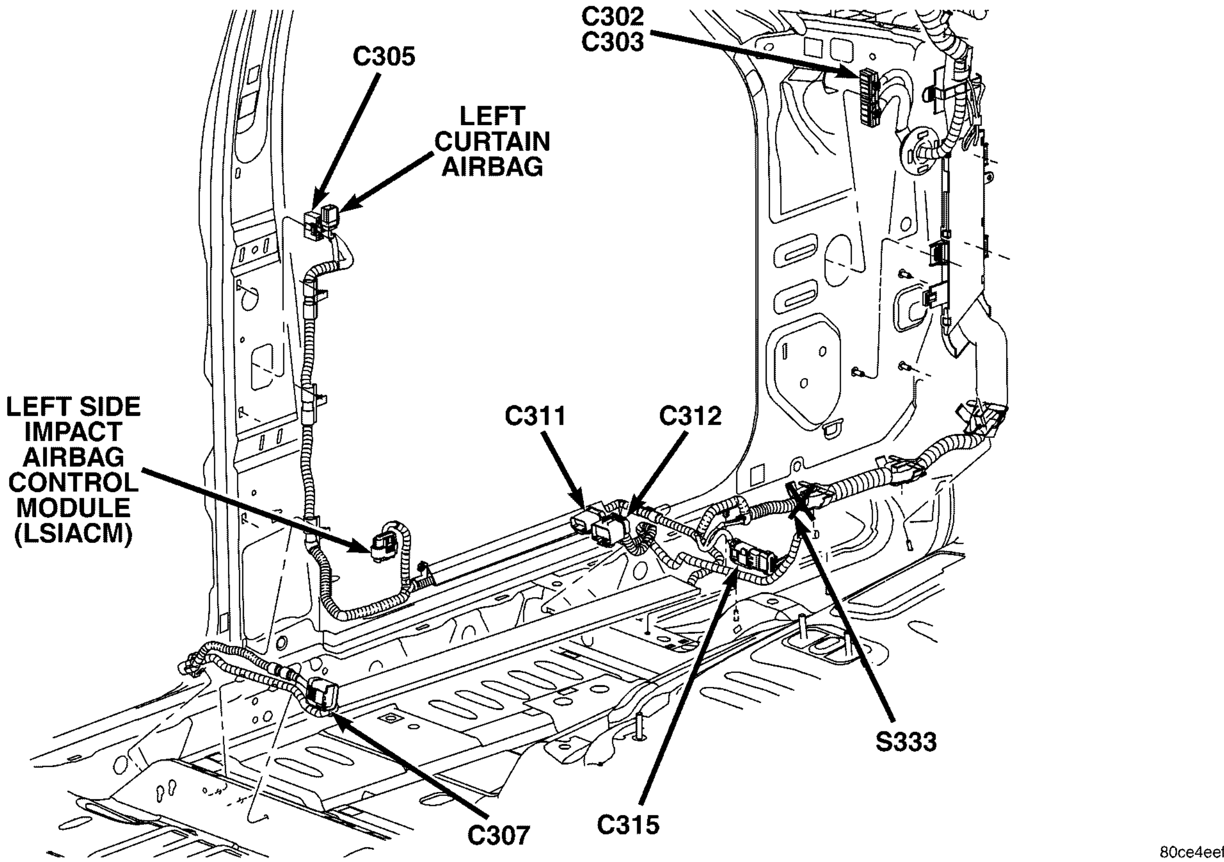


Fig. 38 LEFT FRONT BODY, RHD

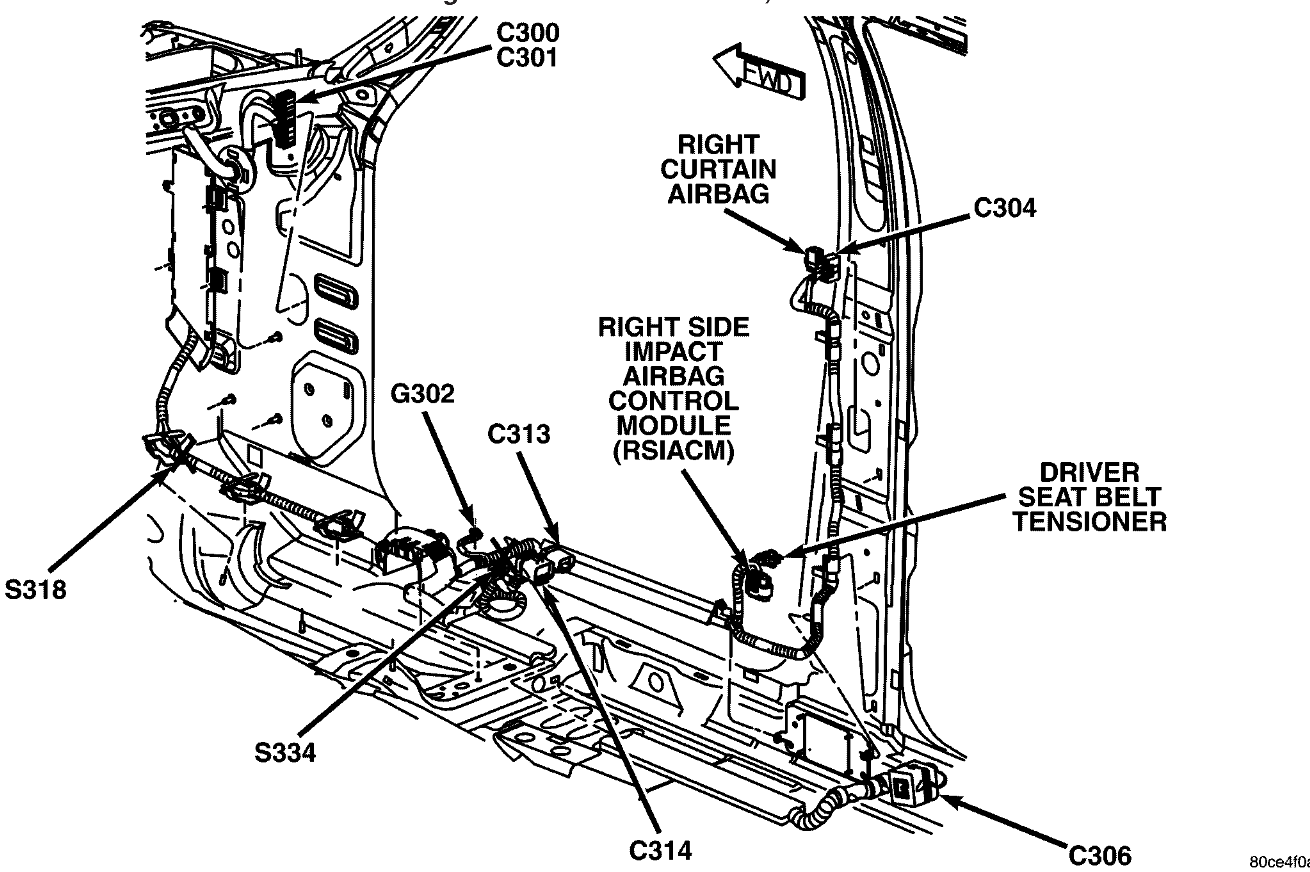


Fig. 39 RIGHT FRONT BODY, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

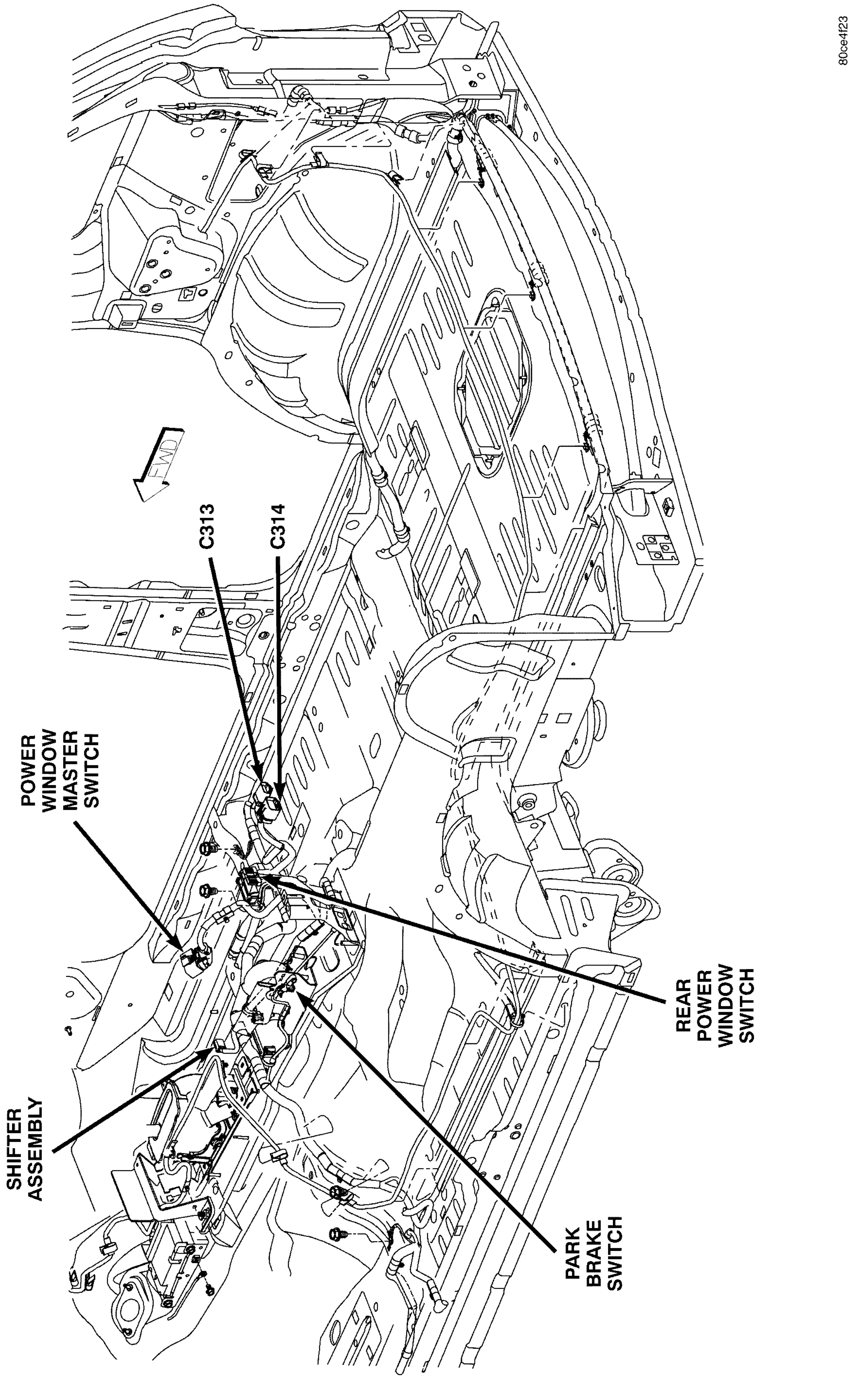


Fig. 40 RIGHT FRONT BODY, RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

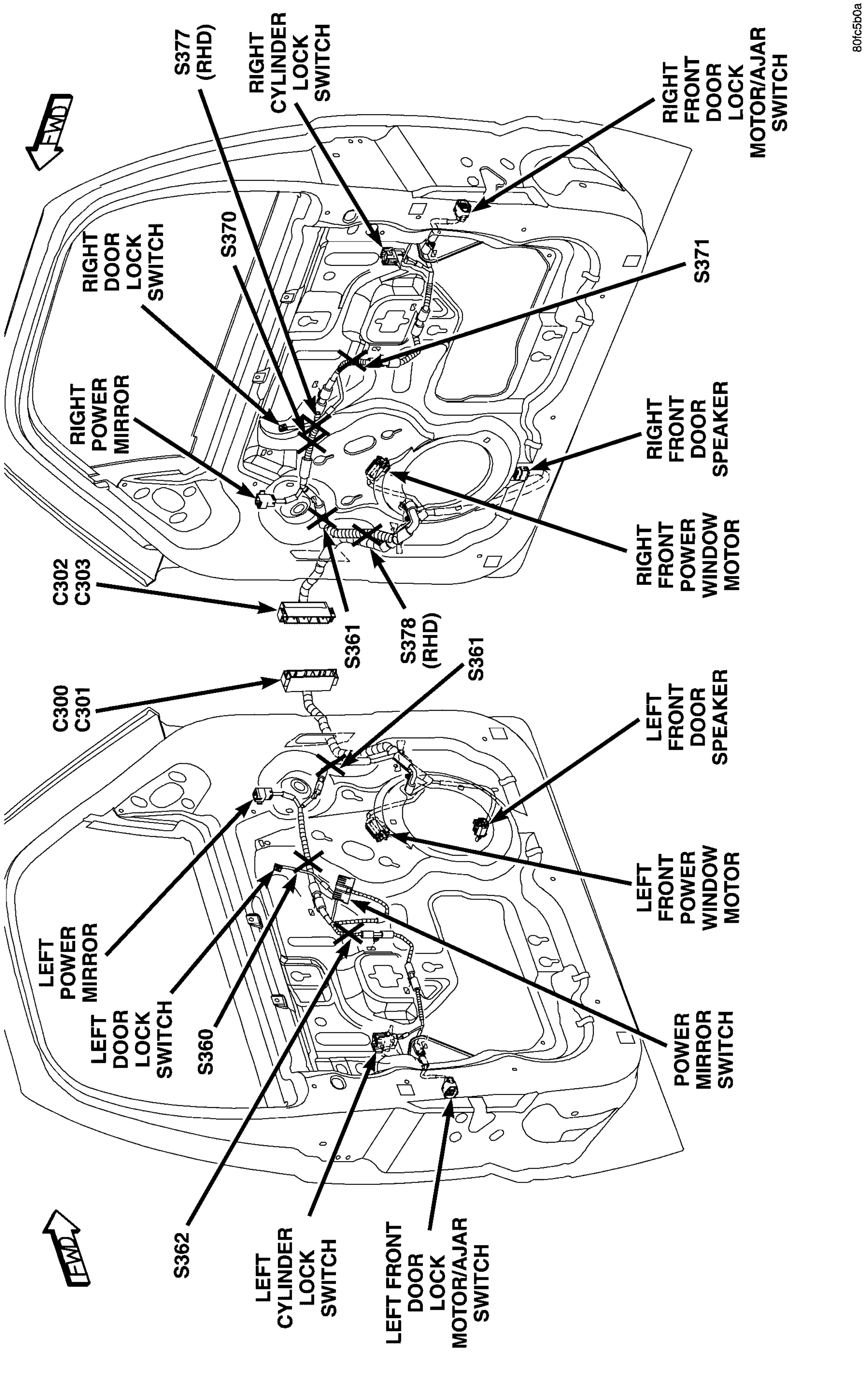


Fig. 41 FRONT DOORS

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

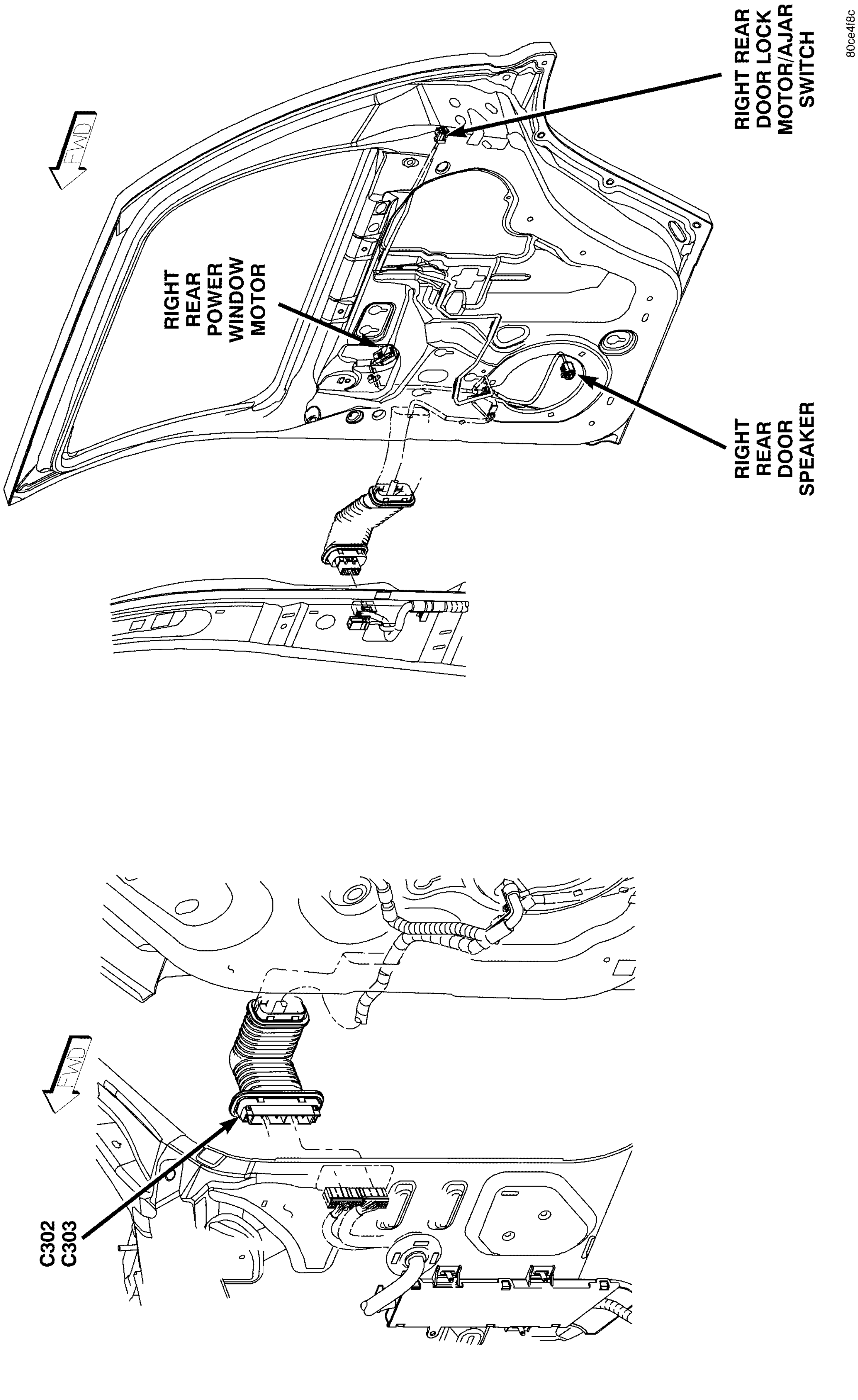


Fig. 42 REAR DOOR

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

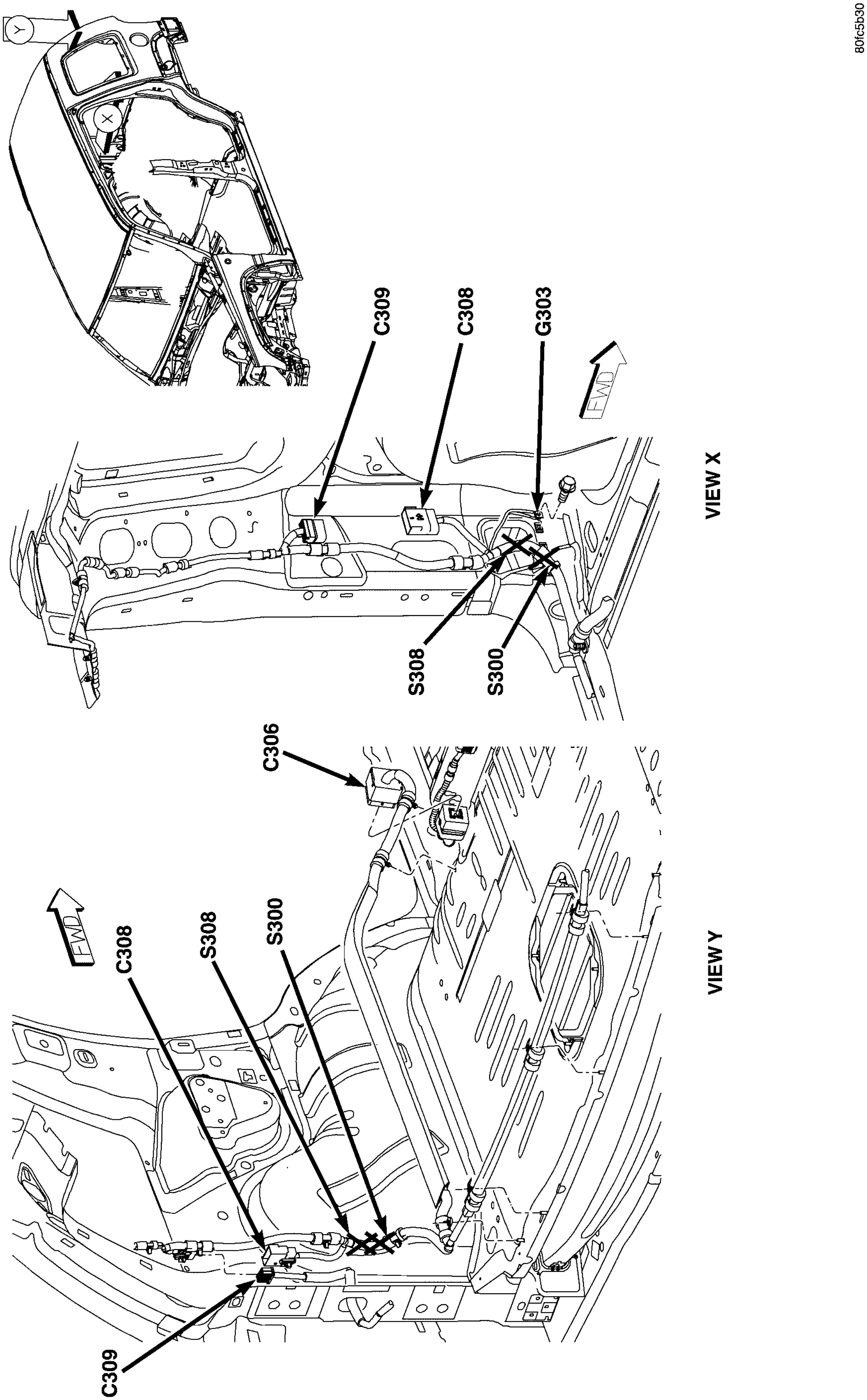


Fig. 43 LEFT REAR BODY

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

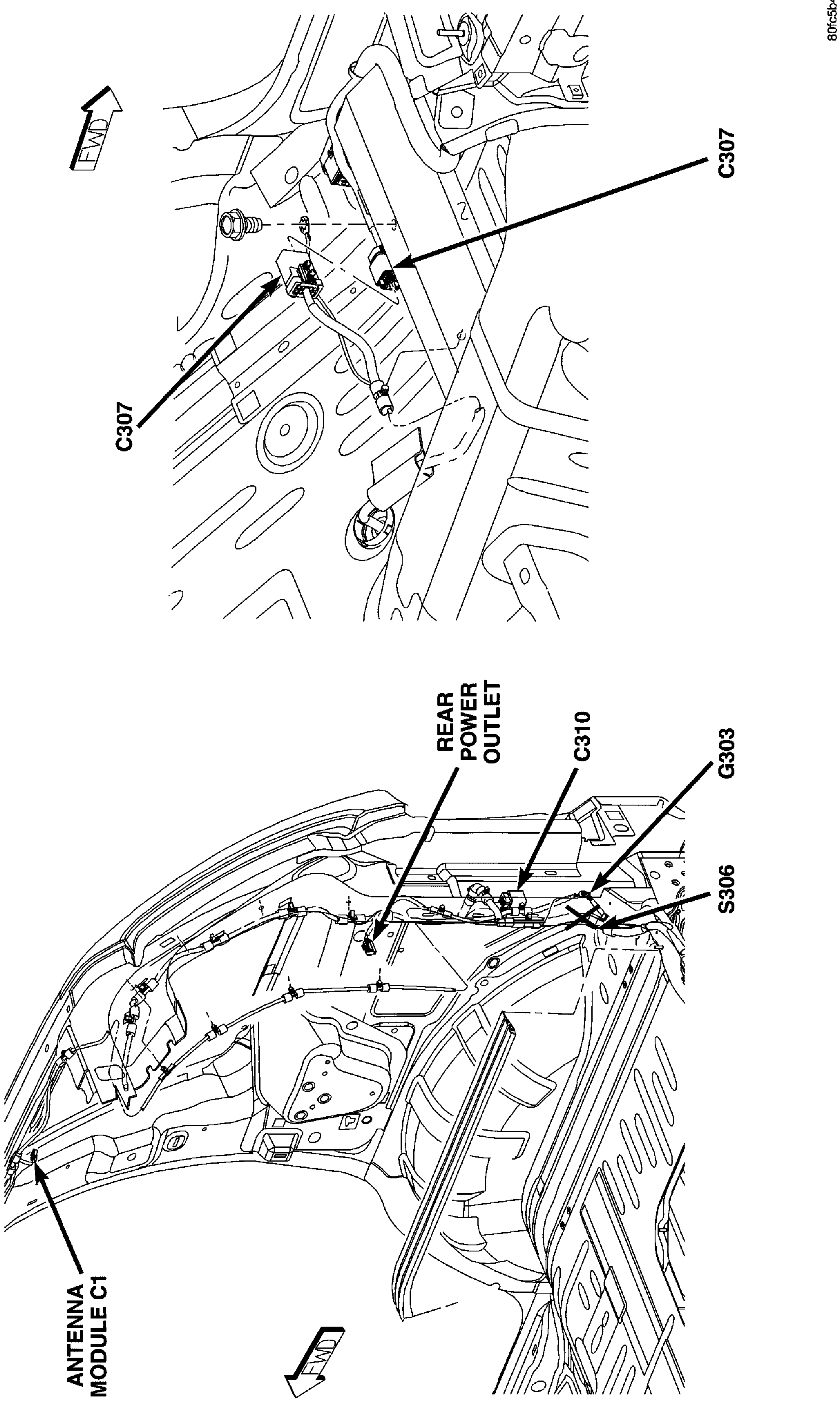


Fig. 44 RIGHT REAR BODY

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

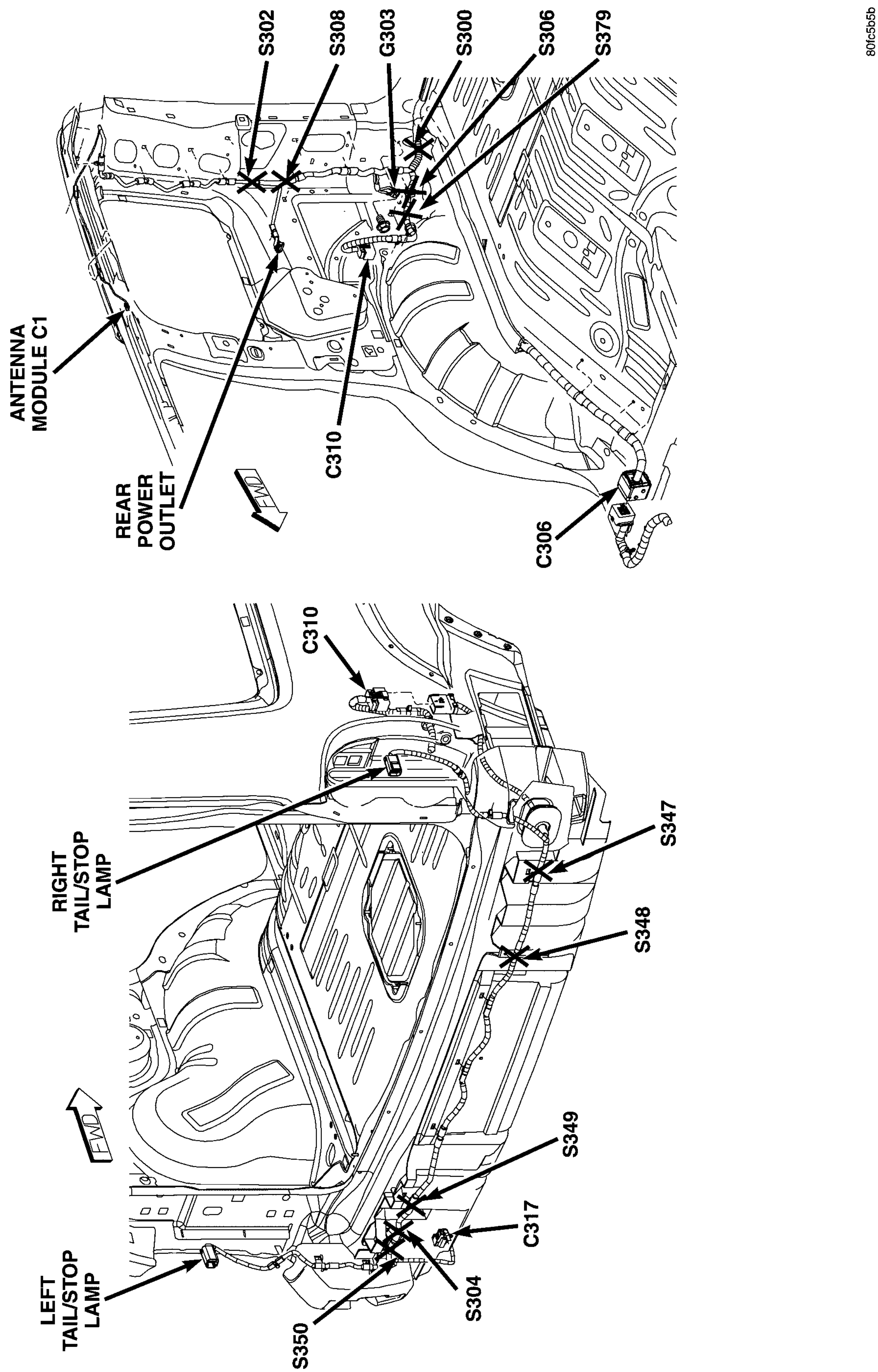


Fig. 45 REAR BODY

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

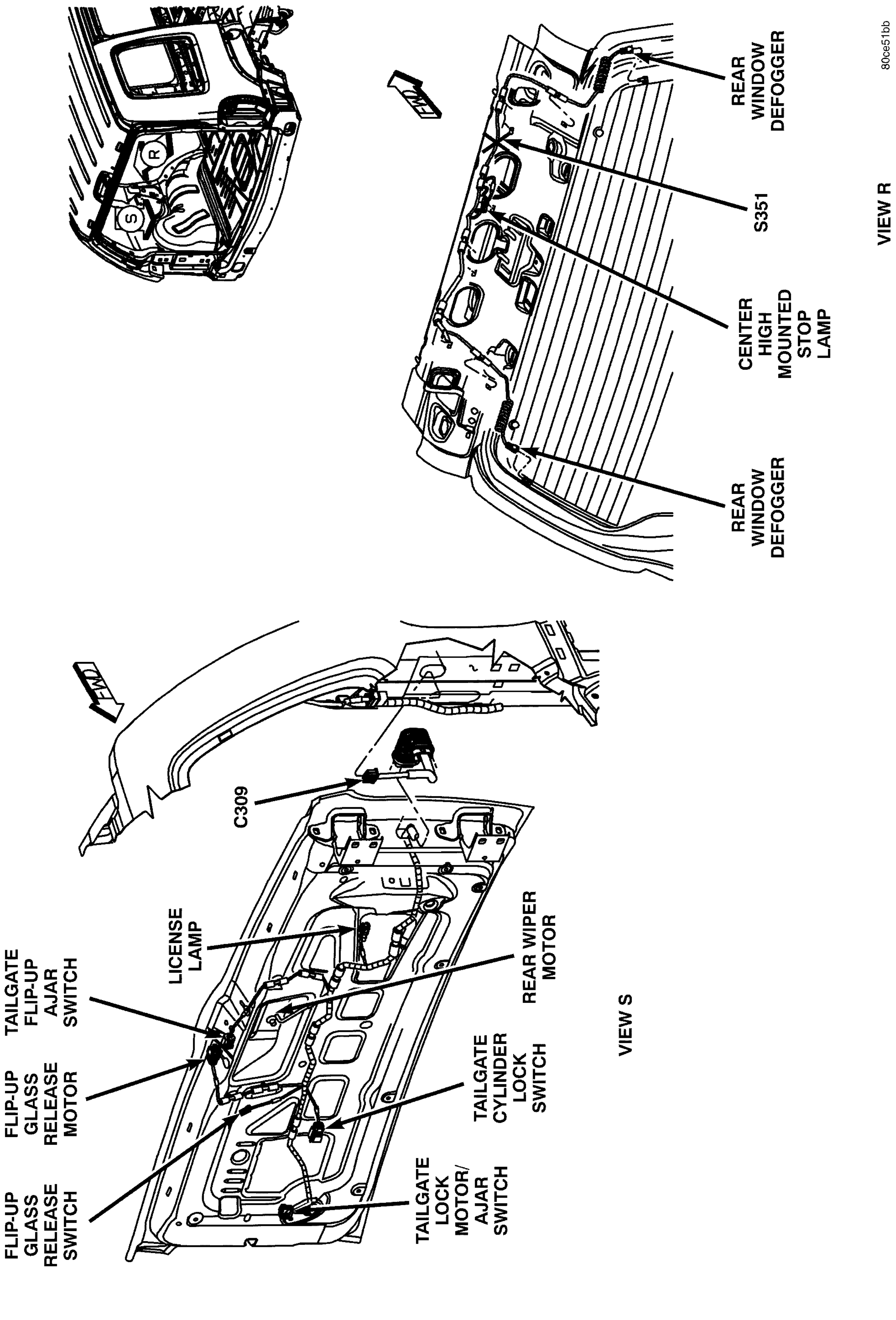


Fig. 46 TAILGATE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

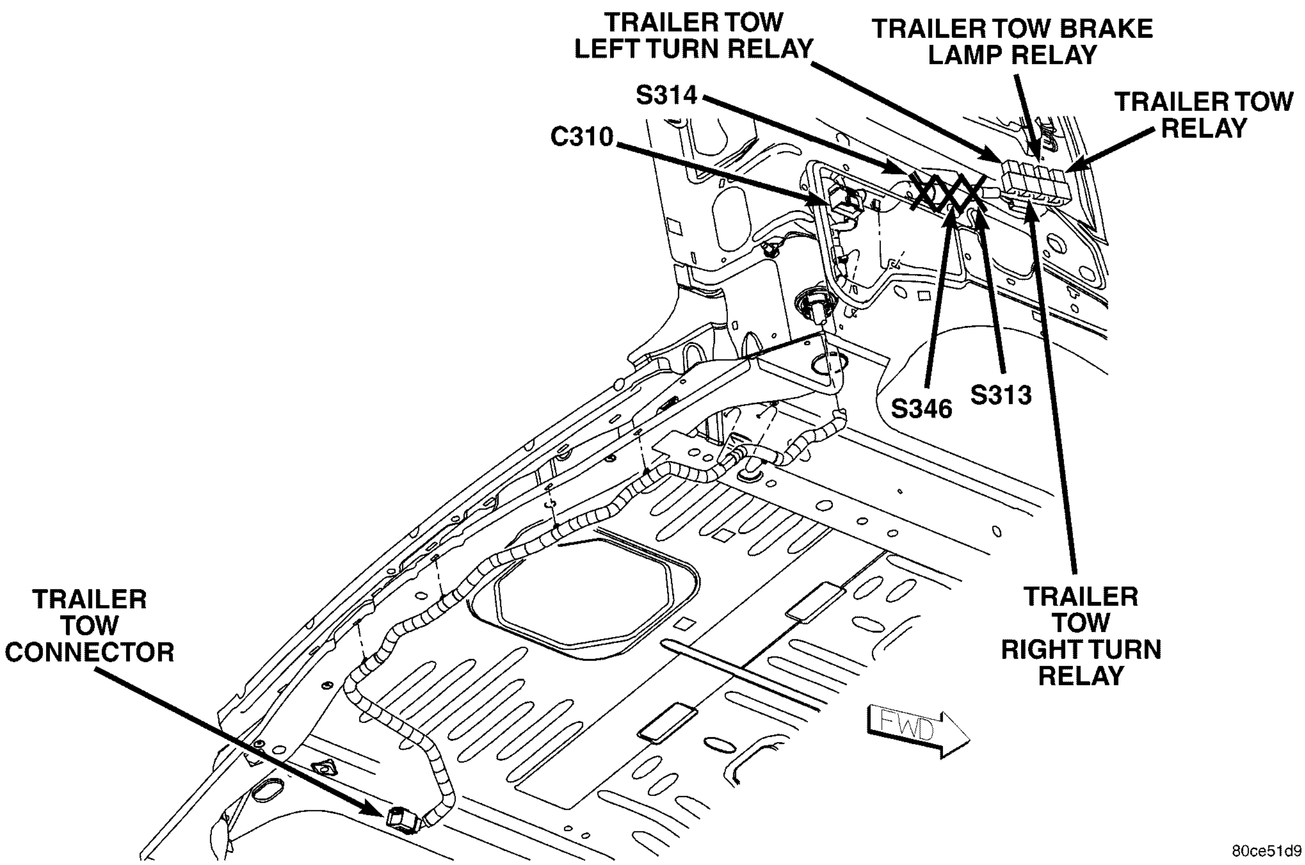


Fig. 47 TRAILER TOW CONNECTORS

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

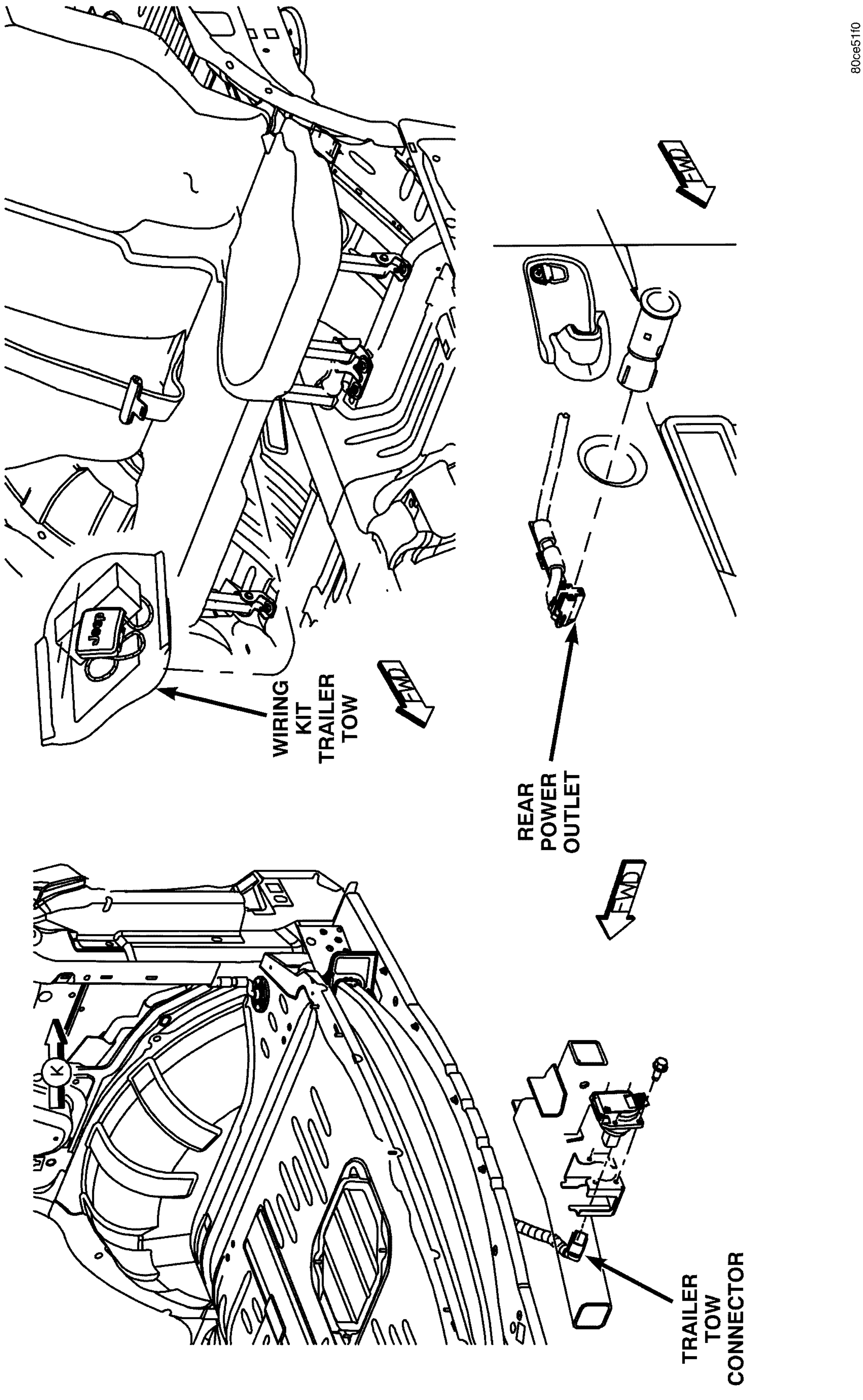


Fig. 48 REAR BODY

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

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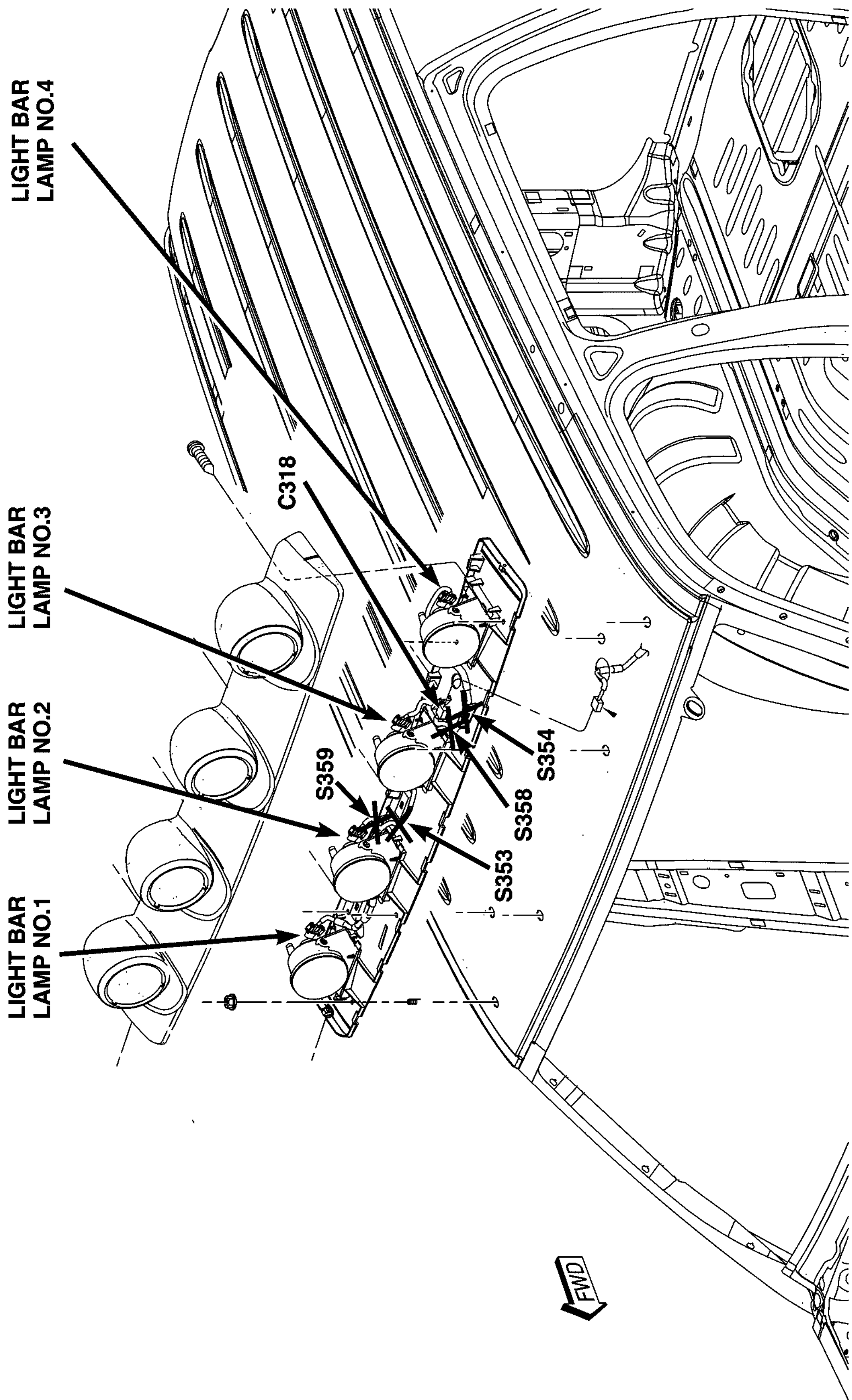


Fig. 49 ROOF LIGHT BAR

8W-97 POWER DISTRIBUTION

TABLE OF CONTENTS

POWER DISTRIBUTION

DESCRIPTION

This group covers the various standard and optional power distribution components used on this model. The power distribution system for this vehicle consists of the following components:

- Power Distribution Center (PDC)
- Junction Block (JB)
- Cigar Lighter Outlet
- Power Outlets

The power distribution system also incorporates various types of circuit control and protection features, including:

- Automatic resetting circuit breakers
- Blade-type fuses
- Bus bars
- Cartridge fuses
- Circuit splice blocks
- Fusible link
- ISO Standard and Micro-Relays

Following are general descriptions of the major components in the power distribution system. See the owner's manual in the vehicle glove box for more information on the features and use of all of the power distribution system components. Refer to Wiring Diagrams for complete circuit diagrams.

OPERATION

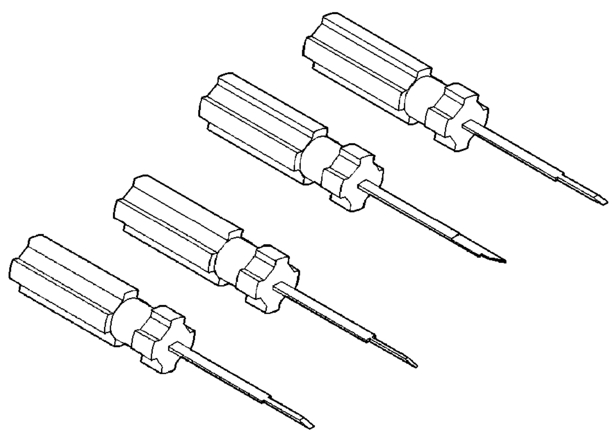
The power distribution system for this vehicle is designed to provide safe, reliable, and centralized distribution points for the electrical current required to operate all of the standard and optional factory-installed electrical and electronic powertrain, chassis, safety, security, comfort and convenience systems. At the same time, the power distribution system was designed to provide ready access to these electrical distribution points for the vehicle technician to use when conducting diagnosis and repair of faulty cir-

POWER DISTRIBUTION (Continued)

cuits. The power distribution system can also prove useful for the sourcing of additional electrical circuits that may be required to provide the electrical current needed to operate accessories that the vehicle owner may choose to have installed in the aftermarket.

SPECIAL TOOLS

POWER DISTRIBUTION SYSTEMS



Terminal Pick Kit 6680

CIGAR LIGHTER OUTLET

DESCRIPTION

Some models are equipped with a cigar lighter outlet installed in the instrument panel. The cigar lighter outlet is located near the bottom of the instrument panel center stack area, below the heater and air conditioner controls. The cigar lighter outlet is secured by a snap fit within the center lower bezel.

The cigar lighter outlet, plastic cap and the knob and heating element unit are available for service replacement. These components cannot be repaired and, if faulty or damaged, they must be replaced.

OPERATION

The cigar lighter consists of two major components: a knob and heating element unit, and the cigar lighter base or outlet shell. The receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The cigar lighter receives battery voltage from a fuse in the junction block when the ignition switch is in the Accessory or Run positions.

The cigar lighter knob and heating element are encased within a spring-loaded housing, which also features a sliding protective heat shield. When the knob and heating element are inserted in the outlet shell, the heating element resistor coil is grounded through its housing to the outlet shell. If the cigar lighter knob is pushed inward, the heat shield slides up toward the knob exposing the heating element, and the heating element extends from the housing toward the insulated contact in the bottom of the outlet shell.

Two small spring-clip retainers are located on either side of the insulated contact inside the bottom of the outlet shell. These clips engage and hold the heating element against the insulated contact long enough for the resistor coil to heat up. When the heating element is engaged with the contact, battery current can flow through the resistor coil to ground, causing the resistor coil to heat.

When the resistor coil becomes sufficiently heated, excess heat radiates from the heating element causing the spring-clips to expand. Once the spring-clips expand far enough to release the heating element, the spring-loaded housing forces the knob and heating element to pop back outward to their relaxed position. When the cigar lighter knob and element are pulled out of the outlet shell, the protective heat shield slides downward on the housing so that the heating element is recessed and shielded around its circumference for safety.

DIAGNOSIS AND TESTING - CIGAR LIGHTER OUTLET

For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the Run position. Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open or short as required.

(3) Remove the cigar lighter knob and element from the cigar lighter outlet shell. Check for continuity between the inside circumference of the cigar lighter outlet shell and a good ground. there should be continuity. If OK, go to Step 4. If not OK, go to Step 5.

(4) Turn the ignition switch to the Run position. Check for battery voltage at the insulated contact located at the back of the cigar lighter outlet shell. If OK, replace the faulty cigar lighter knob and element. If not OK, go to Step 5.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the instrument panel center lower bezel. Check for continuity between the ground circuit cavity of the cigar lighter wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

CIGAR LIGHTER OUTLET (Continued)

(6) Connect the battery negative cable. Turn the ignition switch to the Accessory or Run positions. Check for battery voltage at the fused B(+) circuit cavity of the cigar lighter wire harness connector. If OK, replace the faulty cigar lighter outlet. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

IOD FUSE

DESCRIPTION

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse that is disconnected within the Junction Block when the vehicle is shipped from the factory. Dealer personnel are to reconnect the IOD fuse in the junction block as part of the preparation procedures performed just prior to new vehicle delivery.

On left hand drive vehicles, the left end of the instrument panel cover has a snap-fit fuse access panel that can be removed to provide service access to the fuses in the junction block. On right hand drive vehicles the junction block is mounted on the right hand side of the instrument panel. A finger recess is molded into the access panel for easy removal. An adhesive-backed fuse layout map is secured to the instrument panel side of the access panel to ensure proper fuse identification. The IOD fuse is a 15 ampere mini blade-type fuse, located in fuse cavity # 34. The fuse is secured within a White molded plastic fuse holder and puller unit that serves both as a tool for disconnecting and reconnecting the fuse in its junction block cavity, and as a fuse holder that conveniently stores the fuse in the same junction block cavity after it has been disconnected.

CIRCUITS INCLUDED WITH IOD FUSE

- Cluster
- Body Control Module
- Diagnostic Connector
- Map Lamps
- Glove Box Lamp
- Courtesy Lamps
- Compass Mini-Trip Computer
- Radio

OPERATION

The term ignition-off draw identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. The IOD fuse feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the Off position. The only reason the IOD fuse is disconnected is to reduce the normal IOD of the vehicle electrical system during new vehicle transportation and pre-delivery storage to reduce battery depletion, while still allowing vehicle operation so that the vehicle can be loaded, unloaded and moved as needed by both vehicle transportation company and dealer personnel.

The IOD fuse is disconnected from JB fuse cavity # 34 when the vehicle is shipped from the assembly plant. Dealer personnel must reconnect the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation. Once the vehicle is prepared for delivery, the IOD function of this fuse becomes transparent and the fuse that has been assigned the IOD designation becomes only another Fused B(+) circuit fuse.

The IOD fuse can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about thirty days. However, it must be remembered that disconnecting the IOD fuse will not eliminate IOD, but only reduce this normal condition. If a vehicle will be stored for more than about thirty days, the battery negative cable should be disconnected to eliminate normal IOD; and, the battery should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged.

REMOVAL

The Ignition-Off Draw (IOD) fuse is disconnected from Junction Block fuse cavity # 34 when the vehicle is shipped from the assembly plant. Dealer personnel must reconnect the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation.

(1) Turn the ignition switch to the Off position.

(2) Remove the fuse access panel by unsnapping it from the outboard end of the instrument panel.

(3) Grasp the outer tabs of the IOD fuse holder unit in fuse cavity # 34 of the Junction Block between the thumb and forefinger and pull the unit firmly outward.

(4) Install the fuse access panel by snapping it onto the outboard end of the instrument panel.

INSTALLATION

(1) Turn the ignition switch to the Off position.

(2) To install the IOD fuse, use a thumb to press the IOD fuse holder unit in fuse cavity # 34 firmly into the junction block.

(3) Install the fuse access panel by snapping it onto the left outboard end of the instrument panel.

JUNCTION BLOCK

DESCRIPTION

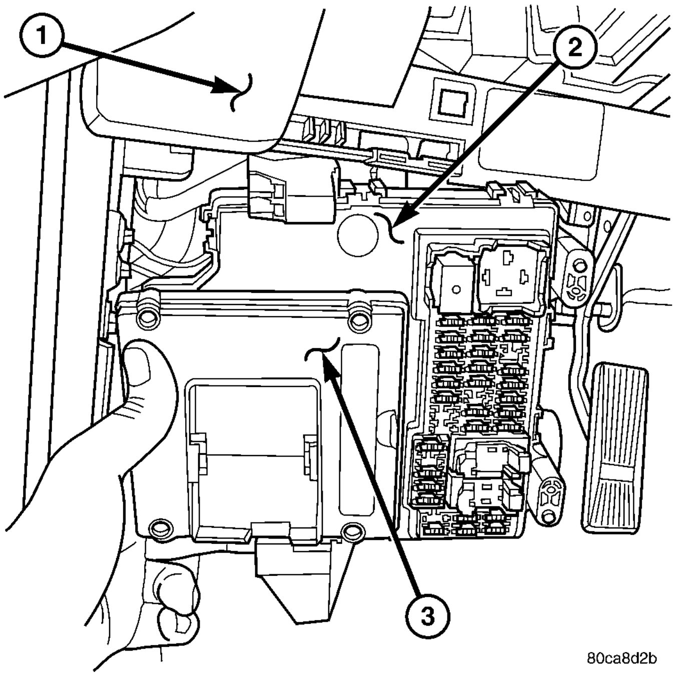


Fig. 1 KJ Junction Block

1 - INSTRUMENT PANEL
2 - JUNCTION BLOCK
3 - BODY CONTROL MODULE

An electrical Junction Block (JB) is concealed behind the left outboard end of the instrument panel on left hand drive vehicles. On right hand drive vehicles the Junction Block is concealed behind the right outboard end of the instrument panel. The junction block simplifies and centralizes numerous electrical components and distributes electrical current to many of the accessory systems throughout the vehicle. It also eliminates the need for numerous splice connections and serves in place of a bulkhead connector between many of the engine compartment, instrument panel, and body wire harnesses. The junction block houses up to thirty-nine mini blade-type fuses, up to three blade-type automatic resetting circuit breakers, up to three International Standards Organization (ISO) relays and up to eleven International Standards Organization (ISO) micro-relays.

The junction block also provides the mounting location for the Body Control Module (BCM) (Fig. 1) and Remote Keyless Entry (RKE) Module. Refer to the Electronic Control Modules section of this manual for more information on these two modules. The body control module is secured to the junction block assembly with four screws and multiple electrical connectors. The remote keyless entry module is mounted on the body control module via a single built-in electrical connector. With the junction block in its normal mounting location the body control module and remote keyless entry module are not accessible.

The molded plastic junction block housing has two integral mounting bosses that are secured with two screws to the left instrument panel end bracket on left hand drive. Additionally, upper and lower mounting brackets are attached to the junction block. These brackets are also secured to the instrument panel with two screws. On right hand drive vehicles, the junction block is secured to the right instrument panel end bracket on right hand drive. The left or right instrument panel end caps have snap-fit fuse access panels that can be removed for service of the junction block mounted fuses, daytime running lamp or high beam headlamp relays. A fuse puller and spare fuse holders are located on the back of the fuse access cover, as well as an adhesive-backed fuse layout map to ensure proper fuse identification. Refer to the owners manual or Wiring section of this manual for detailed component location and/or identification.

The junction block unit cannot be repaired and is only serviced as an assembly. If any internal circuit or the junction block housing is faulty or damaged, the entire junction block unit must be replaced.

OPERATION

All of the circuits entering and exiting the junction block do so through wire harness connectors or the body control module which is mounted directly to the junction block underneath the instrument panel. These components are connected to the junction block through integral connector receptacles molded into the junction block housing. Internal connection of all of the junction block circuits is accomplished by an intricate combination of hard wiring and bus bars. Refer to **Wiring Diagrams** for the location of complete junction block circuit diagrams.

DIAGNOSIS AND TESTING - JUNCTION BLOCK

The junction block does not incorporate any self diagnostic capability. Most of the electrical circuits incorporated into the vehicle must pass through the junction block at one point or another. The most efficient means of diagnosing a suspected junction block problem involves a simple continuity tester or ohm meter. Using the Wiring Diagrams as a guide trace the problem circuit to the proper junction block cavity and test all circuits in the effected circuit for proper continuity. A open or high resistance circuit is a sign of a problem. Some other possible junction block problems to look for are:

- Loose fuse receptacle terminals.
- Loose relay / circuit breaker receptacle terminals.

JUNCTION BLOCK (Continued)

- Bent or distorted electrical circuit pins.
- Incorrect size fuse installed in junction block fuse cavity.
- Dark areas identifying a source of excess heat.
- Defective fuse, relay or circuit breaker installed in junction block cavity.

REMOVAL

REMOVAL - LHD

The following junction block removal procedure is for Left Hand Drive (LHD) vehicles only.

(1) Disconnect and isolate the negative battery cable.

(2) Remove the left end cap from the instrument panel.

(3) Unsnap and remove the left outboard trim bezel from the instrument panel. Located just to the left of the steering column.

(4) Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(5) Remove the left cowl trim panel from the vehicle (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).

(6) Remove the courtesy lamp from under the left side of the instrument panel. This will allow sufficient room to remove the junction block from under the instrument panel.

(7) Working through the steering column opening cover, remove the three bulkhead and two body controller electrical connectors from the junction block assembly.

(8) Detach instrument panel wire harness from the lower channel on the instrument panel. This will allow sufficient room to remove the junction block from under the instrument panel.

(9) Remove the four junction block retaining screws and remove the junction block from under the instrument panel. See (Fig. 2) for access to the top outboard retaining screw.

NOTE: On models equipped with a manual transmission, depress the clutch pedal to remove the Junction Block from under the instrument panel.

REMOVAL - RHD

The following junction block removal procedure applies to Right Hand Drive (RHD) vehicles only.

(1) Disconnect and isolate the negative battery cable.

(2) Remove the right end cap from the instrument panel.

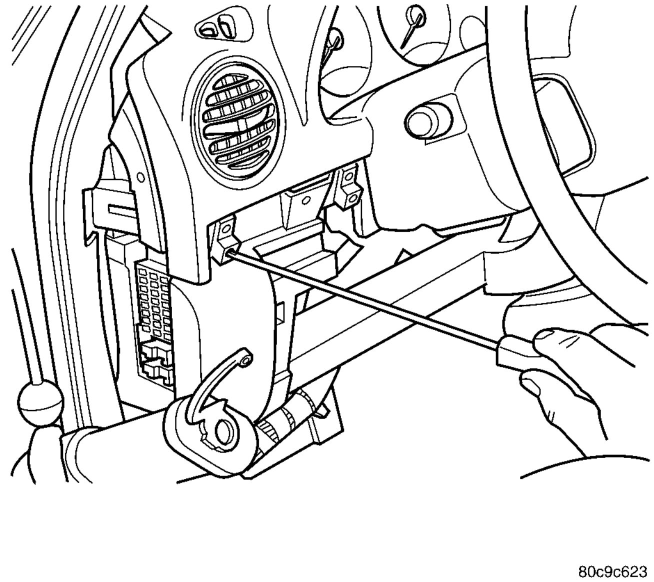


Fig. 2 Accessing Junction Block Retaining Screw - LHD Only

(3) Unsnap and remove the right outboard trim bezel from the instrument panel. Located just to the right of the steering column.

(4) Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(5) Remove the right cowl trim panel from the vehicle (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).

(6) Remove the courtesy lamp from under the right side of the instrument panel. This will allow sufficient room to remove the junction block from under the instrument panel.

(7) Working through the steering column opening cover, remove the three bulkhead and two body controller electrical connectors from the junction block assembly.

(8) Remove the two ground wires from the right lower kick panel area. Located directly behind the kick trim panel. This will allow sufficient room to remove the junction block from under the instrument panel.

(9) Remove the upper and forward most (in relation to the vehicle) group of relays from the junction block. This will allow sufficient room to remove the junction block from under the instrument panel.

(10) Remove the four junction block retaining screws and remove the junction block from under the instrument panel. It will be necessary to position the under instrument panel wire harness out of the way to remove the junction block.

JUNCTION BLOCK (Continued)

INSTALLATION

INSTALLATION - LHD

NOTE: On vehicles equipped with a manual transmission, it will be helpful to depress the clutch pedal when installing the Junction Block under the instrument panel.

(1) Position the junction block and install the four junction block retaining screws.

(2) Install instrument panel wire harness on the lower channel of the instrument panel.

(3) Working through the steering column opening cover, install the three bulkhead and two body controller electrical connectors on the junction block assembly.

(4) Install the courtesy lamp under the left side of the instrument panel.

(5) Install the left cowl trim panel on the vehicle (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).

(6) Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(7) Install the left outboard trim bezel on the instrument panel.

(8) Install the left end cap on the instrument panel.

(9) Connect the negative battery cable.

INSTALLATION - RHD

(1) Position the junction block and install the four junction block retaining screws.

(2) Install the upper and forward most group of relays in the junction block.

(3) Install the two ground wires on the right lower kick panel area.

(4) Working through the steering column opening cover, install the three bulkhead and two body controller electrical connectors on the junction block assembly.

(5) Install the courtesy lamp under the right side of the instrument panel.

(6) Install the right cowl trim panel on the vehicle (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION).

(7) Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(8) Install the right outboard trim bezel on the instrument panel.

(9) Install the right end cap on the instrument panel.

(10) Connect the negative battery cable.

POWER DISTRIBUTION CENTER

DESCRIPTION

All of the electrical current distributed throughout this vehicle is directed through the standard equipment Power Distribution Center (PDC). The molded plastic PDC housing is located in the left front corner of the engine compartment, between the battery and the grille. The PDC houses up to fifteen maxi-type cartridge fuses, which replace all in-line fusible links, except for the fusible link between the PDC and alternator. The PDC also houses up to thirteen blade-type mini fuses, and up to twelve International Standards Organization (ISO) relays (four standard-type and eight micro-type).

The PDC housing is secured in the engine compartment at three points. Integral mounts on both sides of the PDC housing engage and latch to stanchions that are integral to the molded plastic battery tray. The PDC is integral to the headlamp and dash wire harness, which exits from the bottom of the PDC housing. The PDC housing has a molded plastic cover that includes an integral latch at the front and pivot hooks at the back that snap over a hinge pin on the rear of the PDC housing. The PDC cover is easily opened or removed for service access and has a convenient fuse and relay layout map integral to the inside surface of the cover to ensure proper component identification. A fuse puller is also stored on the inside of the PDC cover.

The PDC cover, the PDC housing lower cover, the PDC relay wedges, the PDC mini fuse wedge, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC main housing unit, the cartridge fuse wedges and the bus bars cannot be repaired and are only serviced as a unit with the headlamp and dash wire harness. If the PDC main housing unit, cartridge fuse wedge or the bus bars are faulty or damaged, the headlamp and dash wire harness unit must be replaced.

OPERATION

All of the current from the battery and the alternator output enters the PDC through two cables and a single two-holed eyelet that is secured with nuts to the two PDC B(+) terminal studs just inside the inboard end of the PDC housing. The PDC cover is unlatched and opened to access the battery and alternator output connection B(+) terminal studs, the fuses or the relays. Internal connection of all of the PDC circuits is accomplished by an intricate combination of hard wiring and bus bars. Refer to **Power**

POWER DISTRIBUTION CENTER (Continued)

Distribution in Wiring Diagrams for the location of complete PDC circuit diagrams.

REMOVAL

The Power Distribution Center (PDC) main housing unit, the PDC cartridge fuse wedge and the PDC bus bars cannot be repaired and are only serviced as a unit with the headlamp and dash wire harness. If the PDC main housing unit, the cartridge fuse wedges or the bus bars are faulty or damaged, the entire PDC and headlamp and dash wire harness unit must be replaced.

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect each of the headlamp and dash wire harness connectors. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the right headlamp and dash wire harness connector locations.

(3) Remove all of the fasteners that secure each of the headlamp and dash wire harness ground eyelets to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the ground eyelet locations.

(4) Disengage each of the retainers that secure the headlamp and dash wire harness to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the headlamp and dash wire harness retainer locations.

(5) Unlatch and open the PDC cover.

(6) Remove the two nuts that secure the two-holed eyelet of the battery wire harness PDC take outs to the PDC B(+) terminal studs.

(7) Remove the battery wire harness PDC take out eyelet from the B(+) terminal studs.

(8) Disengage the latches on the PDC housing mounts from the tabs on the PDC mounting stanchions of the battery tray, and pull the PDC housing upward to disengage the mounts from the stanchions.

(9) Remove the PDC and the headlamp and dash wire harness from the engine compartment as a unit.

DISASSEMBLY

POWER DISTRIBUTION CENTER DISASSEMBLY

PDC HOUSING LOWER COVER

REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC mini fuse wedge, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Unlatch and remove the cover from the PDC.

(2) Remove the two nuts that secure the two-holed eyelet of the battery wire harness PDC take out to the B(+) terminal studs near the inboard end of the PDC.

(3) Remove the battery wire harness PDC take out eyelet from the two PDC B(+) terminal studs.

(4) Disengage the latches on the PDC housing mounts from the tabs on the PDC mounting stanchions on the battery tray, and pull the PDC housing upward to disengage the mounts from the stanchions.

(5) Where the headlamp and dash wire harness exits the PDC, remove the tape that secures the wire harness to the trough formation on the PDC housing lower cover.

(6) Using a trim stick or another suitable wide flat-bladed tool, gently pry the latches on each side of the PDC housing that secure the housing lower cover to the PDC and remove the housing lower cover (Fig. 3).

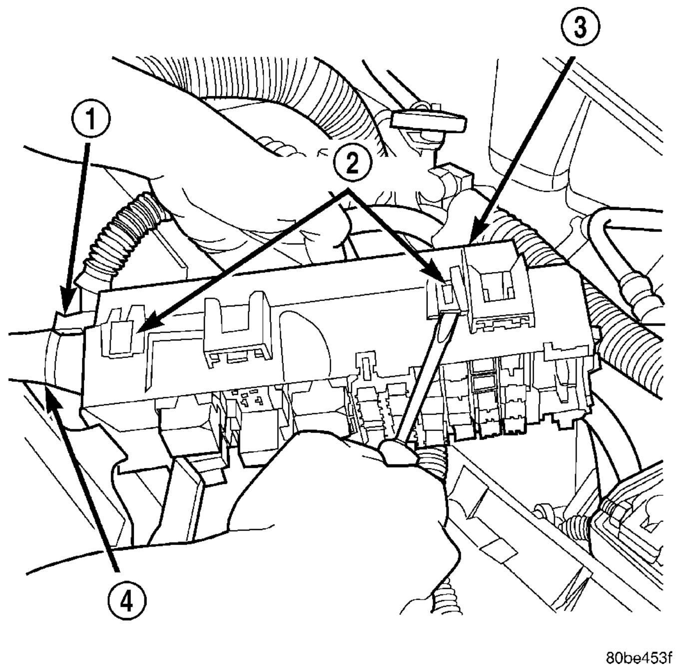


Fig. 3 PDC Housing Lower Cover Remove/Install - Typical

1 - TROUGH FORMATION
2 - LATCHES (5)
3 - PDC HOUSING LOWER COVER
4 - WIRE HARNESS

POWER DISTRIBUTION CENTER (Continued)

PDC B+ TERMINAL MODULE

REMOVAL

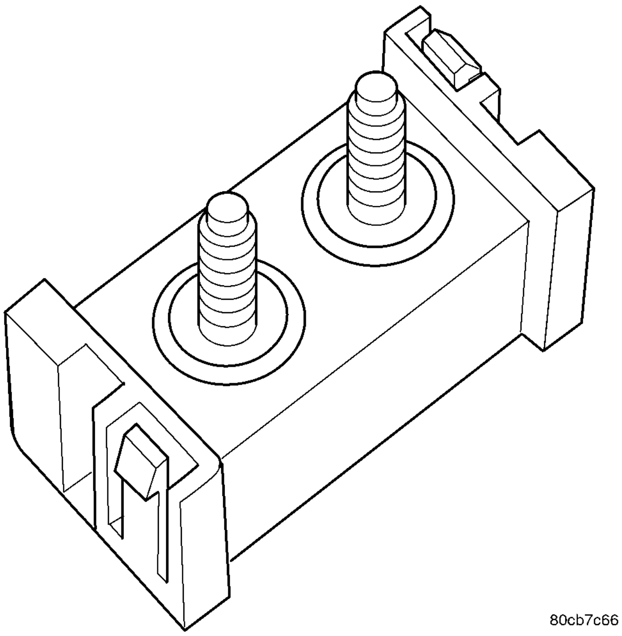


Fig. 4 B+ Terminal Module

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC mini fuse wedge, the PDC relay cassettes and the PDC B(+) terminal stud module (Fig. 4) are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Remove the PDC housing lower cover.

(2) From the top of the PDC housing, use a small screwdriver or a terminal pick tool (Special Tool Kit 6680) to release the two latches that secure the B(+) terminal module in the PDC.

(3) Gently and evenly press the two B(+) terminal studs down through the bus bar in the PDC.

(4) From the bottom of the PDC housing, remove the B(+) terminal module from the PDC.

PDC RELAY WEDGE

REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC mini fuse wedge, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Remove the PDC housing lower cover.

(2) Remove each of the relays from the PDC relay wedge to be removed.

(3) From the bottom of the PDC housing, use a small screwdriver or a terminal pick tool (Special Tool Kit 6680) to release the two latches (yellow) that secure the relay wedge to the PDC relay cassette.

(4) From the top of the PDC housing, remove the relay wedge from the PDC relay cassette (Fig. 5).

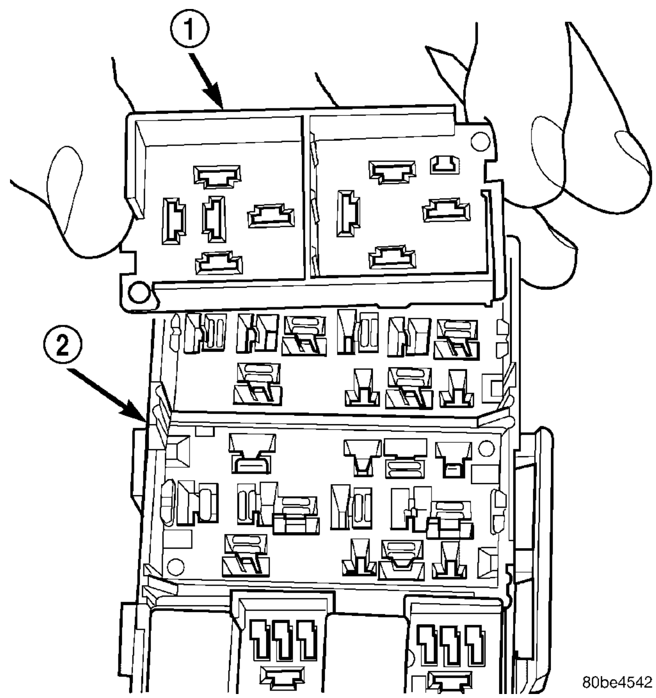


Fig. 5 PDC Relay Wedge Remove/Install - Typical

1 - RELAY WEDGE
2 - PDC HOUSING

PDC RELAY CASSETTE

REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC mini fuse wedge, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

POWER DISTRIBUTION CENTER (Continued)

(1) Remove the relay wedge from the PDC relay cassette to be removed.

NOTE: It may be necessary to remove relay cassettes that are not being serviced from the PDC housing in order to obtain sufficient clearance to access the faulty relay cassette. The same service procedure is repeated as necessary to remove each of the interfering relay wedges and relay cassettes from the PDC housing.

(2) From the top of the PDC housing, use a small screwdriver or a terminal pick tool (Special Tool Kit 6680) to release the two latches that secure the relay cassette in the PDC (Fig. 6).

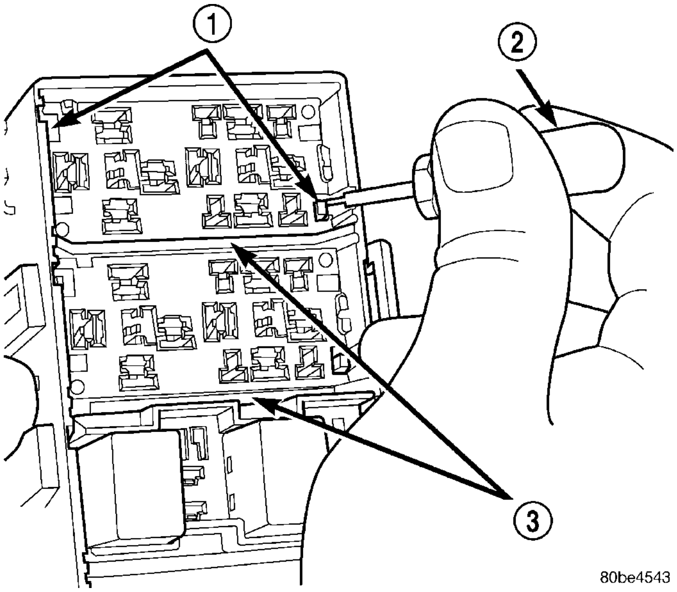


Fig. 6 PDC Relay Cassette Latches - Typical

1 - LATCHES
2 - FROM SPECIAL TOOL KIT 6680
3 - PDC RELAY CASSETTES

(3) Gently and evenly press the relay cassette down through the PDC housing.

(4) From the bottom of the PDC housing, remove the relay cassette from the PDC (Fig. 7).

CAUTION: Do not remove the wiring and terminals from the terminal cavities of the faulty PDC relay cassette at this time. Refer to the Assembly procedure that follows for the proper procedures for transferring the wiring and terminals to the replacement PDC relay cassette.

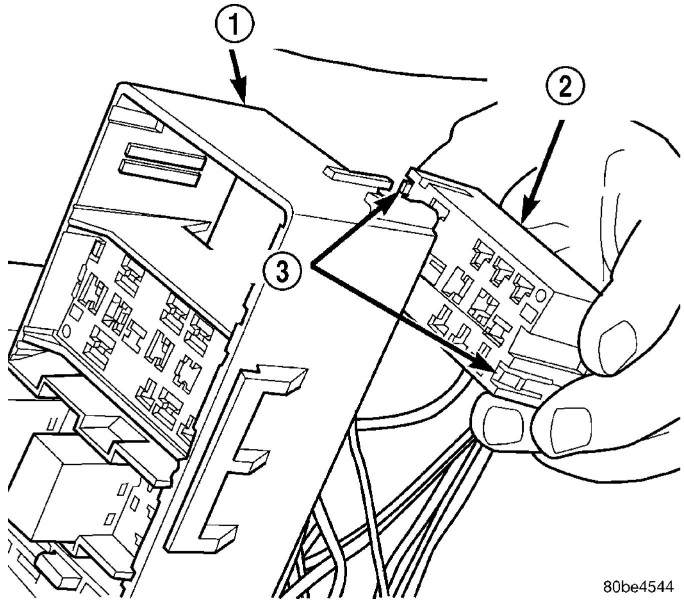


Fig. 7 PDC Relay - Typical

1 - PDC HOUSING
2 - PDC RELAY CASSETTE
3 - LATCHES

ASSEMBLY

POWER DISTRIBUTION CENTER ASSEMBLY

PDC B(+) TERMINAL MODULE

INSTALLATION

(1) From the bottom of the PDC housing, align and insert the B(+) terminal module into the PDC.

(2) From the bottom of the PDC housing, align and insert the two studs of the PDC B(+) terminal module through the bus bar in the PDC.

(3) From the bottom of the PDC housing, press the B(+) terminal module gently and evenly into the PDC until both of the latches are fully engaged.

(4) Install the PDC housing lower cover.

RELAY WEDGE

INSTALLATION

(1) From the top of the PDC housing, align and insert the PDC relay wedge latch arms into the correct cavities in the relay cassette.

(2) Gently and evenly press the PDC relay wedge down into the relay cassette until both of the latches are fully engaged.

(3) Install each of the removed relays into the proper cavities of the PDC relay wedge.

(4) Install the PDC housing lower cover.

POWER DISTRIBUTION CENTER (Continued)

RELAY CASSETTE

INSTALLATION

(1) Move the faulty PDC relay cassette with its wiring away from the bottom of the PDC housing far enough to allow the replacement relay cassette to be installed into the PDC.

(2) Using the faulty relay cassette as a guide, be certain that the replacement relay cassette is correctly oriented before installing it into the PDC housing.

(3) From the bottom of the PDC housing, align and insert the replacement relay cassette into the PDC. Press the relay cassette up into the PDC until both of the latches are fully engaged.

CAUTION: Proper care must be taken to be certain that the wiring and terminals from the faulty PDC relay cassette are installed in the correct terminal cavities of the replacement relay cassette. To prevent mistakes it is recommended that the wiring and terminals be removed from the faulty relay cassette one cavity at a time, repaired or spliced as necessary, then installed securely into the correct cavity of the replacement relay cassette. If you are not absolutely certain into which cavity a terminal should be installed, refer to Power Distribution in the index of this service manual for the location of complete circuit diagrams covering the PDC.

(4) While pulling gently on the wire from the bottom of the faulty PDC relay cassette, use a terminal pick tool (Special Tool Kit 6680) from the top of the relay cassette to release the latch that secures the terminal in the relay cassette terminal cavity (Fig. 8).

(5) From the bottom of the faulty PDC relay cassette, remove the wire and terminal from the relay cassette terminal cavity.

(6) Make all necessary repairs and splices to the wire for the removed terminal. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(7) From the bottom of the PDC housing, align and insert the removed wire and terminal into the correct terminal cavity of the replacement relay cassette. Push the wire and terminal up into the relay cassette terminal cavity until it is fully engaged by the latch.

(8) Repeat Step 4, Step 5, Step 6 and Step 7 one wire and terminal at a time until each of the wires and terminals have been transferred from the faulty PDC relay cassette into the replacement relay cassette.

(9) Install the PDC relay wedge into the replacement PDC relay cassette.

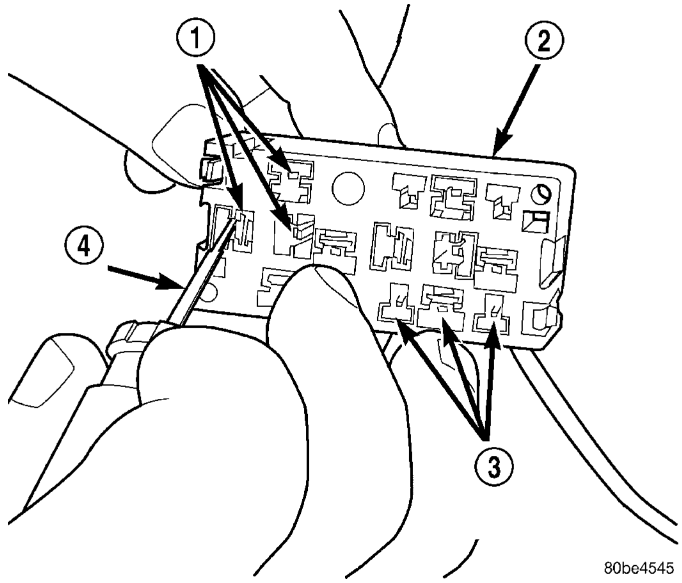


Fig. 8 PDC Relay Cassette Terminal Remove/Install

1 - TERMINAL CAVITIES
2 - PDC RELAY CASSETTE
3 - TERMINAL LATCHES
4 - FROM SPECIAL TOOL KIT 6680

PDC LOWER COVER

INSTALLATION

(1) Align the PDC housing lower cover on the bottom of the PDC.

(2) Evenly press the lower cover into place until latches are fully engaged.

(3) Where the headlamp and dash harness enters the PDC, tape the harness securely to the trough formation on the PDC lower cover.

(4) Install the PDC in its mounting location on the battery support.

(5) Install the battery wire harness over the two PDC B+ terminal studs. Torque the nuts to 11.3 N·m (100 in. lbs.).

(6) Install the battery. Refer to the Battery section for the procedure.

(7) Install the PDC cover.

INSTALLATION

The Power Distribution Center (PDC) main housing unit, the PDC fuse wedges, the PDC mini fuse wedge and the PDC bus bars cannot be repaired and are only serviced as a unit with the right headlamp and dash wire harness. If the PDC main housing unit, the fuse wedges or the bus bars are faulty or damaged, the entire PDC and right headlamp and dash wire harness unit must be replaced.

(1) Position the PDC and the headlamp and dash wire harness unit in the engine compartment.

(2) Engage the PDC housing mounts with the stanchions of the battery tray and push the unit

POWER DISTRIBUTION CENTER (Continued)

downward until the mount latches fully engage the mounting tabs on the stanchions.

(3) Install the two-holed eyelet of the battery wire harness PDC take outs onto the two PDC B(+) terminal studs.

(4) Install and tighten the nuts that secure the eyelet of the battery wire harness PDC take outs to the B(+) terminal studs. Tighten the nuts to 11.3 N·m (100 in. lbs.).

(5) Engage each of the retainers that secure the headlamp and dash wire harness to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the headlamp and dash wire harness retainer locations.

(6) Install all of the fasteners that secure each of the headlamp and dash wire harness ground eyelets to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the ground eyelet locations.

(7) Reconnect each of the headlamp and dash wire harness connectors. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the headlamp and dash wire harness connector locations. For connectors secured with bolts, tighten the screws to 4.3 N·m (38 in. lbs.).

(8) Reconnect the battery negative cable.

POWER OUTLET

DESCRIPTION

Two power outlets are installed in the vehicle. One in the instrument panel next to the cigar lighter and the other in the right rear quarter trim panel. The power outlet bases are secured by a snap fit within the instrument panel or trim panel. A plastic protective cap snaps into the power outlet base when the power outlet is not being used, and hangs from the power outlet base mount by an integral bail strap while the power outlet is in use.

The power outlet receptacle unit and the accessory power outlet protective cap are available for service. The power outlet receptacle cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

The power outlet base or receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The power outlet receives battery voltage from a fuse in the Junction Block at all times.

While the power outlet is very similar to a cigar lighter base unit, it does not include the two small spring-clip retainers inside the bottom of the receptacle shell that are used to secure the cigar lighter heating element to the insulated contact.

DIAGNOSIS AND TESTING - POWER OUTLET

For complete circuit diagrams, refer to **Power Outlet** in Wiring Diagrams.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the battery as required.

(3) Remove the plastic protective cap from the power outlet receptacle. Check for continuity between the inside circumference of the power outlet receptacle and a good ground. There should be continuity. If OK, go to Step 4. If not OK, go to Step 5.

(4) Check for battery voltage at the insulated contact located at the back of the power outlet receptacle. If not OK, go to Step 5.

(5) Disconnect and isolate the battery negative cable. Remove the power outlet receptacle from the instrument panel. Disconnect the wire harness connector from the power outlet receptacle. Check for continuity between the ground circuit cavity of the power outlet wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the power outlet wire harness connector. If OK, replace the faulty power outlet receptacle. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Pull the cigar lighter knob and element out of the cigar lighter receptacle base, or unsnap the protective cap from the power outlet receptacle base (Fig. 9).

(3) Look inside the cigar lighter or power outlet receptacle base and note the position of the rectangular retaining bosses of the mount that secures the receptacle base to the instrument panel (Fig. 10).

(4) Insert a pair of external snap ring pliers into the cigar lighter or power outlet receptacle base and engage the tips of the pliers with the retaining bosses of the mount.

(5) Squeeze the pliers to disengage the mount retaining bosses from the receptacle base and, using a gentle rocking motion, pull the pliers and the receptacle base out of the mount.

POWER OUTLET (Continued)

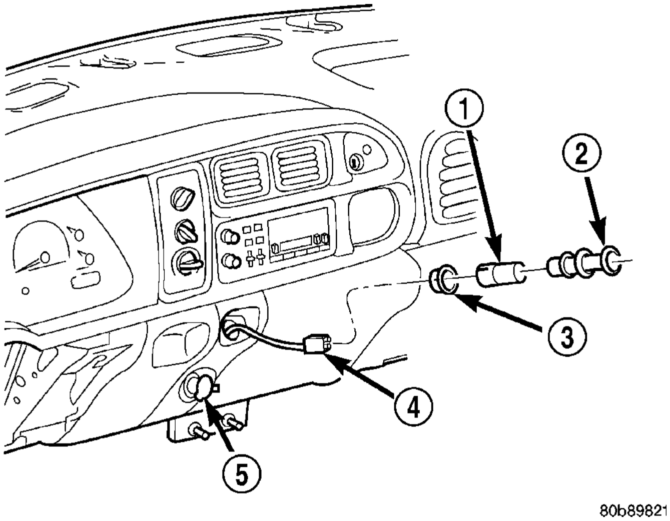


Fig. 9 Cigar Lighter and Power Outlet - Typical

1 - RECEPTACLE BASE
2 - KNOB & ELEMENT
3 - MOUNT
4 - WIRE HARNESS CONNECTOR
5 - POWER OUTLET

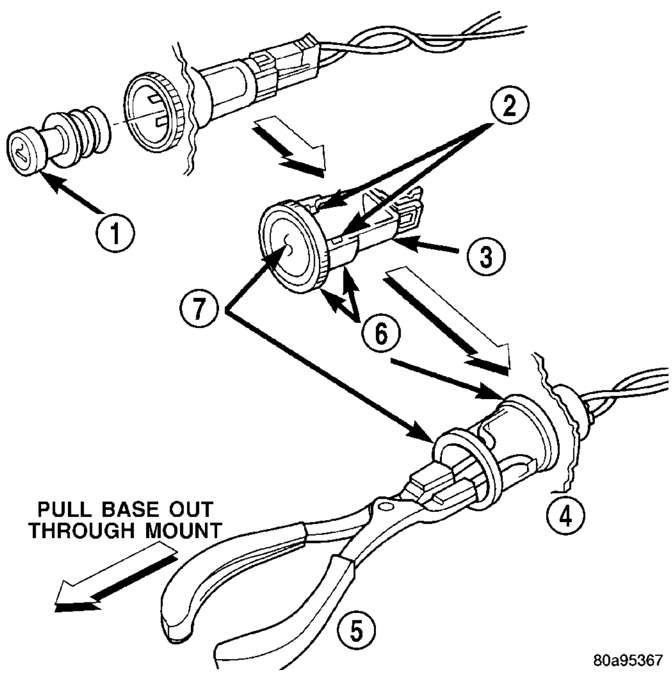


Fig. 10 Cigar Lighter and Power Outlet Remove/ Install

1 - KNOB AND ELEMENT
2 - RETAINING BOSSES-ENGAGE PLIERS HERE
3 - BASE
4 - PARTIALLY REMOVED
5 - EXTERNAL SNAP-RING PLIERS
6 - MOUNT
7 - BASE

(6) Pull the receptacle base away from the instrument panel far enough to access the instrument panel wire harness connector.

(7) Disconnect the instrument panel wire harness connector from the cigar lighter or power outlet receptacle base connector receptacle.

(8) Remove the cigar lighter or power outlet mount from the instrument panel.

INSTALLATION

(1) Reconnect the instrument panel wire harness connector to the cigar lighter or power outlet receptacle base connector receptacle.

(2) Install the cigar lighter or power outlet mount into the instrument panel.

(3) Align the splines on the outside of the cigar lighter or power outlet receptacle base connector receptacle with the grooves on the inside of the mount.

(4) Press firmly on the cigar lighter or power outlet receptacle base until the retaining bosses of the mount are fully engaged in their receptacles.

(5) Install the cigar lighter knob and element into the cigar lighter receptacle base, or the protective cap into the power outlet receptacle base.

(6) Reconnect the battery negative cable.

RELAY

DESCRIPTION

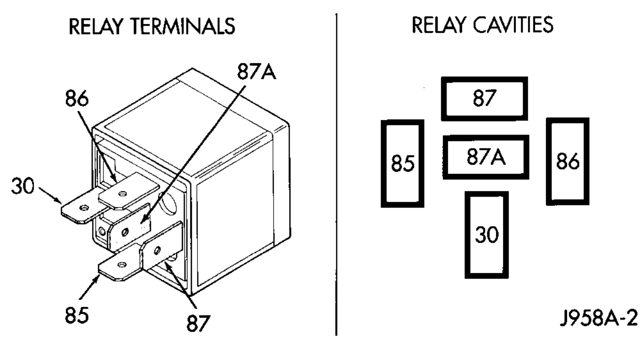


Fig. 11 ISO Relay

30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

A relay is an electromechanical device that switches fused battery current to a electrical component when the ignition switch is turned to the Accessory or Run positions, or when controlled by a electronic module. The relays are located in the junction block or power distribution center (Fig. 11).

RELAY (Continued)

The relay is a International Standards Organization (ISO) relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

A relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - RELAY

The relays are located in the junction block or power distribution center. For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Remove the relay from its mounting location.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 60.7 - 80.3 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

DIAGNOSIS & TESTING - RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) of the junction block or power distribution center is connected to battery voltage and should be hot at all times. Check for battery voltage at the fused B(+) circuit cavity in the junction block receptacle for the relay. If OK, go to Step 2. If not OK, repair the fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the fused B(+) fuse in the junction block that feeds the accessory when the relay is energized by the ignition switch. There should be continuity between the junction block cavity for relay terminal 87 and the fused B(+) fuse in the junction block at all times. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

(4) The coil ground terminal (85) is connected to the electromagnet in the relay. It receives battery feed to energize the relay when the ignition switch is in the Accessory or Run positions. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (acc/run) circuit cavity for relay terminal 85 in the junction block receptacle for the relay. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (acc/run) circuit to the ignition switch as required.

(5) The coil battery terminal (86) is connected to the electromagnet in the relay. The junction block cavity for this terminal should have continuity to ground at all times. If not OK, repair the open ground circuit to ground as required.

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the relay by grasping it firmly and pulling it straight out from its receptacle. A slight back and fourth rocking motion may help the removal process.

INSTALLATION

(1) Position the relay to the proper receptacle.

(2) Align the relay terminals with the terminal cavities in the receptacle.

(3) Push firmly and evenly on the top of the relay until the terminals are fully seated in the terminal cavities in the receptacle.

(4) Connect the negative battery cable.

MICRO-RELAY

DESCRIPTION

A micro-relay is a conventional International Standards Organization (ISO) micro relay (Fig. 12). Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs by five integral male spade-type terminals that extend from the bottom of the relay base.

Relays cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

MICRO-RELAY (Continued)

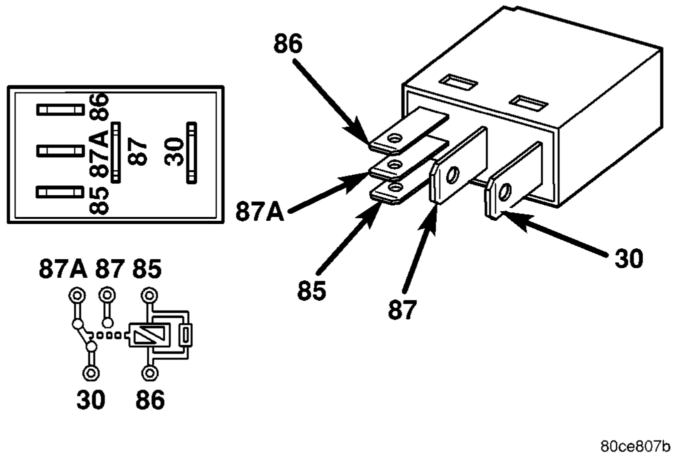


Fig. 12 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

OPERATION

A micro-relay is an electromechanical switch that uses a low current input from one source to control a high current output to another device. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

DIAGNOSIS AND TESTING - MICRO-RELAY

(1) Remove the relay from its mounting location.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 67.5 - 82.5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the relay by grasping it firmly and pulling it straight out from its receptacle. A slight back and fourth rocking motion may help the removal process.

INSTALLATION

(1) Align the micro-relay terminals with the terminal cavities in the receptacle.

(2) Push firmly and evenly on the top of the relay until the terminals are fully seated in the terminal cavities in the receptacle.

(3) Connect the battery negative cable.

ENGINE

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ENGINE - 2.4L

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ENGINE - 2.4L

DESCRIPTION

The 2.4 Liter (148 cu. in.) in-line four cylinder engine is a double over head camshaft with hydraulic lifters and four valve per cylinder design. The engine is free-wheeling; meaning it has provisions for piston-to-valve clearance. However valve-to-valve interference can occur, if camshafts are rotated independently.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the rear of the cylinder block (Fig. 1).

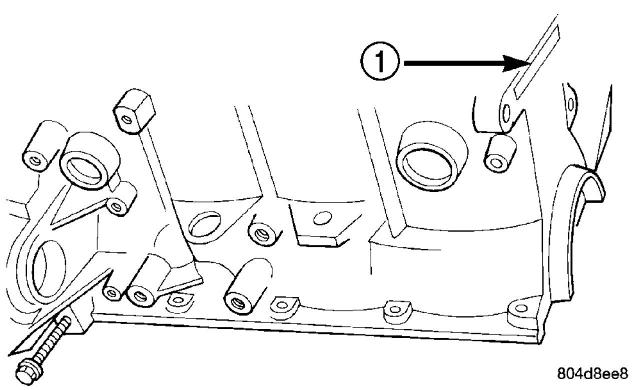


Fig. 1 Engine Identification

1 - ENGINE IDENTIFICATION LOCATION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

ENGINE - 2.4L (Continued)

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Check engine oil level and add oil if necessary.

(2) Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.

(3) Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.

(4) Remove the Auto Shutdown (ASD) relay from the PDC.

(5) Be sure throttle blade is fully open during the compression check.

(6) Insert compression gage adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer with cable adaptors to the DRBIII®.

(7) Crank engine until maximum pressure is reached on gage. Record this pressure as #1 cylinder pressure.

(8) Repeat the previous step for all remaining cylinders.

(9) Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.

(10) If one or more cylinders have abnormally low compression pressures, repeat the compression test.

(11) If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

DIAGNOSIS AND TESTING - ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.

(5) **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:

- Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
- Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
- Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

- Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
- If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.

(7) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

ENGINE - 2.4L (Continued)

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.

(4) If no leaks are detected, pressurize the crankcase as previously described.

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

(7) After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

DIAGNOSIS AND TESTING - ENGINE

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to the Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Engine Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis
- Lash Adjuster (Tappet) Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE - 2.4L (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

ENGINE - 2.4L (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE - 2.4L (Continued)

DIAGNOSIS AND TESTING - ENGINE MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Dirt in tappets/lash adjusters.	5. Replace rocker arm/hydraulic lash adjuster assembly.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn tappets/lash adjusters.	7. Install new rocker arm/hydraulic lash adjuster assembly.
	8. Worn valve guides.	8. Replace cylinder head assembly.
	9. Excessive runout of valve seats on valve faces.	9. Grind valve seats and valves.
	10. Missing adjuster pivot.	10. Replace rocker arm/hydraulic lash adjuster assembly.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Misaligned connecting rods.	7. Replace bent connecting rods.

ENGINE - 2.4L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level.	1. Check engine oil level.
	2. Faulty oil pressure sending unit.	2. Install new sending unit.
	3. Low oil pressure.	3. Check sending unit and main bearing oil clearance.
	4. Clogged oil filter.	4. Install new oil filter.
	5. Worn parts in oil pump.	5. Replace worn parts or pump.
	6. Thin or diluted oil.	6. Change oil to correct viscosity.
	7. Oil pump relief valve stuck.	7. Replace oil pump.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	2. Loose fastener, broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Misaligned or deteriorated cup or threaded plug.	3. Replace as necessary.

ENGINE - 2.4L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Replace cylinder head assembly.
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 2).

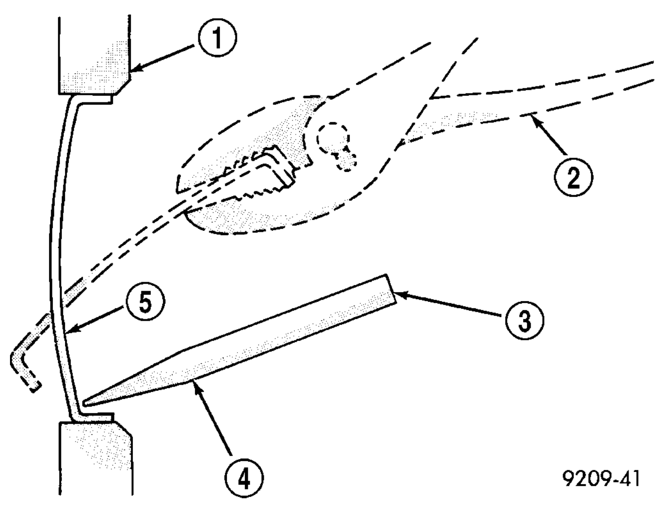


Fig. 2 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

STANDARD PROCEDURE - REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

STANDARD PROCEDURE - HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.

ENGINE - 2.4L (Continued)

(1) Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.

(2) Remove negative battery cable.

(3) Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.

(4) With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.

(5) Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).

(6) Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)

(7) Repair engine or components as necessary to prevent this problem from re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

(8) Install new spark plugs.

(9) Drain engine oil and remove oil filter.

(10) Install a new oil filter.

(11) Fill engine with specified amount of approved oil.

(12) Connect negative battery cable.

(13) Start engine and check for any leaks.

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bedplate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multilayer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

ENGINE - 2.4L (Continued)

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush (Fig. 3)

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (Fig. 3)
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (Fig. 3)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

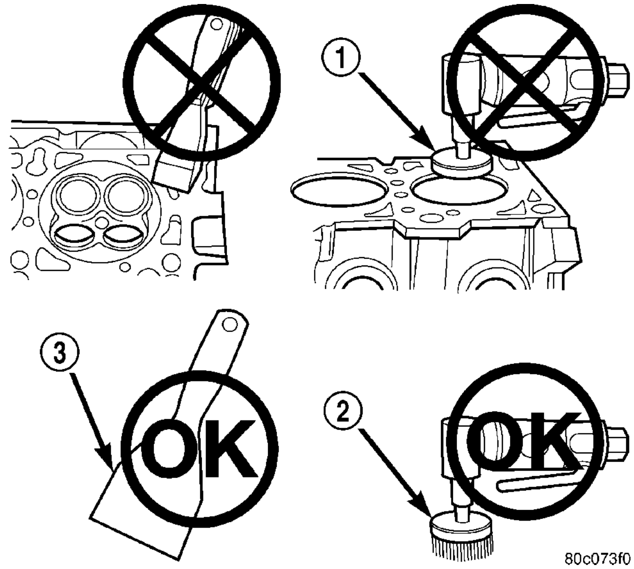


Fig. 3 Proper Tool Usage For Surface Preparation

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

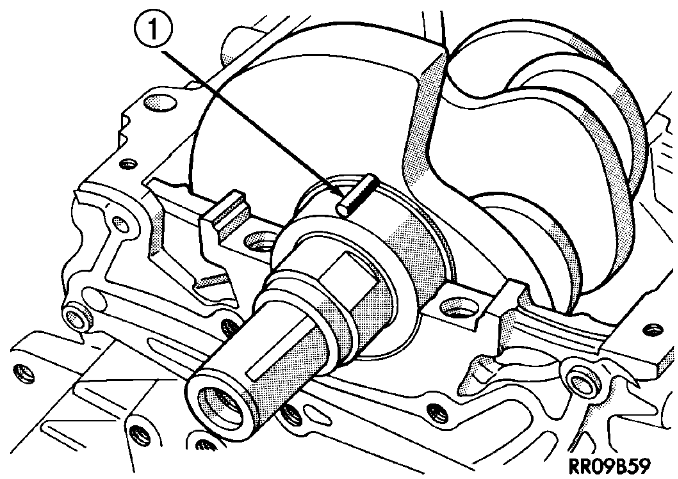


Fig. 4 Plastigage Placed in Lower Shell — Typical

1 - PLASTIGAGE

STANDARD PROCEDURE - MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

(1) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(2) Place a piece of Plastigage across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes (Fig. 4). (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap bolts of the bearing being checked to the proper specifications.

(3) Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Compare clearance measurements to specs found in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

ENGINE - 2.4L (Continued)

(4) Install the proper crankshaft bearings to achieve the specified bearing clearances. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE) (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE)

REMOVAL - ENGINE ASSEMBLY

(1) Disconnect the battery negative cable.
(2) Remove hood. Mark hood hinge location for reinstallation.
(3) Remove air cleaner assembly.
(4) Remove radiator core support bracket.
(5) Remove fan shroud with electric fan assembly.
(6) Remove drive belt.

NOTE: It is NOT necessary to discharge the A/C system to remove the engine.

(7) Remove A/C compressor and secure away from engine with lines attached.
(8) Remove generator and secure away from engine.

NOTE: Do NOT remove the phenolic pulley from the P/S pump. It is not required for P/S pump removal.

(9) Remove power steering pump with lines attached and secure away from engine.
(10) Drain cooling system.
(11) Remove coolant bottle.
(12) Disconnect the heater hoses from the engine.
(13) Disconnect heater hoses from heater core and remove hose assembly.
(14) Disconnect throttle and speed control cables.
(15) Remove upper radiator hose from engine.
(16) Remove lower radiator hose from engine.
(17) Disconnect the engine to body ground straps at the left side of cowl.
(18) Disconnect the engine wiring harness at the following points:

- Intake air temperature (IAT) sensor
- Fuel Injectors
- Throttle Position (TPS) Switch
- Idle Air Control (IAC) Motor
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure MAP) Sensor
- Camshaft Position (CMP) Sensor
- Coil Over Plugs
- Crankshaft Position Sensor

(19) Remove coil over plugs.
(20) Release fuel rail pressure.
(21) Remove fuel rail and secure away from engine.
(22) Remove the PCV hose.
(23) Remove the breather hoses.
(24) Remove the vacuum hose for the power brake booster.
(25) Disconnect knock sensors.
(26) Secure the left and right engine wiring harnesses away from engine.
(27) Raise vehicle.
(28) Disconnect oxygen sensor wiring.
(29) Disconnect crankshaft position sensor.
(30) Disconnect the engine block heater power cable, if equipped.
(31) Disconnect the front propshaft at the front differential and secure out of way.
(32) Remove the starter.
(33) Remove the ground straps from the engine
(34) Disconnect the exhaust pipes at the manifold.
(35) Remove the structural cover, if equipped.
(36) Remove torque convertor bolts, and mark location for reassembly.
(37) Remove transmission bellhousing to engine bolts.
(38) Loosen left and right engine mount thru bolts.

NOTE: It is not necessary to completely remove engine mount thru bolts, for engine removal.

(39) Lower the vehicle.
(40) Support the transmission with a suitable jack.
(41) Connect a suitable engine hoist to the engine.

CAUTION: The 2.4L engine with manual transmissions, can be removed without removing the manual transmission. Use caution when attempting this procedure as the clearance is tight.

(42) Remove engine from vehicle.

INSTALLATION - ENGINE ASSEMBLY

(1) Position the engine in the vehicle.

CAUTION: Use caution when installing 2.4L engine into vehicle equipped with manual transmission, as clearance is tight.

(2) Install both left and right side engine mounts into the frame mounts.
(3) Raise the vehicle.
(4) Install the transmission bellhousing to engine mounting bolts. Tighten the bolts to 41 N·m (30 ft. lbs.).
(5) Tighten the engine mount thru bolts.
(6) Install the torque convertor bolts.
(7) Connect the ground straps on the left and right side of the engine.
(8) Install the starter.
(9) Connect the crankshaft position sensor.
(10) Install the engine block heater power cable, if equipped.

ENGINE - 2.4L (Continued)

CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

(11) Install the structural cover.
(12) Install the exhaust pipe.
(13) Connect the oxygen sensors.
(14) Lower vehicle.
(15) Connect the knock sensors.
(16) Connect the engine to body ground straps.
(17) Install the power brake booster vacuum hose.
(18) Install the breather hoses.
(19) Install the PCV hose.
(20) Install the fuel rail.
(21) Install the coil over plugs.
(22) Reconnect the engine wiring harness at the following points:

- Intake air temperature (IAT) sensor
- Fuel Injectors
- Throttle Position (TPS) Switch
- Idle Air Control (IAC) Motor
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure MAP) Sensor
- Camshaft Position (CMP) Sensor
- Coil Over Plugs
- Crankshaft Position Sensor

(23) Connect lower radiator hose.
(24) Connect upper radiator hose.
(25) Connect throttle and speed control cables.
(26) Install the heater hose assembly.
(27) Install coolant recovery bottle.
(28) Install the power steering pump.
(29) Install the generator.
(30) Install the A/C compressor.
(31) Install the drive belt.
(32) Install the fan shroud with the electric fan assembly.
(33) Install the radiator core support bracket.
(34) Install the air cleaner assembly.
(35) Refill the engine cooling system.
(36) Install the hood.
(37) Check and fill engine oil.
(38) Connect the battery negative cable.
(39) Start the engine and check for leaks.

SPECIFICATIONS

SPECIFICATIONS - 2.4L ENGINE

DESCRIPTION	SPECIFICATION
General Specification	
Type	In-Line OHV, DOHC
Number of Cylinders	4
Displacement	2.4 Liters (148 cu. in.)
Bore	87.5 mm (3.445 in.)
Stroke	101.0 mm (3.976 in.)
Compression Ratio	9.4:1
Firing Order	1-3-4-2
Compression Pressure	690 kPa (Minimum) (100 psi Minimum)
Max. Variation Between Cylinders	25%
Cylinder Block	
Cylinder Bore Diameter	87.4924–87.5076 mm (3.4446–3.4452 in.)
Out-of-Round (Max.)	0.051 mm (0.002 in.)
Taper (Max.)	0.051 mm (0.002 in.)
Pistons	
Piston Diameter	87.463–87.481 mm (3.4434–3.4441 in.)
Clearance @ 14 mm (9/16 in.) from bottom of skirt	0.024–0.057 mm (0.0009–0.0022 in.)
Weight	346–356 grams (12.20–12.56 oz.)
Land Clearance (Diametrical)	0.614–0.664 mm (0.024–0.026 in.)
Piston Length	66.25 mm (2.608 in.)
Piston Ring Groove Depth No. 1	4.640–4.784 mm (0.182–0.188 in.)
Piston Ring Groove Depth No. 2	4.575–4.719 mm (0.180–0.185 in.)

ENGINE - 2.4L (Continued)

DESCRIPTION	SPECIFICATION
Piston Ring Groove Depth No. 3	4.097–4.236 mm (0.161–0.166 in.)
Piston Pins	
Clearance in Piston	0.005–0.018 mm (0.0002–0.0008 in.)
Clearance in Connecting Rod	Interference
Diameter	21.998–22.003 mm (0.8660–0.8662 in.)
End Play	None
Length	72.75–73.25 mm (2.864–2.883 in.)
Piston Rings	
Ring Gap—Top Compression Ring	0.25–0.51 mm (0.0098–0.020 in.)
Wear Limit	0.8 mm (0.031 in.)
Ring Gap—2nd Compression Ring	0.23–0.48 mm (0.009–0.018 in.)
Wear Limit	0.8 mm (0.031 in.)
Ring Gap—Oil Control Steel Rails	0.25–0.64 mm (0.0098–0.025 in.)
Wear Limit	1.00 mm (0.039 in.)
Ring Side Clearance—Compression Rings	0.030–0.080 mm (0.0011–0.0031 in.)
Wear Limit	0.10 mm (0.004 in.)
Ring Side Clearance—Oil Ring Pack	0.012–0.178 mm (0.0004–0.0070 in.)
Ring Width—Compression Rings	1.47–1.50 mm (0.057–0.059 in.)
Ring Width—Oil Ring Pack	2.72–2.88 mm (0.107–0.1133 in.)
Connecting Rod	
Bearing Clearance	0.025–0.071 mm (0.0009–0.0027 in.)
Wear Limit	0.075 mm (0.003 in.)
Bore Diameter—Piston Pin	20.96–20.98 mm (0.8252–0.8260 in.)

DESCRIPTION	SPECIFICATION
Bore Diameter—Crankshaft End	53.007–52.993 mm (2.0868–2.0863 in.)
Side Clearance	0.13–0.38 mm (0.005–0.015 in.)
Wear Limit	0.40 mm (0.016 in.)
Weight—Total (Less Bearing)	565.8 grams (19.96 oz.)
Crankshaft	
Connecting Rod Journal Diameter	49.984–50.000 mm (1.968–1.9685 in.)
Main Bearing Journal Diameter	59.992–60.008 mm (2.362–2.3625 in.)
Journal Out-of-Round (Max.)	0.0035 mm (0.0003 in.)
Journal Taper (Max.)	0.007 mm (0.0001 in.)
End Play	0.09–0.24 mm (0.0035–0.0094 in.)
Wear Limit	0.38 mm (0.015 in.)
Main Bearing Diametrical Clearance	0.018–0.062 mm (0.0007–0.0024 in.)
Hydraulic Lash Adjuster	
Body Diameter	15.901–15.913 mm (0.626–0.6264 in.)
Plunger Travel Minimum (Dry)	3.0 mm (0.118 in.)
Cylinder Head Camshaft Bearing Bore Diameter	
Journals No.1–6	26.020–26.041 mm (1.024–1.025 in.)
Camshaft	
Journal Diameter No. 1–6	25.951–25.970 mm (1.021–1.022 in.)
Bearing Clearance—Diametrical	0.069–0.071 mm (0.0027–0.003 in.)
End Play	0.05–0.17 mm (0.0019–0.0066 in.)
Lift (Zero Lash)	
Intake	8.25 mm (0.324 in.)

ENGINE - 2.4L (Continued)

DESCRIPTION	SPECIFICATION
Exhaust	6.60 mm (0.259 t>
Intake Valve Timing*	
Closes (ABDC)	51°
Opens (BTDC)	1°
Duration	232°
Exhaust Valve Timing*	
Closes (ATDC)	7°
Opens (BBDC)	47°
Duration	234°
Valve Overlap	8°
*All readings in crankshaft degrees. Timing points @ 4° from top of Ramps.	
Cylinder Head	
Material	Cast Aluminum
Gasket Thickness (Compressed)	0.71 mm (0.028 in.)
Valve Seat	
Angle	44.5–45°
Seat Diameter—Intake	34.37–34.63 mm (1.353–1.363 in.)
Seat Diameter—Exhaust	27.06–27.32 mm (1.065–1.075 in.)
Runout (Max.)	0.05 mm (0.002 in.)
Valve Seat Width—Intake and Exhaust	0.9–1.3 mm (0.035–0.051 in.)
Service Limit—Intake	2.0 mm (0.079 in.)
Service Limit—Exhaust	2.5 mm (0.098 in.)
Valve Guide	
Diameter I.D.	5.975–6.000 mm (0.235–0.236 in.)
Guide Bore Diameter	11.0–11.02 mm (0.4330–0.4338 in.)
Guide Height (spring seat to guide tip)	13.25–13.75 mm (0.521–0.541 in.)
Valves	
Face Angle—Intake and Exhaust	44.5—45°

DESCRIPTION	SPECIFICATION
Head Diameter—Intake	34.67–34.93 mm 1.364–1.375 in.)
Head Diameter—Exhaust	28.32–28.52 mm (1.114–1.122 in.)
Valve Length (Overall)	
—Intake	112.76–113.32 mm (4.439–4.461 in.)
—Exhaust	110.89–111.69 mm (4.365–4.397 in.)
Valve Stem Diameter	
—Intake	5.934–5.952 mm (0.2337–0.2344 in.)
—Exhaust	5.906–5.924 mm (0.2326–0.2333 in.)
Valve Margin	
Intake	1.2–1.7 mm (0.047–0.066 in.)
Service Limit	0.95 mm (1/32 in.)
Exhaust	0.985–1.315 mm (0.038–0.051 in.)
Service Limit	1.05 mm (3/64 in.)
Valve Stem Tip	
Intake	48.04 mm (1.891 in.)
Exhaust	47.99 mm (1.889 in.)
Valve Stem to Guide Clearance	
Intake	0.048–0.066 mm (0.0018–0.0025 in.)
Max. Allowable	0.076 mm (0.003 in.)
Service Limit	0.25 mm (0.010 in.)
Exhaust	0.0736–0.094 mm (0.0029–0.0037 in.)
Max. Allowable	0.101 mm (0.004 in.)
Service Limit	0.25 mm (0.010 in.)

ENGINE - 2.4L (Continued)

DESCRIPTION	SPECIFICATION
Valve Springs	
Free Length (Approx.)	48.4 mm (1.905 in.)
Nominal Force (Valve Closed)	338 N @ 38.0 mm (75.98 lbs. @ 1.496 in.)
Nominal Force (Valve Open)	607 N @ 29.75 mm (136 lbs. @ 1.172 in.)
Installed Height	38.00 mm (1.496 in.)
Number of Coils	7.82
Wire Diameter	3.86 mm (1.496 in.)
Oil Pump	
Clearance Over Rotors (Max.)	0.10 mm (0.004 in.)
Cover Out-of-Flat (Max.)	0.025 mm (0.001 in.)
Inner Rotor Thickness (Min.)	9.40 mm (0.370 in.)
Outer Rotor Thickness (Min.)	9.40 mm (0.370 in.)
Outer Rotor Clearance (Max.)	0.039 mm (0.015 in.)
Outer Rotor Diameter (Min.)	79.95 mm (3.148 in.)
Tip Clearance Between Rotors (Max.)	0.20 mm (0.008 in.)
Oil Pressure	
At Curb Idle Speed*	25 kPa (4 psi)
At 3000 rpm	170–550 kPa (25–80 psi)
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 rpm.	

SPECIFICATIONS - TORQUE

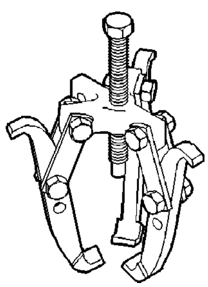
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Balance Shaft Carrier to Block—Bolts	54	40	—
Balance Shaft Gear Cover—Double Ended Fastener	12	—	105
Balance Shaft Sprocket—Bolt	28	—	250
Balance Shaft Chain Tensioner—Bolts	12	—	105
Balance Shaft Carrier Cover—Bolts	12	—	105
Camshaft Sprocket—Bolt	101	75	—
Connecting Rod Cap—Bolts	54 +¼ turn	40 +¼ turn	—
Crankshaft Main Bearing Cap/Bedplate			
—M8 Bolts	34		250
—M11 Bolts	41 +¼ Turn	30 +¼ Turn	—
Crankshaft Damper	136	100	—
Cylinder Head—Bolts	(Refer to 9 - ENGINE/ CYLINDER HEAD - INSTALLATION)		
Cylinder Head Cover—Bolts	12	—	105
Flex Plate to Crankshaft	95	70	—
Flywheel Mounting Bolts	81	60	—
Engine Mount Bracket Right—Bolts	61	45	—
Engine Mounting—Bolts	(Refer to 9 ENGINE/ ENGINE MOUNTING)		
Exhaust Manifold to Cylinder Head—Bolts	23	—	200
Exhaust Manifold Heat Shield—Bolts	12	—	105
Intake Manifold - Lower —Bolts	28	—	250
Oil Filter	20	15	—
Oil Pan—Bolts	12	—	105
Oil Pan Drain—Plug	27	20	—
Oil Pump to Block—Bolts	28	—	250

ENGINE - 2.4L (Continued)

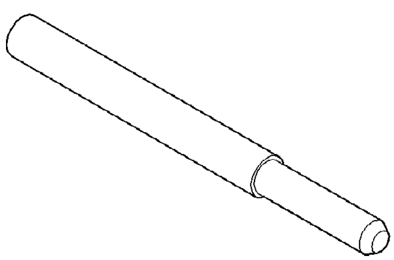
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Oil Pump Cover Plate—Bolts	12	—	105
Oil Pump Pick-up Tube—Bolt	28	20	—
Oil Pump Relief Valve—Cap	41	30	
Spark Plugs	28	—	
Timing Belt Covers			
- Front Covers to Rear Cover—Bolts	12	—	105
- Rear Cover—Bolts	12	—	105
Timing Belt Tensioner Assembly—Bolts	61	45	—

SPECIAL TOOLS

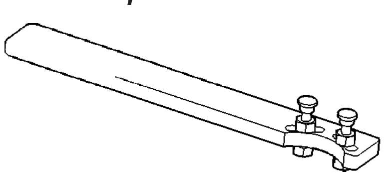
2.4L ENGINE



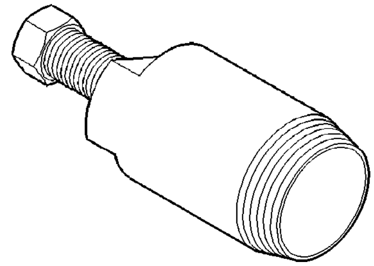
Puller 1026



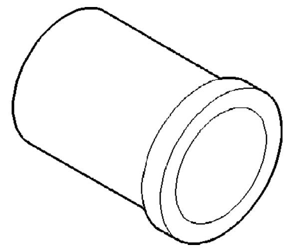
Crankshaft Damper Removal Insert 6827-A



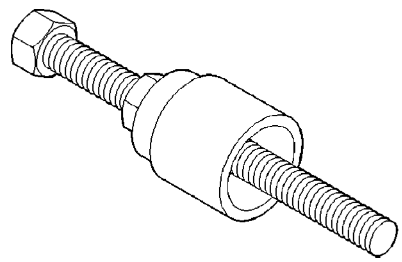
Camshaft Sprocket Holder 6847



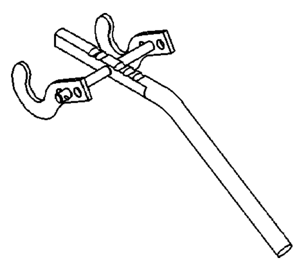
Camshaft Seal Remover C-4679-A



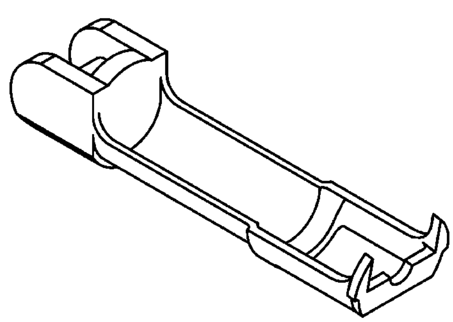
Camshaft Seal Installer MD-998306



Crankshaft Damper Installer 6792

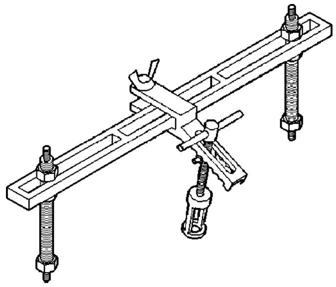


Valve Spring Compressor 8215

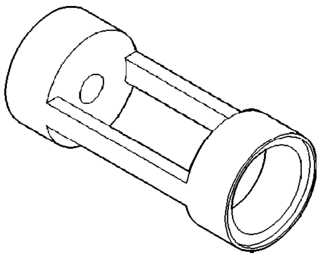


Adaptor 8436

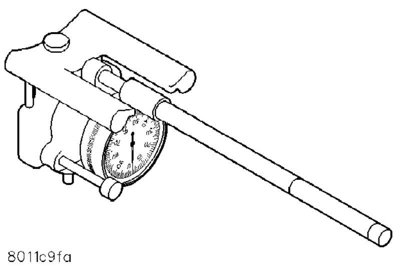
ENGINE - 2.4L (Continued)



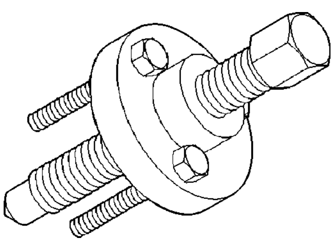
Valve Spring Compressor MD-998772-A



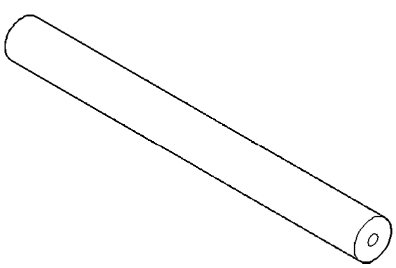
Valve Spring Compressor Adapter 6779



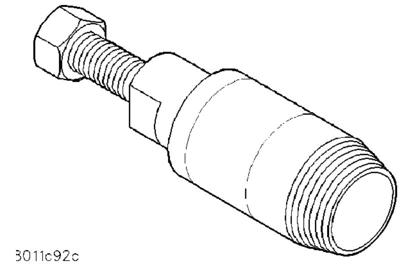
Cylinder Bore Gage C-119



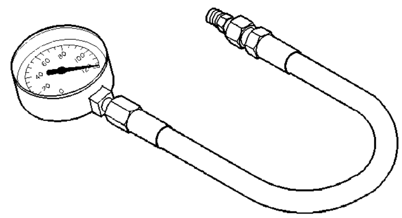
Crankshaft Sprocket Remover 6793



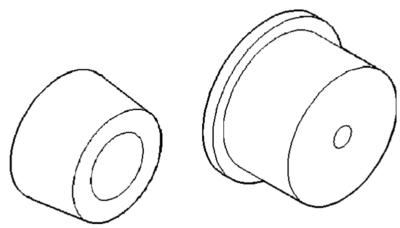
Crankshaft Sprocket Remover Insert C-4685-C2



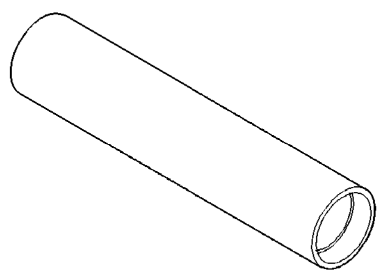
Crankshaft Seal Remover 6771



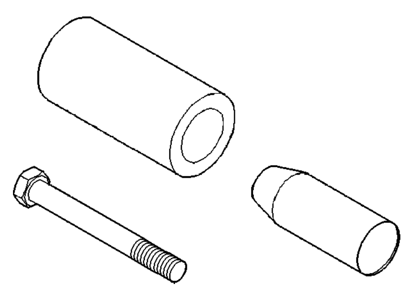
Oil Pressure Gauge C-3292



Rear Crankshaft Seal Guide and Installer 6926-1 and 6926-2

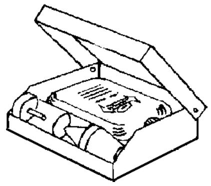


Balance Shaft Sprocket Installer 6052

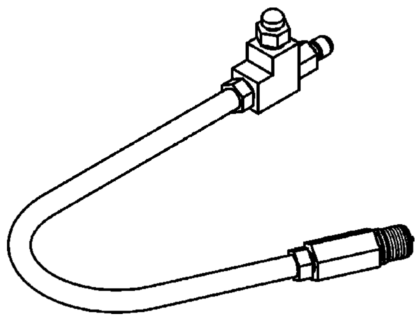


Front Crankshaft Oil Seal Installer 6780

ENGINE - 2.4L (Continued)



Combustion Leak Tester C-3685-A



Cylinder Compression Pressure Adaptor 8116

AIR CLEANER ELEMENT

REMOVAL - 2.4L

Housing removal is not necessary for element (filter) replacement.

(1) Disconnect air intake duct at side of element cover.

(2) Pry up 2 spring clips from front of housing cover (spring clips retain cover to housing).

(3) Release housing cover from locating tabs located on rear of housing, and remove cover.

(4) Remove air cleaner element (filter) from housing.

(5) Clean inside of housing before replacing element.

INSTALLATION - 2.4L

(1) Install element into housing.

(2) Position housing cover into housing locating tabs.

(3) Pry up spring clips and lock cover to housing.

(4) Connect air intake duct.

If any air filter, air resonator, air intake tubes or air filter housing clamps had been loosened or removed, tighten them to 5 N·m (40 in. lbs.) torque.

CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains dual over-head camshafts with four valves per cylinder (Fig. 5). The valves are arrange in two in-line banks. The intake valves face toward the left side of the vehicle. The exhaust valves face the right side. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries providing lubrication passages to the hydraulic lash adjusters, camshafts, and valve mechanisms.

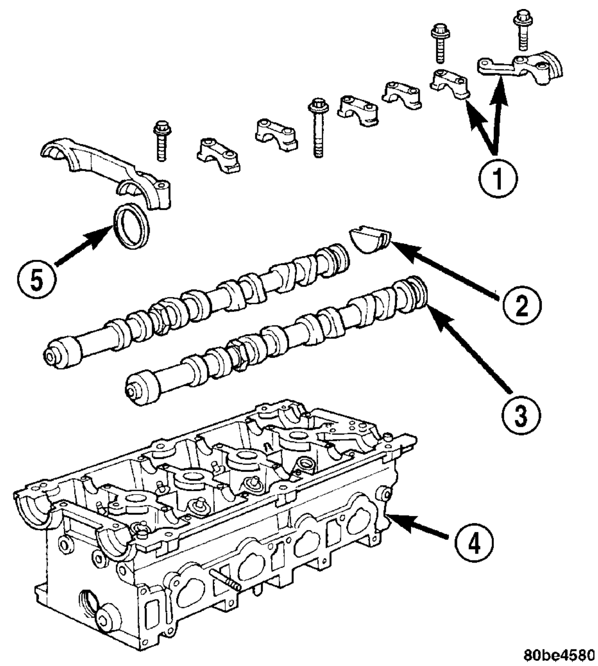


Fig. 5 Cylinder Head and Camshafts

CAM PLUG - NOT SHOWN
1 - CAMSHAFT BEARING CAPS
2 - PLUG
3 - CAMSHAFT
4 - CYLINDER HEAD
5 - CAMSHAFT OIL SEAL

OPERATION

The cylinder head closes the combustion chamber, allowing the pistons to compress the fuel/air mixture for ignition. The valves are actuated by the lobe profiles on the camshaft to open and close at specified duration to either allow clean air in the combustion chamber or the exhaust gases out; depending on the stroke of the engine.

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

CYLINDER HEAD (Continued)

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

(1) Perform fuel system pressure release procedure **before attempting any repairs.** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - SPECIFICATIONS)

(2) Disconnect battery negative cable.

(3) Drain cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE)

(4) Remove air filter housing and inlet tube.

(5) Remove intake manifold.

(6) Remove heater tube support bracket from cylinder head.

(7) Disconnect radiator upper and heater supply hoses from water outlet connections.

(8) Remove accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)

(9) Raise vehicle and remove exhaust pipe from manifold.

(10) Remove power steering pump and set aside. Do not disconnect lines.

(11) Remove accessory drive bracket

(12) Remove ignition coil and wires from engine.

(13) Disconnect cam sensor and fuel injector wiring connectors.

(14) Remove timing belt and camshaft sprockets. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(15) Remove timing belt idler pulley and rear timing belt cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(16) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(17) Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

NOTE: Identify rocker arm position to ensure correct re-installation in original position, if reused.

(18) Remove rocker arms. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - REMOVAL).

(19) Remove cylinder head bolts in REVERSE sequence of tightening.

(20) Remove cylinder head from engine block.

(21) Inspect and clean cylinder head. (Refer to 9 - ENGINE/CYLINDER HEAD - INSPECTION) (Refer to 9 - ENGINE/CYLINDER HEAD - CLEANING)

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

CYLINDER HEAD (Continued)

Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

INSPECTION

(1) Cylinder head must be flat within 0.1 mm (0.004 in.) (Fig. 6).

(2) Inspect camshaft bearing journals for scoring.

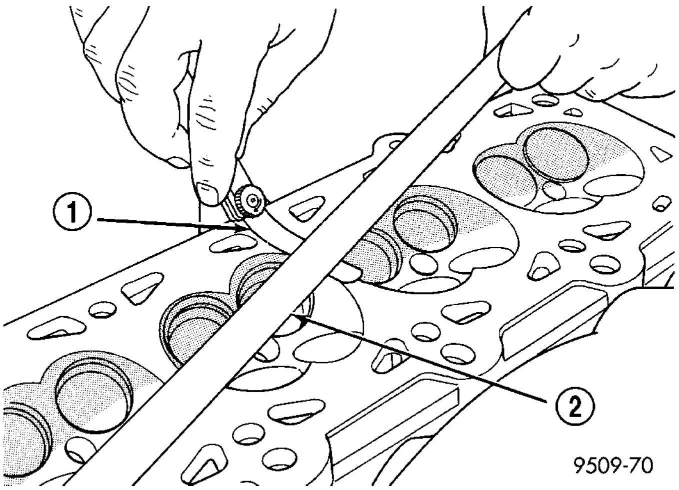


Fig. 6 Checking Cylinder Head Flatness

1 - FEELER GAUGE
2 - STRAIGHT EDGE

(3) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(4) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (Fig. 7). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.

(5) Check valve guide height (Fig. 8).

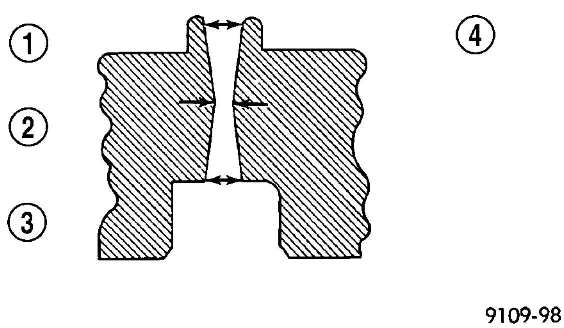


Fig. 7 Checking Wear on Valve Guide—Typical

1 - TOP
2 - MIDDLE
3 - BOTTOM
4 - CUT AWAY VIEW OF VALVE GUIDE MEASUREMENT LOCATIONS

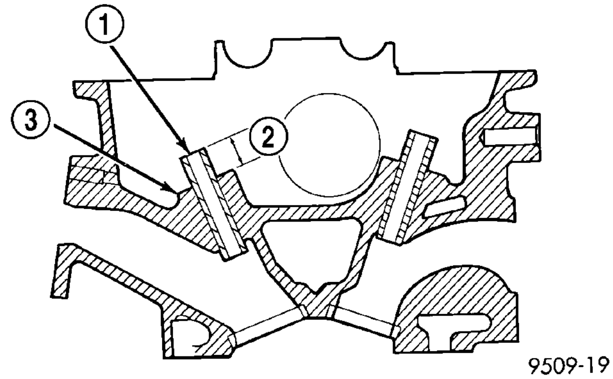


Fig. 8 Valve Guide Height

1 - VALVE GUIDE
2 - 13.25 - 13.75 MM (.521 - .541 IN.)
3 - SPRING SEAT

INSTALLATION - CYLINDER HEAD

NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts must be replaced (Fig. 9).

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced.

(1) Before installing the bolts, the threads should be coated with engine oil.

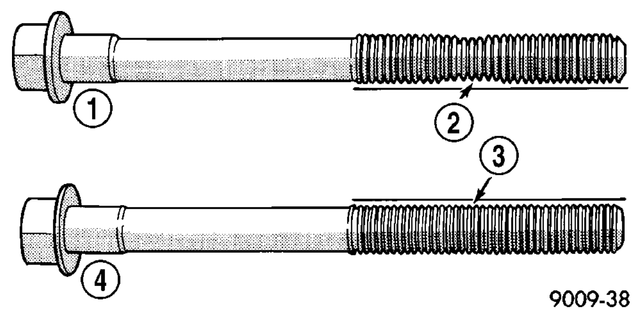


Fig. 9 Checking Bolts for Stretching (Necking)

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

(2) Position cylinder head gasket on engine block (Fig. 10).

(3) Install cylinder head on engine block.

(4) Tighten the cylinder head bolts in the sequence shown in (Fig. 11). Using the 4 step torque turn method, tighten according to the following values:

- First All to 34 N·m (25 ft. lbs.)
- Second All to 68 N·m (50 ft. lbs.)
- Third All to 68 N·m (50 ft. lbs.)

CYLINDER HEAD (Continued)

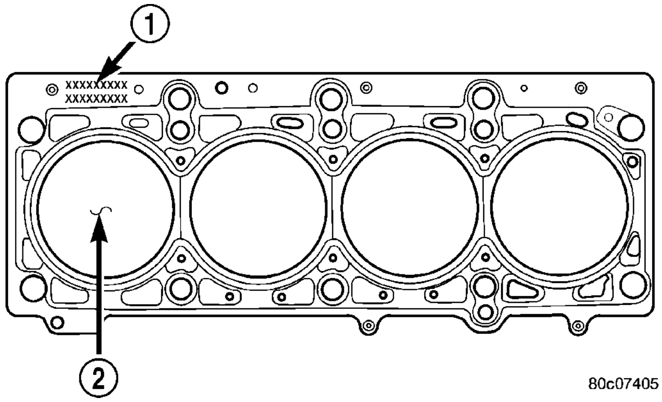


Fig. 10 Cylinder Head Gasket Positioning

1 - PART NUMBER FACES UP
2 - NO. 1 CYLINDER

CAUTION: Do not use a torque wrench for the following step.

- Fourth Turn an additional 1/4 Turn,

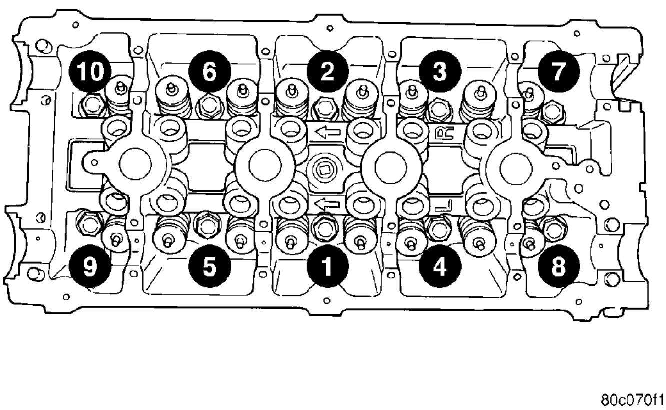


Fig. 11 Cylinder Head Tightening Sequence

(5) Install rocker arms. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSTALLATION)

(6) Install camshafts. (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

(7) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

(8) Install timing belt rear cover and timing belt idler pulley. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

(9) Install timing belt and camshaft sprockets. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(10) Connect cam sensor and fuel injectors wiring connectors.

(11) Install ignition coil and wires. Connect ignition coil wiring connector.

(12) Install accessary drive bracket.

(13) Install power steering pump to cylinder head.

(14) Raise vehicle and install the exhaust pipe to the manifold.

(15) Install accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

(16) Install heater tube support bracket to cylinder head.

(17) Install intake manifold.

(18) Connect all vacuum lines, electrical wiring, ground straps and fuel line.

(19) Fill cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE)

(20) Connect battery negative cable.

CAMSHAFT OIL SEAL(S)

REMOVAL

(1) Remove timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(2) Hold each camshaft sprocket with Special Tool 6847 while removing center bolt (Fig. 12).

(3) Remove camshaft sprockets.

(4) Remove exhaust camshaft target ring.

(5) Remove exhaust camshaft sensor.

CAUTION: Inspect sensor and target ring for excessive wear. Clean sensor face and install new spacer pad.

(6) Remove rear timing belt cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(7) Remove camshaft seal using Special Tool C-4679-A (Fig. 13).

CAUTION: Do not nick shaft seal surface or seal bore.

INSTALLATION

NOTE: Clean and inspect sensor and target ring for excessive wear. Clean sensor face and always install a new spacer pad.

(1) Shaft seal surface must be free of varnish, dirt or nicks. Polish with 400 grit paper if necessary.

(2) Install camshaft seals into cylinder head using Special Tool MD-998306 until flush with head (Fig. 14).

(3) Install timing belt rear cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

CAMSHAFT OIL SEAL(S) (Continued)

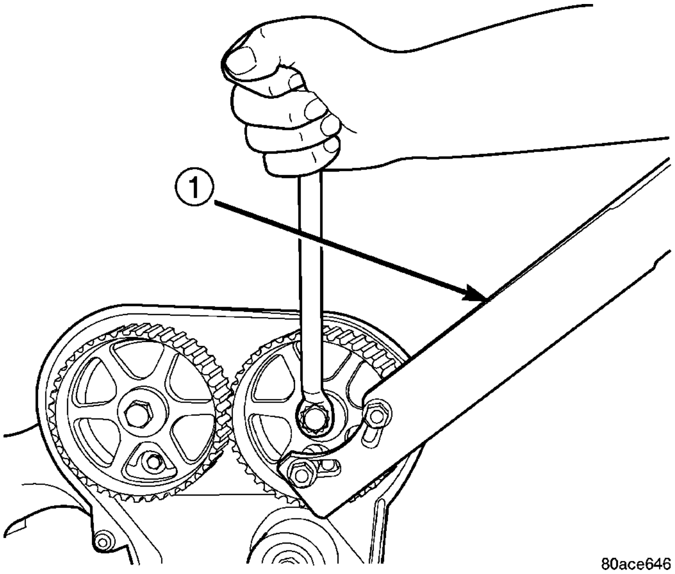


Fig. 12 Camshaft Sprocket - Removal/Installation

1 - SPECIAL TOOL 6847

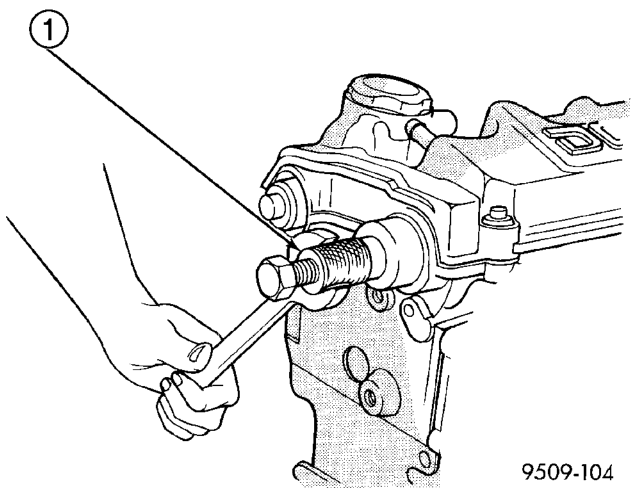


Fig. 13 Camshaft Oil Seal - Removal With C-4679-A

1 - SPECIAL TOOL C-4679

NOTE: Target ring tab should provide posative snap-on fit on the camshaft.

(4) Install exhaust camshaft target ring with the word **FRONT** facing forward.

(5) Install exhaust camshaft sensor.

(6) Install camshaft sprockets. Hold each sprocket with Special Tool 6847 and tighten center bolt to 101 N·m (75 ft. lbs.).

(7) Install timing belt and front covers. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

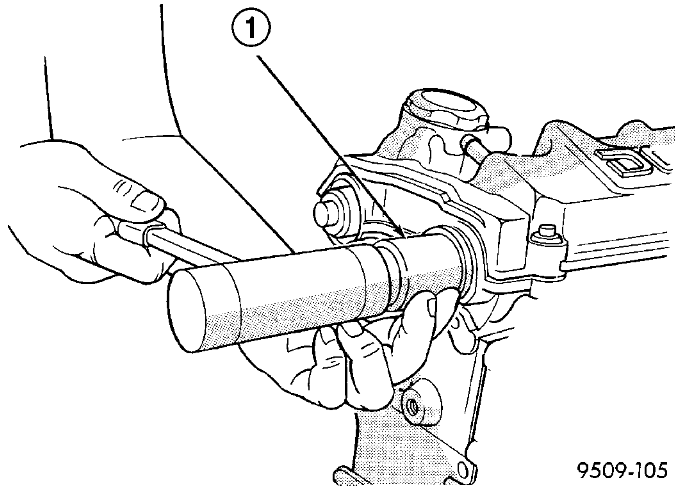


Fig. 14 Camshaft Seal - Installation

1 - SPECIAL TOOL MD 998306

CAMSHAFT(S)

DESCRIPTION

Both nodular iron camshafts have six bearing journal surfaces and two cam lobes per cylinder (Fig. 15). Flanges at the rear journals control camshaft end play. Provision for a cam position sensor is located on the exhaust camshaft on the front of the cylinder head. A hydrodynamic oil seal is used for oil control at the front of the camshaft.

OPERATION

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE - CAMSHAFT END-PLAY

(1) Oil camshaft journals and install camshaft **WITHOUT** cam follower assemblies. Install rear cam caps and tighten screws to specified torque.

(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 16).

(4) Move camshaft as far forward as it will go.

(5) Record reading on dial indicator. For end play specification, (Refer to 9 - ENGINE - SPECIFICATIONS).

(6) If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

REMOVAL

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

CAMSHAFT(S) (Continued)

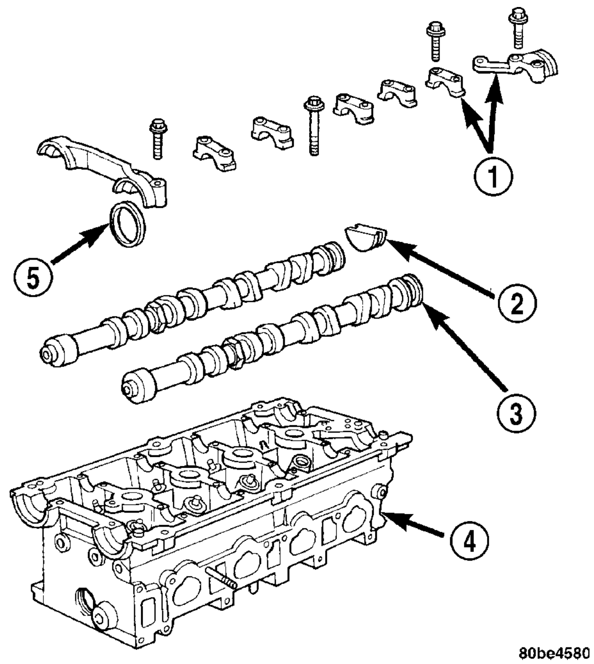


Fig. 15 Camshafts

CAM PLUG - NOT SHOWN
1 - CAMSHAFT BEARING CAPS
2 - PLUG
3 - CAMSHAFT
4 - CYLINDER HEAD
5 - CAMSHAFT OIL SEAL

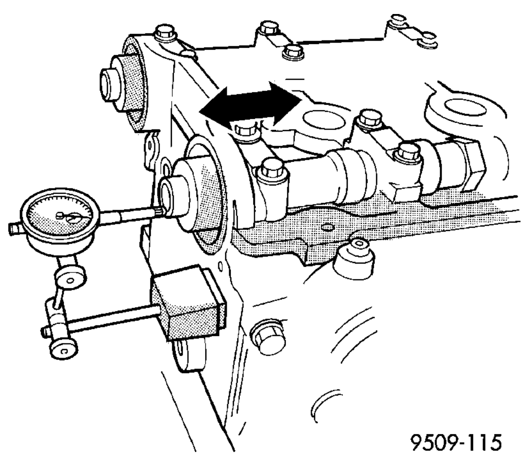


Fig. 16 Camshaft End Play - Typical

(2) Remove camshaft position sensor and camshaft target magnet. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/CAMSHAFT POSITION SENSOR - REMOVAL)

(3) Remove timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(4) Remove camshaft sprockets and timing belt rear cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(5) Bearing caps are identified for location. Remove the outside bearing caps first (Fig. 17).

(6) Loosen the camshaft bearing cap attaching fasteners in sequence shown (Fig. 18) one camshaft at a time.

CAUTION: Camshafts are not interchangeable. The intake cam number 6 thrust bearing face spacing is wider.

(7) Identify the camshafts before removing from the head. The camshafts are not interchangeable.

(8) Remove camshafts from cylinder head.

NOTE: If removing rocker arms, identify for reinstallation in the original position.

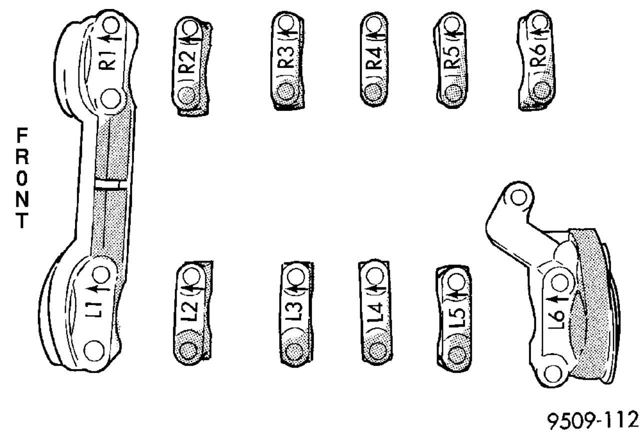


Fig. 17 Camshaft Bearing Cap Identification

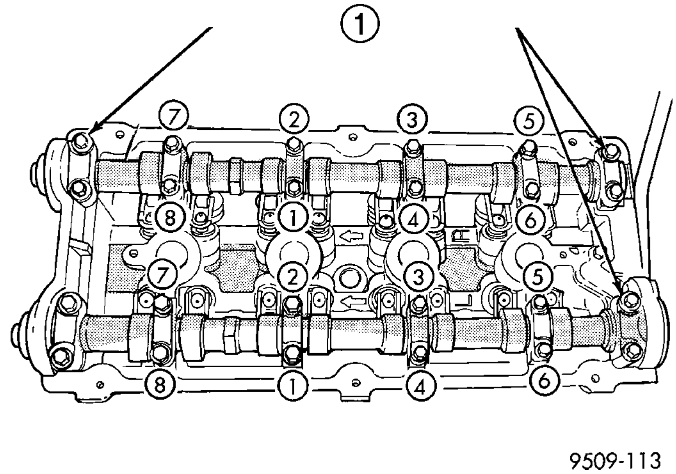


Fig. 18 Camshaft Bearing Cap - Removal

1 - REMOVE OUTSIDE BEARING CAPS FIRST

CLEANING

Clean camshaft with a suitable solvent.

INSPECTION

(1) Inspect camshaft bearing journals for damage and binding (Fig. 19). If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.

CAMSHAFT(S) (Continued)

(2) Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the rocker arms.

(3) Measure the lobe actual wear (unworn area - wear zone = actual wear) (Fig. 19) and replace camshaft if out of limit. Standard value is 0.0254 mm (0.001 in.), wear **limit** is 0.254 mm (0.010 in.).

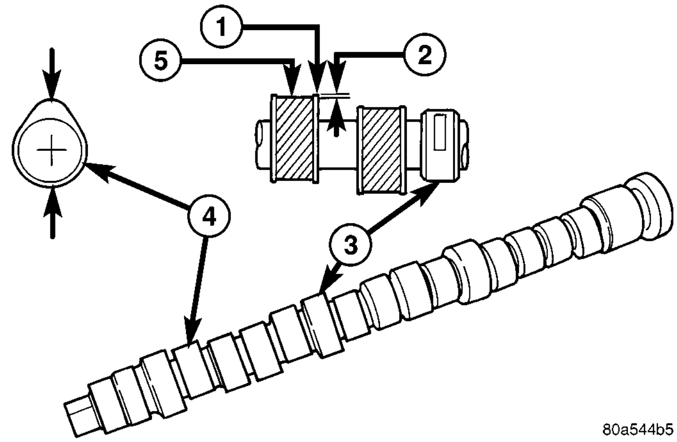


Fig. 19 Checking Camshaft(s) for Wear

1 - UNWORN AREA
2 - ACTUAL WEAR
3 - BEARING JOURNAL
4 - LOBE
5 - WEAR ZONE

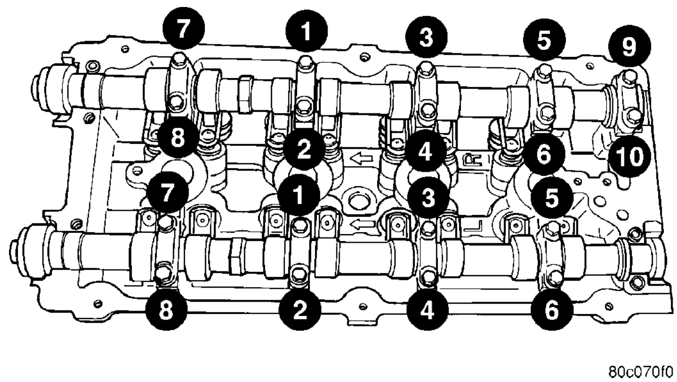


Fig. 20 Camshaft Bearing Cap Tightening Sequence

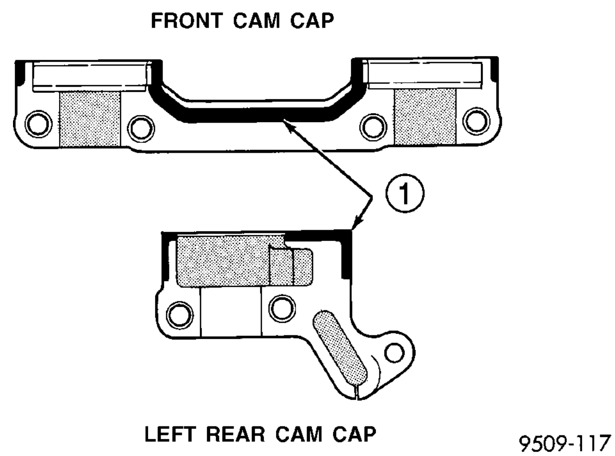


Fig. 21 Camshaft Bearing Cap Sealing

1 - 1.5 mm (.060 in.) DIAMETER BEAD OF MOPAR GASKET MAKER

INSTALLATION

CAUTION: Ensure that NONE of the pistons are at top dead center when installing the camshafts.

(1) Lubricate all camshaft bearing journals, rocker arms and camshaft lobes.

(2) Install all rocker arms in original positions, if reused.

(3) Position camshafts on cylinder head bearing journals. Install right and left camshaft bearing caps No. 2 – 5 and right No. 6. Tighten M6 fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 20).

(4) Apply Mopar® Gasket Maker to No. 1 and No. 6 bearing caps (Fig. 21). Install bearing caps and tighten M8 fasteners to 28 N·m (250 in. lbs.).

NOTE: Bearing end caps must be installed before seals can be installed.

(5) Install camshaft oil seals. (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT OIL SEAL(S) - INSTALLATION)

(6) Install camshaft target magnet and camshaft position sensor.

(7) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

(8) Install timing belt rear cover and camshaft sprocket. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

(9) Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

CYLINDER HEAD COVER

REMOVAL

(1) Remove intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL)

(2) Remove ignition coil and spark plug wires.

(3) Disconnect PCV and make-up air hoses from cylinder head cover.

(4) Remove cylinder head cover bolts.

(5) Remove cylinder head cover from cylinder head.

CYLINDER HEAD COVER (Continued)

CLEANING

Clean cylinder head and cover mating surfaces using a suitable solvent.

INSPECTION

Inspect cover rails for flatness.

INSTALLATION

NOTE: Replace spark plug well seals and bolt assemblies when installing a new cylinder head cover gasket.

(1) Install new cylinder head cover gaskets and spark plug well seals (Fig. 22).

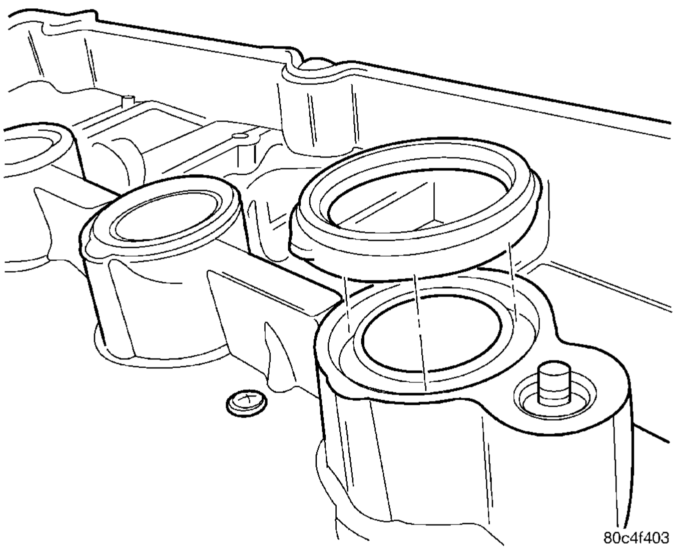


Fig. 22 Spark Plug Well Seals

(2) Replace cylinder head cover bolt assemblies (Fig. 23).

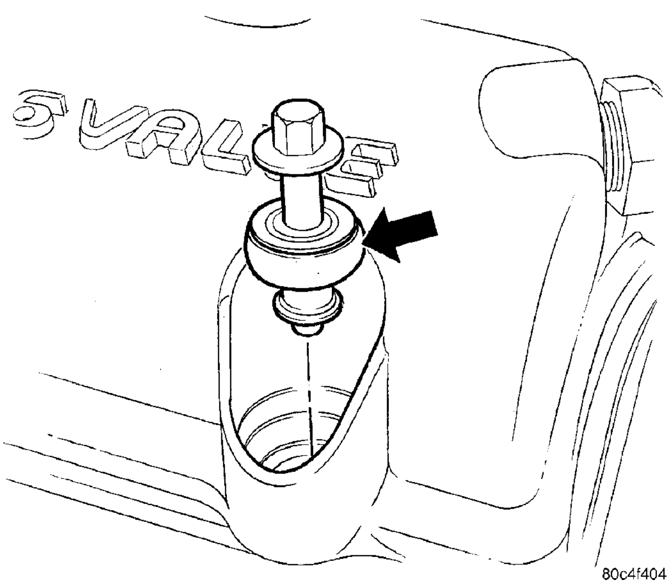


Fig. 23 Cylinder Head Cover Bolt Assembly

CAUTION: Do not allow oil or solvents to contact the timing belt as they can deteriorate the rubber and cause tooth skipping.

(3) Apply Mopar® Engine RTV GEN II at the camshaft cap corners and at the top edges of the 1/2 round seal (Fig. 24).

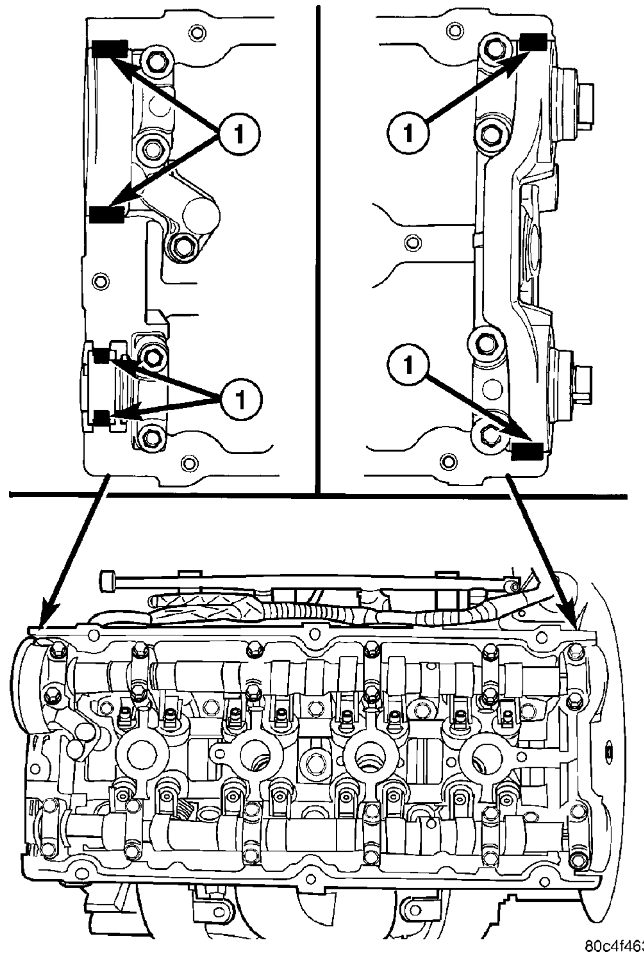


Fig. 24 Sealer Locations - Typical

1 – SEALER LOCATION

(4) Install cylinder head cover assembly to cylinder head. Install all bolts, ensuring the two (2) bolts containing the sealing washer are located in the center locations of cover. Tighten bolts in sequence shown in (Fig. 25). Using a 3 step torque method as follows:

(a) Tighten all bolts to 4.5 N·m (40 in. lbs.).

(b) Tighten all bolts to 9.0 N·m (80 in. lbs.).

(c) Tighten all bolts to 12 N·m (105 in. lbs.).

(5) Install ignition coil and spark plug wires. Tighten fasteners to 12 N·m (105 in. lbs.).

(6) If the PCV valve was removed, apply Mopar® Thread Sealant with Teflon to threads and install valve to cylinder head cover. Tighten PCV valve to 8 N·m (70 in. lbs.).

CYLINDER HEAD COVER (Continued)

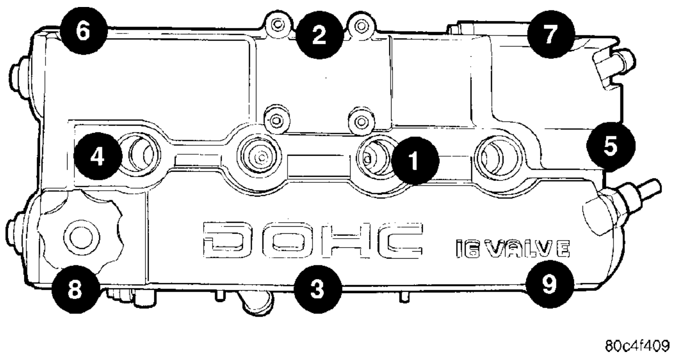


Fig. 25 Cylinder Head Cover Tightening Sequence (Typical Cover Shown)

(7) Connect PCV and make-up air hoses to cylinder head cover.

(8) Install upper intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The four valves per cylinder are opened by using roller rocker arms which pivot on hydraulic lash adjusters. The valves have chrome plated valve stems. Viton rubber valve stem seals are integral with the spring seats.They have chrome plated stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves, spring retainers,and locks, are the 3 - bead lock design

CLEANING

(1) Clean all valves thoroughly and discard burned, warped and cracked valves.

VALVE SPRINGS

REMOVAL

REMOVAL - CYLINDER HEAD ON

(1) Remove camshafts.

(2) Rotate crankshaft until piston is at TDC on compression.

(3) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.

(4) Using Special Tool MD-998772-A with adapter 6779 (Fig. 26), compress valve springs and remove valve locks.

(5) Remove valve spring(s).

(6) Remove valve stem seal(s) by a using valve stem seal tool (Fig. 28).

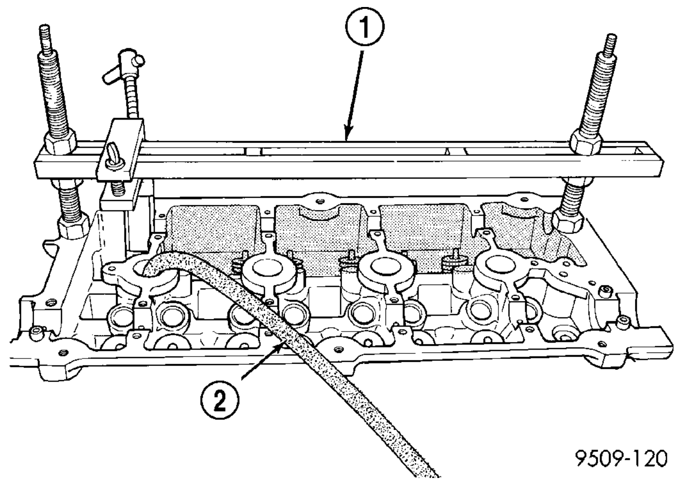


Fig. 26 Valve Spring - Removal/Installation

1 - VALVE SPRING COMPRESSOR MD 998772A
2 - AIR HOSE

REMOVAL - CYLINDER HEAD OFF

(1) With cylinder head removed from cylinder block, compress valve springs using a universal valve spring compressor.

(2) Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.

(3) Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves, locks and retainers to insure installation in original location.

(4) Inspect the valves. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSPECTION)

INSPECTION

(1) Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:

- Valve Closed Nominal Tension—76 lbs. @ 38.0 mm (1.50 in.)
- Valve Open Nominal Tension—136 lbs. @ 29.75 mm (1.17 in.)

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

INSTALLATION

INSTALLATION - CYLINDER HEAD ON

(1) Install valve seal/valve spring seat assembly (Fig. 27). Push the assembly down to seat it onto the valve guide.

VALVE SPRINGS (Continued)

(2) Install valve spring and retainer, use Special Tool MD-998772-A with adapter 6779 to compress valve springs only enough to install locks. Correct alignment of tool is necessary to avoid nicking valve stems.

(3) Remove air hose and install spark plugs.

(4) Install camshafts and cylinder head cover .

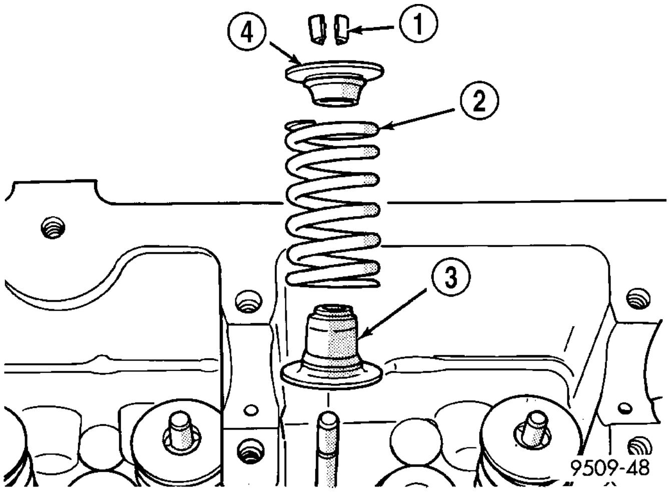


Fig. 27 Valve Stem Seal/Valve Spring Seat - Typical

1 - 3-GROOVE -VALVE RETAINING LOCKS
2 - VALVE SPRING
3 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY
4 - VALVE SPRING RETAINER

INSTALLATION - CYLINDER HEAD OFF

(1) Coat valve stems with clean engine oil and insert in cylinder head.

(2) Install new valve stem seals on all valves using a valve stem seal tool (Fig. 28). The valve stem seals should be pushed firmly and squarely over valve guide.

CAUTION: When oversize valves are used, the corresponding oversize valve seal must also be used. Excessive guide wear may result if oversize seals are not used with oversize valves.

(3) Install valve springs and retainers. Compress valve springs only enough to install locks, taking care not to misalign the direction of compression. Nicked valve stems may result from misalignment of the valve spring compressor.

CAUTION: When depressing the valve spring retainers with valve spring compressor the locks can become dislocated. Ensure both locks are in the correct location after removing tool.

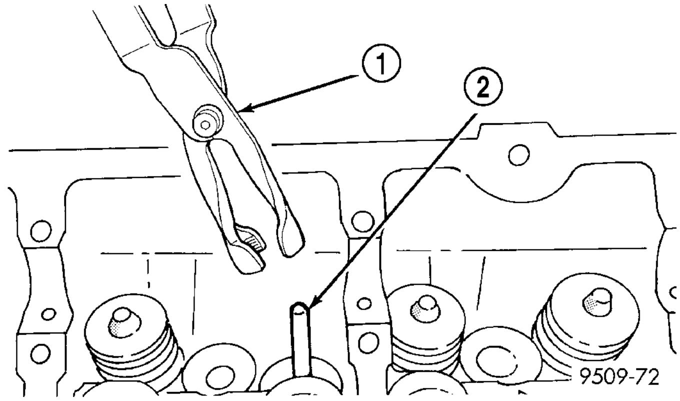


Fig. 28 Valve Stem Oil Seal Tool

1 - VALVE SEAL TOOL
2 - VALVE STEM

(4) Check the valve spring installed height B after refacing the valve and seat (Fig. 29). Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.

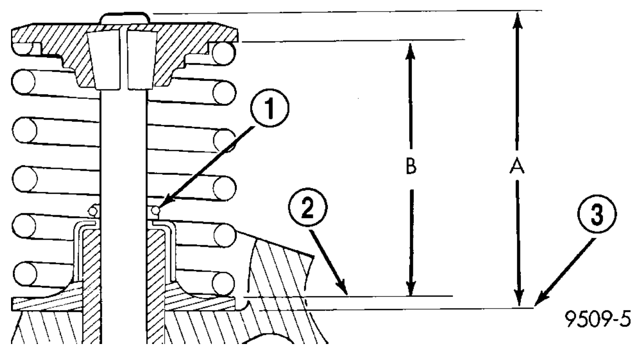


Fig. 29 Checking Spring Installed Height and Valve Tip Height Dimensions

1 - GARTER SPRING
2 - VALVE SPRING SEAT
3 - CYLINDER HEAD SURFACE

HYDRAULIC LIFTERS

DIAGNOSIS AND TESTING - LASH ADJUSTER (TAPPET) NOISE DIAGNOSIS

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

HYDRAULIC LIFTERS (Continued)

(3) During this time, turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor (integral to the head gasket) in the vertical oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and replace as necessary.

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Remove the camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

(3) Remove rocker arm. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - REMOVAL)

(4) Remove hydraulic lifter (Fig. 30).

(5) Repeat removal procedure for each hydraulic lifter.

(6) If reusing, mark each hydraulic lifter for reassembly in original position. Lifters are serviced as an assembly.

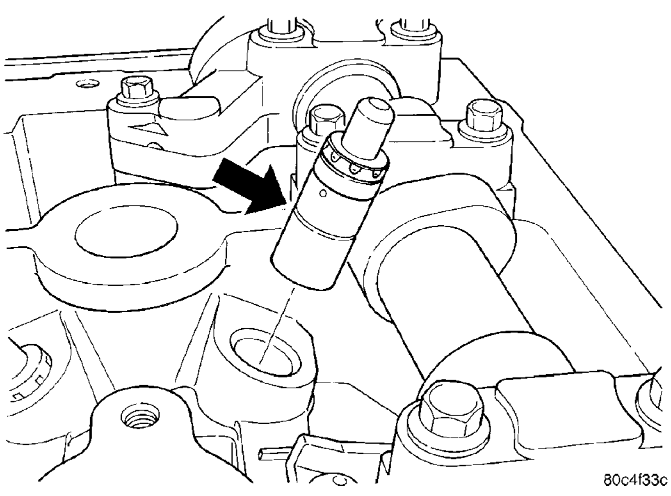


Fig. 30 Hydraulic Lash Adjuster

INSTALLATION

(1) Install hydraulic lifter (Fig. 30). Ensure the lifters are at least partially full of engine oil. This is indicated by little or no plunger travel when the lifter is depressed.

(2) Install rocker arm. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSTALLATION)

(3) Repeat installation procedure for each hydraulic lifter.

(4) Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

(5) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

ROCKER ARMS

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

(1) Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

(2) Remove fuel rail. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - REMOVAL)

(3) Remove spark plugs.

(4) Rotate engine until the camshaft lobe, on the follower being removed, is position on its base circle (heel). Also, the piston should be a minimum of 6.3 mm (0.25 in) below TDC position.

CAUTION: If cam follower assemblies are to be reused, always mark position for reassembly in their original positions.

(5) Using Special Tools 8215 and 8436 slowly depress valve assembly until rocker arm can be removed (Fig. 31).

NOTE: It may be necessary to remove additional brackets or components to allow clearance for tool handle movement.

(6) Repeat removal procedure for each rocker arm.

INSPECTION

Inspect the rocker arm for wear or damage (Fig. 32). Replace as necessary.

ROCKER ARMS (Continued)

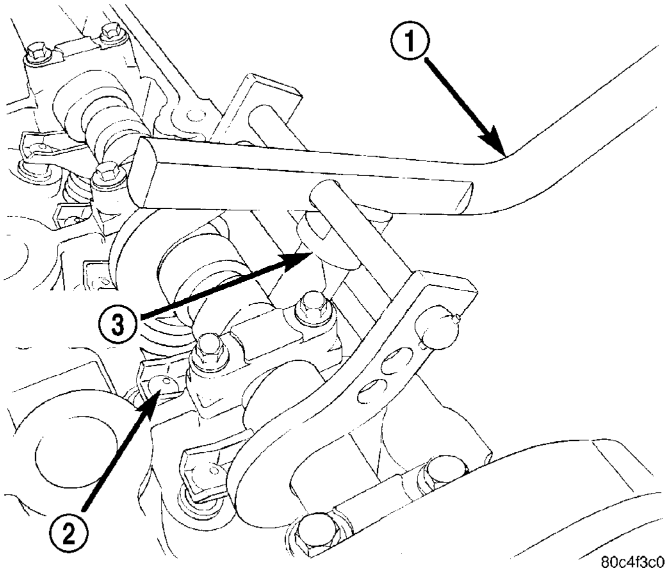


Fig. 31 Rocker Arm - Removal/Installation

1 - SPECIAL TOOL 8215
2 - ROCKER ARM
3 - SPECIAL TOOL 8436

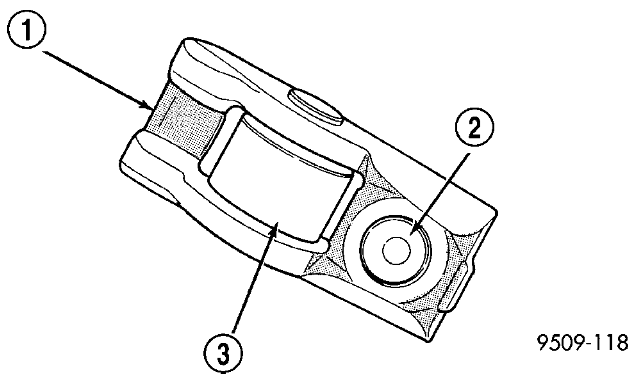


Fig. 32 Rocker Arm - Typical

1 - TIP
2 - LASH ADJUSTER POCKET
3 - ROLLER

INSTALLATION

(1) Lubricate rocker arm with clean engine oil.

(2) Using Special Tools 8215 and 8436 slowly depress valve assembly until rocker arm can be installed on the hydraulic lifter and valve stem.

(3) Repeat installation procedure for each rocker arm.

(4) Install spark plugs.

(5) Install fuel rail. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - INSTALLATION)

(6) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

ENGINE BLOCK

DESCRIPTION

The cast iron cylinder block is a two-piece assembly, consisting of the cylinder block and bedplate (Fig. 33). The bedplate incorporates the main bearing caps and bolts to the cylinder block. This design offers a much stronger lower end and increased cylinder block rigidity. The rear oil seal retainer is integral with the block. The bedplate and block are serviced as an assembly.

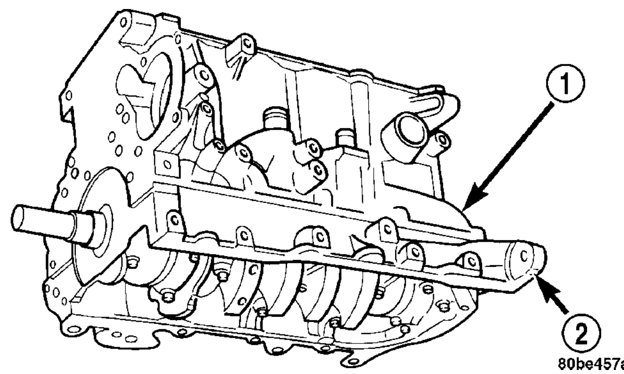


Fig. 33 2.4L Cylinder Block and Bedplate - Typical

1 - CYLINDER BLOCK
2 - BEDPLATE

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON TO CYLINDER BORE FITTING

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin about 14 mm (9/16 inch.) from the bottom of the skirt as shown in (Fig. 35). Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line shown in (Fig. 34). Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS). Correct piston to bore clearance must be established in order to assure quiet and economical operation.

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

STANDARD PROCEDURE - CYLINDER BORE HONING

(1) Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

ENGINE BLOCK (Continued)

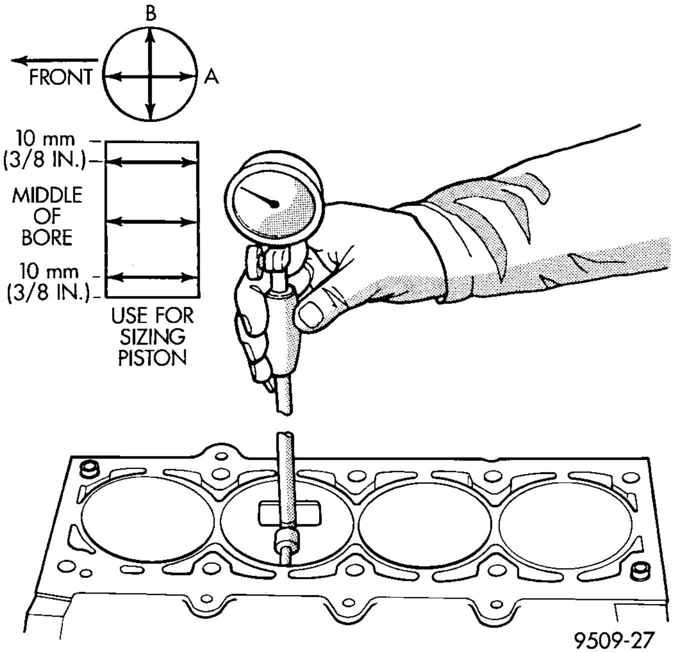


Fig. 34 Checking Cylinder Bore -Typical

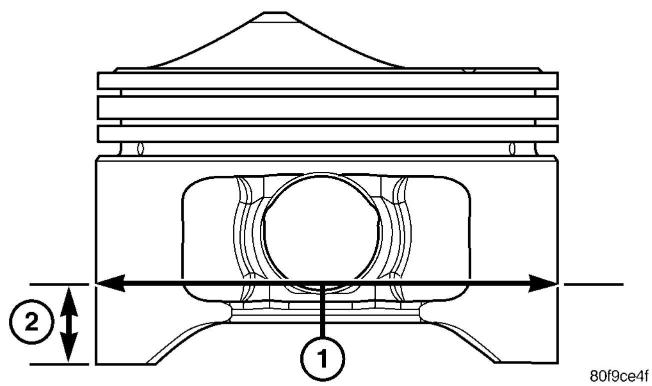


Fig. 35 Piston Measurement - Typical

1 - PISTON DIAMETER
2 - 14 mm (0.551 in.)

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20–60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 40-60 degrees, the cross hatch angle is most satisfactory for proper seating of rings (Fig. 36).

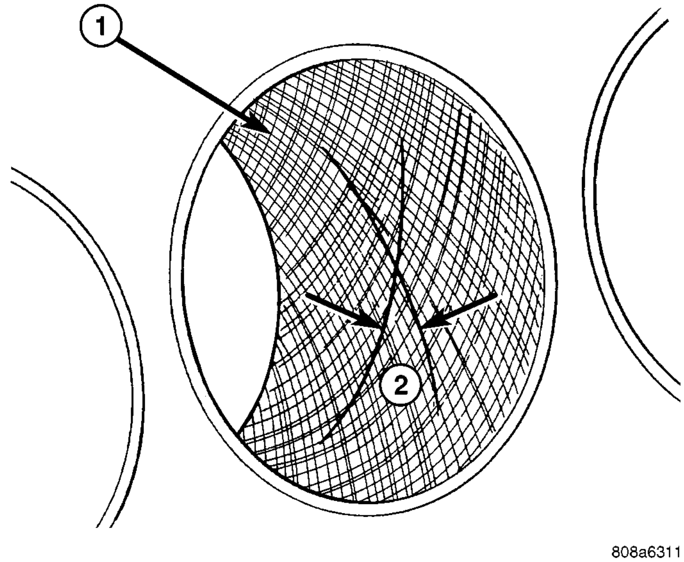


Fig. 36 Cylinder Bore Cross-Hatch Pattern

1 - CROSS-HATCH PATTERN
2 - 40°–60°

(4) A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 degree angle. Faster up and down strokes increase the cross-hatch angle.

(5) After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

CAUTION: Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

ENGINE BLOCK

(1) Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.

(2) If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).

(3) Examine block and cylinder bores for cracks or fractures.

(4) Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

ENGINE BLOCK (Continued)

CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Fig. 37) (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

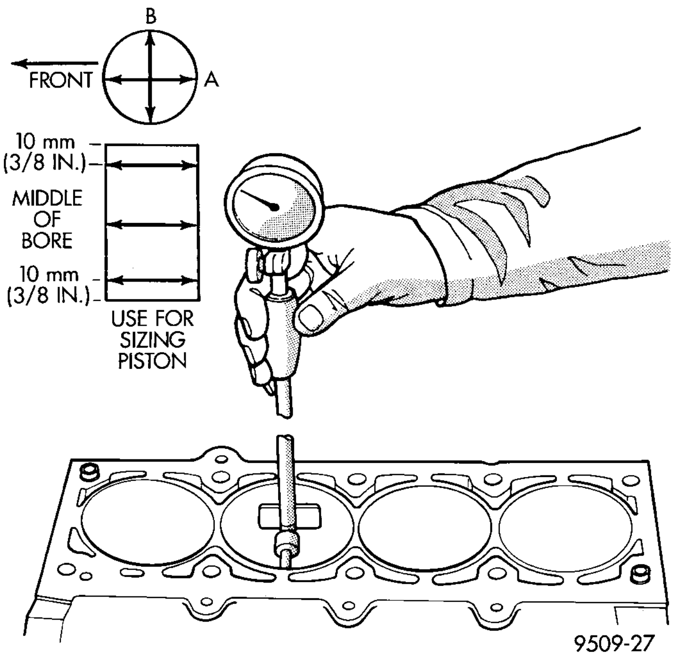


Fig. 37 Checking Cylinder Bore Size

Measure the cylinder bore at three levels in directions A and B (Fig. 37). Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).

CONNECTING ROD BEARINGS

STANDARD PROCEDURE

CONNECTING ROD - FITTING

(1) For measuring connecting rod bearing clearance procedure and use of Plastigage(Refer to 9 - ENGINE - STANDARD PROCEDURE). For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS)

NOTE: The rod bearing bolts should not be reused.

(2) Before installing the **NEW** bolts the threads should be oiled with clean engine oil.

(3) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

(4) Tighten the bolts to 27 N·m PLUS 1/4 turn (20 ft. lbs. PLUS 1/4 turn) **Do not use a torque wrench for last step.**

(5) Using a feeler gauge, check connecting rod side clearance (Fig. 38). Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

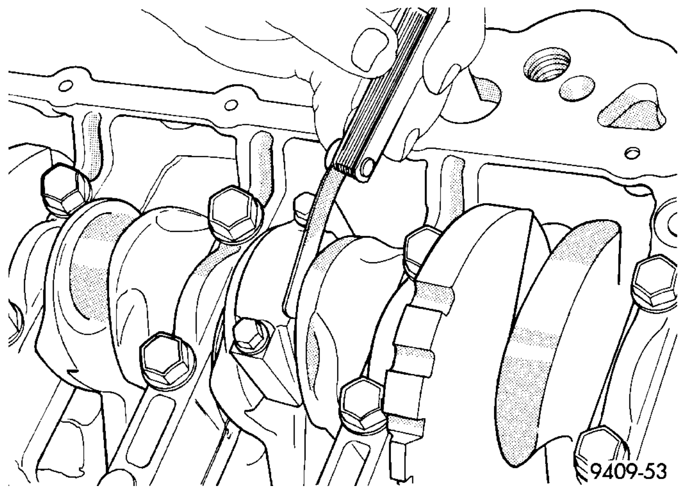


Fig. 38 Connecting Rod Side Clearance

CRANKSHAFT

DESCRIPTION

The crankshaft is made of nodular cast iron and includes five main bearing journals and four connecting rod journals (Fig. 39). The number three journal is the location for the thrust bearing. The mains and connecting rod journals have undercut fillet radiuses that are rolled for added strength. To optimize bearing loading, eight counterweights are used.

OPERATION

The crankshaft transfers force generated by combustion within the cylinder to the flywheel or flexplate.

STANDARD PROCEDURE - CRANKSHAFT END PLAY

(1) Using Dial Indicator C-3339 and Mounting Post L-4438, attach to front of engine, locating probe perpendicular on nose of crankshaft (Fig. 40).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

(4) Move crankshaft all the way to the front and read the dial indicator. Refer to Engine Specifications.

CRANKSHAFT (Continued)

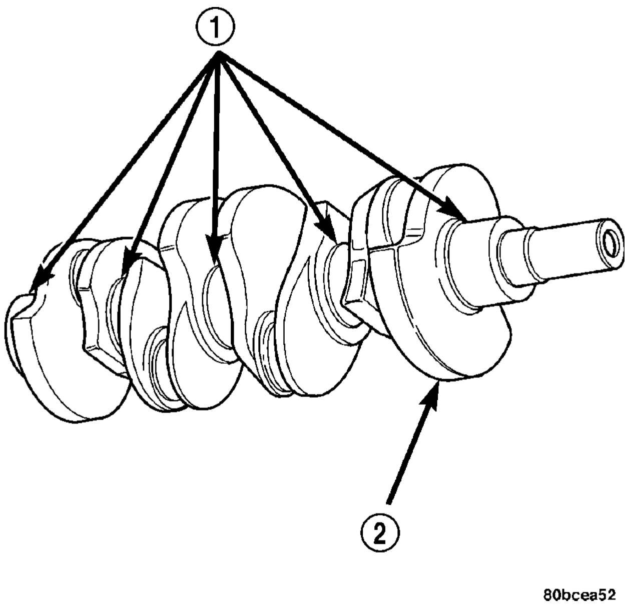


Fig. 39 Crankshaft - Typical

1 - MAIN BEARING JOURNALS
2 - COUNTER BALANCE WEIGHTS

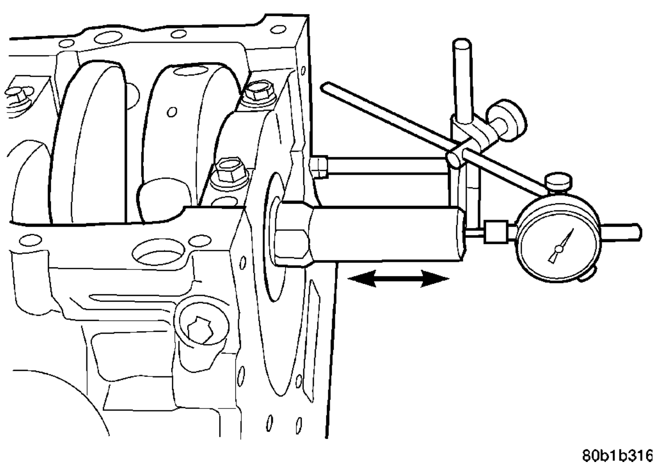


Fig. 40 CHECKING CRANKSHAFT END PLAY

REMOVAL

NOTE: Crankshaft can not be removed when engine is in vehicle.

(1) Remove engine assembly from vehicle. (Refer to 9 - ENGINE - REMOVAL)

(2) Remove flex plate and crankshaft rear oil seal.

(3) Mount engine on a repair stand.

(4) Drain engine oil and remove oil filter.

(5) Remove the oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)

(6) Remove the timing belt covers. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(7) Remove the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(8) Remove the oil pump. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL)

(9) Remove balance shafts and housing assembly. (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - REMOVAL)

(10) Remove all bedplate bolts from the engine block (Fig. 41).

(11) Using a mallet gently tap the bedplate loose from the engine block dowel pins.

CAUTION: Do not pry up on one side of the bedplate. Damage may occur to cylinder block to bedplate alignment and thrust bearing.

(12) Bedplate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.

(13) Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

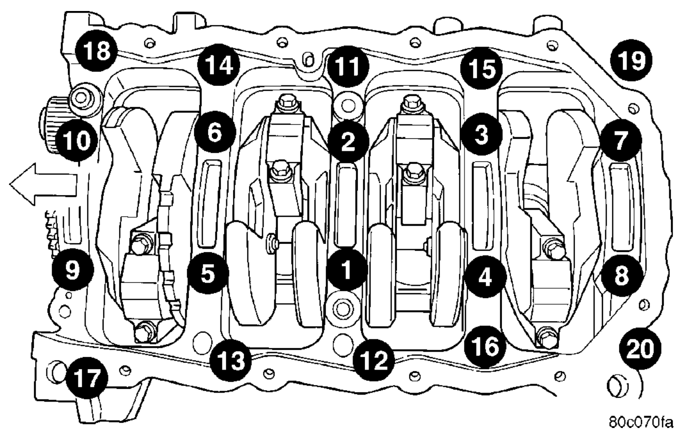


Fig. 41 Bedplate Bolt Tightenening Sequence

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring (Fig. 42). Limits of taper or out of round on any crankshaft journals should within specitifications. (Refer to 9 - ENGINE - SPECIFICATIONS) Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

CAUTION: With the nodular cast iron crankshafts, it is important that the final paper or cloth polish be in the same direction as normal rotation in the engine.

CRANKSHAFT (Continued)

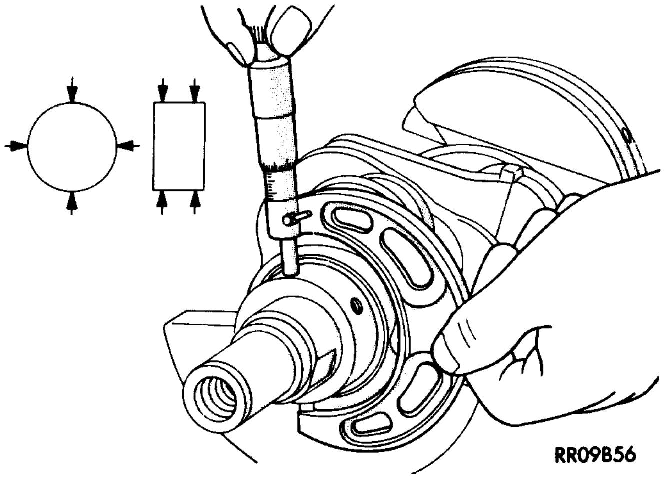


Fig. 42 Crankshaft Journal Measurements

INSTALLATION

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 43).

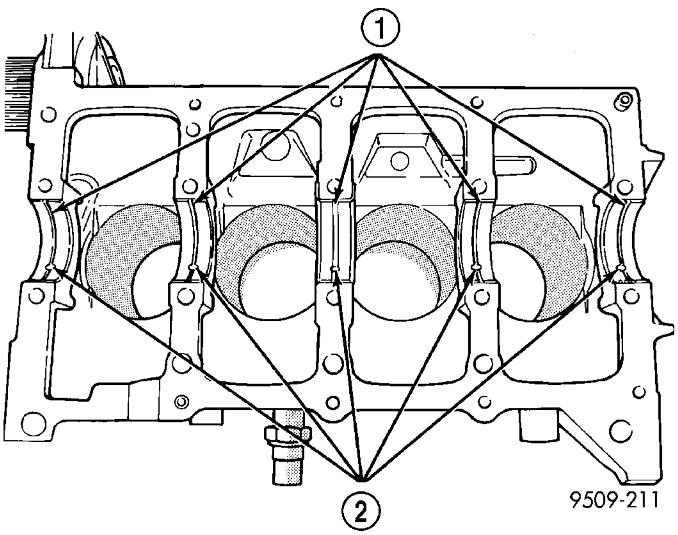


Fig. 43 Installing Main Bearing Upper Shell

1 - LUBRICATION GROOVES
2 - OIL HOLES

(2) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

CAUTION: Do not get oil on the bedplate mating surface. It will affect the sealer ability to seal the bedplate to cylinder block.

(3) Oil the bearings and journals. Install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bedplate or damage may occur to the engine.

(4) Apply 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar® Bed Plate Sealant to cylinder block as shown in (Fig. 44).

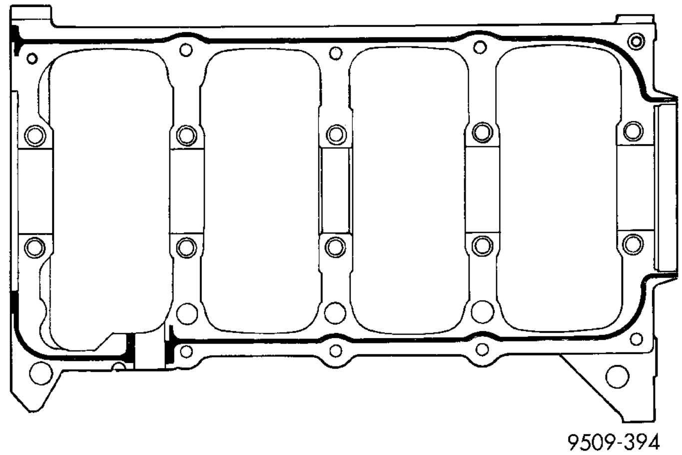


Fig. 44 Bedplate Sealing

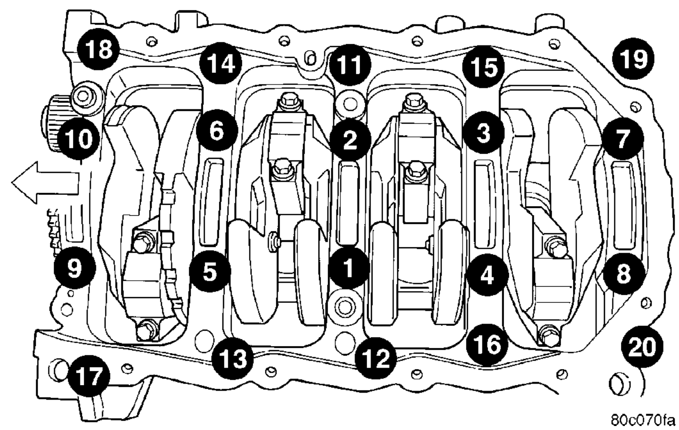


Fig. 45 Bedplate Bolt Torque Sequence

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are seated into the bedplate slots. Install the main bearing/bedplate into engine block.

(6) Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.

(7) Install main bearing bedplate to engine block bolts 11, 17, and 20 finger tight. Tighten these bolts down together until the bedplate contacts the cylinder block.

(8) To ensure correct thrust bearing alignment, perform the following steps:

- Step 1: Rotate crankshaft until number 4 piston is at TDC.
- Step 2: Move crankshaft rearward to limits of travel.
- Step 3: Then, move crankshaft forward to limits of travel.

CRANKSHAFT (Continued)

- Step 4: Wedge an appropriate tool between the rear of the cylinder block **(NOT BED PLATE)** and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
- Step 5: Install and tighten bolts (1–10) in sequence shown in (Fig. 45) to 41 N·m (30 ft. lbs.).
- Step 6: Remove wedge tool used to hold crankshaft.

(9) Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) +1/4 turn in sequence shown in (Fig. 45).

(10) Install main bearing bedplate to engine block bolts (11–20), and torque each bolt to 28 N·m (20 ft. lbs.) in sequence shown in (Fig. 45).

(11) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

(12) Install balance shafts and housing assembly. (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - INSTALLATION)

(13) Install the oil pump and pickup tube. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION)

(14) Install the timing belt rear cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

(15) Install the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(16) Install the timing belt front covers. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

(17) Install engine support bracket.

(18) Install the oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION)

(19) Install the oil filter.

(20) Install crankshaft rear oil seal. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION)

(21) Install flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).

(22) Install the engine assembly. (Refer to 9 - ENGINE - INSTALLATION)

CRANKSHAFT MAIN BEARINGS

STANDARD PROCEDURE - MAIN BEARING - FITTING

For crankshaft specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT MAIN BEARINGS

The crankshaft is supported in five main bearings. All upper and lower bearing shells in the crankcase have oil grooves. Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal (Fig. 46).

Upper and lower Number 3 bearing halves are flanged to carry the crankshaft thrust loads and are NOT interchangeable with any other bearing halves in the engine (Fig. 46). All bearing cap bolts removed during service procedures are to be cleaned and oiled before installation. Bearing shells are available in standard and the following undersized: 0.025 mm (0.001 in.) and 0.250 mm (0.010 in.). Never install an undersize bearing that will reduce clearance below specifications. Replace or machine the crankshaft as necessary to obtain proper bearing clearances.

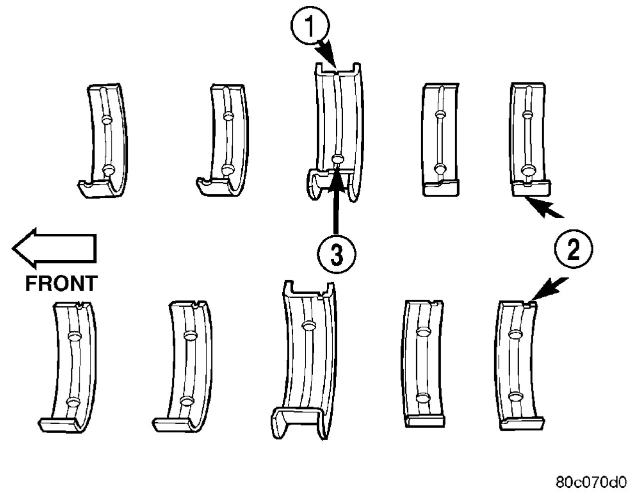


Fig. 46 Main Bearing Identification

1 - OIL GROOVE
2 - MAIN BEARINGS
3 - OIL HOLE

MAIN BEARING INSTALLATION

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 47).

(2) Make certain oil holes in block line up with oil holes in bearings. Bearing tabs must seat in the block tab slots.

CAUTION: Do not get oil on the bedplate mating surface. It will may effect the sealer ability to seal the bedplate to cylinder block.

(3) Oil the bearings and journals and install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bedplate or damage may occur to the engine. Ensure that both cylinder block and bedplate surfaces are clean.

CRANKSHAFT MAIN BEARINGS (Continued)

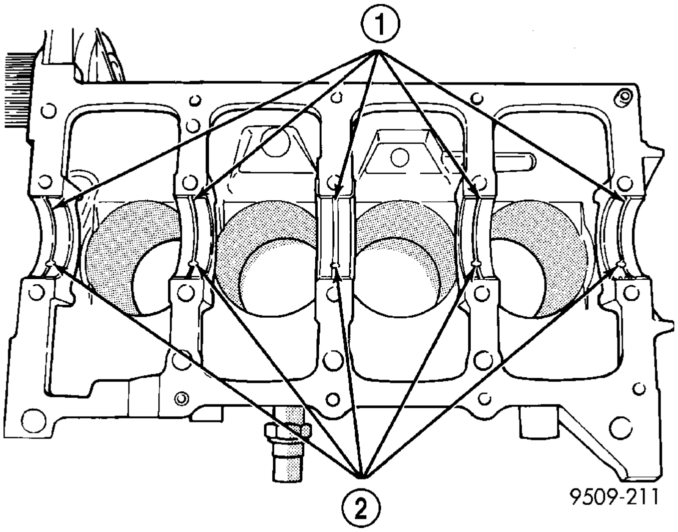


Fig. 47 Installing Main Bearing Upper Shell

1 - LUBRICATION GROOVES
2 - OIL HOLES

(4) Apply 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of anaerobic sealer Mopar® Bed Plate Sealant to cylinder block as shown in (Fig. 48).

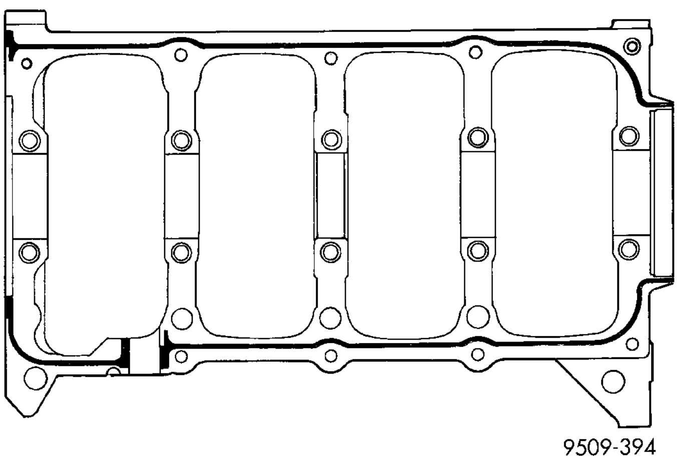


Fig. 48 Main Bearing Caps/Bedplate Sealing

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are seated into the bedplate slots.

(6) Position the main bearing/bedplate onto the engine block.

(7) Before installing bolts, lubricate the threads with clean engine oil, wipe off any excess oil.

(8) Install main bearing bedplate to engine block bolts 11, 17 and 20 finger tight. Tighten these bolts down together until the bedplate contacts the cylinder block.

(9) To ensure correct thrust bearing alignment, perform the following steps:

• Step 1: Rotate crankshaft until number 4 piston is at TDC.

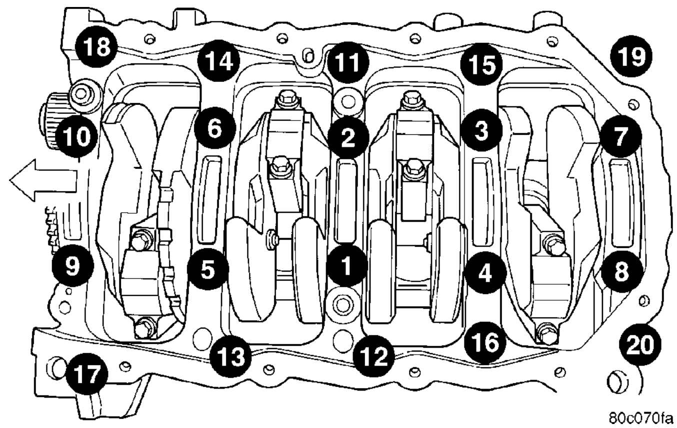


Fig. 49 Main Bearing Caps/Bedplate Tightening Sequence

• Step 2: Move crankshaft rearward to limits of travel.

• Step 3: Then, move crankshaft forward to limits of travel.

• Step 4: Wedge an appropriate tool between the rear of the cylinder block **(NOT BED PLATE)** and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.

• Step 5: Install and tighten bolts (1–10) in sequence shown in (Fig. 49) to 41 N·m (30 ft. lbs.).

• Step 6: Remove wedge tool used to hold crankshaft.

(10) Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) **PLUS** 1/4 turn in sequence shown in (Fig. 49).

(11) Install main bearing bedplate to engine block bolts (11–20), and torque each bolt to 28 N·m (20 ft. lbs.) in sequence shown in (Fig. 49).

(12) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N·m (50 in. lbs.).

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

(1) Remove the crankshaft vibration damper (Fig. 50). (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(2) Remove timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(3) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 51).

CAUTION: Do not nick shaft seal surface or seal bore.

CRANKSHAFT OIL SEAL - FRONT (Continued)

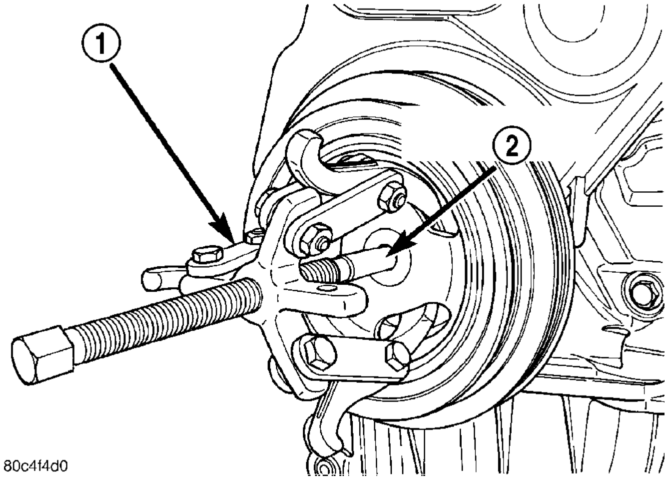


Fig. 50 CRANKSHAFT DAMPER - REMOVAL - TYPICAL

1 - SPECIAL TOOL 1026
2 - SPECIAL TOOL 6827-A- INSERT

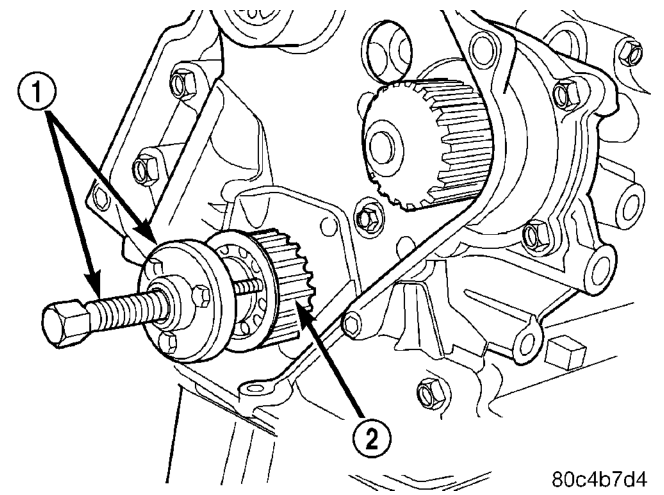


Fig. 51 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - CRANKSHAFT SPROCKET

(4) Using Tool 6771 to remove front crankshaft oil seal (Fig. 52). Be careful not to damage the seal surface of cover.

INSTALLATION

(1) Install new seal by using Special Tool 6780 (Fig. 53).

(2) Place seal into opening with seal spring towards the inside of engine. Install seal until flush with cover.

(3) Install crankshaft sprocket using Special Tool 6792 (Fig. 54).

(4) Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

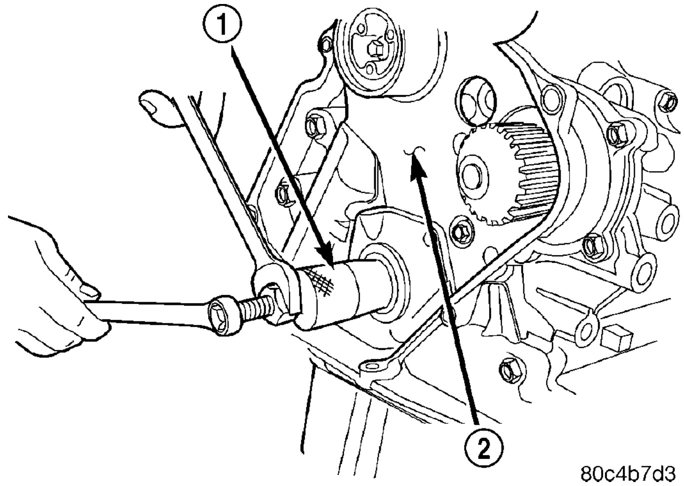


Fig. 52 Front Crankshaft Oil Seal - Removal

1 - SPECIAL TOOL 6771
2 - REAR TIMING BELT COVER

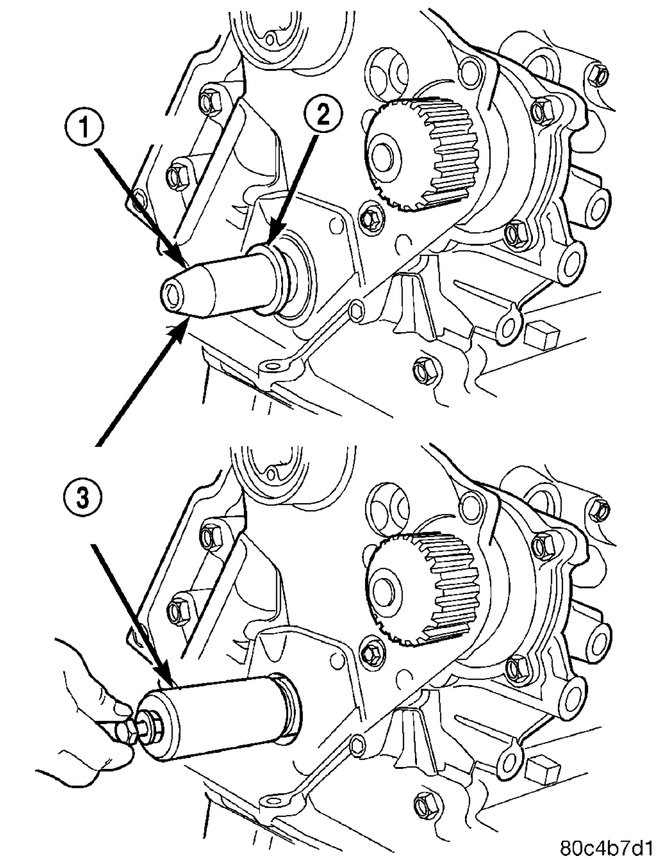


Fig. 53 Crankshaft Front Oil Seal - Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780

(5) Install crankshaft vibration damper (Fig. 55). (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

CRANKSHAFT OIL SEAL - FRONT (Continued)

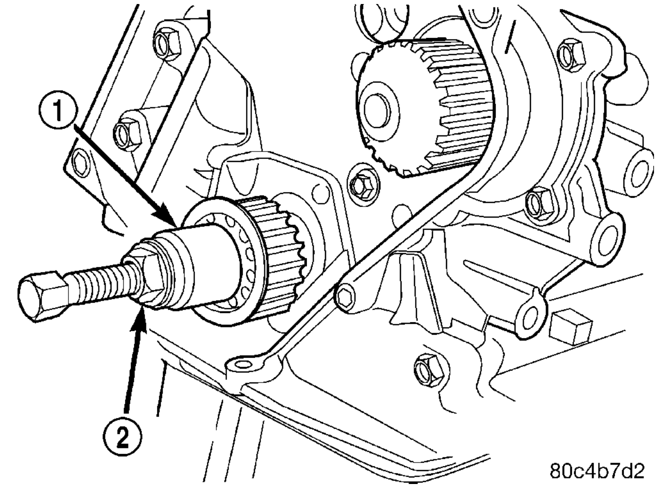


Fig. 54 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

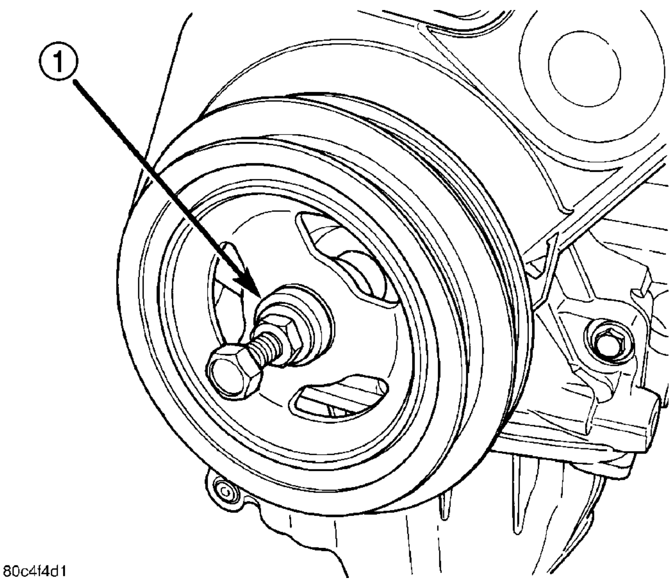


Fig. 55 Crankshaft Damper - Installation - Typical

1 - SPECIAL TOOL 6792

CRANKSHAFT OIL SEAL - REAR

REMOVAL

(1) Remove transmission.

(2) Remove flex plate.

(3) Insert a 3/16 flat bladed screwdriver between the dust lip and the metal case of the crankshaft seal. Angle the screwdriver (Fig. 56)through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

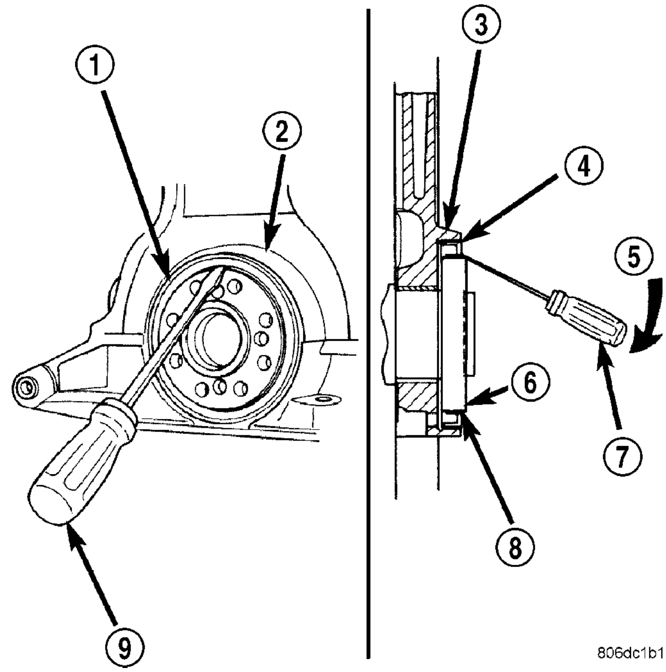


Fig. 56 Rear Crankshaft Oil Seal — Removal

1 - REAR CRANKSHAFT SEAL
2 - ENGINE BLOCK
3 - ENGINE BLOCK
4 - REAR CRANKSHAFT SEAL METAL CASE
5 - PRY IN THIS DIRECTION
6 - CRANKSHAFT
7 - SCREWDRIVER
8 - REAR CRANKSHAFT SEAL DUST LIP
9 - SCREWDRIVER

INSTALLATION

CAUTION: If burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

NOTE: When installing seal, no lube on seal is needed.

(1) Place Special Tool 6926-1 Seal Guide on crankshaft (Fig. 57).

(2) Position seal over guide tool (Fig. 57). Guide tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.

CAUTION: If the seal is driven into the block past flush, this may cause an oil leak.

(3) Drive the seal into the block using Special Tool 6926-2 and handle C-4171 (Fig. 58) until the tool bottoms out against the block (Fig. 59).

CRANKSHAFT OIL SEAL - REAR (Continued)

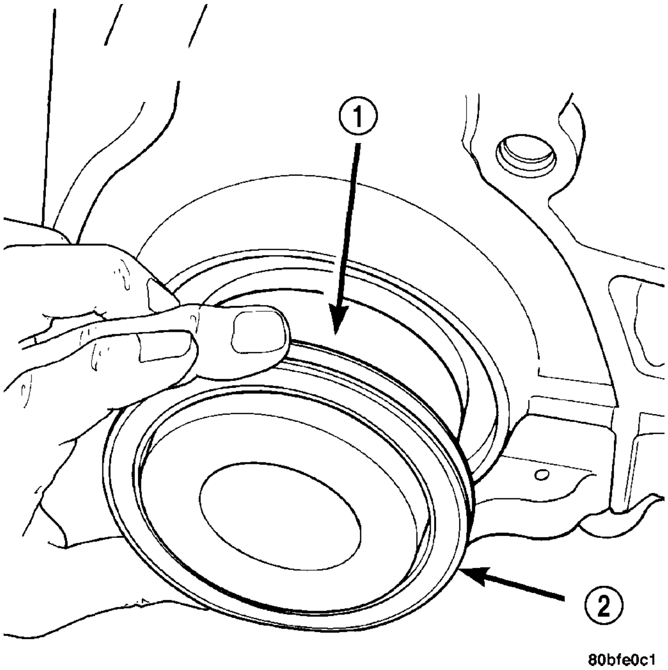


Fig. 57 Rear Crankshaft Seal and Special Tool 6926-1

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL

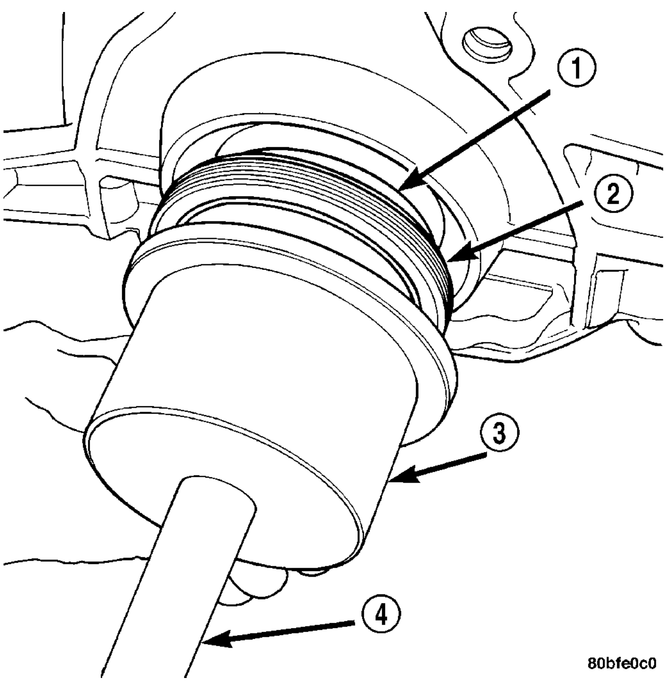


Fig. 58 Crankshaft Seal and Special Tools 6926-2 & C-4171

1 - SPECIAL TOOL 6926–1 PILOT
2 - SEAL
3 - SPECIAL TOOL 6926–2 INSTALLER
4 - SPECIAL TOOL C-4171

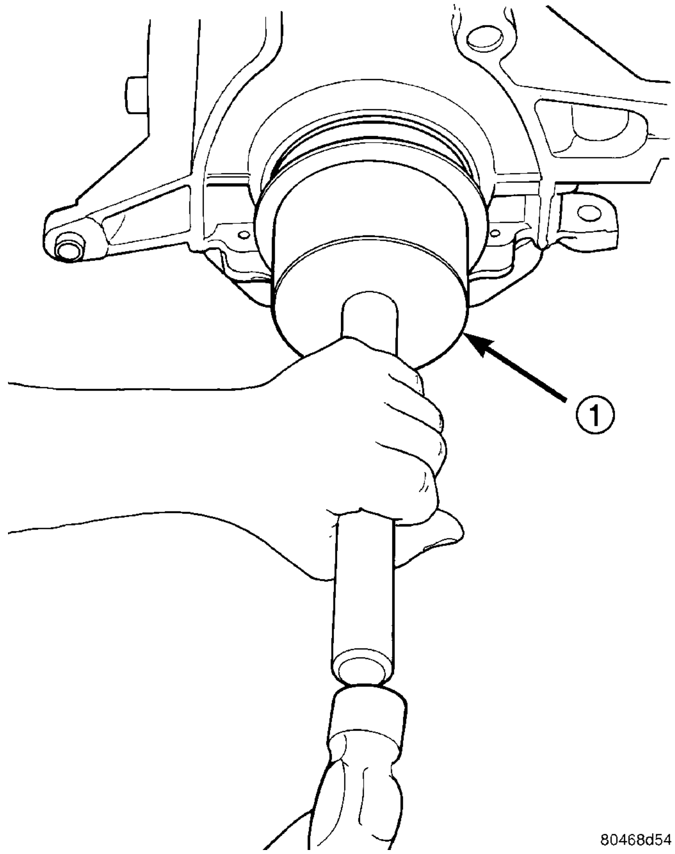


Fig. 59 Rear Crankshaft Seal — Installation

1 - SPECIAL TOOL 6926–2 INSTALLER

(4) Install flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten bolts to 95 N·m (70 ft. lbs.).

(5) Install the transmission.

PISTON & CONNECTING ROD

DESCRIPTION

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged powdered metal connecting rods. The pistons pin is offset 1 mm (0.0394 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. Hex head cap screws are used to provide alignment and durability in the assembly. The pistons and connecting rods are serviced as an assembly.

OPERATION

The piston and connecting rod is the link between the combustion force to the crankshaft.

PISTON & CONNECTING ROD (Continued)

REMOVAL

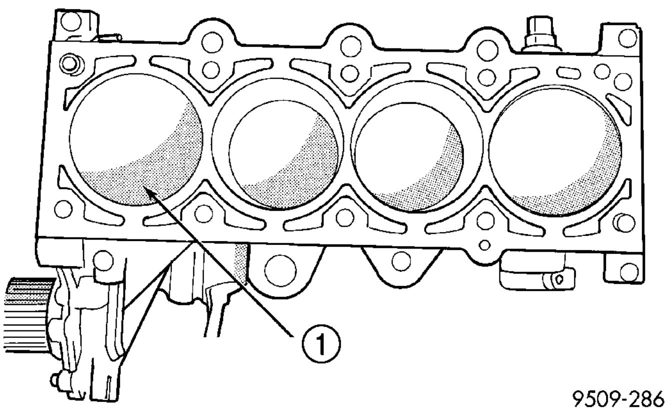


Fig. 60 Piston Markings

1 - DIRECTIONAL ARROW WILL BE IMPRINTED IN THIS AREA

NOTE: Cylinder Head must be removed before Pistons and Rods. Refer to Cylinder Head Removal in this section.

(1) Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation**. Mark piston with matching cylinder number (Fig. 60).

(2) Remove oil pan. Scribe the cylinder number on the side of the rod and cap (Fig. 61) for identification.

(3) Pistons have a directional stamping in the front half of the piston facing towards the **front** of engine.

(4) Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centered in cylinder bore.

(5) Remove Balance Shaft Assembly. Refer to Balance Shaft Removal in this section.

(6) Remove connecting rod cap bolts. Push each piston and rod assembly out of cylinder bore.

NOTE: Be careful not to nick crankshaft journals.

(7) After removal, install bearing cap on the mating rod.

(8) Piston and Rods are serviced as an assembly.

INSTALLATION

(1) Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.

(2) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in (Fig. 62). As viewed from top.

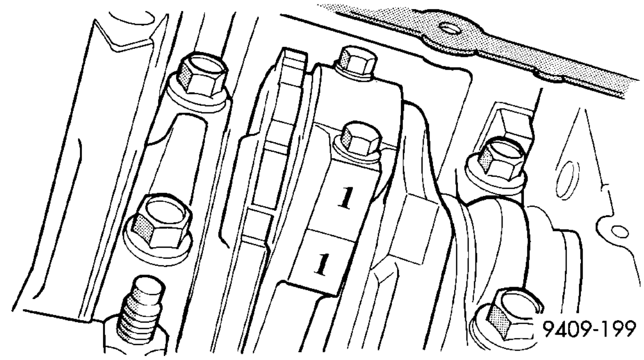


Fig. 61 Identify Connecting Rod to Cylinder

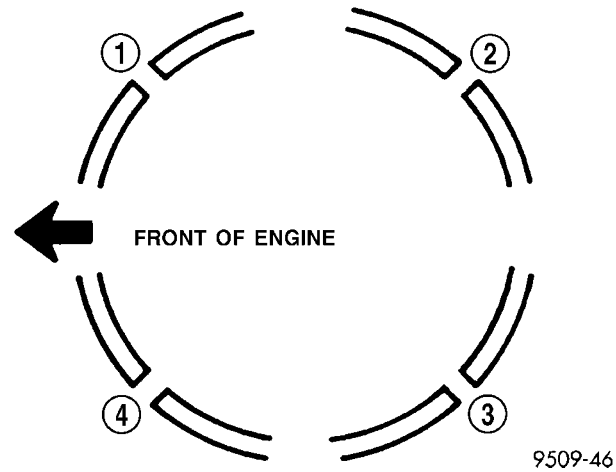


Fig. 62 Piston Ring End Gap Position

1 - GAP OF LOWER SIDE RAIL
2 - NO. 1 RING GAP
3 - GAP OF UPPER SIDE RAIL
4 - NO. 2 RING GAP AND SPACER EXPANDER GAP

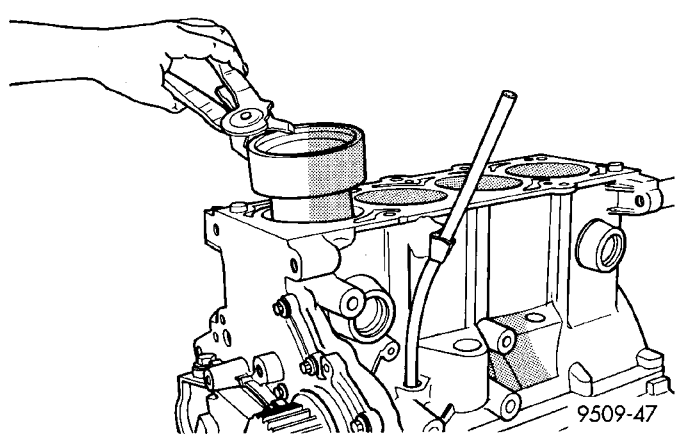


Fig. 63 Piston—Installation

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston (Fig. 63). **Be sure position of rings does not change during this operation**.

(4) The directional stamp on the piston should face toward the front of the engine.

PISTON & CONNECTING ROD (Continued)

(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston assembly into cylinder bore and guide rod over the crankshaft journal.

(6) Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

NOTE: The connecting rod cap bolts should not be reused.

(7) Before installing the **NEW** bolts the threads should be coated with clean engine oil.

(8) Install each bolt finger tight than alternately torque each bolt to assemble the cap properly.

CAUTION: Do not use a torque wrench for second part of last step.

(9) Tighten the bolts to 54 N·m PLUS 1/4 turn (40 ft. lbs. PLUS 1/4 turn).

(10) Using a feeler gauge, check connecting rod side clearance (Fig. 64).

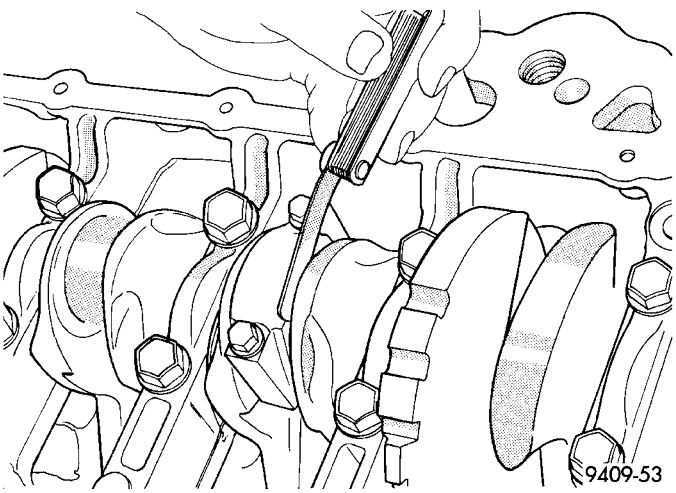


Fig. 64 Checking Connecting Rod Side Clearance

PISTON RINGS

STANDARD PROCEDURE

PISTON RING - FITTING

(1) Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge (Fig. 65). Refer to Engine Specifications.

(2) Check piston ring to groove side clearance (Fig. 66). Refer to Engine Specifications.

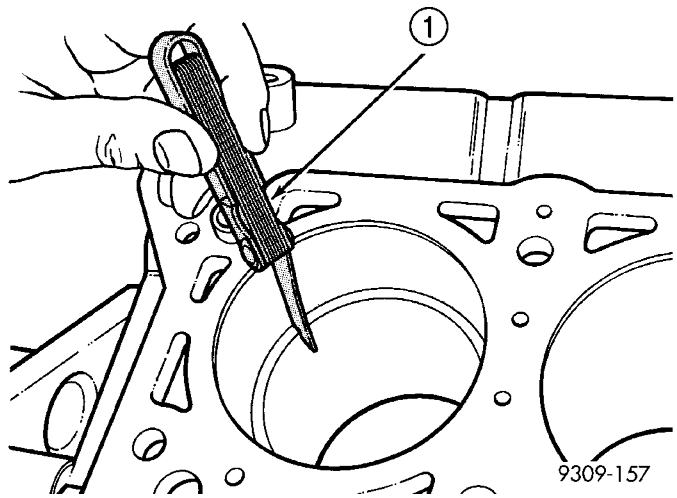


Fig. 65 Piston Ring Gap

1 - FEELER GAUGE

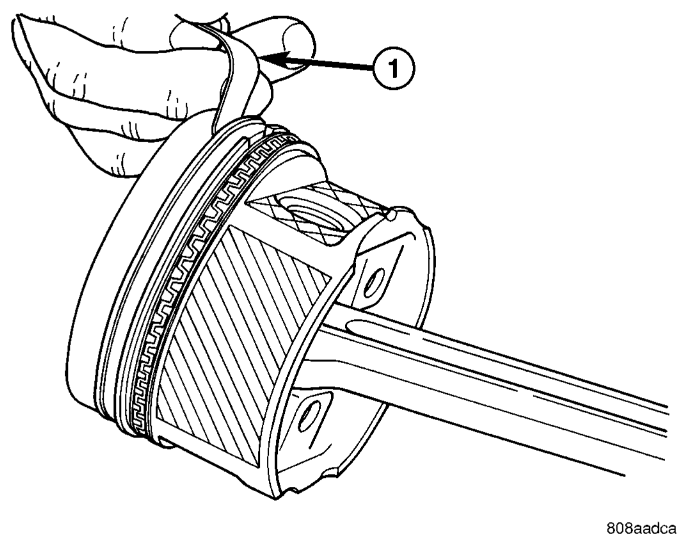


Fig. 66 Piston Ring Side Clearance

1 - FEELER GAUGE

PISTON RINGS - INSTALLATION

(1) Install rings with manufacturers I.D. mark facing up, to the top of the piston (Fig. 67).

CAUTION: Install piston rings in the following order:

a. Oil ring expander.
b. Upper oil ring side rail.
c. Lower oil ring side rail.
d. No. 2 Intermediate piston ring.
e. No. 1 Upper piston ring.

(2) Install the side rail by placing one end between the piston ring groove and the expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander** (Fig. 68).

PISTON RINGS (Continued)

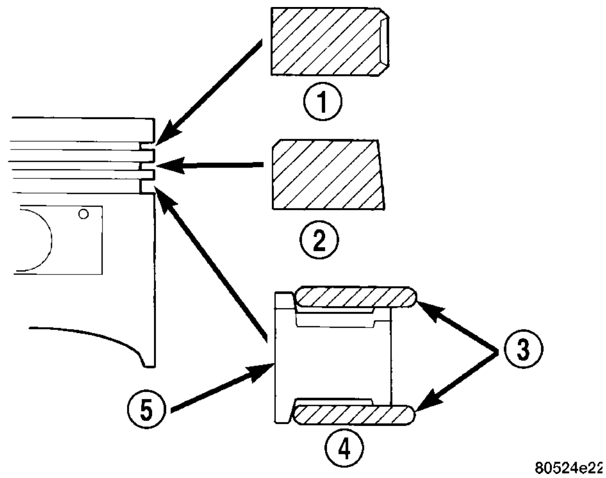


Fig. 67 Piston Ring Installation

1 - NO. 1 PISTON RING
2 - NO. 2 PISTON RING
3 - SIDE RAIL
4 - OIL RING
5 - SPACER EXPANDER

(3) Install upper side rail first and then the lower side rail.

(4) Install No. 2 piston ring and then No. 1 piston ring.

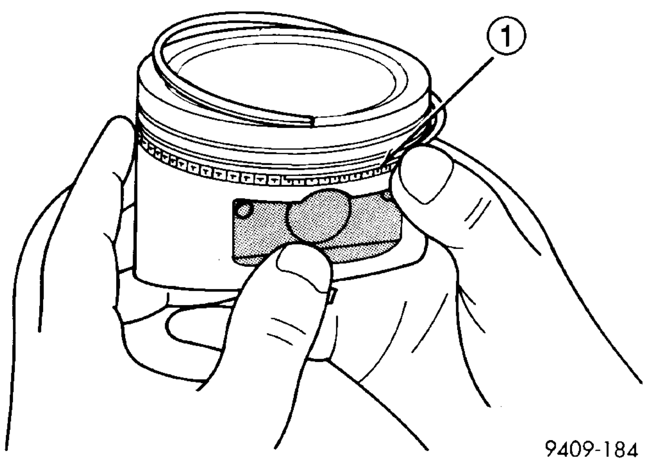


Fig. 68 Installing Side Rail - Typical

1 - SIDE RAIL END

(5) Position piston ring end gaps as shown in (Fig. 69).

(6) Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.

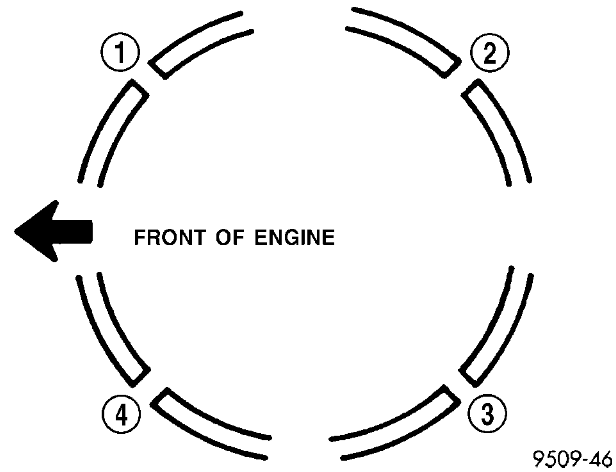


Fig. 69 Piston

1 - GAP OF LOWER SIDE RAIL
2 - NO. 1 RING GAP
3 - GAP OF UPPER SIDE RAIL
4 - NO. 2 RING GAP AND SPACER EXPANDER GAP

VIBRATION DAMPER

REMOVAL

(1) Remove accesory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)

(2) Remove crankshaft damper bolt.

(3) Remove damper using Special Tool 3-Jaw Puller 1026 and Insert 6827–A (Fig. 70).

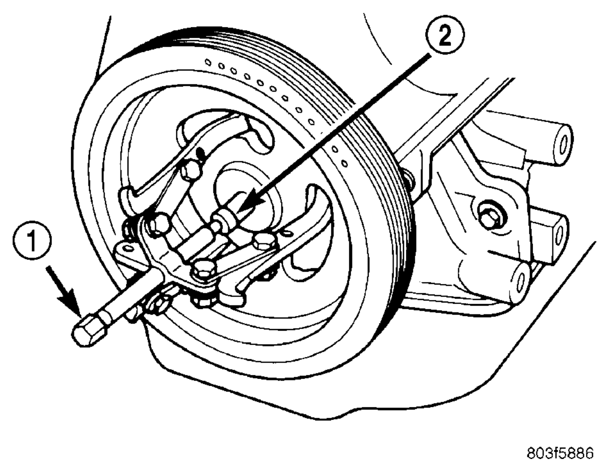


Fig. 70 Crankshaft Vibration Damper - Removal - Typical

1 - SPECIAL TOOL 1026 3-JAW PULLER
2 - SPECIAL TOOL 6827–A INSERT

INSTALLATION

(1) Install crankshaft vibration damper using M12 1.75 x 150 mm bolt, washer, thrust bearing and nut from Special Tool 6792 (Fig. 71).

(2) Install crankshaft vibration damper bolt and tighten to 142 N·m (105 ft. lbs.).

VIBRATION DAMPER (Continued)

(3) Install accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

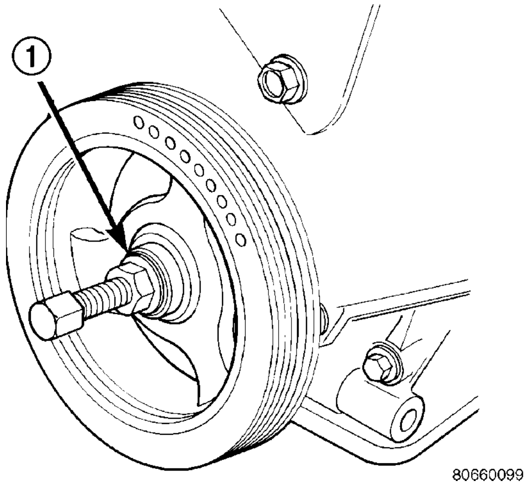


Fig. 71 Crankshaft Vibration Damper - Installation - Typical

1 - M12–1.75 × 150 MM BOLT, WASHER AND THRUST BEARING FROM SPECIAL TOOL 6792

STRUCTURAL COLLAR

REMOVAL

(1) Raise vehicle on hoist.
(2) Remove structural collar attaching bolts.
(3) Remove collar.

INSTALLATION

CAUTION: Torque procedure for the structural collar must be followed or damage could occur to oil pan and collar.

(1) Perform the following steps for installing structural collar.

- Step 1: Position collar between transmission and oil pan. Install collar to transmission bolts, **hand start only**.
- Step 2: Install collar to oil pan bolts, **hand snug only.**
- Step 3: Tighten collar to transmission bolts.
- Step 4: Tighten collar to oil pan bolts.

(2) Lower vehicle.

ENGINE MOUNTING

DESCRIPTION

The engine mounting system consist of three mounts; right and a left side support the powertrain, and rear mount to control powertrain torque. The mounts are of molded rubber material.

FRONT MOUNT

REMOVAL

(1) Raise vehicle on hoist.
(2) Remove the front engine mount through bolt from the insulator.
(3) Remove the engine front mount bolts and remove the insulator assembly.
(4) Remove the front mounting bracket from engine, if necessary.

INSTALLATION

(1) Install the insulator mount assembly (Fig. 72)and (Fig. 73).

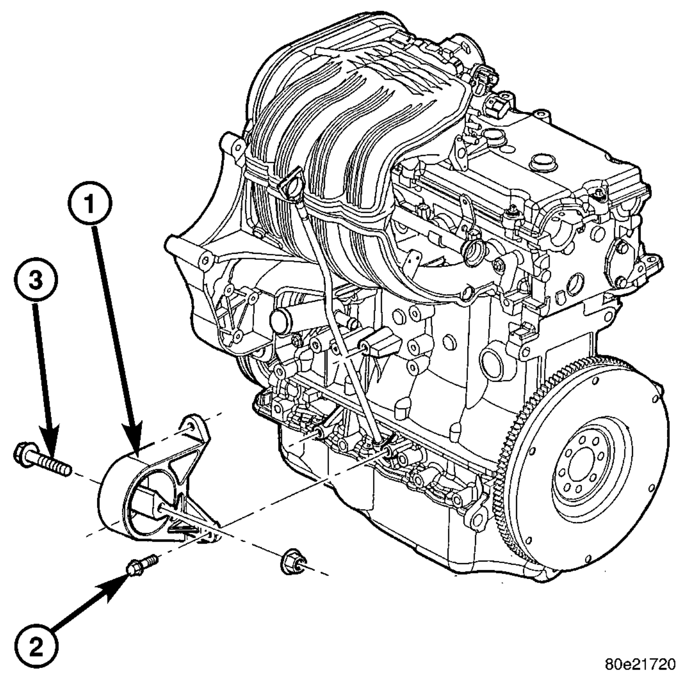


Fig. 72 LH ENGINE MOUNT

1 - ENGINE MOUNT
2 - ENGINE MOUNT BOLT (3)
3 - ENGINE MOUNT THROUGH BOLT

FRONT MOUNT (Continued)

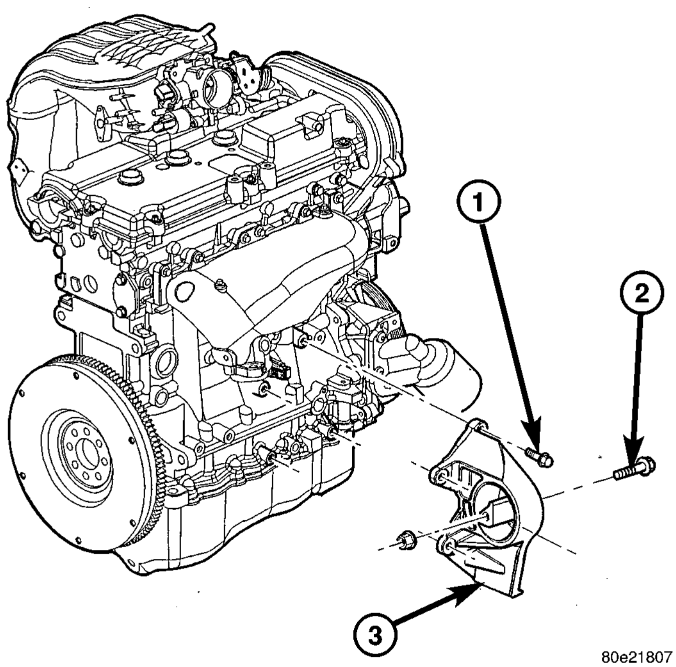


Fig. 73 RH ENGINE MOUNT

1 - ENGINE MOUNT BOLT (4)
2 - ENGINE MOUNT THROUGH BOLT
3 - ENGINE MOUNT

(2) Tighten the mount to engine bolts.
(3) Loosely install the front engine mount through bolt to the insulator.
(4) Lower the engine.
(5) Tighten the through bolt.
(6) Lower the vehicle.

REAR MOUNT

REMOVAL

NOTE: A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

(1) Disconnect negative cable from battery.
(2) Raise the vehicle and support the transmission.
(3) Remove the nuts holding the support cushion to the crossmember. Remove the crossmember.

MANUAL TRANSMISSION

a. Remove the support cushion nuts and remove the cushion.
b. Remove the transmission support bracket bolts and remove the bracket from the transmission.

AUTOMATIC TRANSMISSION

c. Remove the support cushion bolts and remove the cushion and the support bracket from the transmission (4WD) or from the adaptor bracket (2WD).
d. On 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission. Remove the adaptor bracket.

INSTALLATION

MANUAL TRANSMISSION:

(1) Install the support cushion to the transmission (Fig. 74)or (Fig. 75). Install the bolts and tighten.

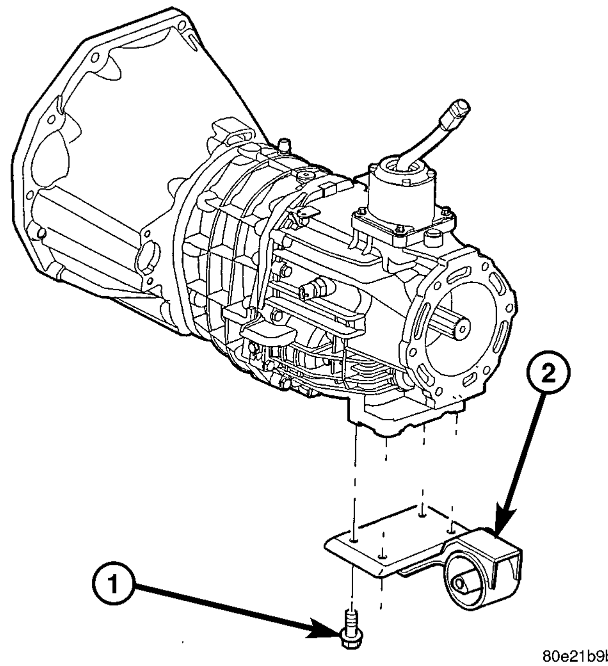


Fig. 74 TRANSMISSION MOUNT-2.4L MANUAL TRANS

1 - TRANSMISSION MOUNT
2 - MOUNTING BOLT

(2) Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
(3) Install crossmember-to-sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.
(4) Remove the transmission support.
(5) Lower the vehicle.
(6) Connect negative cable to battery.

AUTOMATIC TRANSMISSION:

(1) Install the transmission mount to transmission (Fig. 76) and (Fig. 77). Install the bolts.
(2) Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
(3) Remove the transmission support.
(4) Lower the vehicle.
(5) Connect negative cable to battery.

REAR MOUNT (Continued)

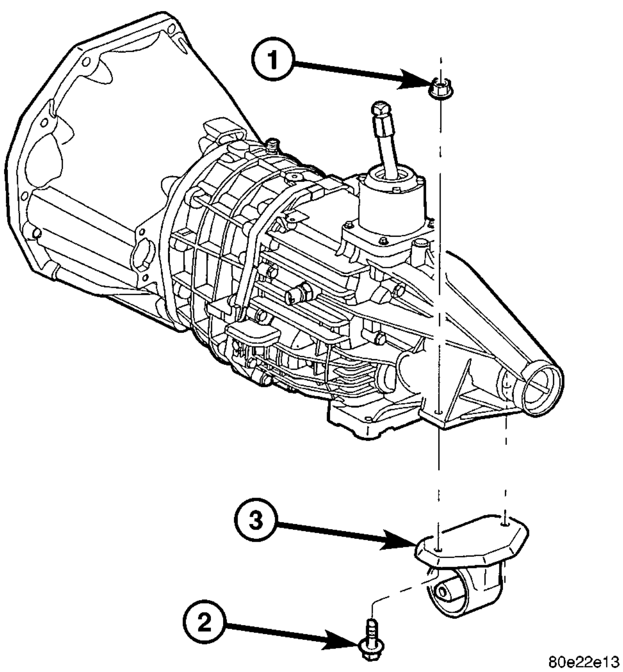


Fig. 75 TRANSMISSION MOUNT 3.7L MANUAL TRANS 2WD

1 - NUT
2 - BOLT
3 - TRANS MOUNT

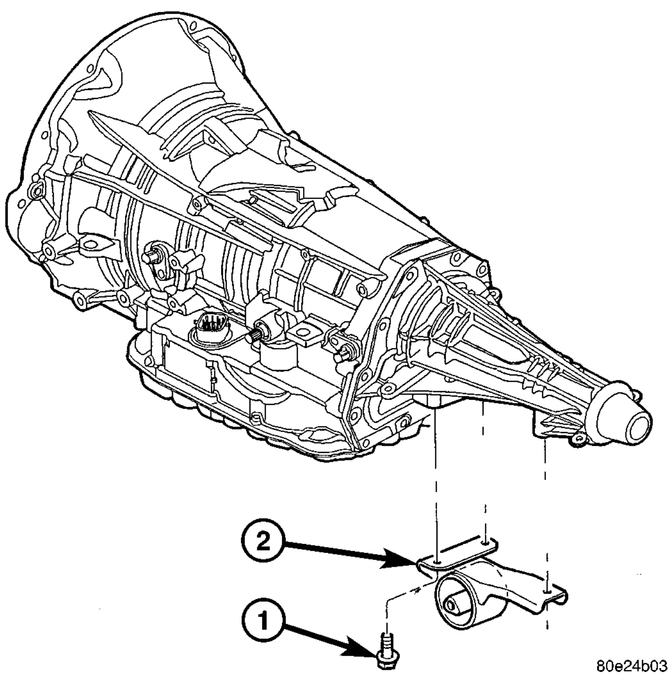


Fig. 76 TRANSMISSION MOUNT 3.7L 2WD AUTO TRANS

1 - BOLT
2 - MOUNT

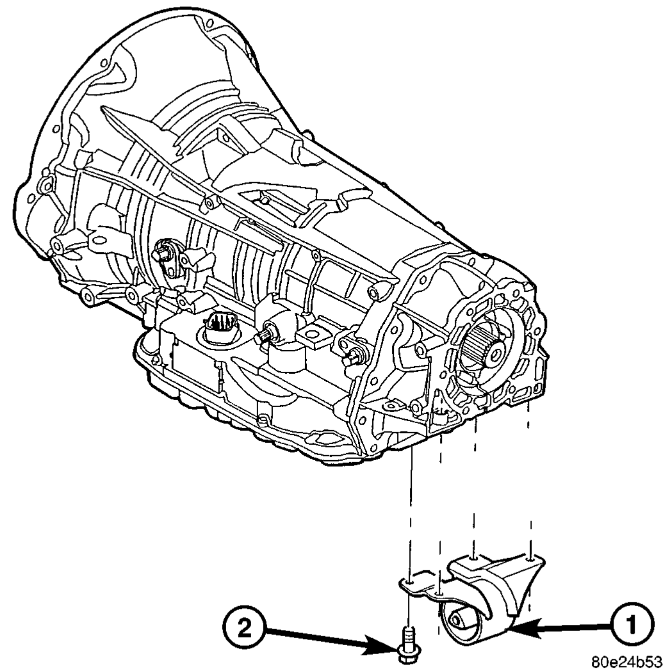


Fig. 77 TRANSMISSION MOUNT 3.7L 4WD AUTO TRANS

1 - MOUNT
2 - BOLT

LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is mounted in the front engine cover and driven by the crankshaft.

OPERATION

Engine oil drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals. Balance shaft lubrication is provided through an oil passage from the number one main bearing cap through the balance shaft carrier support leg. This passage directly supplies oil to the front bearings and internal machined passages in the shafts that routes oil from front to the rear shaft bearing journals. A vertical hole at the number five bulkhead routes pressurized oil through a restrictor (integral to the cylinder head gasket) up past a cylinder head bolt to an oil gallery running the length of the cylinder head. The camshaft journals are partially slotted to allow a predetermined amount of pressurized oil to pass into the bearing cap cavities. Lubrication of the camshaft lobes are provided by small holes in the camshaft

LUBRICATION (Continued)

bearing caps that are directed towards each lobe. Oil returning to the pan from pressurized components supplies lubrication to the valve stems. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING - ENGINE OIL PRESSURE CHECKING

(1) Disconnect and remove oil pressure switch. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL)

(2) Install Special Tools C-3292 Gauge with 8406 Adaptor fitting.

(3) Start engine and record oil pressure. Refer to Specifications for correct oil pressure requirements. (Refer to 9 - ENGINE - SPECIFICATIONS)

CAUTION: If oil pressure is 0 at idle, do not perform the 3000 RPM test

(4) If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open, a clogged oil pick-up screen or a damaged oil pick-up tube O-ring.

(5) After test is complete, remove test gauge and fitting.

(6) Install oil pressure switch and connector. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - INSTALLATION)

OIL

STANDARD PROCEDURE

ENGINE OIL LEVEL CHECK

The best time to check engine oil level is after it has sat overnight, or if the engine has been running, allow the engine to be shut off for at least 5 minutes before checking oil level.

Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Remove dipstick and observe oil level. Add oil only when the level is at or below the ADD mark (Fig. 78).

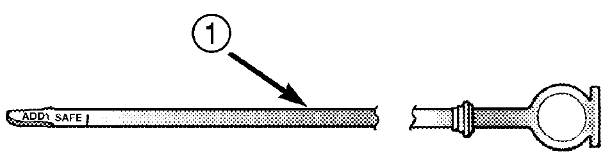


Fig. 78 Oil Level

1 - ENGINE OIL LEVEL DIPSTICK

STANDARD PROCEDURE - ENGINE OIL AND FILTER CHANGE

Change engine oil at mileage and time intervals described in the Maintenance Schedule. (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands. Refer to Hoisting and Jacking Recommendations. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.

(6) Remove oil filter. (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL)

(7) Install and tighten drain plug in crankcase.

(8) Install new oil filter. (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION)

(9) Lower vehicle and fill crankcase with specified type and amount of engine oil. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION)

(10) Install oil fill cap.

(11) Start engine and inspect for leaks.

(12) Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

OIL FILTER

DESCRIPTION

The engine oil filter is a high quality full-flow, disposable type. Replace the oil filter with a Mopar® or the equivalent.

REMOVAL

(1) Raise vehicle on hoist.

(2) Position an oil collecting container under oil filter location.

CAUTION: When servicing the oil filter avoid deforming the filter can by installing the remove/install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

(3) Using a suitable filter wrench, turn oil filter (Fig. 79) counterclockwise to remove.

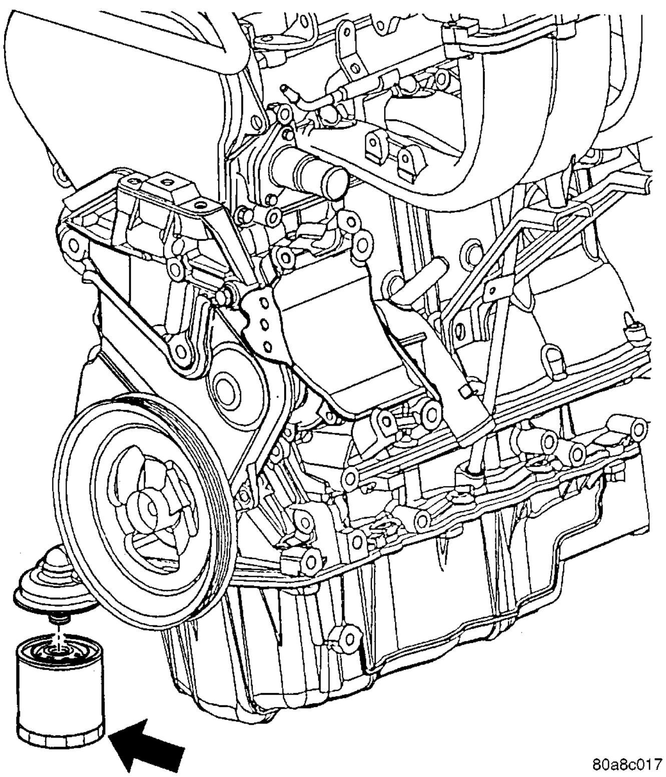


Fig. 79 Oil Filter - Typical

INSTALLATION

(1) Clean and check filter mounting surface. The surface must be smooth, flat and free of debris or pieces of gasket.

(2) Lubricate new oil filter gasket with clean engine oil.

(3) Screw oil filter on until the gasket contacts base. Tighten to 21 N·m (15 ft. lbs.).

OIL PAN

REMOVAL

(1) Remove air cleaner assembly.

(2) Raise vehicle on hoist and drain engine oil.

(3) Loosen the engine mount thru bolts.

(4) Disconnect exhaust pipe at manifold.

(5) Remove structural collar, if equipped.

(6) Remove front axle mounting bolts, and lower axle as far possible, if equipped.

(7) Position Special Tool 8534 on fender lip and align the slots in the brackets with the fender mounting holes.

(8) Secure brackets to the fender using four M6 X 1.0 X 25 MM flanged cap screws.

(9) Tighten the thumbscrews to secure the sleeves to the support tube.

(10) Secure the support tube in an upright position.

(11) Assemble the flat washer, thrust bearing, hook and T handle.

(12) Using the M10 X 1.5 X 40 mm capscrew supplied with the support fixture, secure the chain to the front cover and the hook.

(13) Support engine as needed.

(14) Remove oil pan attaching bolts.

(15) Remove oil pan.

(16) Clean oil pan and all gasket surfaces.

INSTALLATION

(1) Install the oil pan gasket to the block.

(2) Apply a 3MM (1/8 inch) bead of Mopar® Engine RTV at the oil pump to engine block parting line (Fig. 80).

(3) Install pan and tighten the screws to 12 N·m (105 in. lbs.).

(4) Lower engine, and remove Special Tool 8534.

(5) Tighten engine mount thru bolts.

(6) Raise the front axle into position, and reinstall front axle mounting bolts. If equipped.

(7) Reconnect exhaust pipe to manifold.

(8) Install structural collar, if equipped.

(9) Lower vehicle.

(10) Fill engine crankcase with proper oil to correct level.

(11) Reinstall air cleaner assembly.

OIL PAN (Continued)

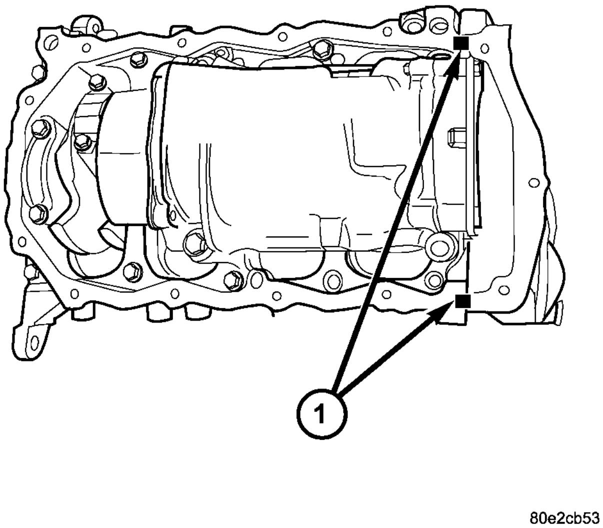


Fig. 80 OIL PAN GASKET INSTALLATION

1 - SEALER LOCATION

OIL PRESSURE SENSOR/ SWITCH

DESCRIPTION

The 3–wire, electrical/mechanical engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

The oil pressure sensor uses three circuits. They are:

- A 5–volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3–wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5–volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

OIL PUMP

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(3) Remove timing belt rear cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(4) Remove oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)

(5) Remove crankshaft sprocket using Special Tools 6793 and C-4685-C2 (Fig. 81).

(6) Remove crankshaft key (Fig. 82).

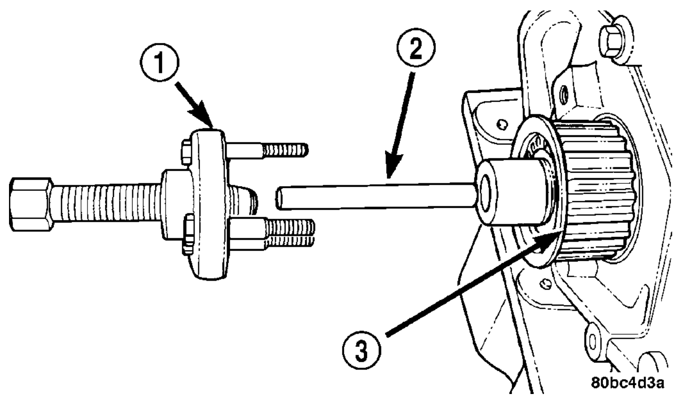


Fig. 81 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

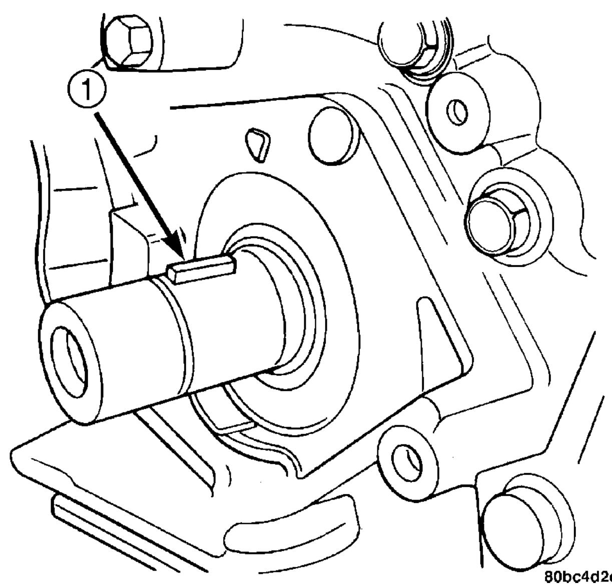


Fig. 82 Crankshaft Key

1 - CRANKSHAFT KEY

(7) Remove oil pick-up tube.

OIL PUMP (Continued)

(8) Remove oil pump (Fig. 83) and front crankshaft seal.

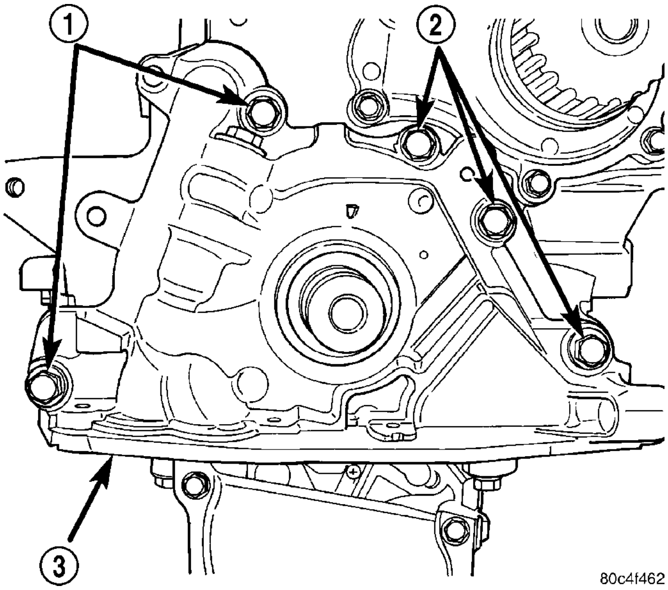


Fig. 83 Oil Pump

1 - BOLTS
2 - BOLTS
3 - OIL PUMP

DISASSEMBLY

(1) To remove the relief valve, proceed as follows:

(a) Remove the threaded plug and gasket from the oil pump (Fig. 84).

(b) Remove spring and relief valve (Fig. 84).

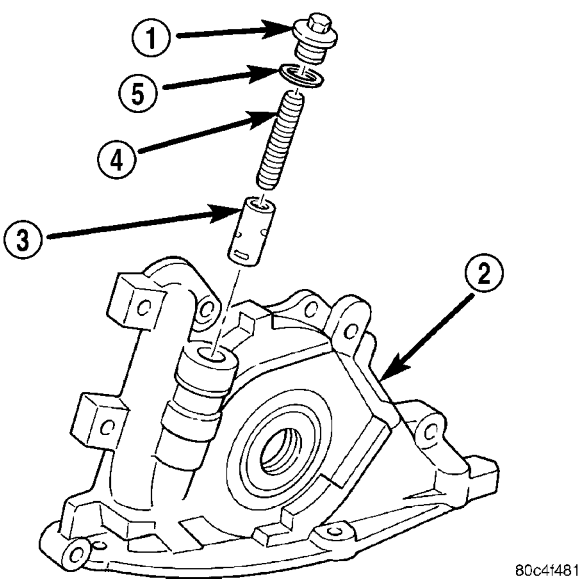


Fig. 84 Oil Pressure Relief Valve

1 - PLUG
2 - OIL PUMP BODY
3 - RELIEF VALVE
4 - SPRING
5 - SEAL

(2) Remove oil pump cover fasteners, and lift off cover (Fig. 85).

(3) Remove pump rotors (Fig. 85).

(4) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

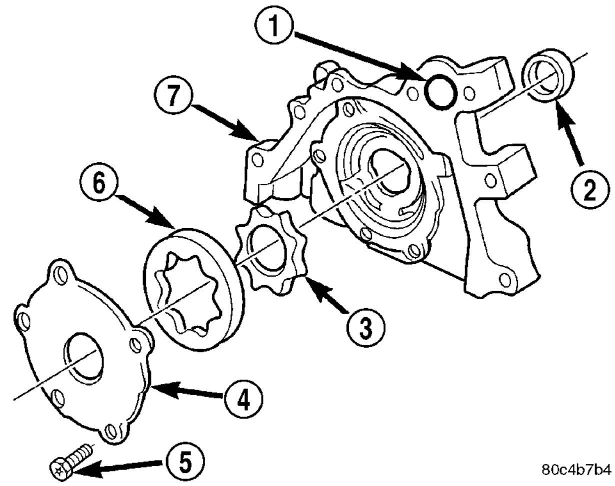


Fig. 85 Oil Pump

1 - O-RING
2 - SEAL
3 - INNER ROTOR
4 - OIL PUMP COVER
5 - FASTENER
6 - OUTER ROTOR
7 - OIL PUMP BODY

CLEANING

(1) Clean all parts thoroughly in a suitable solvent.

INSPECTION

(1) Inspect the mating surface of the oil pump. Surface should be smooth (Fig. 86). Replace pump cover if scratched or grooved.

(2) Lay a straightedge across the pump cover surface (Fig. 87). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced.

(3) Measure thickness and diameter of outer rotor. If outer rotor thickness measures 9.40 mm (0.370 in.) or less (Fig. 88), or if the diameter is 79.95 mm (3.148 in.) or less, replace outer rotor.

(4) If inner rotor measures 9.40 mm (0.370 in.) or less replace inner rotor (Fig. 89).

ASSEMBLY

(1) Assemble pump, using new parts as required. **Install the inner rotor with chamfer facing the cast iron oil pump cover.**

(2) Prime oil pump before installation by filling rotor cavity with engine oil.

(3) Install cover and tighten fasteners to 12 N·m (105 in. lbs.).

OIL PUMP (Continued)

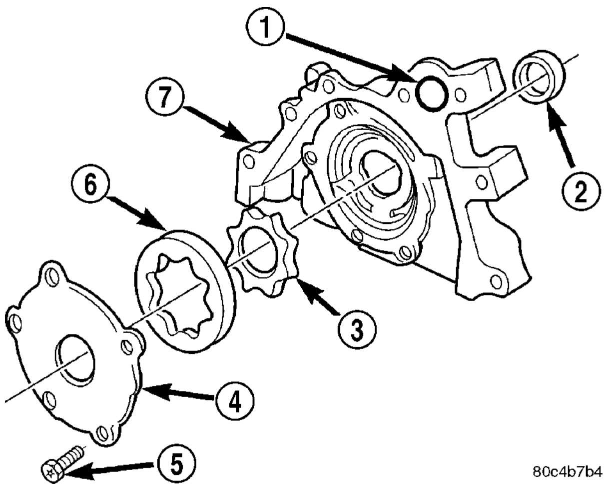


Fig. 86 Oil Pump

1 - O-RING
2 - SEAL
3 - INNER ROTOR
4 - OIL PUMP COVER
5 - FASTENER
6 - OUTER ROTOR
7 - OIL PUMP BODY

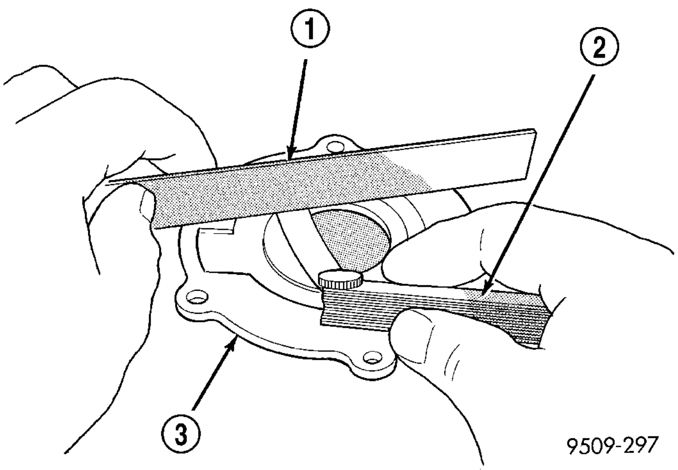


Fig. 87 Checking Oil Pump Cover Flatness

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

CAUTION: Oil pump pressure relief valve must be installed correctly or serious engine damage may occur.

(4) Install relief valve, spring, gasket and cap. Tighten cap to 41 N·m (30 ft. lbs.).

INSTALLATION

(1) Make sure all surfaces are clean and free of oil and dirt.

(2) Apply Mopar® Gasket Maker to oil pump as shown in (Fig. 90). Install O-ring into oil pump body discharge passage.

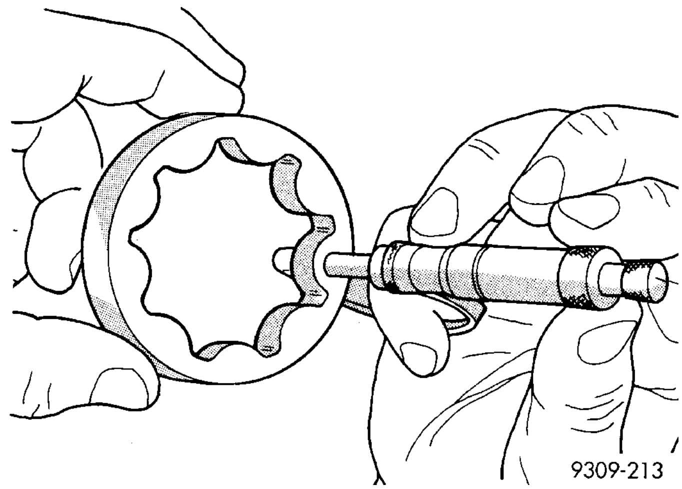


Fig. 88 Measuring Outer Rotor Thickness

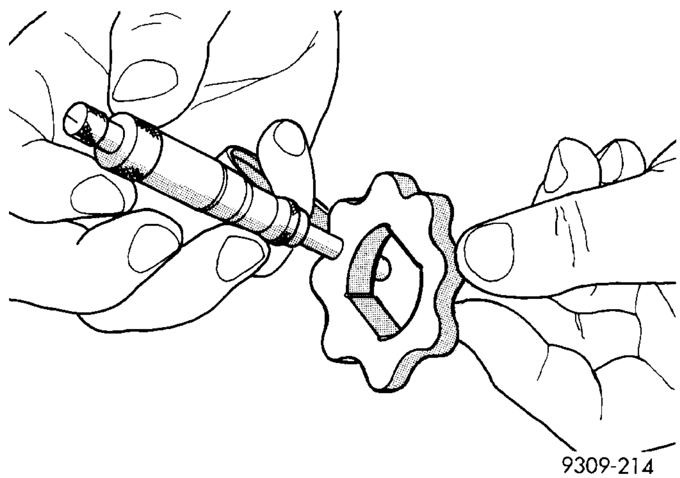


Fig. 89 Measuring Inner Rotor Thickness

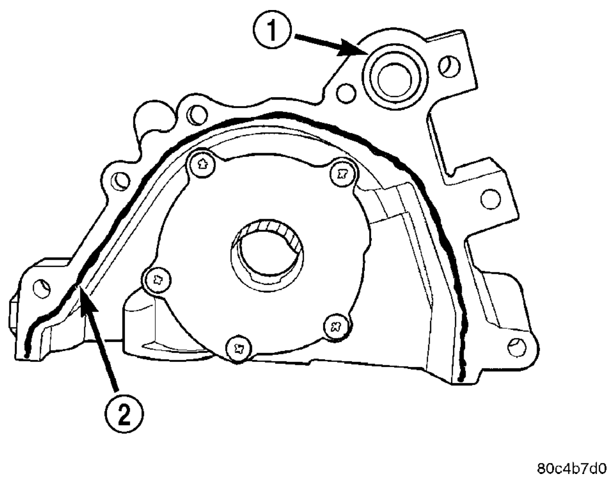


Fig. 90 Oil Pump Sealing - Typical

1 - O-RING
2 - SEALER LOCATION

(3) Prime oil pump with engine oil before installation.

OIL PUMP (Continued)

(4) Align oil pump rotor flats with flats on crankshaft. Install the oil pump to the block.

CAUTION: To align, the front crankshaft seal MUST be out of pump, or damage may result.

(5) Install new front crankshaft seal using Special Tool 6780 (Fig. 91).

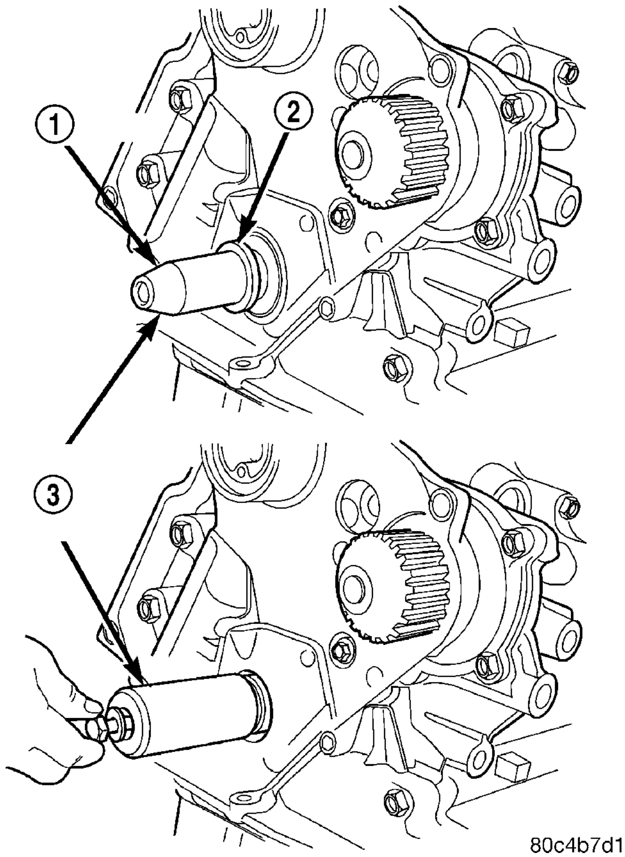


Fig. 91 Front Crankshaft Seal - Installation

1 - PROTECTOR
2 - SEAL
3 - SPECIAL TOOL 6780

(6) Install crankshaft key (Fig. 82).

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

(7) Install crankshaft sprocket using Special Tool 6792 (Fig. 92).

(8) Install oil pump pick-up tube.

(9) Install oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION)

(10) Install timing belt rear cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

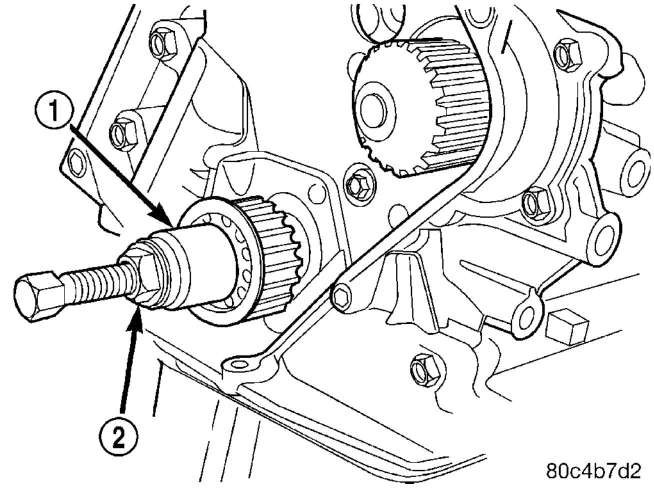


Fig. 92 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

(11) Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is a two piece aluminum casting (Fig. 93) that attaches to the cylinder head with fasteners. The manifold is a long branch design to enhance low and mid-range torque

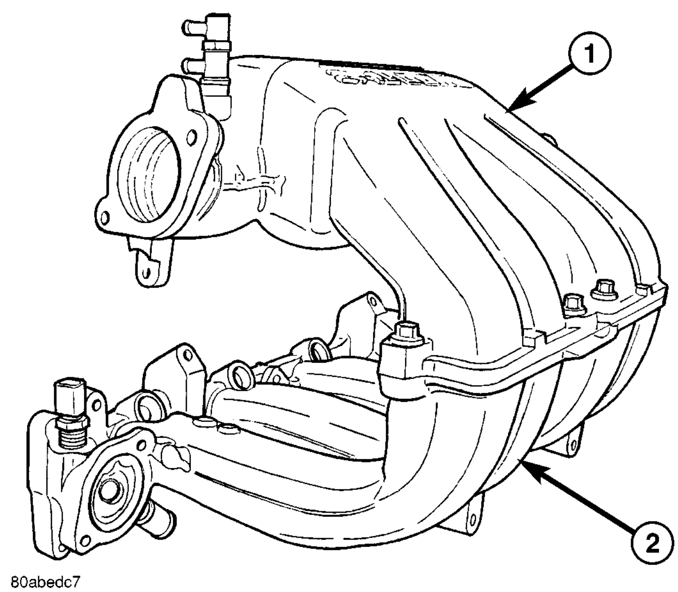


Fig. 93 Intake Manifold - Upper and Lower

1 - UPPER INTAKE MANIFOLD
2 - LOWER INTAKE MANIFOLD

INTAKE MANIFOLD (Continued)

OPERATION

The intake manifold delivers air to the combustion chambers. This air allows the fuel delivered by the fuel injectors to ignite when the spark plug fire.

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.
(2) Spray a small stream of water (Spray Bottle) at the suspected leak area.
(3) If engine RPM'S change, the area of the suspected leak has been found.
(4) Repair as required.

REMOVAL

REMOVAL — UPPER

(1) Disconnect negative cable from battery.
(2) Disconnect connector from inlet air temperature sensor.
(3) Disconnect air intake tube at throttle body and remove upper air cleaner housing.
(4) Disconnect connector from throttle position sensor (TPS).
(5) Disconnect connector from idle air control (IAC) motor.
(6) Disconnect connector from MAP sensor.
(7) Remove vacuum lines for purge solenoid and PCV valve at intake manifold.
(8) Remove vacuum lines for power brake booster, LDP, EGR transducer, and speed control vacuum reservoir (if equipped) at upper intake manifold fittings.
(9) Disconnect throttle, speed control (if equipped), and transaxle control (if equipped) and cables from throttle lever and bracket. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/THROTTLE CONTROL CABLE - REMOVAL).
(10) Remove the EGR tube.
(11) Remove the upper manifold support bracket bolt to manifold.
(12) Remove engine oil dipstick from tube.
(13) Remove upper intake manifold bolts. Remove upper intake manifold.

CAUTION: Cover intake manifold to prevent foreign material from entering engine.

REMOVAL — LOWER

(1) Disconnect negative cable from battery.
(2) Disconnect connector from inlet air temperature sensor.
(3) Disconnect air intake tube at throttle body and remove upper air cleaner housing.
(4) Disconnect connector from throttle position sensor (TPS).
(5) Disconnect connector from idle air control (IAC) motor.
(6) Disconnect connector from MAP sensor.
(7) Remove vacuum lines for purge solenoid and PCV valve at intake manifold.
(8) Remove vacuum lines for power brake booster, LDP, EGR transducer, and speed control vacuum reservoir (if equipped) at intake manifold fittings.
(9) Disconnect throttle, speed control (if equipped), and transaxle control (if equipped) and cables from throttle lever and bracket. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/THROTTLE CONTROL CABLE - REMOVAL)
(10) Perform fuel system pressure release procedure **before attempting any repairs.** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
(11) Disconnect fuel line. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
(12) Disconnect coolant temperature sensor/fuel injector wire harness connector.
(13) Disconnect fuel injector harness.
(14) Remove intake manifold to cylinder head fasteners.
(15) Remove the manifold from engine.

CAUTION: Cover intake manifold openings to prevent foreign material from entering engine.

(16) Inspect the manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSPECTION).

INSPECTION

(1) Check manifold surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
(2) Inspect manifold for cracks or distortion. Replace manifold if necessary.

INSTALLATION

INSTALLATION — UPPER

(1) Clean manifold sealing surfaces.

INTAKE MANIFOLD (Continued)

(2) Apply a 1.5 mm (0.060 in.) bead Mopar® Gasket Maker to the perimeter of the lower intake manifold runner openings.

(3) Install upper intake manifold and tighten fasteners to 28 N·m (250 in. lbs.) in sequence shown in (Fig. 94). Repeat this procedures until all fasteners are at specified torque.

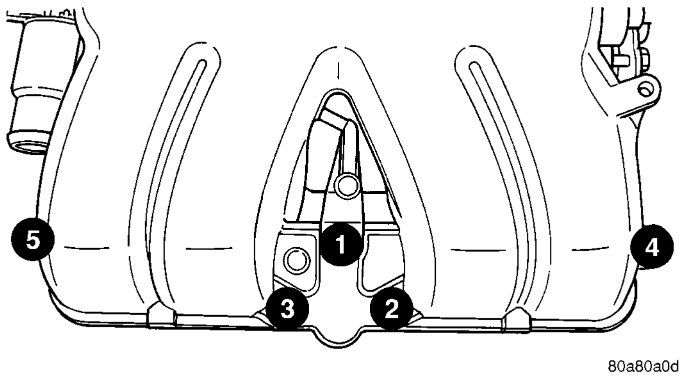


Fig. 94 Upper Intake Manifold Tightening Sequence - 2.4L

(4) Install engine oil dipstick.

(5) Install upper bolt in intake manifold to front support bracket.

(6) Install EGR tube.

(7) Install throttle cables in bracket.

(8) Connect throttle, speed control, (if equipped), cables to throttle lever.

(9) Connect vacuum lines for power brake booster, LDP, EGR transducer, and speed control vacuum reservoir (if equipped) at upper intake manifold fittings.

(10) Connect vacuum lines for purge solenoid and PCV valve.

(11) Connect electrical connectors for MAP sensor, throttle position sensor (TPS), and idle air control (IAC) motor.

(12) Install air cleaner upper housing and air intake tube to throttle body.

(13) Connect inlet air temperature sensor connector.

(14) Connect negative cable to battery.

INSTALLATION — LOWER

If the following items were removed, install and torque to specifications:

- Fuel rail bolts - 22 N·m (200 in. lbs.)
- Coolant outlet connector bolts - 28 N·m (250 in. lbs.)
- Coolant temperature sensor - 7 N·m (60 in. lbs.)

(1) Position a new gasket on cylinder head and install lower manifold.

(2) Install and tighten intake manifold fasteners to 28 N·m (250 in. lbs.) in the sequence shown in (Fig. 95). Repeat procedure until all bolts are at specified torque.

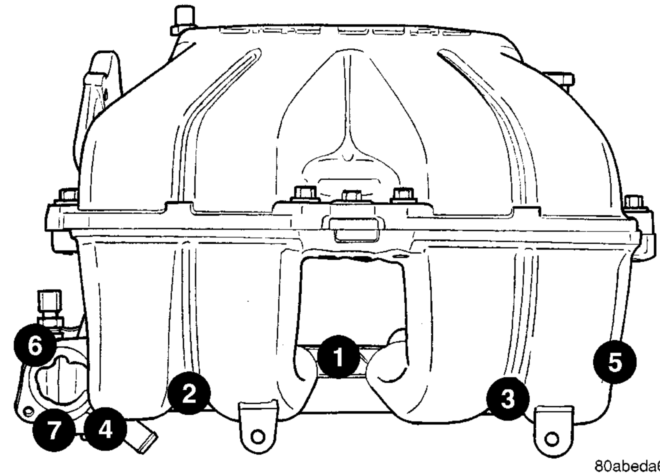


Fig. 95 Lower Intake Manifold Tightening Sequence

(3) Install lower intake manifold support bracket bolts.

- Bolts to intake 28 N·m (250 in. lbs.)
- Bolt to engine block 54 N·m (40 ft. lbs.)

(4) Connect the fuel line. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(5) Connect coolant temperature sensor/fuel injector wiring harness electrical connector.

(6) Install the radiator upper and heater supply hoses.

(7) Install the upper intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(8) Fill the cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).

EXHAUST MANIFOLD

DESCRIPTION

The exhaust manifold is made of Hi-Silicone Moly nodular cast iron for strength and high temperatures. The manifold attaches to the cylinder head.

OPERATION

The exhaust manifold collects the exhaust gasses exiting the combustion chambers. Then it channels the exhaust gasses to the exhaust pipe attached to the manifold.

REMOVAL

(1) Raise vehicle and disconnect exhaust pipe from the exhaust manifold.

(2) Lower the vehicle.

EXHAUST MANIFOLD (Continued)

(3) Disconnect upstream oxygen sensor connector at the rear of exhaust manifold.

(4) Remove the air cleaner bracket (Fig. 96).

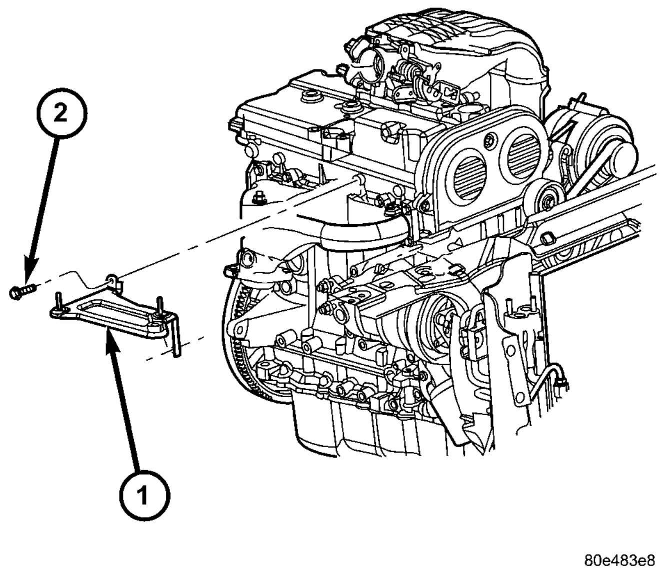


Fig. 96 AIR CLEANER BRACKET

1 - AIR CLEANER BRACKET
2 - BOLT (2)

(5) Remove the heat shield.

(6) Remove the bolts attaching the manifold to the cylinder head.

(7) Remove exhaust manifold.

(8) Inspect the manifold. (Refer to 9 - ENGINE/MANIFOLDS/EXHAUST MANIFOLD - INSPECTION)

CLEANING

(1) Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

(1) Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.

(2) Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

(1) Clean the manifold mating surfaces.

(2) Install exhaust manifold with a new gasket. Tighten attaching nuts to 20 N·m (175 in. lbs.).

(3) Attach exhaust pipe to exhaust manifold and tighten fasteners to 37 N·m (27 ft. lbs.).

(4) Install and connect the oxygen sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - COMPONENT LOCATION)

(5) Install the heat shield.

(6) Install the air cleaner bracket.

TIMING BELT COVER(S)

REMOVAL

FRONT COVER

(1) Remove crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(2) Remove generator drive belt tensioner assembly. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - REMOVAL)

(3) Remove timing belt front cover bolts, and remove covers.

REAR COVER

(1) Remove front covers.

(2) Remove timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(3) Hold camshaft sprocket with Special Tool 6847 while removing center bolt.

(4) Remove timing belt idler pulley.

(5) Remove rear cover fasteners and remove cover from engine.

INSTALLATION

REAR COVER

(1) Install timing belt rear cover and bolts (Fig. 97).

CAUTION: Do not use an impact wrench for tightening camshaft sprocket bolt. Damage to the timing locating pin can occur. Hand tighten using a wrench ONLY.

(2) Install camshaft sprockets. Hold sprockets with Special Tool 6848 and tighten center bolt to 101 N·m (75 ft. lbs.).

(3) Install timing belt idler pulley and tighten mounting bolt to 61 N·m (45 ft. lbs.).

(4) Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(5) Install front covers.

FRONT COVER

(1) Install timing belt front covers. Tighten fasteners to 7 N·m (60 in. lbs.).

TIMING BELT COVER(S) (Continued)

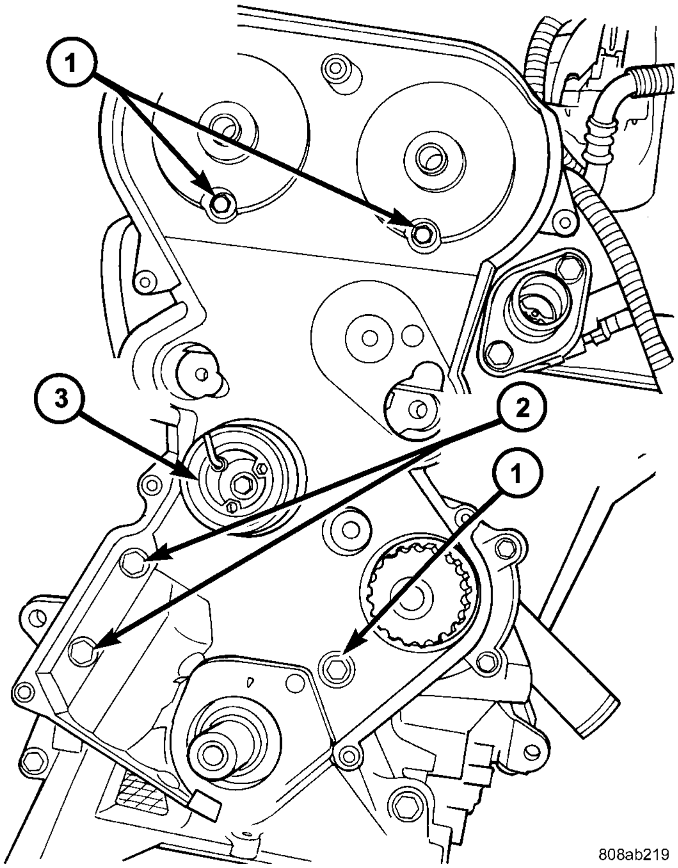


Fig. 97 Timing Belt Rear Cover

1 - REAR COVER TO CYLINDER HEAD FASTENERS
2 - REAR COVER TO ENGINE BLOCK FASTENERS
3 - BELT TENSIONER

(2) Install generator drive belt tensioner. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION)

(3) Install crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

TIMING BELT AND SPROCKET(S)

REMOVAL

REMOVAL - TIMING BELT

(1) Remove air cleaner upper cover, housing, and clean air tube.

(2) Raise vehicle on hoist.

(3) Remove accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - REMOVAL)

(4) Remove crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(5) Remove air conditioner/generator belt tensioner and pulley assembly. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - REMOVAL)

(6) Remove timing belt lower front cover bolts and remove cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

(7) Lower vehicle.

(8) Remove bolts attaching timing belt upper front cover and remove cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)

CAUTION: When aligning crankshaft and camshaft timing marks always rotate engine from crankshaft. Camshaft should not be rotated after timing belt is removed. Damage to valve components may occur. Always align timing marks before removing timing belt.

(9) Before the removal of the timing belt, rotate crankshaft until the TDC mark on oil pump housing aligns with the TDC mark on crankshaft sprocket (trailing edge of sprocket tooth) (Fig. 98).

NOTE: The crankshaft sprocket TDC mark is located on the trailing edge of the sprocket tooth. Failure to align trailing edge of sprocket tooth to TDC mark on oil pump housing will cause the camshaft timing marks to be misaligned.

(10) Install 6 mm Allen wrench into belt tensioner. Before rotating the tensioner, insert the long end of a 1/8” or 3 mm Allen wrench into the pin hole on the front of the tensioner (Fig. 99). While rotating the tensioner counterclockwise, push in lightly on the 1/8” or 3 mm Allen wrench, until it slides into the locking hole.

(11) Remove timing belt.

REMOVAL - CRANKSHAFT SPROCKET

(1) Disconnect negative battery cable.

(2) Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(3) Remove crankshaft sprocket using Special Tools 6793 and insert C-4685-C2 (Fig. 100).

CLEANING

Do Not attempt to clean a timing belt. If contamination from oil, grease, or coolants have occurred, the timing belt should be replaced.

Clean all sprockets using a suitable solvent. Clean all sprocket grooves of any debris.

TIMING BELT AND SPROCKET(S) (Continued)

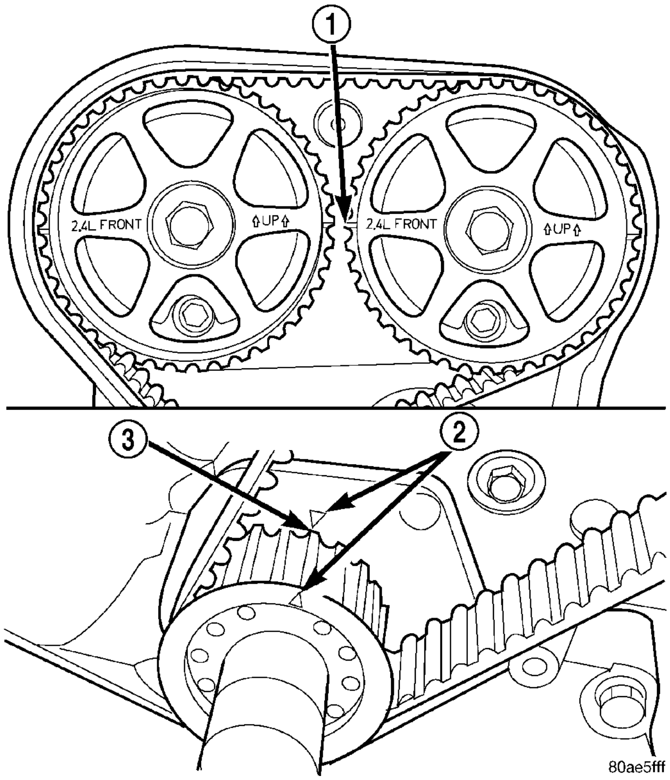


Fig. 98 Crankshaft and Camshaft Timing

1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH

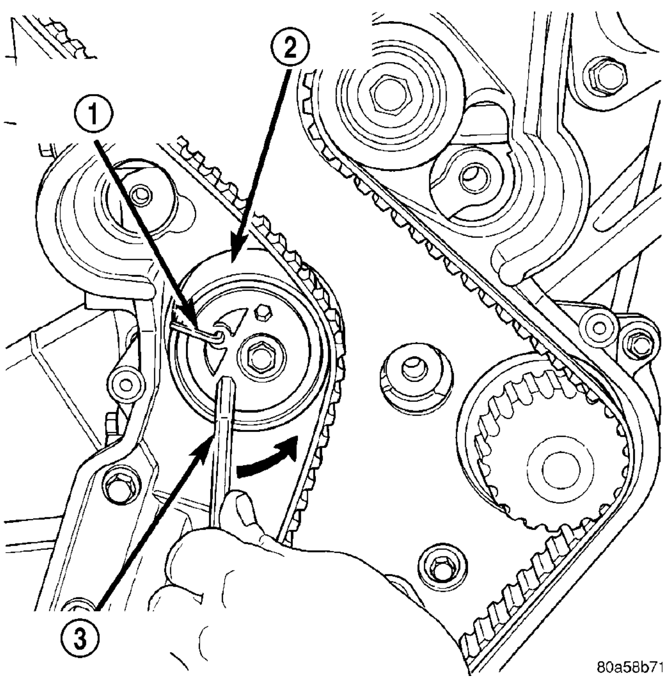


Fig. 99 Locking Timing Tensioner

1 - 1/8 OR 3mm ALLEN WRENCH
2 - BELT TENSIONER
3 - 6mm ALLEN WRENCH

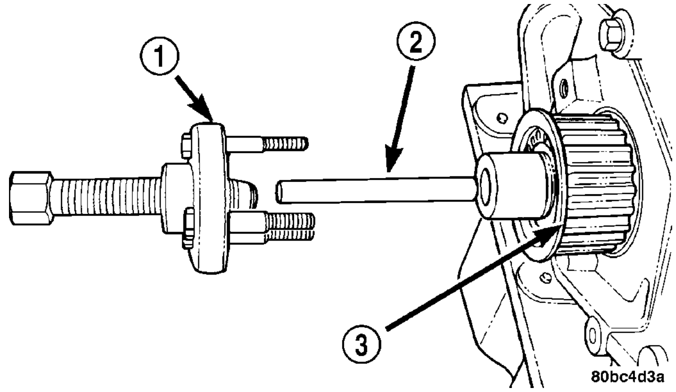


Fig. 100 Crankshaft Sprocket - Removal

1 - SPECIAL TOOL 6793
2 - SPECIAL TOOL C-4685–C2
3 - CRANKSHAFT SPROCKET

INSTALLATION

INSTALLATION - CRANKSHAFT SPROCKET

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

(1) Install crankshaft sprocket using Special Tool 6792 (Fig. 101).

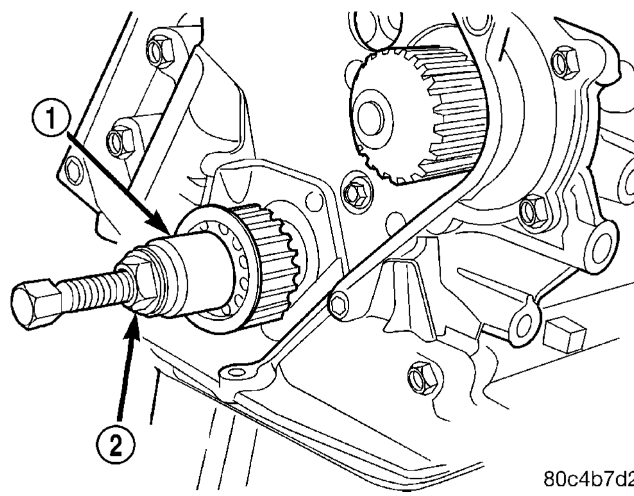


Fig. 101 Crankshaft Sprocket - Installation

1 - SPECIAL TOOL 6792
2 - TIGHTEN NUT TO INSTALL

(2) Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

TIMING BELT AND SPROCKET(S) (Continued)

INSTALLATION - TIMING BELT

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

(1) Set crankshaft sprocket to TDC by aligning the sprocket with the arrow on the oil pump housing.

(2) Set camshafts timing marks so that the exhaust camshaft sprocket is a 1/2 notch below the intake camshaft sprocket (Fig. 102).

CAUTION: Ensure that the arrows on both camshaft sprockets are facing up.

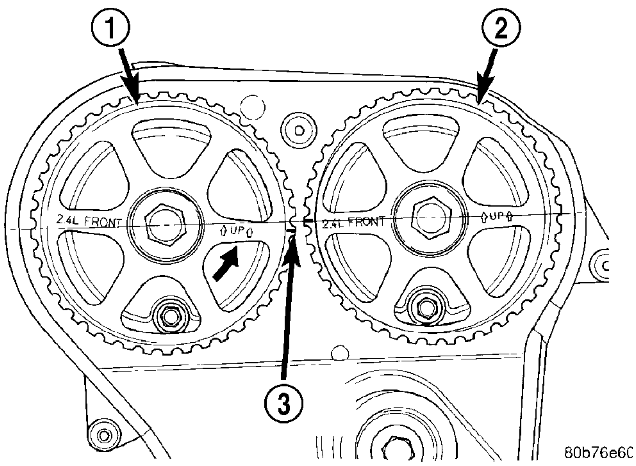


Fig. 102 Camshaft Sprocket Alignment

1 - CAMSHAFT SPROCKET-EXHAUST
2 - CAMSHAFT SPROCKET-INTAKE
3 - 1/2 NOTCH LOCATION

(3) Install timing belt. Starting at the crankshaft, go around the water pump sprocket, idler pulley, camshaft sprockets and then around the tensioner (Fig. 103).

(4) Move the exhaust camshaft sprocket counterclockwise (Fig. 103) to align marks and take up belt slack.

(5) Insert a 6 mm Allen wrench into the hexagon opening located on the top plate of the belt tensioner pulley. Rotate the top plate **COUNTERCLOCKWISE** . The tensioner pulley will move against the belt and the tensioner setting notch will eventually start to move clockwise. Watching the movement of the setting notch, continue rotating the top plate counterclockwise until the setting notch is aligned with the spring tang (Fig. 104). Using the allen wrench to prevent the top plate from moving, torque the tensioner lock nut to 30 N·m (22 ft. lbs.). Setting notch and spring tang should remain aligned after lock nut is torqued.

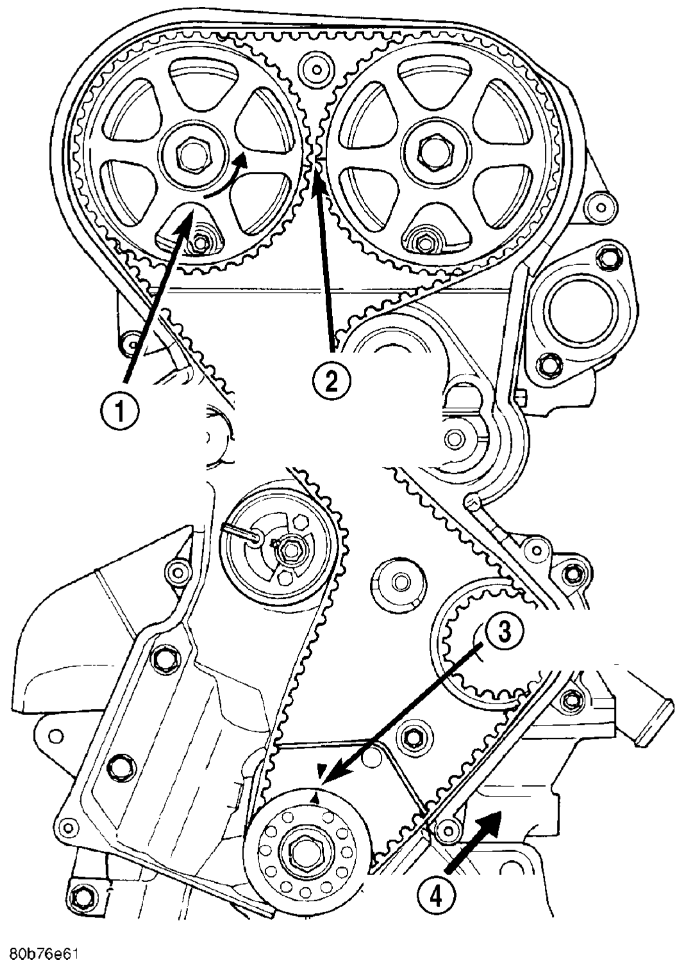


Fig. 103 Timing Belt - Installation - Typical

1 - ROTATE CAMSHAFT SPROCKET TO TAKE UP BELT SLACK
2 - CAMSHAFT TIMING MARKS 1/2 NOTCH LOCATION
3 - CRANKSHAFT AT TDC
4 - INSTALL BELT IN THIS DIRECTION

(6) Remove allen wrench and torque wrench.

NOTE: Repositioning the crankshaft to the TDC position must be done only during the CLOCKWISE rotation movement. If TDC is missed, rotate a further two revolutions until TDC is achieved. DO NOT rotate crankshaft counterclockwise as this will make verification of proper tensioner setting impossible.

(7) Once the timing belt has been installed and tensioner adjusted, rotate the crankshaft CLOCKWISE two complete revolutions manually for seating of the belt, until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position (Fig. 105).

TIMING BELT AND SPROCKET(S) (Continued)

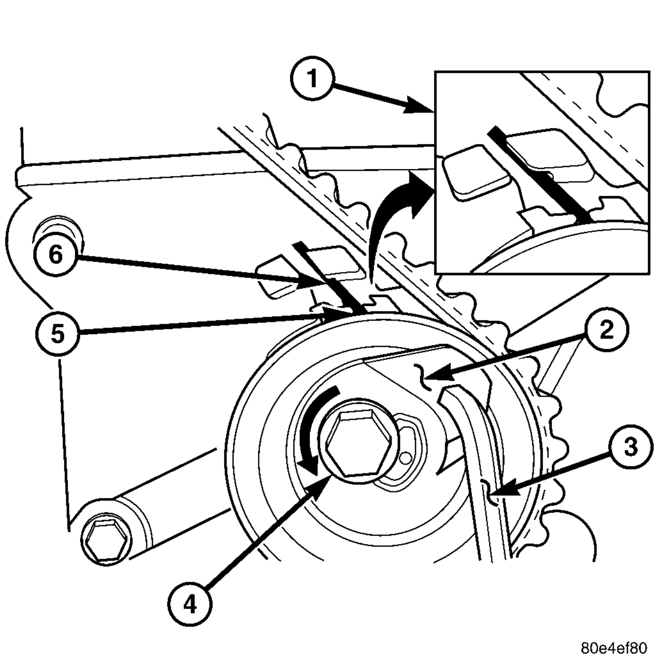


Fig. 104 Timing Belt Tension Adjustment

1 - ALIGN SETTING NOTCH WITH SPRING TANG
2 - TOP PLATE
3 - 6mm ALLEN WRENCH
4 - LOCK NUT
5 - SETTING NOTCH
6 - SPRING TANG

(8) Check if the spring tang is within the tolerance window (Fig. 106). If the spring tang is within the tolerance window, the installation process is complete and nothing further is required. If the spring tang is not within the tolerance window, repeat Steps 5 through 7.

(9) Install timing belt front covers and bolts. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)

(10) Install air conditioning/generator belt tensioner and pulley. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION)

(11) Install crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

(12) Install accessory drive belts. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)

(13) Install drive belt splash shield.

(14) Install air cleaner housing, upper cover, and clean air tube.

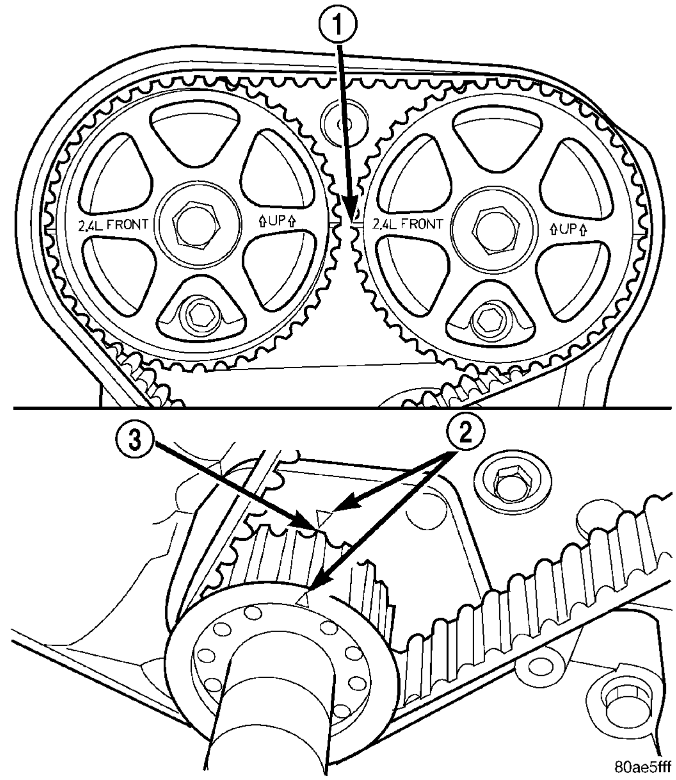


Fig. 105 Crankshaft and Camshaft Timing

1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH

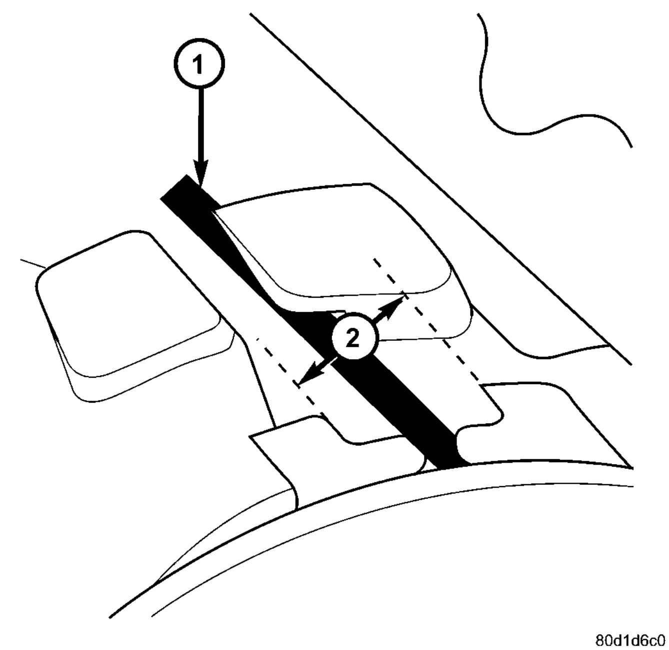


Fig. 106 Timing Belt Tension Verification

1 - SPRING TANG
2 - TOLERANCE WINDOW

TIMING BELT TENSIONER & PULLEY

REMOVAL

(1) Remove the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(2) Remove timing belt idler pulley.

(3) Hold camshaft sprocket with Special Tool 6847 while removing bolt (Fig. 107). Remove both cam sprockets.

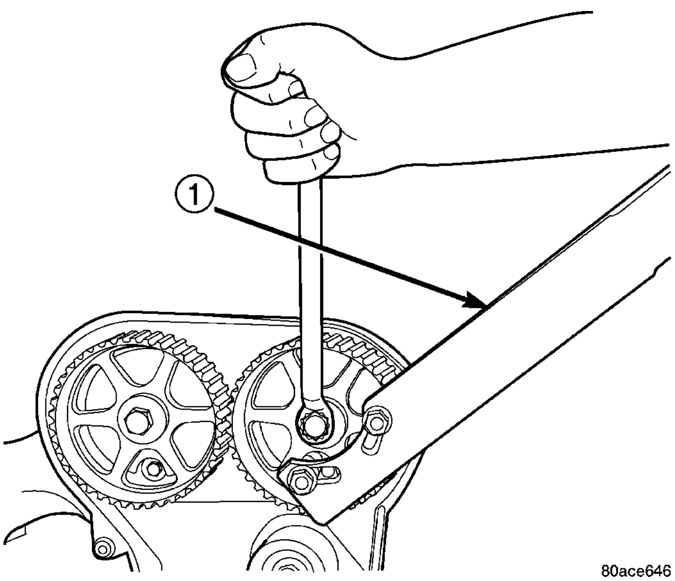


Fig. 107 Camshaft Sprocket - Removal/Installation

1 - SPECIAL TOOL 6847

(4) Remove rear timing belt cover fasteners and remove cover from engine.

(5) Remove lower bolt attaching timing belt tensioner assembly to engine and remove tensioner **as an assembly**.

INSTALLATION

(1) Align timing belt tensioner assembly to engine and install lower mounting bolt **but do not tighten**. To properly align tensioner assembly—install one of the engine bracket mounting bolts (M10) 5 to 7 turns into the tensioner's upper mounting location.

(2) Torque the tensioner's lower mounting bolt to 61 N·m (45 ft. lbs.). Remove the upper bolt used for tensioner alignment.

(3) Install rear timing belt cover and fasteners.

(4) Install timing belt idler pulley and torque mounting bolt to 61 N·m (45 ft. lbs.).

(5) Install camshaft sprockets. Use Special Tool 6847 to hold sprockets, torque bolts to 101 N·m (75 ft. lbs.).

(6) Install the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

BALANCE SHAFT

DESCRIPTION

The 2.4L engine is equipped with two nodular cast iron balance shafts installed in a cast aluminum carrier attached to the lower cylinder block (Fig. 108).

OPERATION

The balance shafts are driven by the crankshaft via a roller chain and sprockets. The balance shafts are connected by helical gears. The dual counter rotating shafts decrease second order vertical shaking forces caused by component movement.

BALANCE SHAFT (Continued)

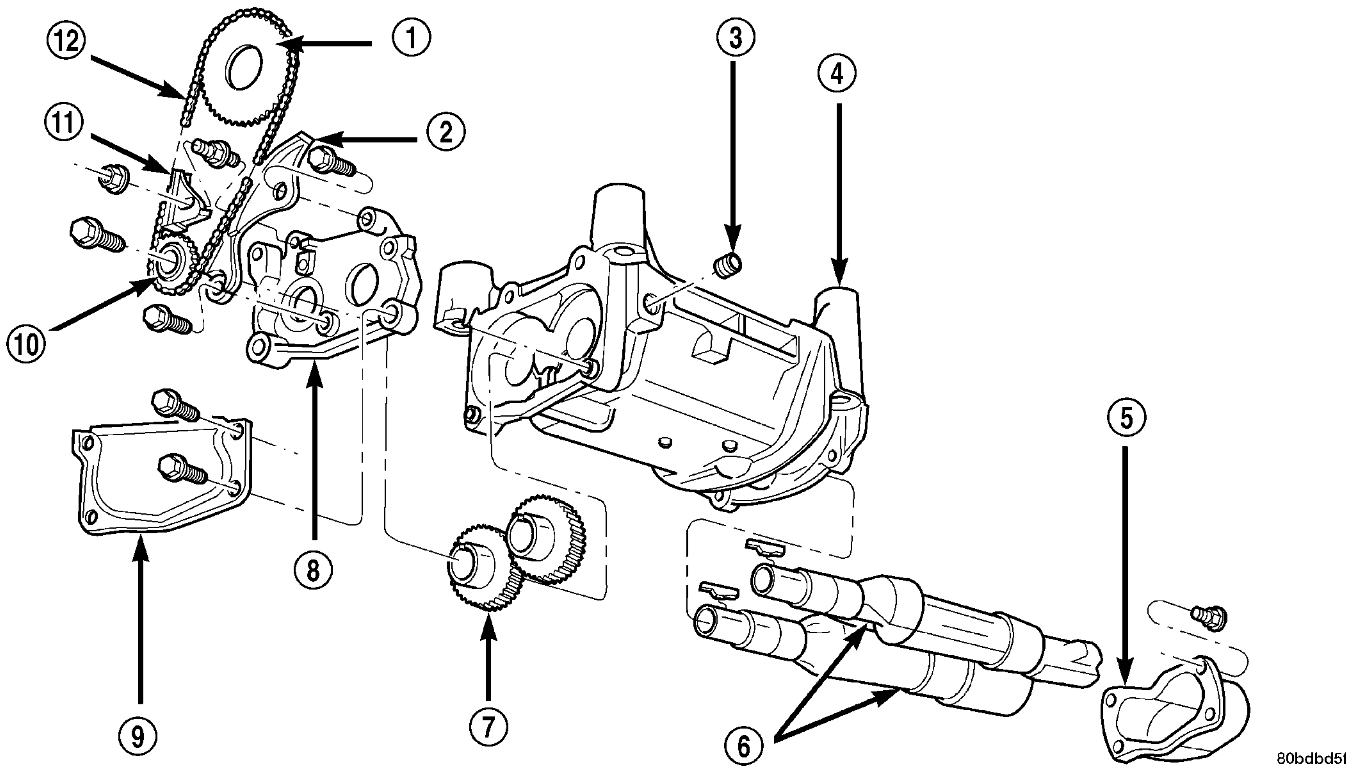


Fig. 108 Balance Shafts and Carrier Assembly

1 - SPROCKET
2 - TENSIONER
3 - PLUG
4 - CARRIER
5 - REAR COVER
6 - BALANCE SHAFTS
7 - GEARS
8 - GEAR COVER
9 - CHAIN COVER
10 - SPROCKET
11 - GUIDE
12 - CHAIN

REMOVAL

BALANCE SHAFTS

(1) Drain engine oil.

(2) Remove the oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)

(3) Remove chain cover, guide and tensioner (Fig. 109). Also see Carrier Assembly Removal for service procedures requiring only temporary relocation of assembly.

(4) Remove gear cover retaining stud (double ended to also retain chain guide). Remove cover and balance shaft gears (Fig. 109).

(5) Remove balance shaft gear, chain sprocket retaining screws, and crankshaft chain sprocket. Remove chain and sprocket assembly (Fig. 110). Using two wide pry bars, work the sprocket back and forth until it is off the shaft.

(6) Remove carrier gear cover and balance shafts (Fig. 111).

(7) Remove four carrier to crankcase attaching bolts to separate carrier from engine bedplate.

BALANCE SHAFT CARRIER

The following components will remain intact during carrier removal. Gear cover, gears, balance shafts and the rear cover (Fig. 112).

(1) Remove chain cover and driven balance shaft chain sprocket screw.

(2) Loosen tensioner pivot and adjusting screws, move driven balance shaft inboard through driven chain sprocket. Sprocket will hang in lower chain loop.

(3) Remove carrier to crankcase attaching bolts to remove carrier.

BALANCE SHAFT (Continued)

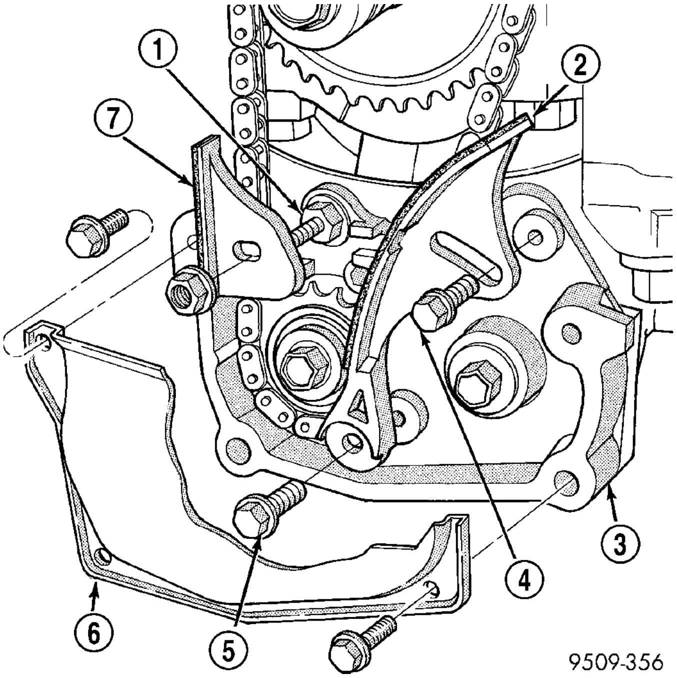


Fig. 109 Chain Cover, Guide and Tensioner

1 - STUD
2 - TENSIONER (ADJUSTER)
3 - GEAR COVER
4 - ADJUST SCREW
5 - PIVOT SCREW
6 - CHAIN COVER (CUTAWAY)
7 - GUIDE

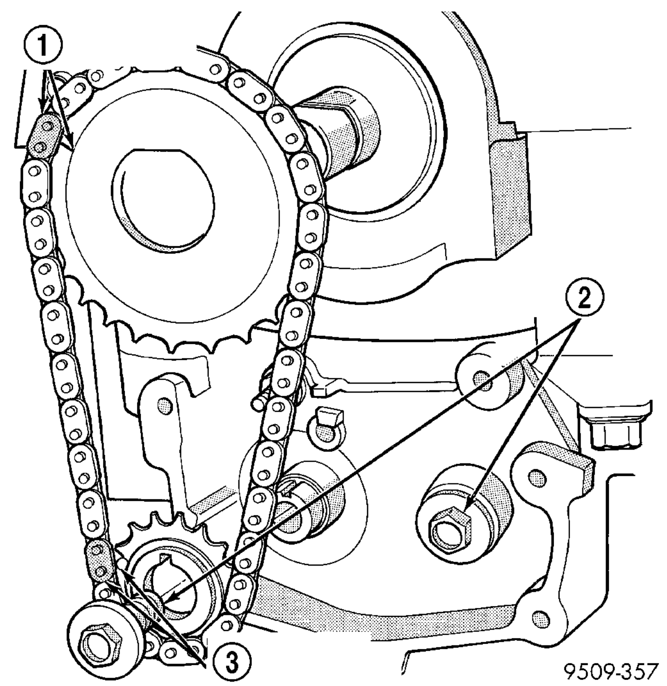


Fig. 110 Drive Chain and Sprockets

1 - NICKEL PLATED LINK AND MARK
2 - GEAR/SPROCKET SCREWS
3 - NICKEL PLATED LINK AND DOT

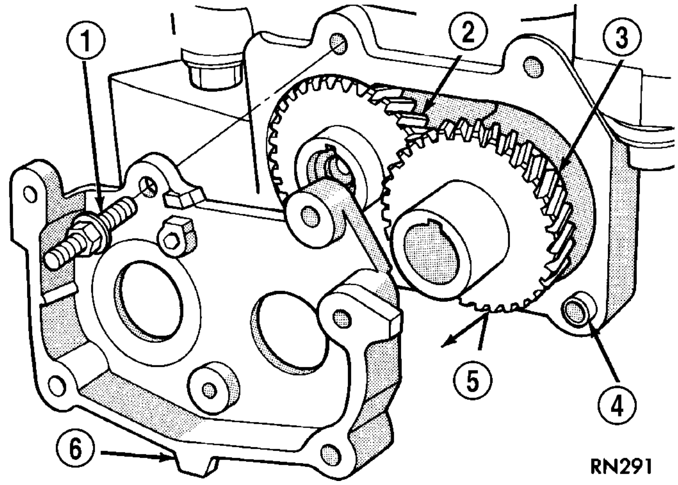


Fig. 111 Gear Cover and Gears

1 - STUD (DOUBLE ENDED)
2 - DRIVE GEAR
3 - DRIVEN GEAR
4 - CARRIER DOWEL
5 - GEAR(S)
6 - GEAR COVER

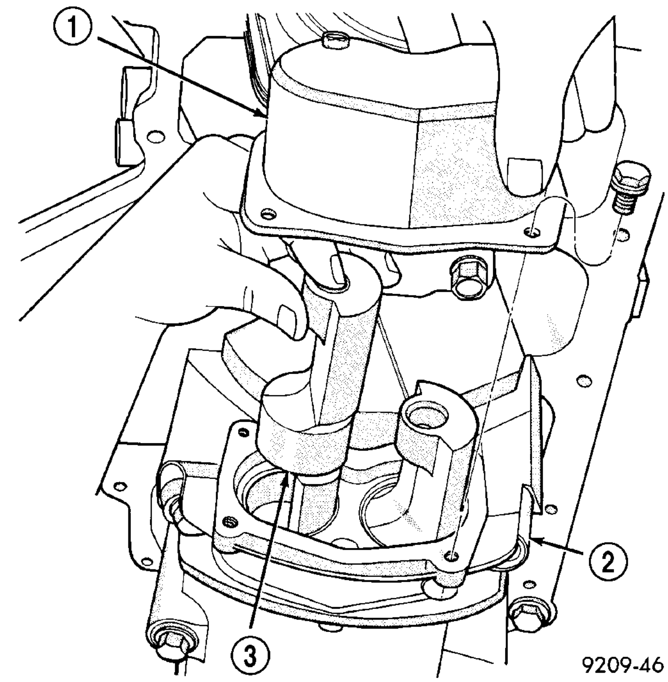


Fig. 112 Balance Shaft - Removal/Installation

1 - REAR COVER
2 - CARRIER
3 - BALANCE SHAFT

BALANCE SHAFT (Continued)

INSTALLATION

BALANCE SHAFT TIMING

BALANCE SHAFT INSTALLATION

Balance shaft and carrier assembly installation is the reverse of the removal procedure. **During installation crankshaft-to-balance shaft timing must be established. Refer to Timing procedure in this section.**

(1) With balance shafts installed in carrier (Fig. 112) position carrier on crankcase and install four attaching bolts and tighten to 54 N·m (40 ft. lbs.).

(2) Turn balance shafts until both shaft key ways are up, parallel to vertical centerline of engine. Install short hub drive gear on sprocket driven shaft and long hub gear on gear driven shaft. After installation gear and balance shaft keyways must be up with gear timing marks meshed as shown in (Fig. 113).

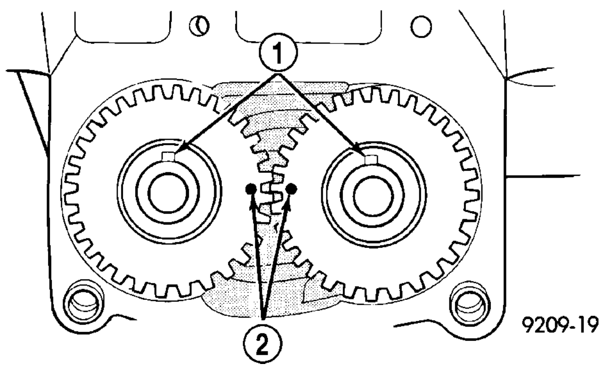


Fig. 113 Gear Timing

1 - KEY WAYS UP
2 - GEAR ALIGNMENT DOTS

(3) Install gear cover and tighten double ended stud/washer fastener to 12 N·m (105 in. lbs.).

(4) Align flat on balance shaft drive sprocket to the flat on crankshaft (Fig. 114).

(5) Install balance shaft drive sprocket on crankshaft using Special Tool 6052 (Fig. 115).

(6) Turn crankshaft until number 1 cylinder is at top dead center (TDC). The timing marks on the chain sprocket should line up with the parting line on the left side of number one main bearing cap. (Fig. 116).

(7) Place chain over crankshaft sprocket so that the plated link of the chain is over the number 1 cylinder timing mark on the balance shaft crankshaft sprocket (Fig. 116).

(8) Place balance shaft sprocket into the timing chain (Fig. 116) and align the timing mark on the sprocket (dot) with the (lower) plated link on the chain.

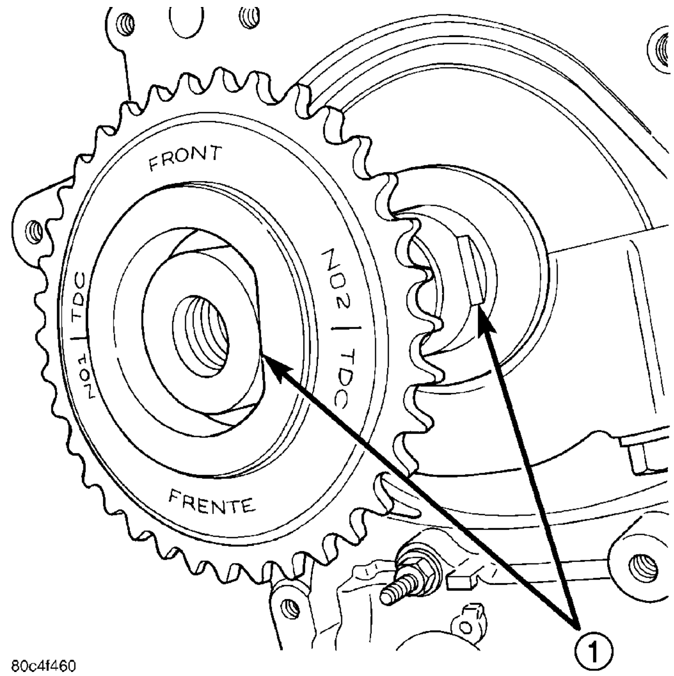


Fig. 114 Balance Shaft Sprocket Alignment to Crankshaft

1 - ALIGN FLATS

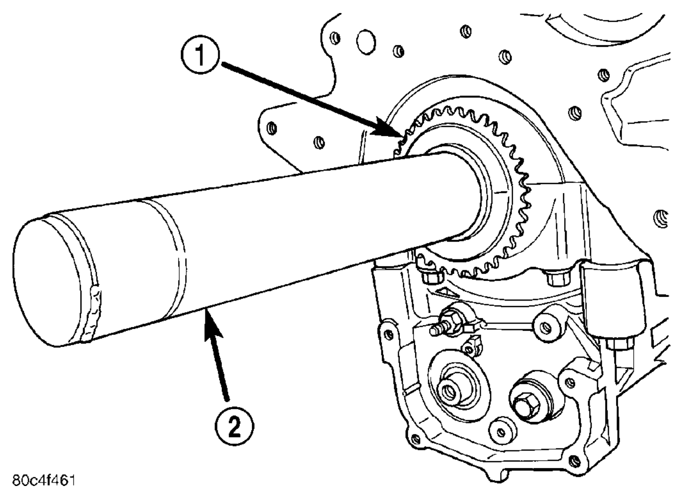


Fig. 115 Balance Shaft Drive

1 - SPROCKET
2 - SPECIAL TOOL 6052

NOTE: The lower plated link is 8 links from the upper link.

(9) With balance shaft keyways pointing up (12 o'clock) slide the balance shaft sprocket onto the nose of the balance shaft. The balance shaft may have to be pushed in slightly to allow for clearance.

BALANCE SHAFT (Continued)

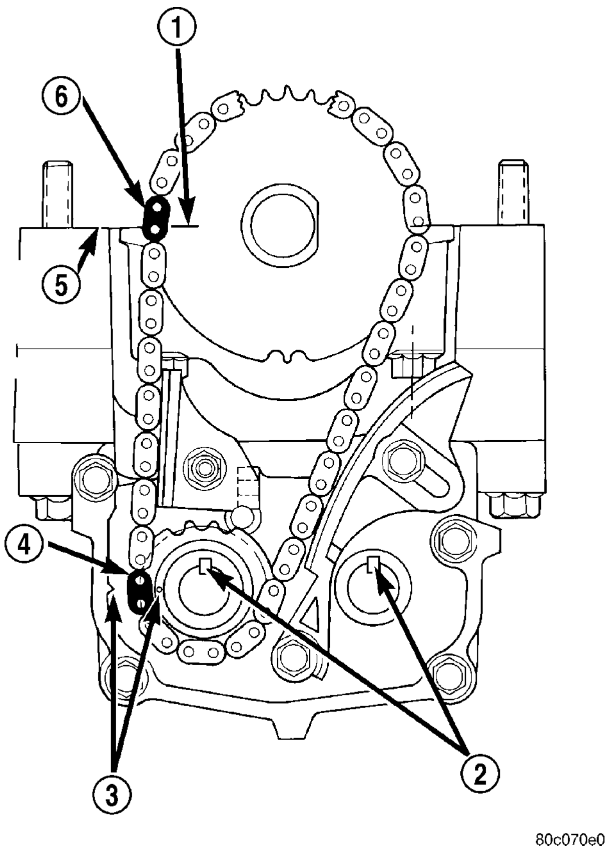


Fig. 116 Balance Shaft Timing

1 - MARK ON SPROCKET
2 - KEYWAYS UP
3 - ALIGN MARKS
4 - PLATED LINK
5 - PARTING LINE (BEDPLATE TO BLOCK)
6 - PLATED LINK

NOTE: THE TIMING MARK ON THE SPROCKET, THE (LOWER) NICKEL PLATED LINK, AND THE ARROW ON THE SIDE OF THE GEAR COVER SHOULD LINE UP WHEN THE BALANCE SHAFTS ARE TIMED CORRECTLY.

(10) If the sprockets are timed correctly, install the balance shaft bolts and tighten to 28 N·m (250 in. lbs.). A wood block placed between crankcase and crankshaft counterbalance will prevent crankshaft and gear rotation.

(11) **CHAIN TENSIONING:**

(a) Install chain tensioner loosely assembled.

(b) Position guide on double ended stud making sure tab on the guide fits into slot on the gear cover. Install and tighten nut/washer assembly to 12 N·m (105 in. lbs.).

(c) Place a shim 1 mm (0.039 in.) thick x 70 mm (2.75 in.) long or between tensioner and chain. Push tensioner and shim up against the chain. **Apply firm pressure 2.5–3 Kg (5.5–6.6 lbs.) directly behind the adjustment slot to take up all slack.** Chain must have shoe radius contact as shown in (Fig. 117).

(d) With the load applied, tighten top tensioner bolt first, then bottom pivot bolt. Tighten bolts to 12 N·m (105 in. lbs.). Remove shim.

(e) Install carrier covers and tighten screws to 12 N·m (105 in. lbs.).

(12) Install pick-up tube and oil pan.

(13) Fill engine crankcase with proper oil to correct level.

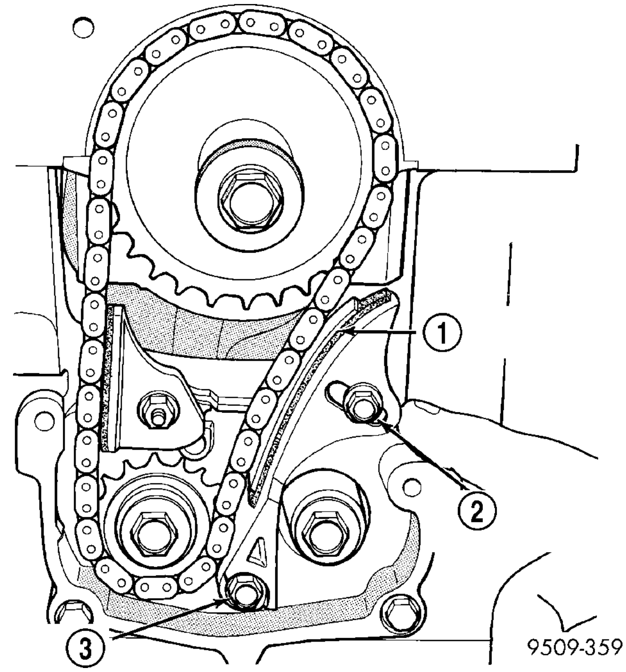


Fig. 117 Chain Tension Adjustment

1 - 1MM (0.039 IN.) SHIM
2 - TENSIONER (ADJUSTER) BOLT
3 - PIVOT BOLT

BALANCE SHAFT CARRIER

REMOVAL

(Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - REMOVAL)

INSTALLATION

(Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - INSTALLATION)

BALANCE SHAFT CHAIN

REMOVAL

(Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - REMOVAL)

INSTALLATION

(Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT - INSTALLATION)

ENGINE - 3.7L

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ENGINE - 3.7L

DESCRIPTION

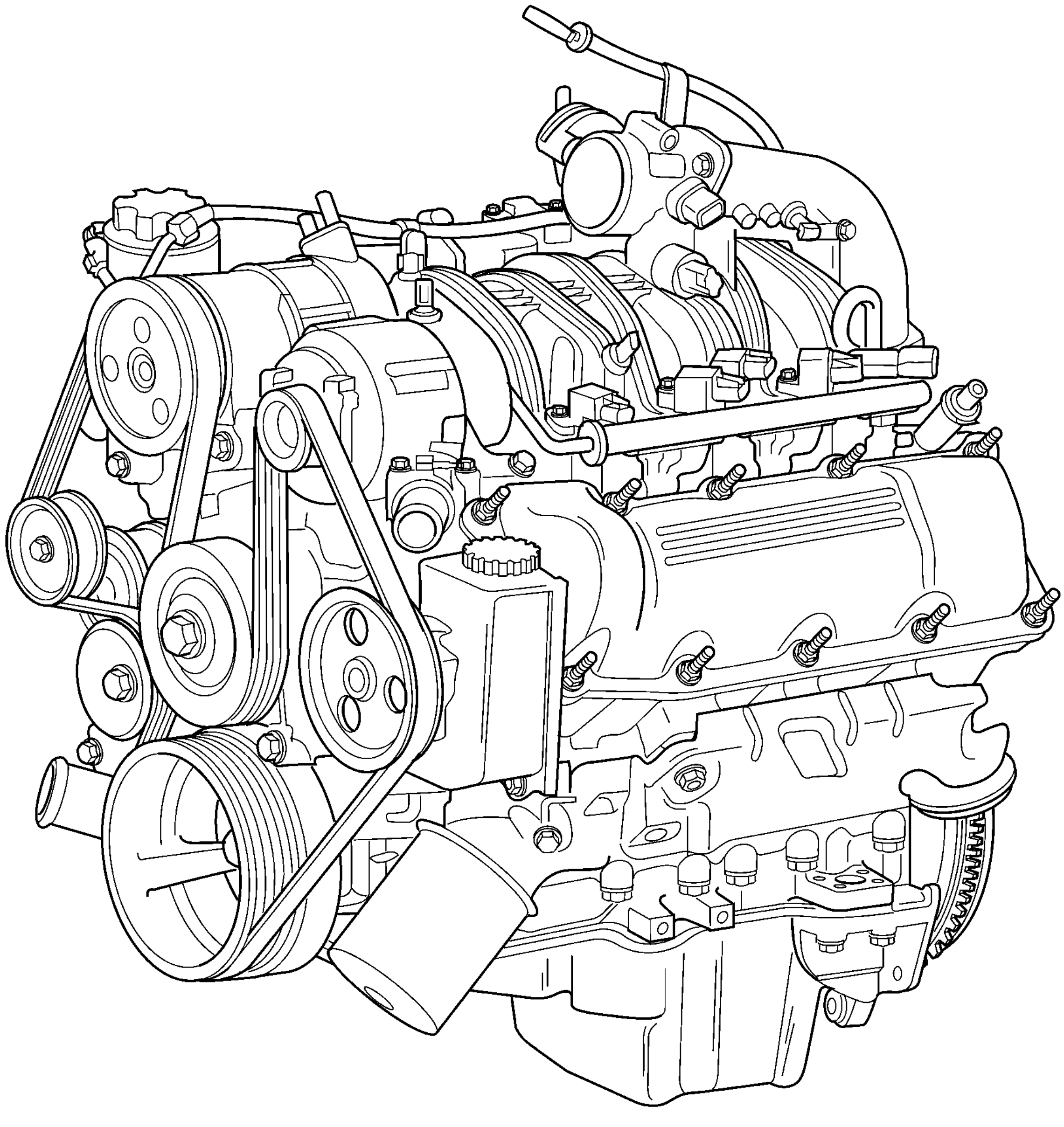


Fig. 1 3.7 L ENGINE

The 3.7 liter (226 CID) six-cylinder engine is an 90° single overhead camshaft engine (Fig. 1). The cast iron cylinder block is made up of two different components; the first component is the cylinder bore and upper block, the second component is the bed-plate that comprises the lower portion of the cylinder block and houses the lower half of the crankshaft main bearings. The cylinders are numbered from front to rear with the left bank being numbered 1,3, and 5 and the right bank being numbered 2,4, and 6. The firing order is 1–6–5–4–3–2. The engine serial number is located at the right front side of the engine block

ENGINE - 3.7L (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. (Refer to 8 - ELECTRICAL/ STARTING - DIAGNOSIS AND TESTING).
	4. Faulty coil or control unit.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect spark plug gap.	5. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	6. Incorrect right bank cam timing.	6. Refer to engine timing in this section.
	7. Dirt or water in fuel system.	7. Clean system and replace fuel filter.
	8. Faulty fuel pump, relay or wiring.	8. Repair or replace as necessary.
	9. Faulty cam or crank sensor	9. Refer to Ignition system.

ENGINE - 3.7L (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE STALLS OR ROUGH IDLE	1. Vacuum leak.	1. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
	2. Faulty crank position sensor	2. Replace crank position sensor.
	3. Faulty coil.	3. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	4. Incorrect cam timing.	4. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/FUEL PUMP - DIAGNOSIS AND TESTING).
	4. Blown cylinder head gasket.	4. Replace cylinder head gasket.
	5. Low compression.	5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), repair as necessary.
	6. Burned, warped or pitted valves.	6. Replace as necessary.
	7. Plugged or restricted exhaust system.	7. Inspect and replace as necessary.
	8. Faulty coil.	8. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	9. Incorrect cam timing.	9. Refer to Engine Timing in this section.
ENGINE MISSES ON ACCELERATION	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt in fuel system.	2. Clean fuel system.
	3. Burned, warped or pitted valves.	3. Replace as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
ENGINE MISSES AT HIGH SPEED	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Faulty coil.	2. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	3. Dirt or water in fuel system.	3. Clean system and replace fuel filter.

ENGINE - 3.7L (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Clean or replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn valve guides.	6. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
	7. Excessive runout of valve seats.	7. Service valves and valve seats (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
ENGINE VIBRATION	1. Refer to Engine Timing in this section	1. Counter Balance Shaft not timed properly
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

ENGINE - 3.7L (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings.	1.
	(a) Misaligned or damaged.	(a) Replace as necessary.
	(b) Loose fasteners, broken or porous metal parts.	(b) Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear seal	2. Replace as necessary (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - REAR - REMOVAL).
	3. Crankshaft seal flange. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
	5. Timing chain cover seal damaged.	5. Re-seal timing cover.
	6. Scratched or damaged vibration damper hub.	6. Polish or replace damper.
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sending unit.	2. Replace sending unit (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).
	3. Low oil pressure.	3. Check oil pump and bearing clearance.
	4. Clogged oil filter.	4. Replace oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).
	5. Worn oil pump.	5. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	6. Thin or diluted oil.	6. Change oil and filter.
	7. Excessive bearing clearance.	7. Replace as necessary.
	8. Oil pump relief valve stuck.	8. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	9. Oil pick up tube loose, damaged or clogged.	9. Replace as necessary.

ENGINE - 3.7L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	3. Incorrect ring size installed.	3. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	4. Worn valve guides.	4. Ream guides and replace valves (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
	5. Leaking valve guide seals.	5. Replace valve guide seals.

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.

(2) Remove the spark plugs.

(3) Secure the throttle in the wide-open position.

(4) Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).

(5) Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).

(6) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(7) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

(8) (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

(1) Check the coolant level and fill as required. DO NOT install the radiator cap.

(2) Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

(3) Remove the spark plugs.

(4) Remove the oil filler cap.

(5) Remove the air cleaner.

(6) Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

(7) Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression,While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

ENGINE - 3.7L (Continued)

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush (Fig. 2)

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (Fig. 2)
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (Fig. 2)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

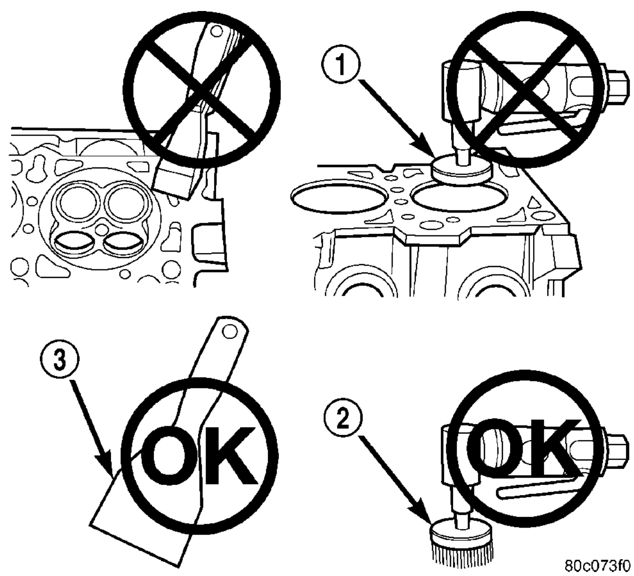


Fig. 2 Proper Tool Usage For Surface Preparation

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.

ENGINE - 3.7L (Continued)

• Tapping the hole with a special Heli-Coil Tap, or equivalent.

• Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 3).

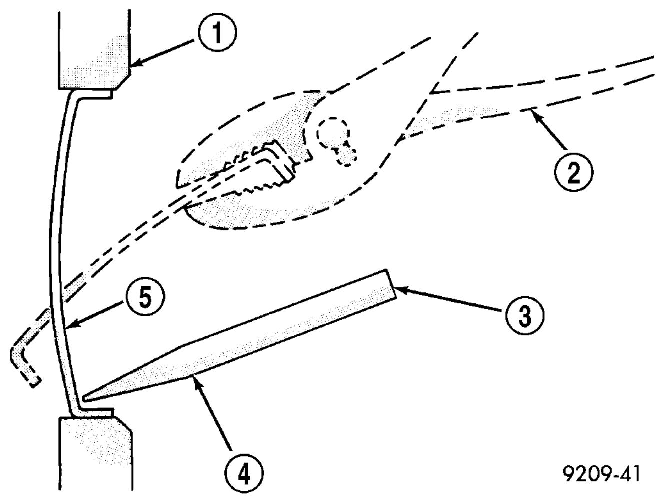


Fig. 3 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove hood. Mark hood hinge location for reinstallation.

(3) Remove air cleaner assembly.

(4) Remove radiator core support bracket.

(5) Remove fan shroud with electric fan assembly.

(6) Remove mechanical cooling fan.

(7) Remove drive belt.

NOTE: It is NOT necessary to discharge the A/C system to remove the engine.

(8) Remove A/C compressor and secure away from engine with lines attached.

(9) Remove generator and secure away from engine.

NOTE: Do NOT remove the phenolic pulley from the P/S pump. It is not required for P/S pump removal.

(10) Remove power steering pump with lines attached and secure away from engine.

(11) Drain cooling system.

(12) Remove coolant bottle.

(13) Disconnect the heater hoses from the engine.

(14) Disconnect heater hoses from heater core and remove hose assembly.

(15) Disconnect throttle and speed control cables.

(16) Remove upper radiator hose from engine.

(17) Remove lower radiator hose from engine.

(18) Disconnect the engine to body ground straps at the left side of cowl.

(19) Disconnect the engine wiring harness at the following points:

- Intake air temperature (IAT) sensor
- Fuel Injectors
- Throttle Position (TPS) Switch
- Idle Air Control (IAC) Motor
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure MAP) Sensor
- Camshaft Position (CMP) Sensor
- Coil Over Plugs
- Crankshaft Position Sensor

(20) Remove coil over plugs.

(21) Release fuel rail pressure.

(22) Remove fuel rail and secure away from engine.

NOTE: It is not necessary to release the quick connect fitting from the fuel supply line for engine removal.

(23) Remove the PCV hose.

(24) Remove the breather hoses.

(25) Remove the vacuum hose for the power brake booster.

(26) Disconnect knock sensors.

(27) Remove engine oil dipstick tube.

(28) Remove intake manifold.

(29) Install engine lift plate.

ENGINE - 3.7L (Continued)

NOTE: Recheck bolt torque for engine lift plate before removing engine.

(30) Secure the left and right engine wiring harnesses away from engine.
(31) Raise vehicle.
(32) Disconnect oxygen sensor wiring.
(33) Disconnect crankshaft postion sensor.
(34) Disconnect the engine block heater power cable, if equipped.
(35) Disconnect the front propshaft at the front differential and secure out of way.

NOTE: It is necessary to disconnect the front propshaft for access to the starter and left side exhaust flange.

(36) Remove the starter.
(37) Remove the ground straps from the left and right side of the block.
(38) Disconnect the right and left exhaust pipes at the manifolds and from the crossover, and remove from the vehicle.

NOTE: The exhaust clamps at the manifolds cannot be reused. New clamps must be used or leaks may occur.

NOTE: For manual transmission vehicles, the transmission must be removed from the vehicle, before the engine can be removed. The manual transmission will contact the floorpan before the engine clears the motor mounts, so it must be removed.

(39) Remove the structural cover.
(40) Remove torque convertor bolts, and mark location for reassembly.
(41) Remove transmission bellhousing to engine bolts.
(42) Loosen left and right engine mount thru bolts.

NOTE: It is not necessary to completely remove engine mount thru bolts, for engine removal.

(43) Lower the vehicle.
(44) Support the transmission with a suitable jack.
(45) Connect a suitable engine hoist to the engine lift plate.
(46) Remove engine from vehicle.

INSTALLATION

(1) Position the engine in the vehicle.
(2) Install both left and right side engine mounts onto engine.
(3) Raise the vehicle.
(4) Install the transmission bellhousing to engine mounting bolts. Tighten the bolts to 41 N·m (30ft. lbs.).
(5) Tighten the engine mount thru bolts.
(6) Install the torque convertor bolts.
(7) Connect the ground straps on the left and right side of the engine.
(8) Install the starter.
(9) Connect the crankshaft position sensor.
(10) Install the engine block heater power cable, if equipped.

CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

(11) Install the structural cover.

NOTE: New clamps must be used on exhaust manifold flanges. Failure to use new clamps may result in exhaust leaks.

(12) Install the left and right exhaust pipes.
(13) Connect the left and right oxygen sensors.
(14) Lower vehicle.
(15) Remove the engine lift plate.
(16) Connect the knock sensors.
(17) Connect the engine to body ground straps at the left side of the cowl.
(18) Install the intake manifold.
(19) Install the engine oil dipstick tube.
(20) Install the power brake booster vacuum hose.
(21) Install the breather hoses.
(22) Install the PCV hose.
(23) Install the fuel rail.
(24) Install the coil over plugs.
(25) Connect the engine wiring harness at the following points:

- Intake air temperature (IAT) sensor
- Fuel Injectors
- Throttle Position (TPS) Switch
- Idle Air Control (IAC) Motor
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure MAP) Sensor
- Camshaft Position (CMP) Sensor
- Coil Over Plugs
- Crankshaft Position Sensor

(26) Connect lower radiator hose.
(27) Connect upper radiator hose.
(28) Connect throttle and speed control cables.
(29) Install the heater hose assembly.
(30) Install coolant recovery bottle.
(31) Install the power steering pump.
(32) Install the generator.
(33) Install the A/C compressor.
(34) Install the drive belt.

ENGINE - 3.7L (Continued)

(35) Install the mechanical cooling fan.
(36) Install the fan shroud with the electric fan assembly.
(37) Install the radiator core support bracket.
(38) Install the air cleaner assembly.
(39) Refill the engine cooling system.
(40) Install the hood.
(41) Check and fill engine oil.
(42) Connect the battery negative cable.
(43) Start the engine and check for leaks.

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft			
Non - Oiled Sprocket Bolt	122	90	—
Bearing Cap Bolts	11	—	100
Counterbalance shaft retaining bolt	28	—	250
Timing Chain Cover—Bolts	58	43	—
Connecting Rod Cap—Bolts	27	20	—
	PLUS 90° TURN		
Bed Plate—Bolts	Refer to Procedure		
Crankshaft Damper—Bolt	175	130	—
Cylinder Head—Bolts			
M11 Bolts	Refer To Procedure		
M8 Bolts	Refer To Procedure		
Cylinder Head Cover—Bolts	12	—	105
Exhaust Manifold—Bolts	25	18	—
Exhaust Manifold Heat Shield—Nuts	8	—	72
	Then loosen 45°		
Flexplate—Bolts	95	70	—
Engine Mount Bracket to Block—Bolts	61	45	—
Rear Mount to Transmission—Bolts	46	34	—
Generator Mounting—Bolts			
M10 Bolts	54	40	—
M8 Bolts	28	—	250
Intake Manifold—Bolts	12	—	105
	Refer to Procedure for		
	Tightening Sequence		
Oil Pan—Bolts	15	—	130
Oil Pan—Drain Plug	34	25	—
Oil Pump—Bolts	28	—	250
Oil Pump Cover—Bolts	12	—	105
Oil Pickup Tube—Bolt and Nut	28	—	250
Oil Dipstick Tube to Engine Block—Bolt	15	—	130
Oil Fill Tube—Bolts	12	—	105
Timing Chain Guide—Bolts	28	—	250
Timing Chain Tensioner Arm—Bolt	28	—	250
Hydraulic Tensioner—Bolts	28	—	250
Timing Chain Primary Tensioner—Bolts	28	—	250
Timing Drive Idler Sprocket—Bolt	34	25	—
Thermostat Housing—Bolts	12	—	105
Water Pump—Bolts	58	43	—

SPECIFICATIONS – 3.7L ENGINE

DESCRIPTION	SPECIFICATION
Engine Type	90° SOHC V-6 12-Valve
Displacement	3.7 Liters / 3700 cc 226 (Cubic Inches)
Bore	93.0 mm (3.66 in.)
Stroke	90.8 mm (3.40 in.)
Compression Ratio	9.1:1
Horsepower	210 BHP @ 5200 RPM
Torque	225 LB-FT @ 4200 RPM
Lead Cylinder	#1 Left Bank
Firing Order	1-6-5-4-3-2
CYLINDER BLOCK	
Cylinder Block	Cast Iron
Bore Diameter	93.0 ± .0075 mm (3.6619 ± 0.0003 in.)
Out of Round (MAX)	0.076 mm (0.003 in.)
Taper (MAX)	0.051 mm (0.002 in.)
PISTONS	
Material	Aluminum Alloy

ENGINE - 3.7L (Continued)

DESCRIPTION	SPECIFICATION
Diameter	92.975 mm (3.6605 in.)
Weight	367.5 grams (12.96 oz)
Ring Groove Diameter	
No. 1	83.73 - 83.13 mm (3.296 - 3.273 in.)
No. 2	82.833 - 83.033 mm (3.261 - 3.310 in.)
No. 3	83.88 - 84.08 mm (3.302 - 3.310 in.)
PISTON PINS	
Type	Floating
Clearance In Piston	0.006 - 0.015 mm (0.0002 - 0.0005 in.)
Diameter	24.017 - 24.020 mm (0.9455 - 0.9456 in.)
PISTON RINGS	
Ring Gap	
Top Compression Ring	0.20 - 0.36 mm (0.0079 - 0.0142 in.)
Second Compression Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)
Oil Control (Steel Rails)	0.25 - 0.76 mm (0.0099 - 0.30 in.)
Side Clearance	
Top Compression Ring	.051 - .094 mm (0.0020 - 0.0037 in.)
Second Compression Ring	0.040 - 0.080 mm (0.0016 - 0.0031 in.)
Oil Ring (Steel Ring)	.019 - .229 mm (.0007 - .0091 in.)
Ring Width	
Top Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Second Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Oil Ring (Steel Rails)	0.445 - 0.470 mm (0.017 - 0.018 in.)

DESCRIPTION	SPECIFICATION
CONNECTING RODS	
Bearing Clearance	0.006 - 0.044 mm (0.00024 - 0.0017 in.)
Side Clearance	0.10 - 0.35 mm (0.004 - 0.0138 in.)
Piston Pin Clearance	.015 - .028 mm (0.0006 - 0.0011 in.)
Bearing Bore Out of Round (MAX)	0.004 mm (0.0002 in.)
Total Weight (Less Bearing)	612 grams (21.588 ounces)
CRANKSHAFT	
Main Bearing Journal	
Diameter	63.488 - 63.512 mm (2.4996 - 2.5005 in.)
Bearing Clearance	0.002 - 0.034 mm
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.006 mm (0.0004 in.)
End Play	0.052 - 0.282 mm (0.0021 - 0.0112 in.)
End Play (MAX)	0.282 mm (0.0112 in)
Connecting Rod Journal	
Diameter	57.908 - 57.892 mm
Bearing Clearance	0.006 - 0.044 mm
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.006 mm (0.0002 in.)
CAMSHAFT	
Bore Diameter	26.02 - 26.04 mm
	(1.0245 - 1.0252 in.)
Bearing Journal Diameter	25.975 - 25.995 mm (1.0227 - 1.0235 in.)
Bearing Clearance	0.025 - 0.065 mm (0.001 - 0.0026 in.)
Bearing Clearance (MAX)	0.065 mm (0.0026 in.)
End Play	.075 - .200 mm (0.003 - 0.0079 in.)

ENGINE - 3.7L (Continued)

DESCRIPTION	SPECIFICATION
End Play (MAX)	.200 mm (0.0079 in.)
VALVE TIMING	
Intake	
Opens (ATDC)	0.0°
Closes (ATDC)	236°
Duration	236°
Exhaust	
Opens (BTDC)	233°
Closes (ATDC)	17°
Duration	250°
Valve Overlap	17°
VALVES	
Face Angle	45° - 45.5°
Head Diameter	
Intake	48.52 - 48.78 mm (1.9103 - 1.9205 in.)
Exhaust	36.87 - 37.13 mm 1.4516 - 1.4618 in.)
Length (Overall)	
Intake	113.45 - 114.21 mm (4.4666 - 4.4965)
Exhaust	114.92 - 115.68 mm (4.5244 - 4.5543 in.)
Stem Diameter	
Intake	6.931 - 6.957 mm (0.2729 - 0.2739 in.)
Exhaust	6.902 - 6.928 mm (0.2717 - 0.2728 in.)
Stem - to - Guide Clearance	
Intake	0.018 - 0.069 mm (0.0008 - 0.0028 in.)
Exhaust	0.047 - 0.098 mm (0.0019 - 0.0039 in.)
Max. Allowable Stem - to - Guide Clearance (Rocking Method)	
Intake	0.069 mm (0.0028 in.)

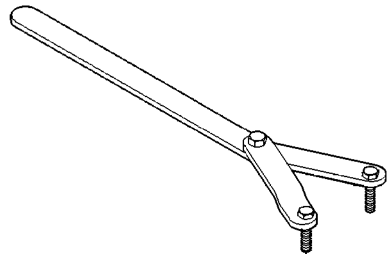
DESCRIPTION	SPECIFICATION
Exhaust	0.098 mm (0.0039 in.)
Valve Lift (Zero Lash)	
Intake	12.00 mm (0.472 in.)
Exhaust	10.90 mm (0.4292 in.)
VALVE SPRING	
Free Length (Approx)	
Intake	48.92 mm (1.9260 in.)
Exhaust	49.81 mm (1.9610 in.)
Spring Force (Valve Closed)	
Intake	361.0 - 390.0 N @ 40.12 mm (81.15 - 87.67 lbs. @ 1.5795 in.)
Exhaust	390.0 - 430.0 N @ 40.12 mm (87.67 - 96.66 lbs. @ 1.5795 in.)
Spring Force (Valve Open)	
Intake	984.0 - 1040.0 N @ 28.12 mm 221.2 - 233.8 lbs. @ 1.107 in.)
Exhaust	965.0 - 1055.0 N @ 28.12 mm 216.9 - 237.1 lbs. @ 1.107 in.)
Number of Coils	
Intake	7.30
Exhaust	7.45
Wire Diameter	
Intake and Exhaust	4.77 × 3.80mm (0.1878 - 0.1496 in.)
Installed Height (Spring Seat to Bottom of Retainer)	
Nominal	
Intake	40.12 mm (1.579 in.)
Exhaust	40.12 mm (1.579 in.)
CYLINDER HEAD	
Gasket Thickness (Compressed)	0.7 mm (0.0276 in.)

ENGINE - 3.7L (Continued)

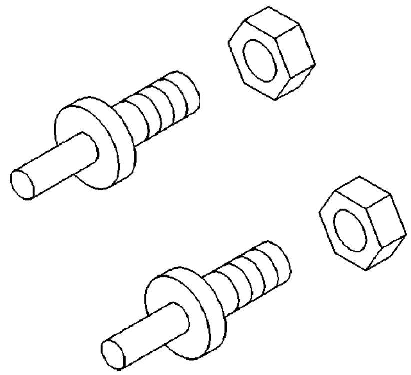
DESCRIPTION	SPECIFICATION
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.051 mm (0.002 in.)
Valve Seat Width	
Intake	1.75 - 2.36 mm (0.0698 - 0.0928 in.)
Exhaust	1.71 - 2.32 mm (0.0673 - 0.0911 in.)
Guide Bore Diameter (Std.)	6.975 - 7.00 mm (0.2747 - 0.2756 in.)
Cylinder Head Warpage (Flatness)	0.0508 mm (0.002 in.)
OIL PUMP	
Clearance Over Rotors/End Face (MAX)	0.035 - 0.095 mm (0.0014 - 0.0038 in.)
Cover Out - of -Flat (MAX)	0.025 mm (0.001 in.)
Inner and Outer Rotor Thickness	12.02 mm (0.4731 in.)
Outer Rotor Diameter (MAX)	.235 mm (.0093 in.)
Outer Rotor Diameter (MIN)	85.925 mm (0.400 in.)
Tip Clearance Between Rotors (MAX)	0.150 mm (0.006 in.)
OIL PRESSURE	
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 rpm.**	

SPECIAL TOOLS

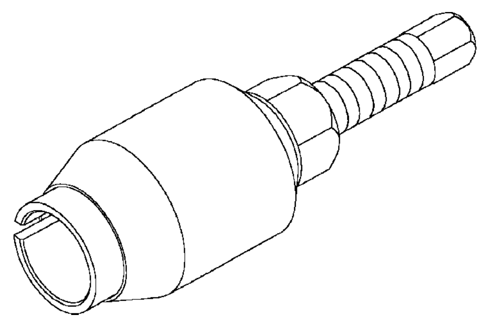
3.7L ENGINE



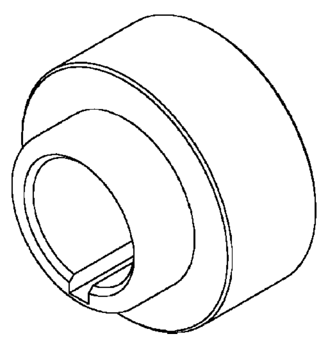
Spanner Wrench 6958



Adapter Pins 8346

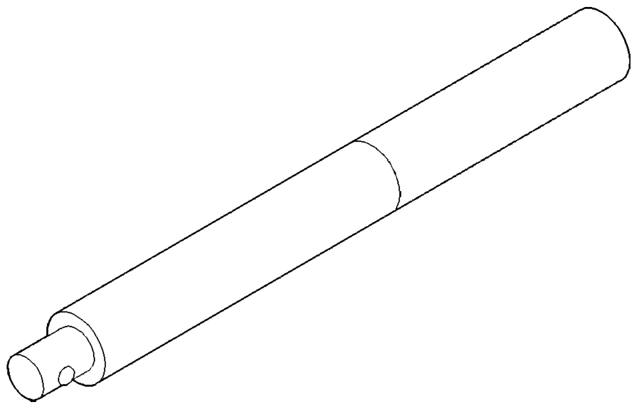


Front Crankshaft Seal Remover 8511

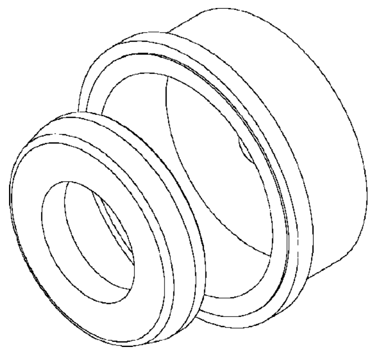


Front Crankshaft Seal Installer 8348

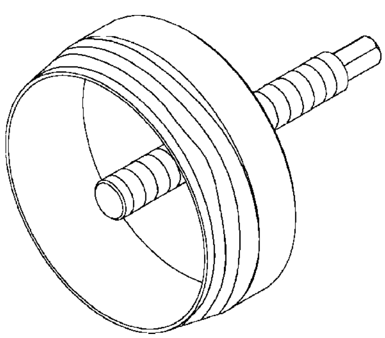
ENGINE - 3.7L (Continued)



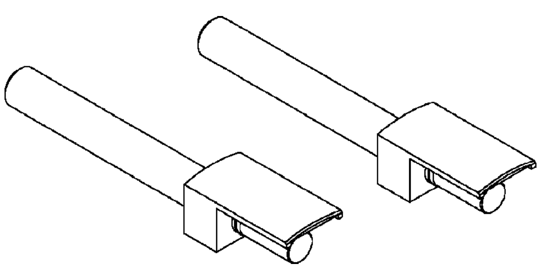
Handle C-4171



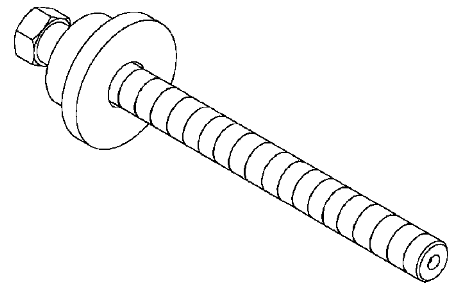
Rear Crankshaft Seal Installer 8349



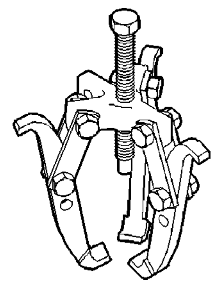
Rear Crankshaft Seal Remover 8506



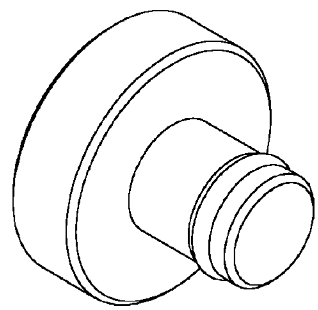
Connecting Rod Guides 8507



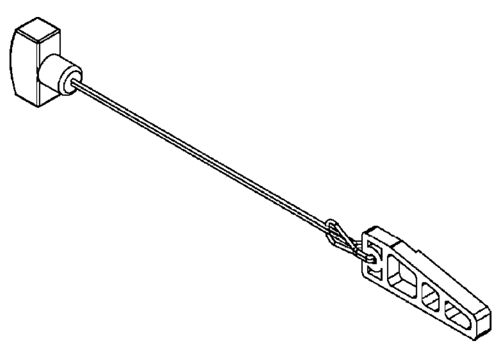
Crankshaft Damper Installer 8512



Puller 1026

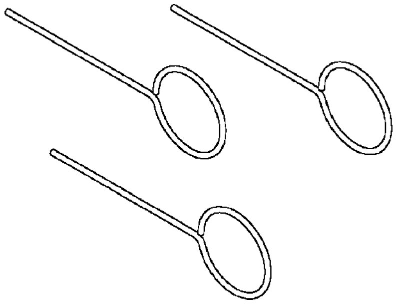


Crankshaft Damper Removal Insert 8513

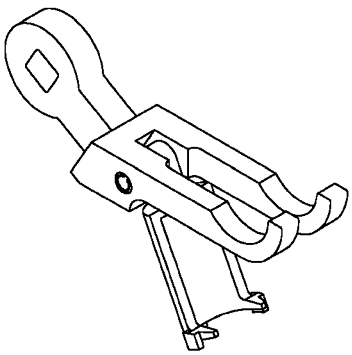


Chain Tensioner Wedge 8379

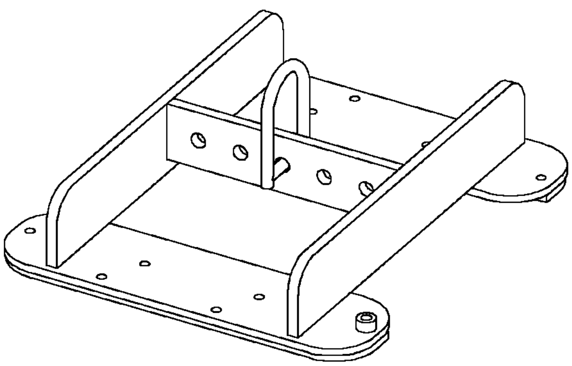
ENGINE - 3.7L (Continued)



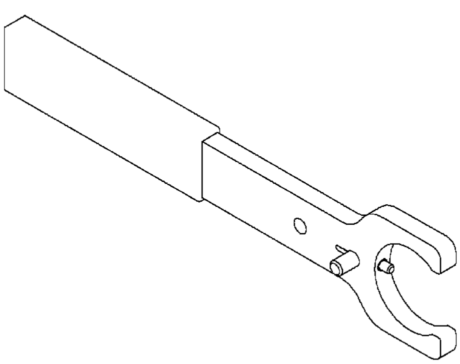
Chain Tensioner Pins 8514



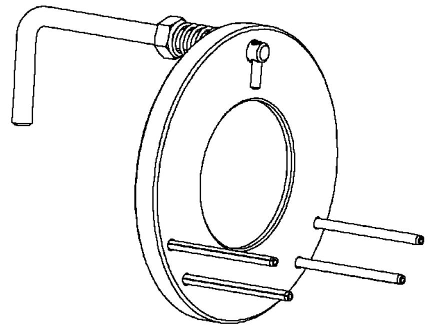
VALVE SPRING COMPRESSOR 8426



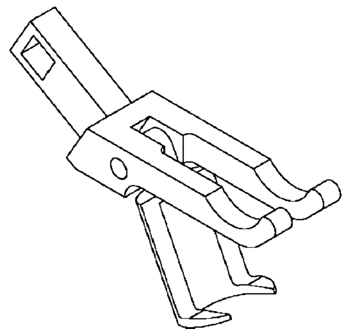
ENGINE LIFTING FIXTURE 8427



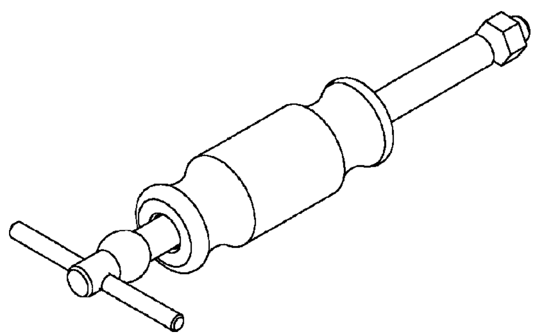
CAMSHAFT HOLDER 8428



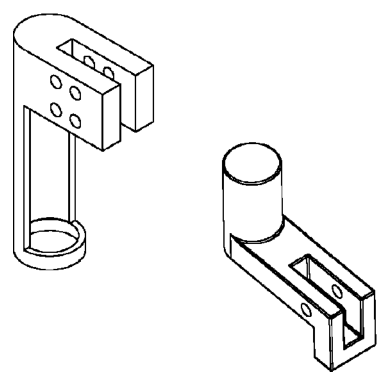
HOLDER SECONDARY CAMSHAFT CHAIN 8429



Remover, Rocker Arm 8516

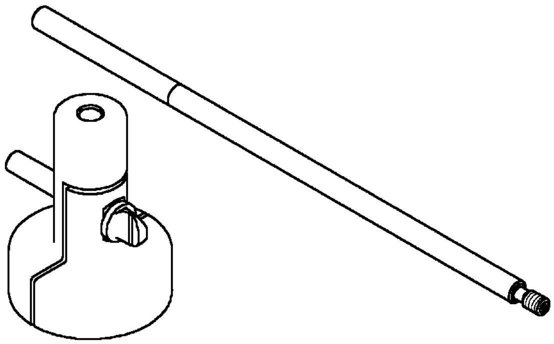


Idler Shaft Remover 8517

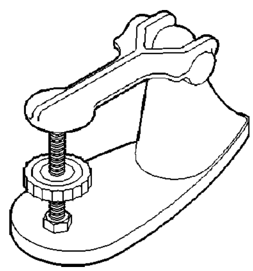


Valve Spring Compressor Adapters 8519

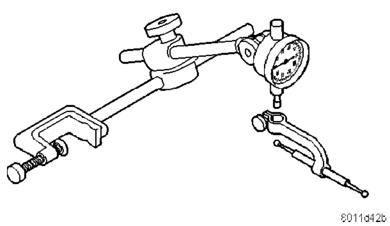
ENGINE - 3.7L (Continued)



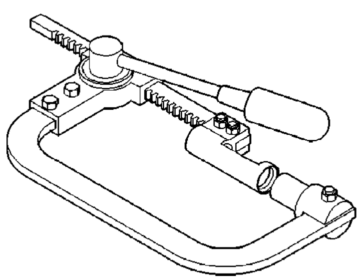
INSTALLER - REMOVER - COUNTER BALANCE SHAFT 8641



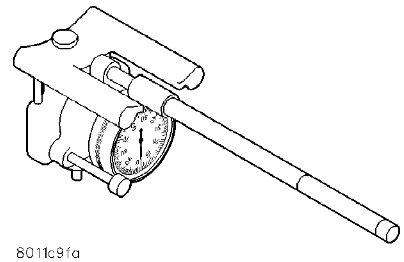
Valve Spring Tester C-647



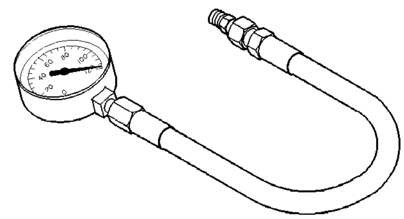
Dial Indicator C-3339



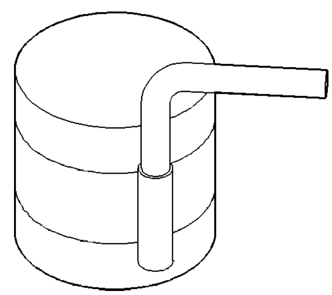
Valve Spring Compressor C-3422-B



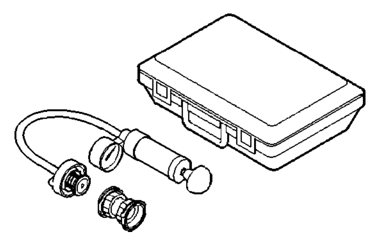
Bore Size Indicator C-119



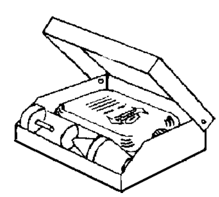
Oil Pressure Gauge C-3292



Piston Ring Compressor C-385



Pressure Tester Kit 7700



Bloc–Chek–Kit C-3685–A

AIR CLEANER ELEMENT

REMOVAL - 3.7L

Housing removal is not necessary for element (filter) replacement.

(1) Pry up 2 spring clips (Fig. 4) from front of housing cover (spring clips retain cover to housing).

(2) Release housing cover from 4 locating tabs located on rear of housing, and remove cover.

(3) Remove air cleaner element (filter) from housing.

(4) Clean inside of housing before replacing element.

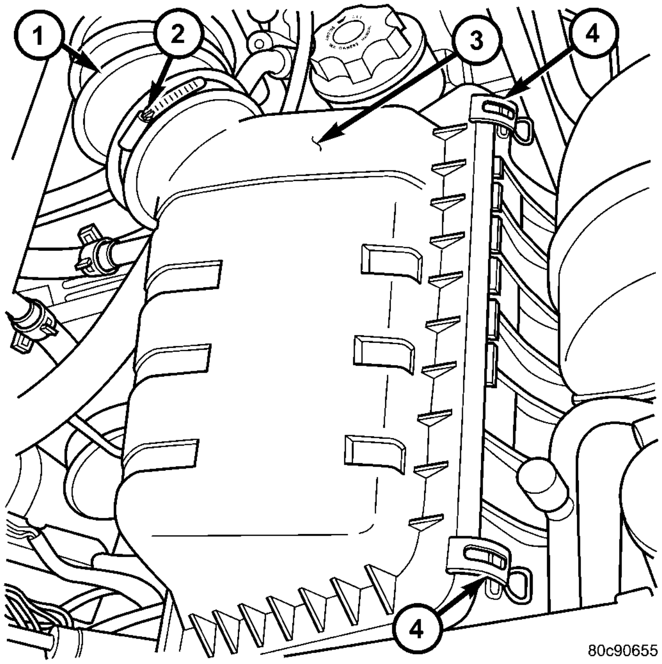


Fig. 4 AIR CLEANER ELEMENT - 3.7L

1 - AIR INTAKE HOSE
2 - HOSE CLAMP
3 - COVER
4 - CLIPS (2)

INSTALLATION - 3.7L

(1) Install element into housing.

(2) Position housing cover into housing locating tabs.

(3) Pry up spring clips and lock cover to housing.

If any air filter, air resonator, air intake tubes or air filter housing clamps had been loosened or removed, tighten them to 5 N·m (40 in. lbs.) torque.

CYLINDER HEAD - LEFT

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

(3) Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Oil leak or excessive cam bore wear in cylinder head.

(11) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and replace.

c. Before installation, make sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

CYLINDER HEAD - LEFT (Continued)

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

(1) Disconnect the negative cable from the battery.

(2) Raise the vehicle on a hoist.

(3) Disconnect the exhaust pipe at the left side exhaust manifold.

(4) Drain the engine coolant. Refer to COOLING SYSTEM.

(5) Lower the vehicle.

(6) Remove the intake manifold. Refer to procedure in this section.

(7) Remove the cylinder head cover. Refer to procedure in this section.

(8) Remove the fan shroud and fan blade assembly. Refer to COOLING SYSTEM.

(9) Remove accessory drive belt. Refer to COOLING SYSTEM.

(10) Remove the power steering pump and set aside.

(11) Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (Fig. 5).

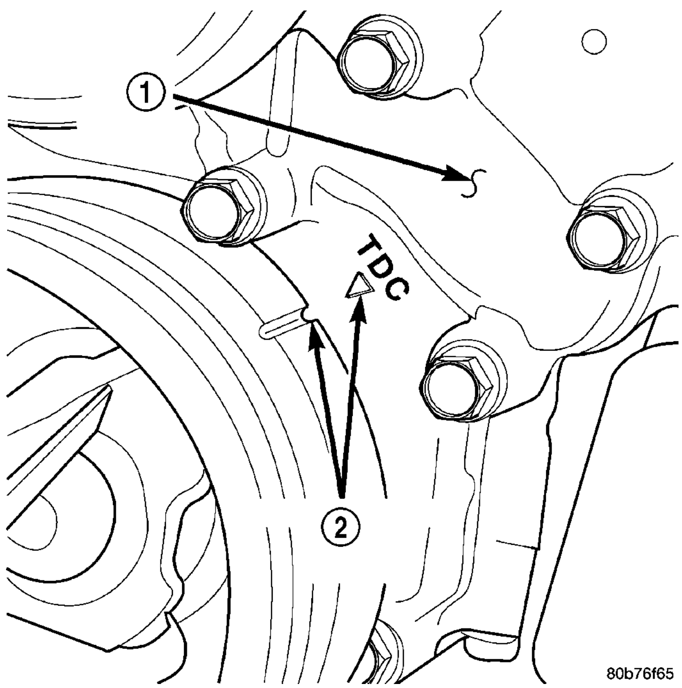


Fig. 5 Engine Top Dead Center

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

(12) Verify the V6 mark on the camshaft sprocket is at the 12 o'clock position (Fig. 6). Rotate the crankshaft one turn if necessary.

(13) Remove the crankshaft damper. Refer to Procedure.

(14) Remove the timing chain cover. Refer to procedure.

(15) Lock the secondary timing chains to the idler sprocket using Special Tool 8429 Timing Chain Holding Fixture (Fig. 7).

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

CYLINDER HEAD - LEFT (Continued)

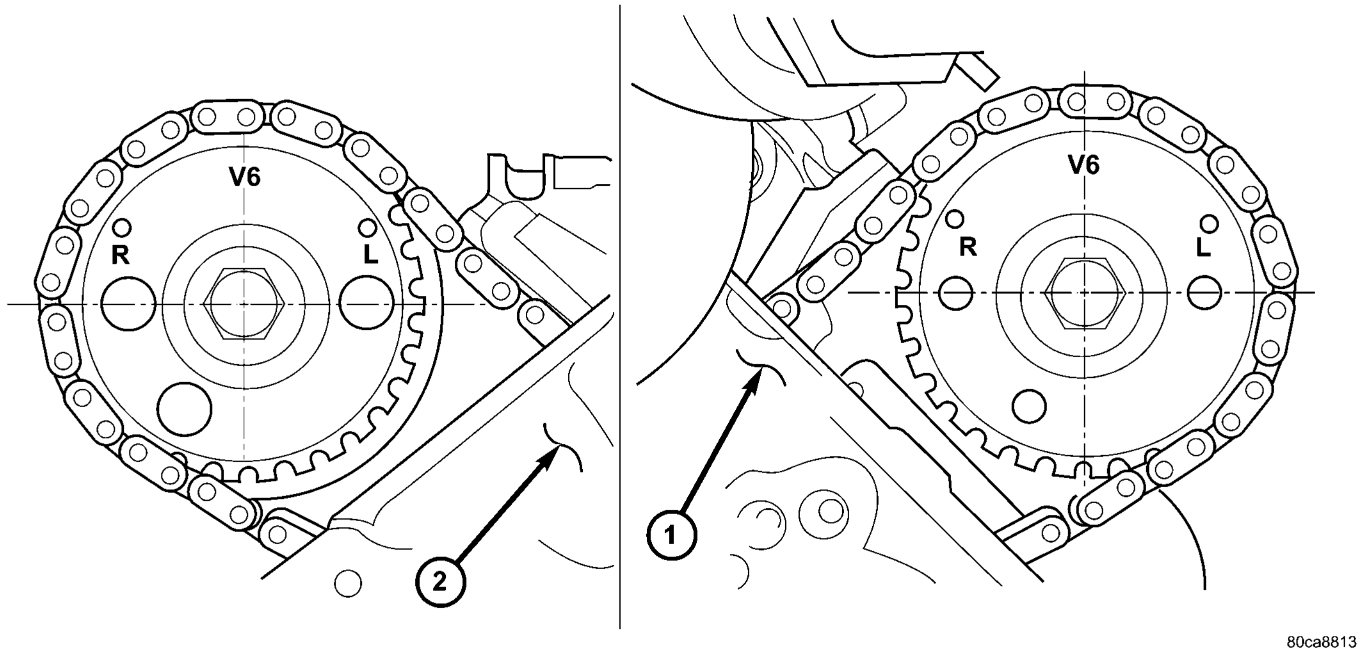


Fig. 6 CAMSHAFT SPROCKET V6 MARKS (#1 TDC, Exhaust stroke)

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

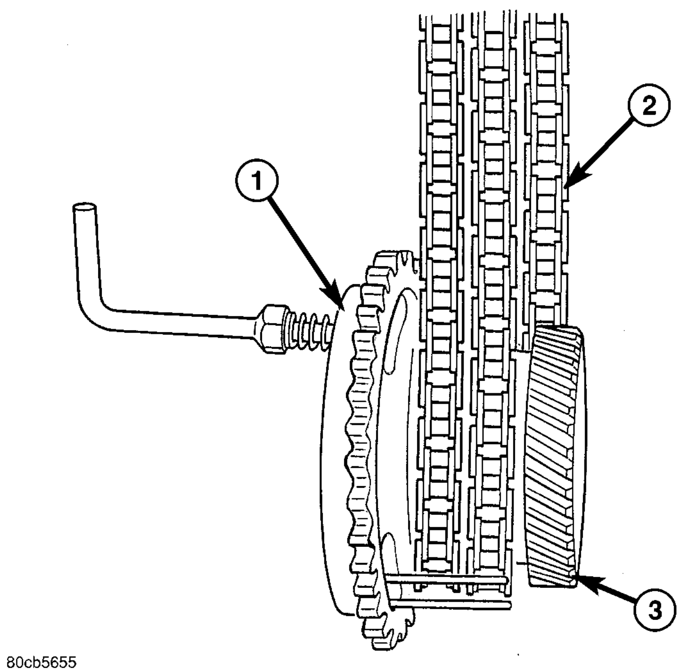


Fig. 7 Using Special Tool 8429

1 - SPECIAL TOOL 8429
2 - CAMSHAFT CHAIN
3 - CRANKSHAFT TIMING GEAR

(16) Mark the secondary timing chain, one link on each side of the V6 mark on the camshaft drive gear.

(17) Remove the left side secondary chain tensioner. Refer to Timing Chain and Sprockets.

(18) Remove the cylinder head access plug (Fig. 8).

(19) Remove the left side secondary chain guide. Refer to Timing Chain and Sprockets.

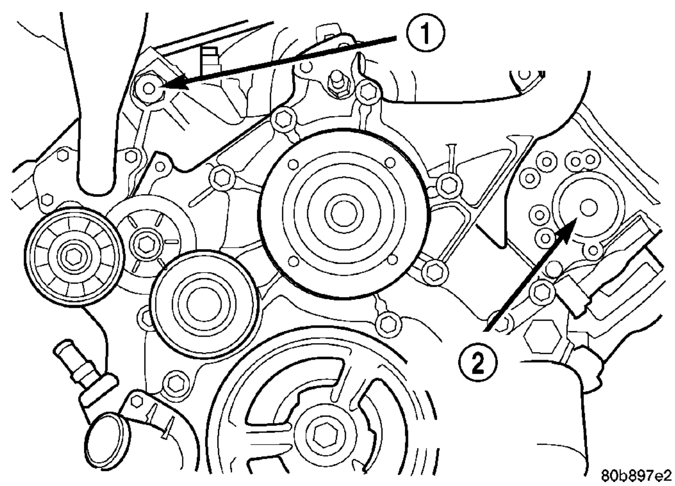


Fig. 8 Cylinder Head Access Plugs

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

(20) Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. Severe damage to the valve train can occur.

CYLINDER HEAD - LEFT (Continued)

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

(21) Remove the cylinder head retaining bolts.

(22) Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, due to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components (Fig. 9). (Refer to 9 - ENGINE - STANDARD PROCEDURE)

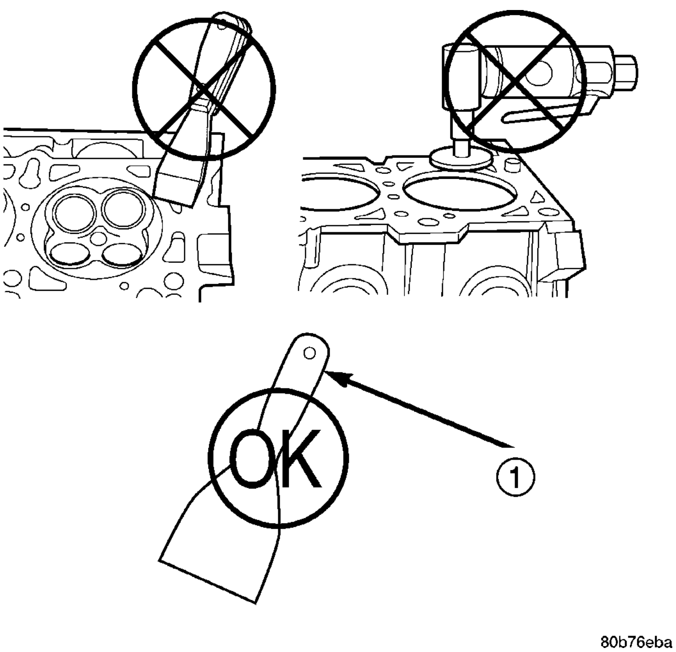


Fig. 9 Proper Tool Usage For Surface Preparation

1 - PLASTIC/WOOD SCRAPER

INSTALLATION

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced (Fig. 10).

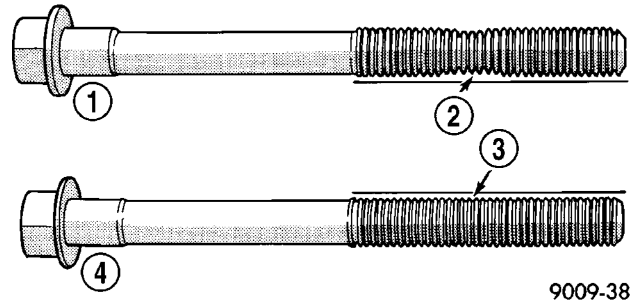


Fig. 10 Checking Cylinder Head Bolts for Stretching (Necking)

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

(1) Clean the cylinder head and cylinder block mating surfaces (Fig. 11).

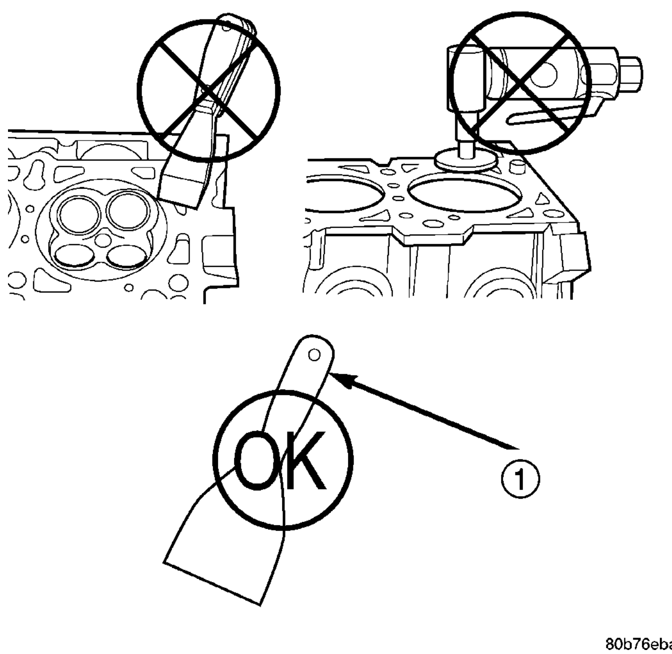


Fig. 11 Proper Tool Usage For Surface Preparation

1 - PLASTIC/WOOD SCRAPER

(2) Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

CYLINDER HEAD - LEFT (Continued)

(3) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

(4) Lubricate the cylinder head bolt threads with clean engine oil and install the eight M11 bolts.

(5) Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

(6) Tighten the bolts in sequence using the following steps and torque values:

- Step 1: Tighten bolts 1–8, 27 N·m (20 ft. lbs.).
- Step 2: Verify that bolts 1–8, all reached 27 N·m (20 ft. lbs.), by repeating step-1 without loosening the bolts. Tighten bolts 9 thru 12 to 14 N·m (10 ft. lbs.).
- Step 3: Tighten bolts 1–8, 90 degrees (Fig. 12).
- Step 4: Tighten bolts 1–8, 90 degrees, again. Tighten bolts 9–12, 26 N·m (19 ft. lbs.)

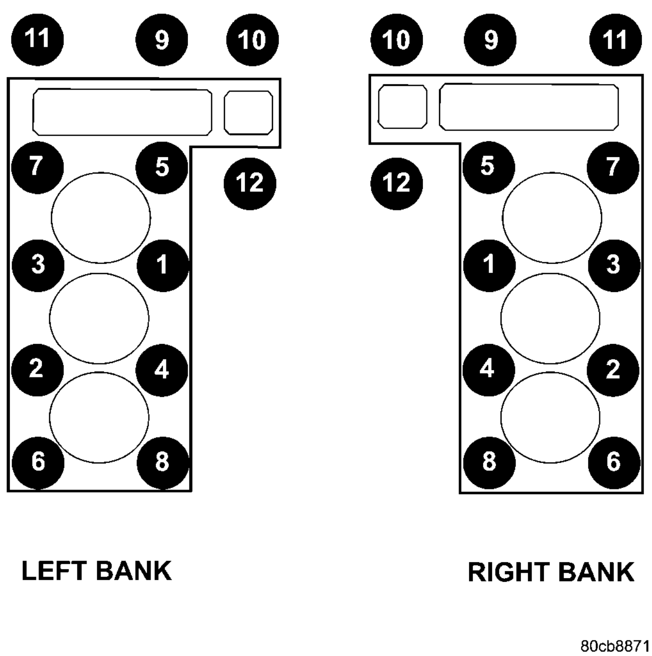


Fig. 12 Cylinder head Tightening Sequence

(7) Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark on the gear then using Special Tool 8428 Camshaft Wrench, position the gear onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

(8) Install the camshaft drive gear retaining bolt.
(9) Install the left side secondary chain guide.
(10) Install the cylinder head access plug.
(11) Re-set and Install the left side secondary chain tensioner.
(12) Remove Special Tool 8429.
(13) Install the timing chain cover.
(14) Install the crankshaft damper. Tighten damper bolt 175 N·m (130 Ft. Lbs.).
(15) Install the power steering pump.
(16) Install the fan blade assembly and fan shroud.
(17) Install the cylinder head cover.
(18) Install the intake manifold.
(19) Refill the cooling system
(20) Raise the vehicle.
(21) Install the exhaust pipe onto the left exhaust manifold.
(22) Lower the vehicle.
(23) Connect the negative cable to the battery.
(24) Start the engine and check for leaks.

CAMSHAFT(S)

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. Four bearing journals are machined into the camshaft. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use Special Tool 8379 will result in hydraulic tensioner ratchet over extension, requiring timing chain cover removal to reset the tensioner ratchet.

CAMSHAFT(S) (Continued)

(1) Remove cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Set engine to TDC cylinder #1, camshaft sprocket V6 marks at the 12 o'clock position.

(3) Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel (Located on the right side camshaft sprocket) for any reason, Severe damage will occur to the target wheel resulting in a vehicle no start condition.

(4) Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave the bolt snug against the sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

(5) Position Special Tool 8379 timing chain wedge between the timing chain strands, tap the tool to securely wedge the timing chain against the tensioner arm and guide (Fig. 13).

(6) Hold the camshaft with Special Tool 8428 Camshaft Wrench, while removing the camshaft sprocket bolt and sprocket (Fig. 14).

(7) Using Special Tool 8428 Camshaft Wrench, gently allow the camshaft to rotate 5° clockwise until the camshaft is in the neutral position (no valve load).

(8) Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

(9) Remove the camshaft bearing caps and the camshaft.

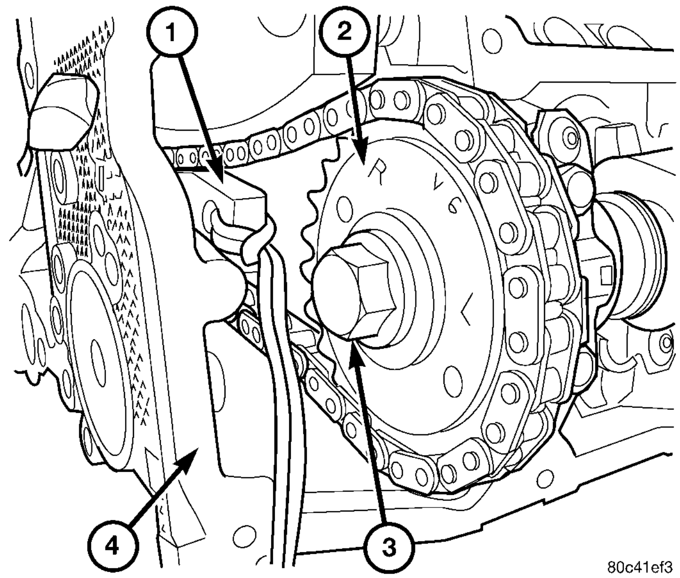


Fig. 13 SECURING TIMING CHAIN TENSIONERS USING TIMING CHAIN WEDGE — Typical

1 - SPECIAL TOOL 8379
2 - CAMSHAFT SPROCKET
3 - CAMSHAFT SPROCKET BOLT

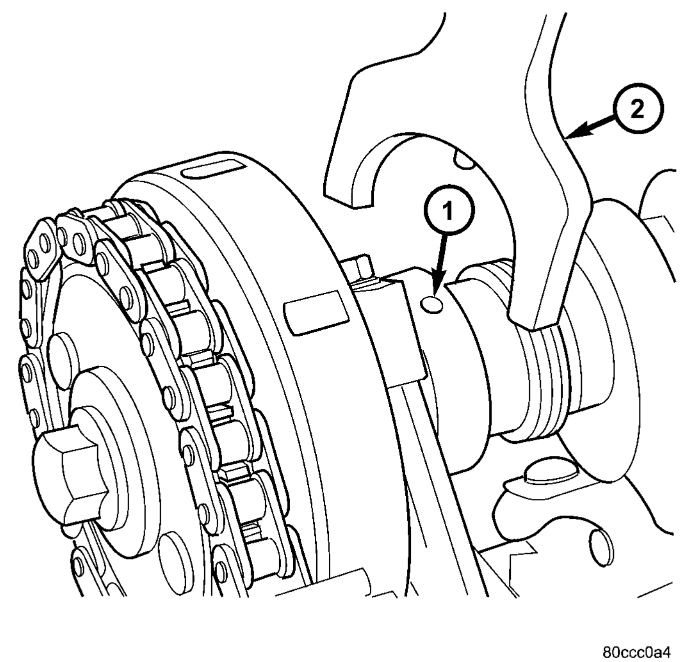


Fig. 14 Special Tool 8428

1 - Camshaft hole
2 - Special Tool 8428

INSTALLATION

(1) Lubricate camshaft journals with clean engine oil.

CAMSHAFT(S) (Continued)

NOTE: Position the left side camshaft so that the camshaft sprocket dowel is near the 1 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

(2) Position the camshaft into the cylinder head.

(3) Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 thru 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.

(4) Working in ½ turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward (Fig. 15).

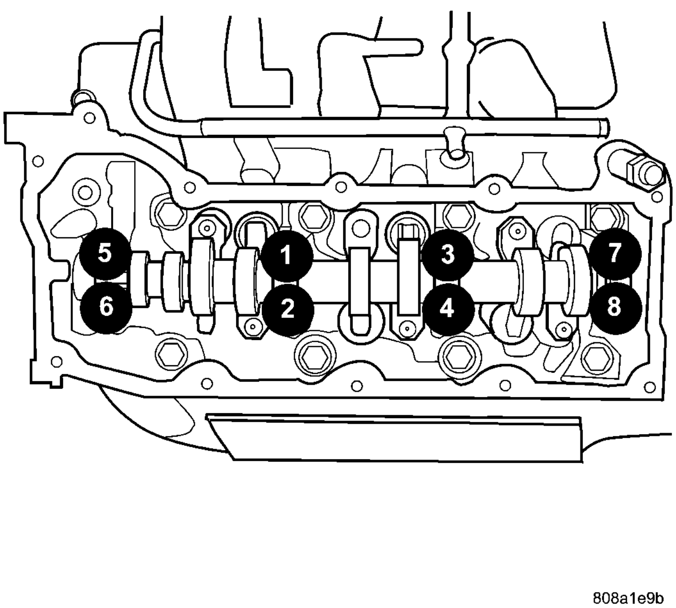


Fig. 15 Camshaft Bearing Caps Tightening Sequence

(5) Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).

(6) Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal).

(7) Using Special Tool 8428 Camshaft Wrench, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt over-torque resulting in bolt failure.

(8) Remove excess oil from bolt, then install the camshaft sprocket retaining bolt and hand tighten.

(9) Remove Special Tool 8379 timing chain wedge.

(10) Using Special Tool 6958 spanner wrench with adapter pins 8346, torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).

(11) Install the cylinder head cover.

CYLINDER HEAD COVER(S)

DESCRIPTION

The cylinder head covers are made of single layer stamped steel, and are not interchangable from side-to-side (Fig. 16).

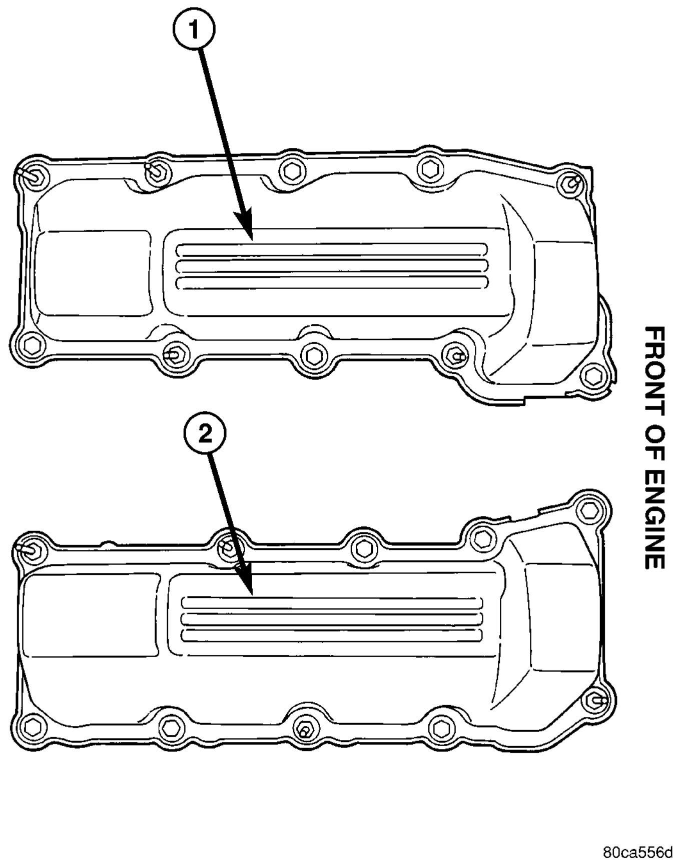


Fig. 16 CYLINDER HEAD COVERS

1 - LEFT SIDE CYLINDER HEAD COVER
2 - RIGHT SIDE CYLINDER HEAD COVER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the resonator assemble and air inlet hose.

CYLINDER HEAD COVER(S) (Continued)

(3) Disconnect injector connectors and un-clip the injector harness.
(4) Route injector harness in front of cylinder head cover.
(5) Disconnect the left side breather tube and remove the breather tube.
(6) Remove the cylinder head cover mounting bolts (Fig. 17).
(7) Remove cylinder head cover and gasket.

NOTE: The gasket may be used again, providing no cuts, tears, or deformation has occurred.

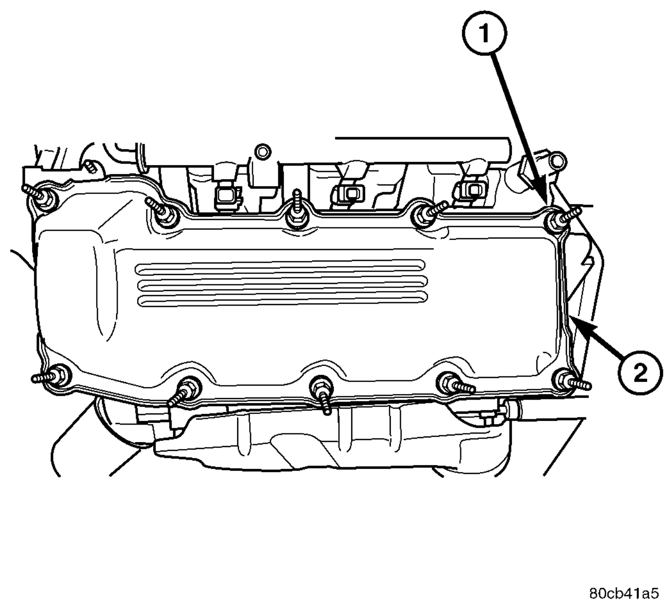


Fig. 17 CYLINDER HEAD COVER -TYPICAL

1 - SCREWS
2 - CYLINDER HEAD COVER

INSTALLATION

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

(1) Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
(2) Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs.).
(3) Install left side breather and connect breather tube.
(4) Connect injector electrical connectors and injector harness retaining clips.
(5) Install the resonator and air inlet hose.
(6) Connect negative cable to battery.

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE - REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(1) Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).
(2) Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
(3) When the seat is properly positioned the width of the intake seat must be 1.75 – 2.36 mm (0.0689 – 0.0928 in.) and the exhaust seat must be 1.71 – 2.32 mm (0.0673 – 0.0911 in.).
(4) Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 40.74 mm (1.6039 in.).
(5) The valve seat and valve face must maintain a face angle of 44.5 – 45 degrees angle (Fig. 18).

REMOVAL

NOTE: The cylinder heads must be removed in order to perform this procedure.

(1) Remove rocker arms and lash adjusters. Refer to procedures in this section (Fig. 19).
(2) Remove the camshaft bearing caps and the camshaft.

INTAKE/EXHAUST VALVES & SEATS (Continued)

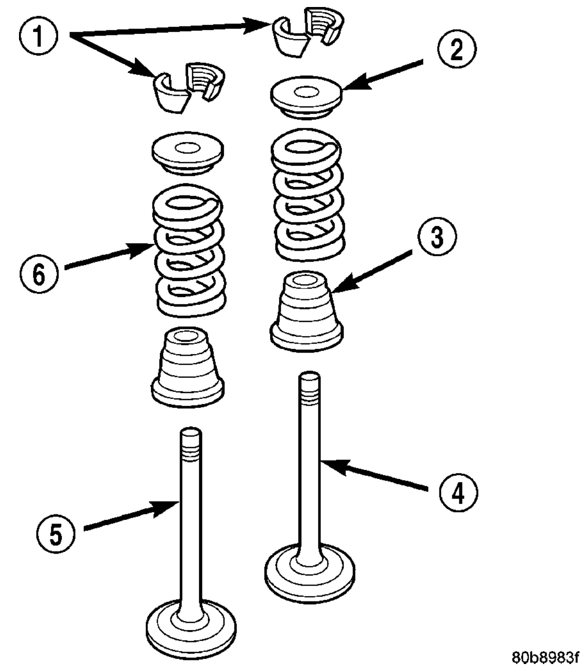


Fig. 18 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

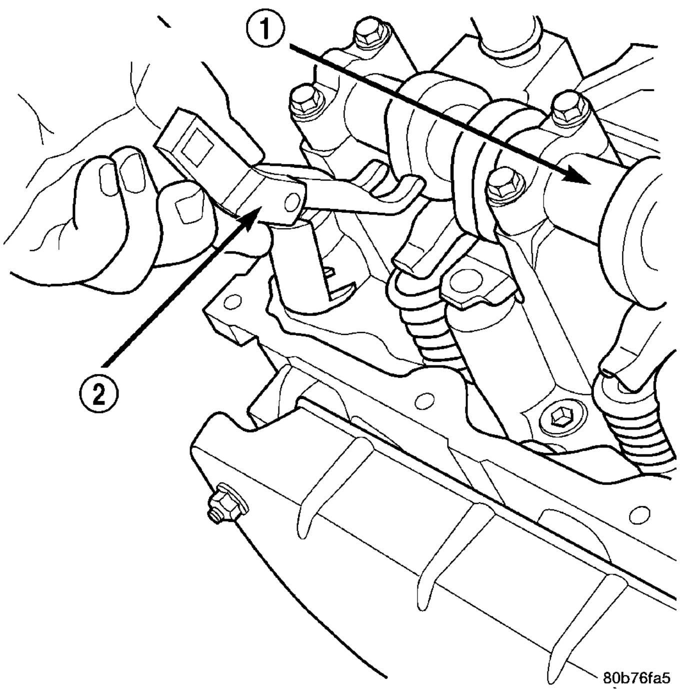


Fig. 19 Rocker Arm Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

NOTE: All six valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

(3) Using Special Tool C-3422–B or C-3422–C Valve Spring Compressor and Special tool 8519 Adapter, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

(4) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(5) Remove the valve spring compressor.
(6) Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

(7) Remove the valve from the cylinder head.

NOTE: The valve stem seals are common between intake and exhaust.

(8) Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

Inspect the valve springs for physical signs of wear or damage. Turn table of tool C-647 until surface is in line with the 40.12 mm (1.579 in.) mark on the threaded stud and the zero mark on the front. Place spring over the stud on the table and lift compressing lever to set tone device. Pull on torque wrench until Ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Specifications Section to obtain specified height and allowable tensions. Replace any springs that do not meet specifications (Fig. 20).

INSTALLATION

(1) coat the valve stem with clean engine oil and insert it into the cylinder head.
(2) Install the valve stem seal. make sure the seal is fully seated and that the garter spring at the top of the seal is intact.

INTAKE/EXHAUST VALVES & SEATS (Continued)

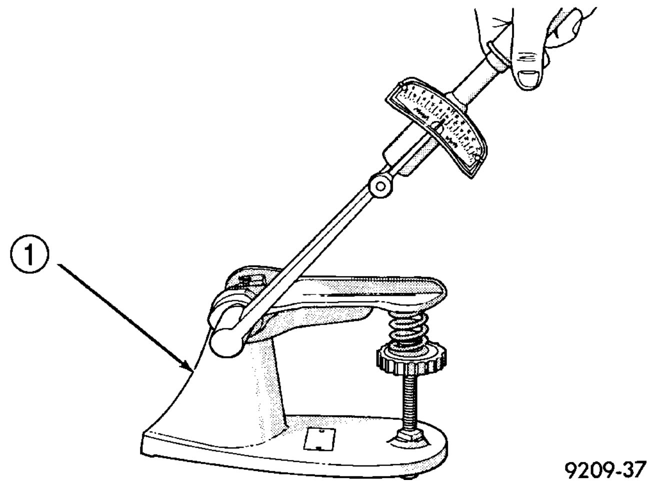


Fig. 20 Testing Valve Springs

1 - SPECIAL TOOL C-647

(3) Install the spring and the spring retainer (Fig. 21).

(4) Using the valve spring compressor, compress the spring and install the two valve spring retainer halves.

(5) Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated.

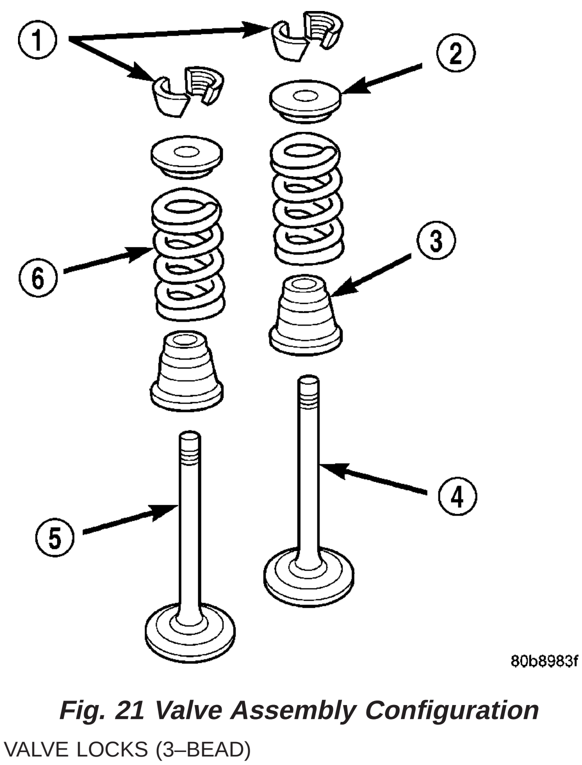


Fig. 21 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

(6) lubricate the camshaft journal with clean engine oil then Position the camshaft (with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock), then position the camshaft bearing caps.

(7) Install the camshaft bearing cap retaining bolts. Tighten the bolts 9–13 N·m (100 in. lbs.) in ½ turn increments in the sequence shown (Fig. 22).

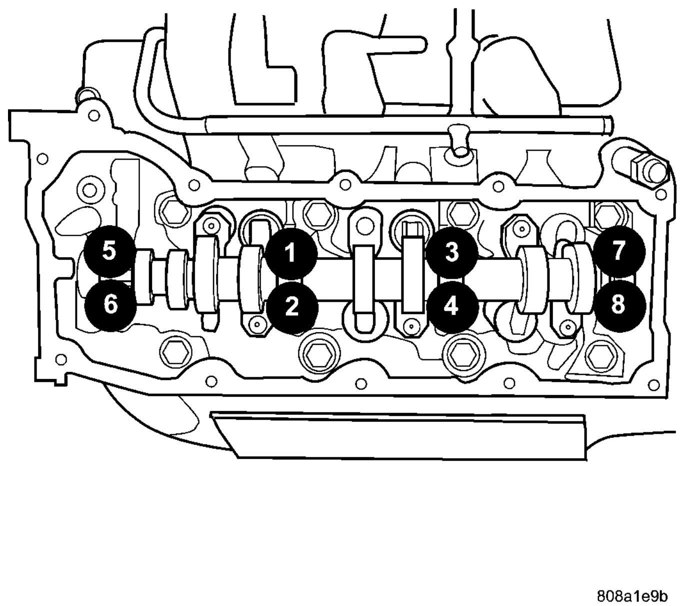


Fig. 22 Camshaft Bearing Caps Tightening Sequence

(8) Position the hydraulic lash adjusters and rocker arms.

ROCKER ARM

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.11 inch) oil hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

(1) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) For rocker arm removal on cylinder #4, Rotate the crankshaft until cylinder #1 is at BDC intake stroke.

ROCKER ARM (Continued)

(3) For rocker arm removal on cylinder #1, Rotate the crankshaft until cylinder #1 is at BDC combustion stroke.

(4) For rocker arm removal on cylinders #3 and #5, Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(5) For rocker arm removal on cylinders #2 and #6, Rotate the crankshaft until cylinder #1 is at TDC ignition stroke.

(6) Using special tool 8516 Rocker Arm Remover, press downward on the valve spring, remove rocker arm (Fig. 23).

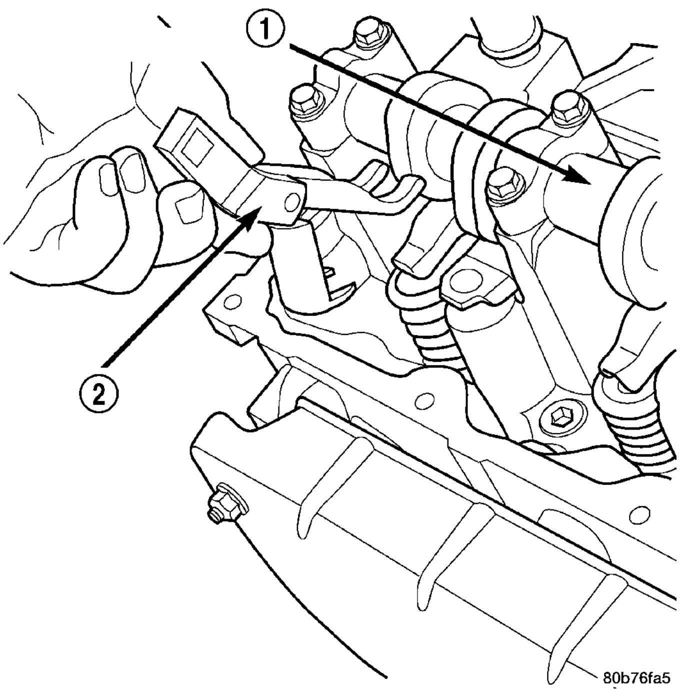


Fig. 23 Rocker Arm - Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

VALVE GUIDE SEALS

DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

VALVE SPRINGS

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are NOT common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

(1) Remove the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Using Special Tool 8516 Valve Spring Compressor, remove the rocker arms and the hydraulic lash adjusters.

(3) Remove the spark plug for the cylinder the valve spring and seal are to be removed from.

(4) Apply shop air to the cylinder to hold the valves in place when the spring is removed.

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

(5) Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

(6) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(7) Remove the valve spring compressor.

NOTE: The valve springs are NOT common between intake and exhaust.

(8) Remove the spring retainer, and the spring.

(9) Remove the valve stem seal.

NOTE: The valve stem seals are common between intake and exhaust.

INSTALLATION

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

(1) Apply shop air to the cylinder to hold the valves in place while the spring is installed.

NOTE: The valve stem seals are common between intake and exhaust.

(2) Install the valve stem seal.

NOTE: The valve springs are NOT common between intake and exhaust.

(3) Install the spring retainer, and the spring.

VALVE SPRINGS (Continued)

(4) Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

(5) Install the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(6) Remove the valve spring compressor.

(7) Disconnect the shop air to the cylinder.

(8) Install the spark plug for the cylinder the valve spring and seal was installed on.

(9) Using Special Tool 8516 Valve Spring Compressor, install the rocker arms and the hydraulic lash adjusters.

(10) Install the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

CYLINDER HEAD - RIGHT

DESCRIPTION

DESCRIPTION - CYLINDER HEAD

The cylinder heads are made of an aluminum alloy. The cylinder head features two valves per cylinder with pressed in powdered metal valve guides. The cylinder heads also provide enclosures for the timing chain drain, necessitating unique left and right cylinder heads.

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

(3) Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Oil leak or excessive cam bore wear in cylinder head.

(11) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and replace.

c. Before installation, make sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER HEAD - RIGHT (Continued)

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

(1) Disconnect battery negative cable.

(2) Raise the vehicle on a hoist.

(3) Disconnect the exhaust pipe at the right side exhaust manifold.

(4) Drain the engine coolant(Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Lower the vehicle.

(6) Remove the intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

(7) Remove the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(8) Remove the fan shroud(Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(9) Remove oil fill housing from cylinder head.

(10) Remove accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(11) Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark.

(12) Verify the V6 mark on the camshaft sprocket is at the 12 o'clock position. Rotate the crankshaft one turn if necessary.

(13) Remove the crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(14) Remove the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(15) Lock the secondary timing chains to the idler sprocket using Special Tool 8429 Timing Chain Holding Fixture.

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

(16) Mark the secondary timing chain, one link on each side of the V6 mark on the camshaft drive gear.

(17) Remove the right side secondary chain tensioner(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(18) Remove the cylinder head access plug.

(19) Remove the right side secondary chain guide(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

CAUTION: The nut on the right side camshaft sprocket should not be removed for any reason, as the sprocket and camshaft sensor target wheel is serviced as an assembly. If the nut was removed retorque nut to 5 N·m (44 in. lbs.).

(20) Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

(21) Remove the cylinder head retaining bolts.

(22) Remove the cylinder head and gasket. Discard the gasket.

CYLINDER HEAD - RIGHT (Continued)

CAUTION: Do not lay the cylinder head on its gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components (Fig. 24). (Refer to 9 - ENGINE - STANDARD PROCEDURE)

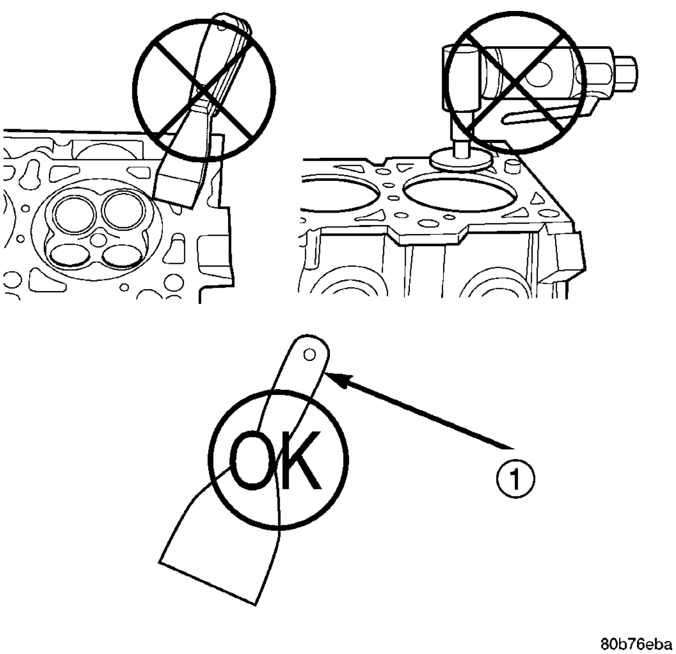


Fig. 24 Proper Tool Usage For Surface Preparation

1 - PLASTIC/WOOD SCRAPER

INSPECTION

(1) Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If measurements exceed 0.0508 mm (0.002 in.) replace the cylinder head.

(2) Inspect the valve seats for damage. Service the valve seats as necessary.

(3) Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.

INSTALLATION

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced.

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

(1) Clean the cylinder head and cylinder block mating surfaces (Fig. 25).

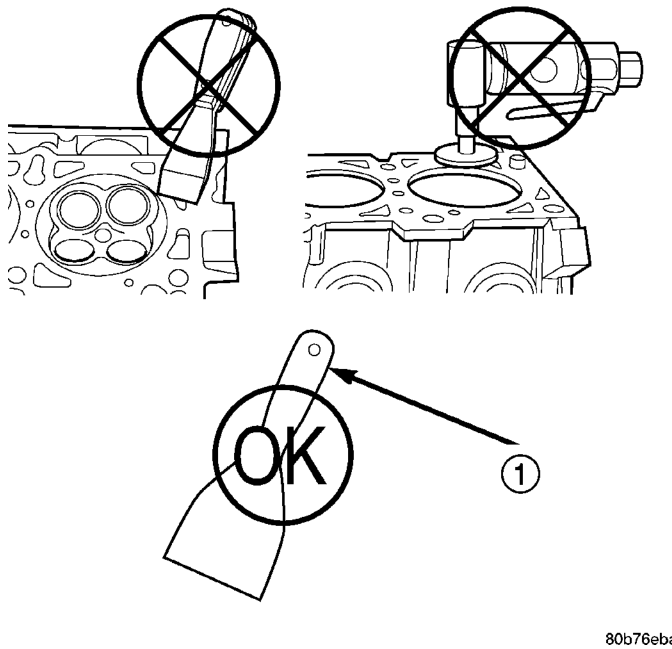


Fig. 25 Proper Tool Usage For Surface Preparation

1 - PLASTIC/WOOD SCRAPER

(2) Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

(3) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four M8 cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

(4) Lubricate the cylinder head bolt threads with clean engine oil and install the eight M10 bolts.

(5) Coat the four M8 cylinder head bolts with **Mopar Lock and Seal Adhesive** then install the bolts.

CYLINDER HEAD - RIGHT (Continued)

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

(6) Tighten the bolts in sequence using the following steps and torque values:

- Step 1: Tighten bolts 1–8, 27 N·m (20 ft. lbs.).
- Step 2: Verify that bolts 1–8, all reached 27 N·m (20 ft. lbs.), by repeating step-1 without loosening the bolts. Tighten bolts 9 thru 12 to 14 N·m (10 ft. lbs.).
- Step 3: Tighten bolts 1–8, 90 degrees (Fig. 26).
- Step 4: Tighten bolts 1–8, 90 degrees, again. Tighten bolts 9–12, 26 N·m (19 ft. lbs.)

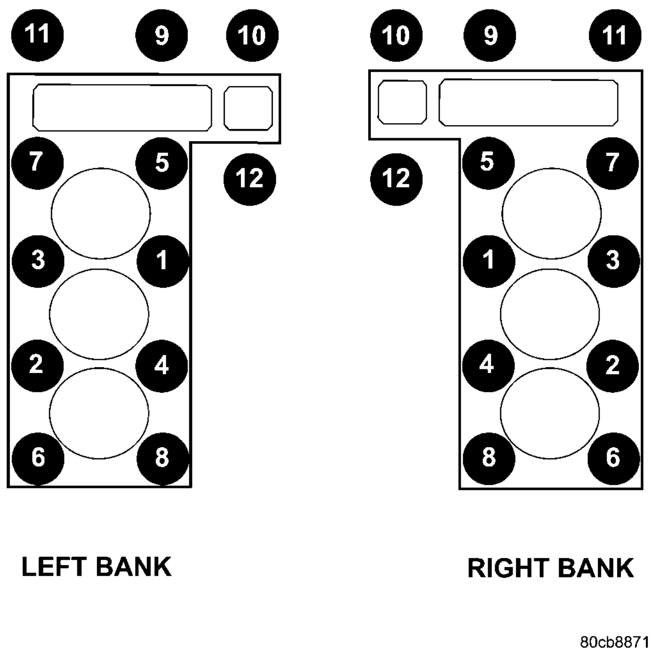


Fig. 26 CYLINDER HEAD TIGHTENING SEQUENCE

CAUTION: The nut on the right side camshaft sprocket should not be removed for any reason, as the sprocket and camshaft sensor target wheel is serviced as an assembly. If the nut was removed retorque nut to 5 ft. lbs.(60 in. lbs.).

(7) Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark on the gear then using Special Tool 8428 Camshaft Wrench, position the gear onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torquing of bolt resulting in bolt failure.

(8) Install the camshaft drive gear retaining bolt.
(9) Install the right side secondary chain guide.
(10) Install the cylinder head access plug.
(11) Re-set and install the right side secondary chain tensioner.
(12) Remove Special Tool 8429.
(13) Install the timing chain cover.
(14) Install the crankshaft damper. Tighten damper bolt 175 N·m (130 Ft. Lbs.).
(15) Install accessory drive belt.
(16) Install the fan shroud.
(17) Install the cylinder head cover.
(18) Install the intake manifold.
(19) Install oil fill housing onto cylinder head.
(20) Refill the cooling system.
(21) Raise the vehicle.
(22) Install the exhaust pipe onto the right exhaust manifold.
(23) Lower the vehicle.
(24) Reconnect battery negitive cable.
(25) Start the engine and check for leaks.

CAMSHAFT(S)

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. Four bearing journals are machined into the camshaft. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use special tool 8379 will result in hydraulic tensioner ratchet over extension, Requiring timing chain cover removal to re-set the tensioner ratchet.

(1) Remove the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
(2) Set engine to TDC cylinder #1, camshaft sprocket V6 marks at the 12 o'clock position.
(3) Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

CAMSHAFT(S) (Continued)

CAUTION: Do not hold or pry on the camshaft target wheel for any reason, Severe damage will occur to the target wheel. A damaged target wheel could cause a vehicle no start condition.

(4) Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave bolt snug against sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

(5) Position Special Tool 8379 timing chain wedge between the timing chain strands. Tap the tool to securely wedge the timing chain against the tensioner arm and guide.

(6) Remove the camshaft position sensor.

(7) Hold the camshaft with Special Tool 8428 Camshaft Wrench, while removing the camshaft sprocket bolt and sprocket.

(8) Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

(9) Remove the camshaft bearing caps and the camshaft.

INSTALLATION

(1) Lubricate camshaft journals with clean engine oil.

NOTE: Position the right side camshaft so that the camshaft sprocket dowel is near the 10 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

(2) Position the camshaft into the cylinder head.

(3) Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 thru 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.

(4) Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward (Fig. 27).

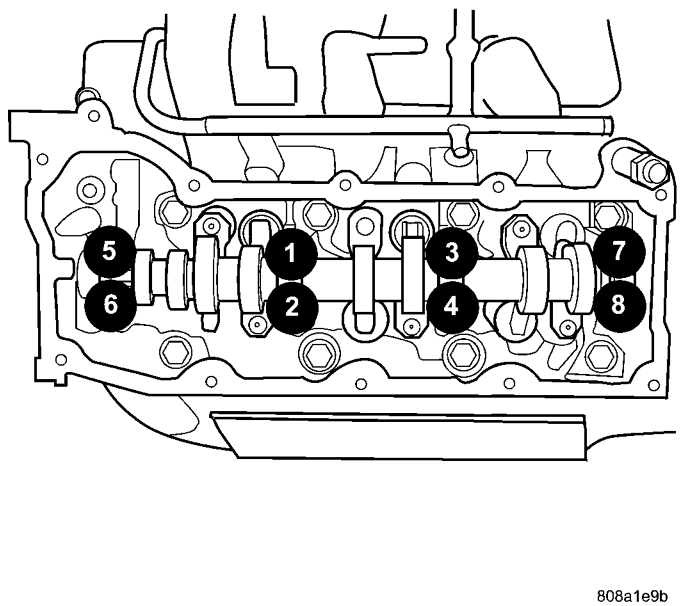


Fig. 27 Camshaft Bearing Caps Tightening Sequence

(5) Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).

(6) Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal).

(7) Using Special Tool 8428 Camshaft Wrench, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket . Install the sprocket onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt overtorque resulting in bolt failure.

(8) Remove excess oil from camshaft sprocket bolt, then install the camshaft sprocket retaining bolt and hand tighten.

(9) Remove timing chain wedge special tool 8379.

(10) Using Special Tool 6958 spanner wrench with adapter pins 8346, torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).

(11) Install the camshaft position sensor.

(12) Install the cylinder head cover.

CYLINDER HEAD COVER(S)

REMOVAL

(1) Disconnect battery negative cable.
(2) Remove air cleaner assembly, resonator assembly and air inlet hose.
(3) Drain cooling system, below the level of the heater hoses(Refer to 7 - COOLING - STANDARD PROCEDURE).
(4) Remove accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(5) Remove air conditioning compressor retaining bolts and move compressor to the left.
(6) Remove heater hoses.
(7) Disconnect injector and ignition coil connectors.
(8) Disconnect and remove positive crankcase ventilation (PCV) hose.
(9) Remove oil fill tube.
(10) Un-clip injector and ignition coil harness and move away from cylinder head cover.
(11) Remove right rear breather tube and filter assembly.
(12) Remove cylinder head cover retaining bolts.
(13) Remove cylinder head cover.

INSTALLATION

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

(1) Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
(2) Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs).
(3) Install right rear breather tube and filter assembly.
(4) Connect injector, ignition coil electrical connectors and harness retaining clips.
(5) Install the oil fill tube.
(6) Install PCV hose.
(7) Install heater hoses.
(8) Install air conditioning compressor retaining bolts.
(9) Install accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(10) Fill Cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
(11) Install air cleaner assembly, resonator assembly and air inlet hose.
(12) Connect battery negative cable.

INTAKE/EXHAUST VALVES & SEATS

STANDARD PROCEDURE - REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(1) Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).
(2) Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
(3) When the seat is properly positioned the width of the intake seat must be 1.75 – 2.36 mm (0.0689 – 0.0928 in.) and the exhaust seat must be 1.71 – 2.32 mm (0.0673 – 0.0911 in.).
(4) Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 40.74 mm (1.6039 in.).
(5) The valve seat and valve face must maintain a face angle of 44.5 – 45 degrees angle (Fig. 28).

REMOVAL

NOTE: The cylinder heads must be removed in order to perform this procedure.

(1) Remove rocker arms and lash adjusters. Refer to procedures in this section (Fig. 29).
(2) Remove the camshaft bearing caps and the camshaft.

NOTE: All six valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

(3) Using Special Tool C-3422–B or C-3422–C Valve Spring Compressor and Special tool 8519 Adapter, compress the valve spring.

INTAKE/EXHAUST VALVES & SEATS (Continued)

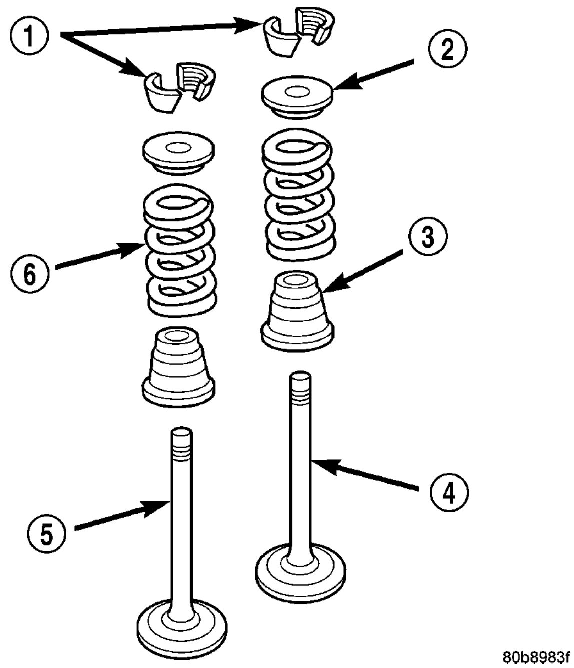


Fig. 28 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

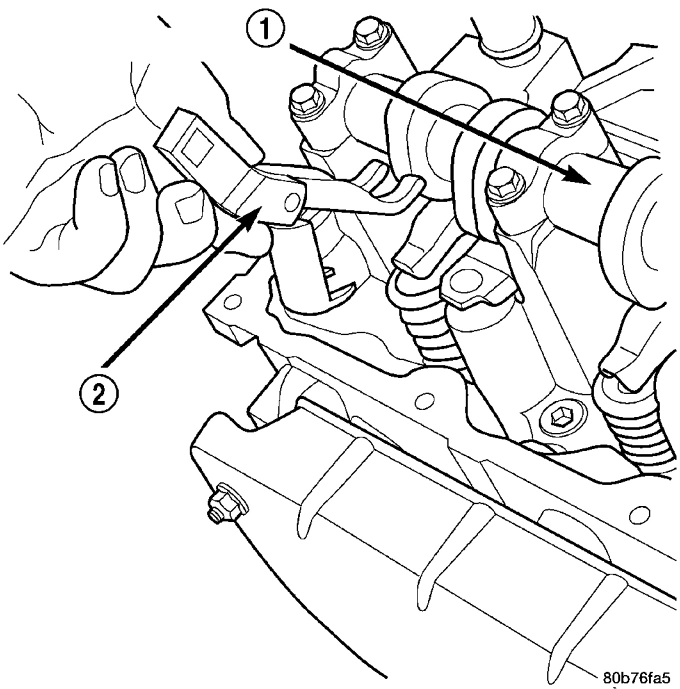


Fig. 29 Rocker Arm Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

(4) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(5) Remove the valve spring compressor.
(6) Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

(7) Remove the valve from the cylinder head.

NOTE: The valve stem seals are common between intake and exhaust.

(8) Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

Inspect the valve springs for physical signs of wear or damage. Turn table of tool C-647 until surface is in line with the 40.12 mm (1.579 in.) mark on the threaded stud and the zero mark on the front. Place spring over the stud on the table and lift compressing lever to set tone device. Pull on torque wrench until Ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Specifications Section to obtain specified height and allowable tensions. Replace any springs that do not meet specifications (Fig. 30).

INSTALLATION

(1) coat the valve stem with clean engine oil and insert it into the cylinder head.
(2) Install the valve stem seal. make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
(3) Install the spring and the spring retainer.
(4) Using the valve spring compressor, compress the spring and install the two valve spring retainer halves (Fig. 31).
(5) Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated.

INTAKE/EXHAUST VALVES & SEATS (Continued)

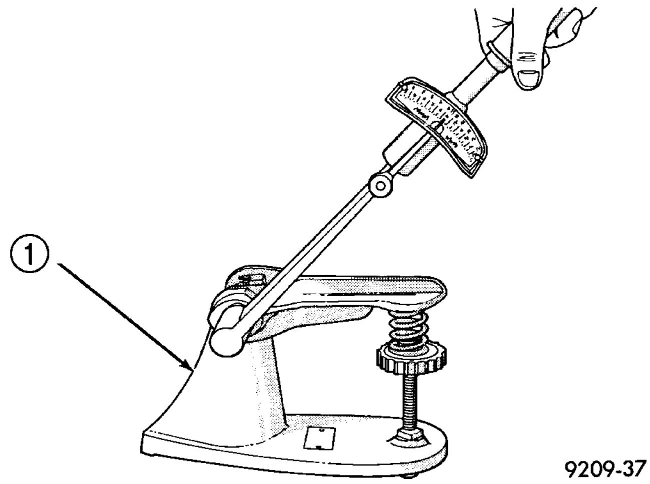


Fig. 30 Testing Valve Springs

1 - SPECIAL TOOL C-647

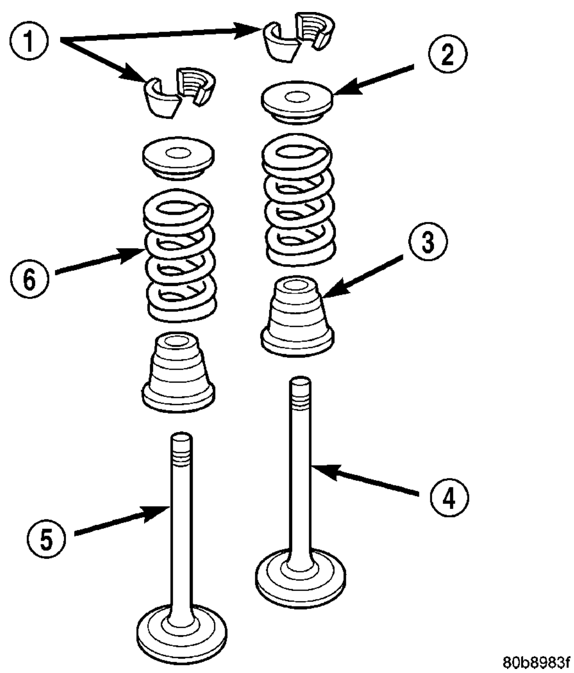


Fig. 31 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

(6) lubricate the camshaft journal with clean engine oil then Position the camshaft (with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock), then position the camshaft bearing caps.

(7) Install the camshaft bearing cap retaining bolts. Tighten the bolts 9–13 N·m (100 in. lbs.) in ½ turn increments in the sequence shown (Fig. 32).

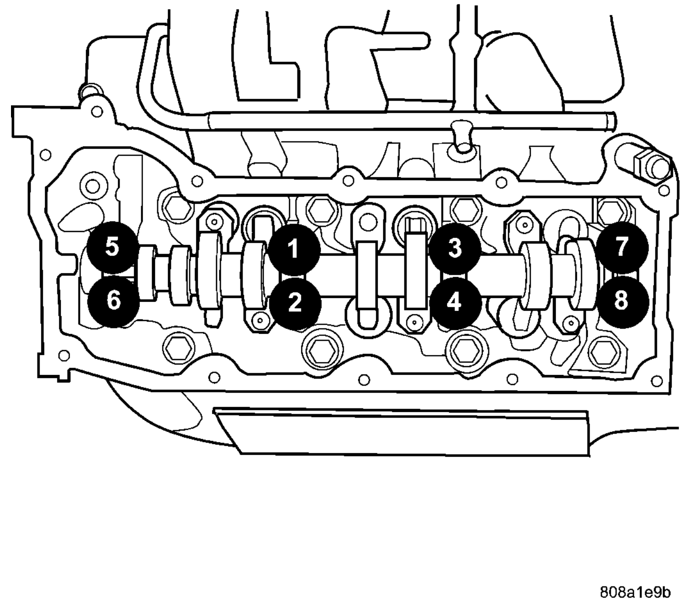


Fig. 32 Camshaft Bearing Caps Tightening Sequence

(8) Position the hydraulic lash adjusters and rocker arms.

ROCKER ARM

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.11 inch) oil hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

(1) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) For rocker arm removal on cylinder #4, Rotate the crankshaft until cylinder #1 is at BDC intake stroke.

(3) For rocker arm removal on cylinder #1, Rotate the crankshaft until cylinder #1 is at BDC combustion stroke.

(4) For rocker arm removal on cylinders #3 and #5, Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(5) For rocker arm removal on cylinders #2 and #6, Rotate the crankshaft until cylinder #1 is at TDC ignition stroke.

ROCKER ARM (Continued)

(6) Using special tool 8516 Rocker Arm Remover, press downward on the valve spring, remove rocker arm (Fig. 33).

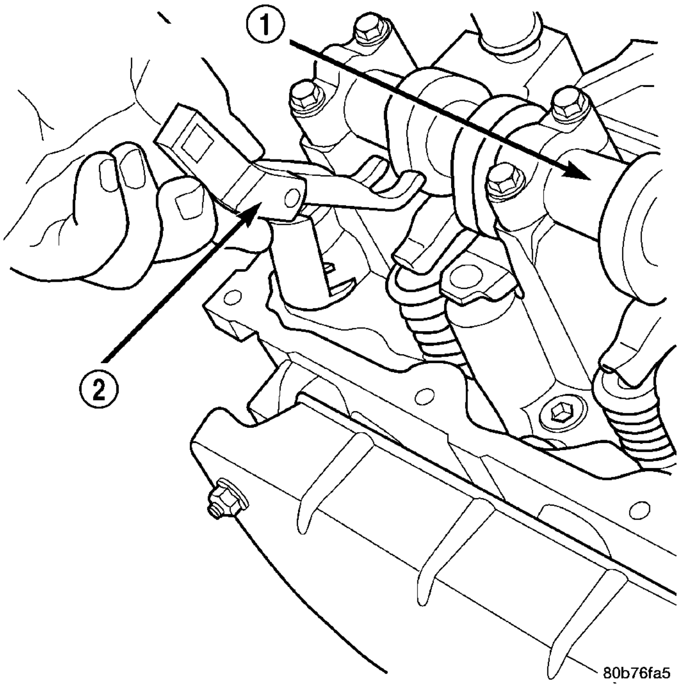


Fig. 33 Rocker Arm - Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

INSTALLATION

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

(1) For rocker arm installation on cylinders #4, Rotate the crankshaft until cylinder #1 is at BDC intake stroke.
(2) For rocker arm installation on cylinder #1, Rotate the crankshaft until cylinder #1 is at BDC combustion stroke.
(3) For rocker arm installation on cylinders #3 and #5, Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.
(4) For rocker arm installation on cylinders #2 and #6, Rotate the crankshaft until cylinder #1 is at TDC ignition stroke.
(5) Using special tool 8516 press downward on the valve spring, install rocker arm (Fig. 34).

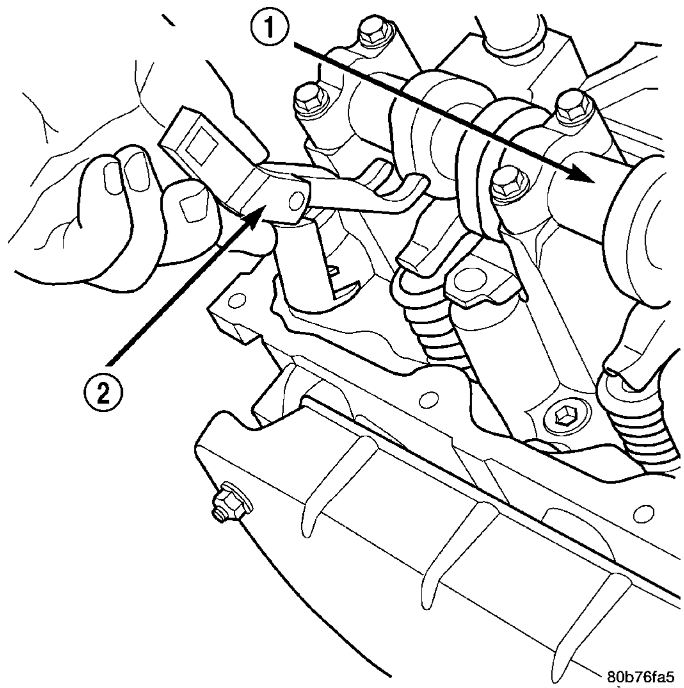


Fig. 34 Rocker Arm - Installation

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

(6) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVE GUIDE SEALS

DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

VALVE SPRINGS

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. There are different springs for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

(1) Remove the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
(2) Using Special Tool 8516 Valve Spring Compressor, remove the rocker arms and the hydraulic lash adjusters.

VALVE SPRINGS (Continued)

(3) Remove the spark plug for the cylinder the valve spring and seal are to be removed from.

(4) Apply shop air to the cylinder to hold the valves in place when the spring is removed.

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

(5) Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

(6) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(7) Remove the valve spring compressor.

NOTE: The valve springs are NOT common between intake and exhaust.

(8) Remove the spring retainer, and the spring.

(9) Remove the valve stem seal.

NOTE: The valve stem seals are common between intake and exhaust.

INSTALLATION

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

(1) Apply shop air to the cylinder to hold the valves in place while the spring is installed.

NOTE: The valve stem seals are common between intake and exhaust.

(2) Install the valve stem seal.

NOTE: The valve springs are NOT common between intake and exhaust.

(3) Install the spring retainer, and the spring.

(4) Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

(5) Install the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(6) Remove the valve spring compressor.

(7) Disconnect the shop air to the cylinder.

(8) Install the spark plug for the cylinder the valve spring and seal was installed on.

(9) Using Special Tool 8516 Valve Spring Compressor, install the rocker arms and the hydraulic lash adjusters.

(10) Install the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

ENGINE BLOCK

DESCRIPTION

The cylinder block is made of cast iron. The block is a closed deck design with the left bank forward. To provide high rigidity and improved NVH an enhanced compacted graphite bedplate (Fig. 35) is bolted to the block. The block design allows coolant flow between the cylinders bores, and an internal coolant bypass to a single poppet inlet thermostat is included in the cast aluminum front cover.

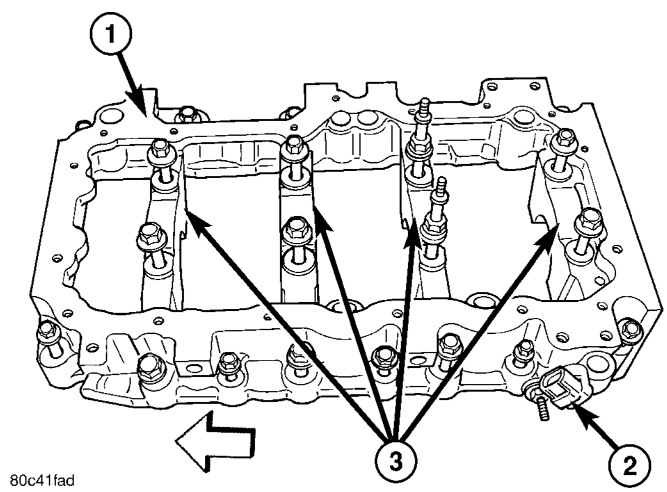


Fig. 35 Cylinder Block Bedplate

1 - CYLINDER BLOCK BEDPLATE
2 - CRANKSHAFT POSITION SENSOR
3 - CRANKSHAFT MAIN BEARING CAPS

STANDARD PROCEDURE - CYLINDER BORE HONING

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

ENGINE BLOCK (Continued)

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880, or a light honing oil, available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings (Fig. 36).

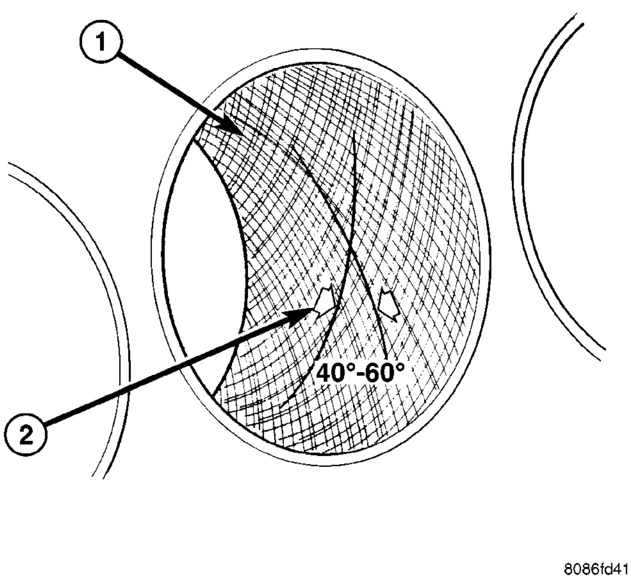


Fig. 36 Cylinder Bore Crosshatch Pattern

1 - CROSSHATCH PATTERN
2 - INTERSECT ANGLE

(4) A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 34 N·m (25 ft. lbs.) torque.

INSPECTION

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer (Fig. 37).

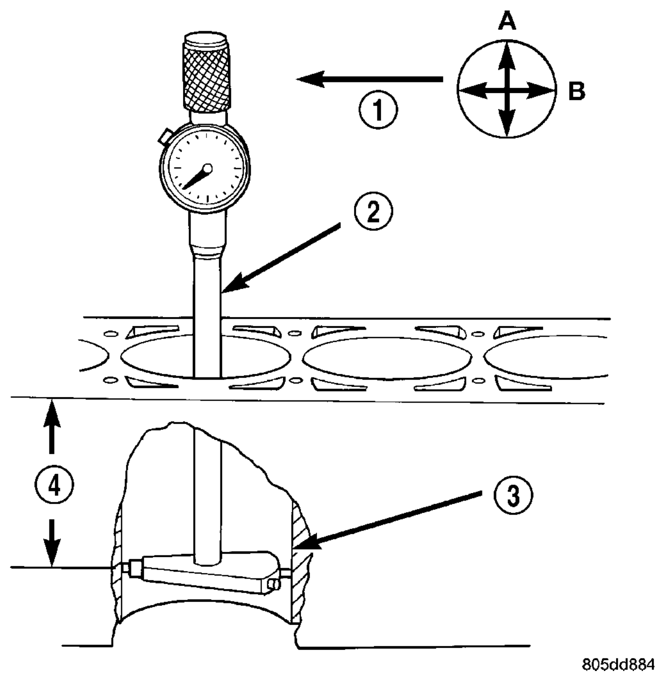


Fig. 37 Bore Gauge—Typical

1 - FRONT
2 - BORE GAUGE
3 - CYLINDER BORE
4 - 38 MM
(1.5 in)

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

ENGINE BLOCK (Continued)

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

(6) Determine out-of-roundness by comparing the difference between each measurement.

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

CRANKSHAFT

DESCRIPTION

The crankshaft (Fig. 38) is constructed of nodular cast iron. The crankshaft is a three throw split pin design with six counterweights for balancing purposes. The crankshaft is supported by four select fit main bearings with the number two serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The number six counterweight has provisions for crankshaft position sensor target wheel mounting. The select fit main bearing markings are located on the rear side of the target wheel. The crankshaft oil seals are one piece design. The front oil seal is retained in the timing chain cover, and the rear seal is pressed in to a bore formed by the cylinder block and the bedplate assembly.

REMOVAL

NOTE: To remove the crankshaft from the engine, the engine must be removed from the vehicle.

(1) Remove the engine(Refer to 9 - ENGINE - REMOVAL).

(2) Remove the engine oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when removing oil pan. Gasket can not be removed with oil pan.

(3) Remove the bedplate mounting bolts. Note the location of the two stud bolts for installation.

(4) Remove the connecting rods from the crankshaft.

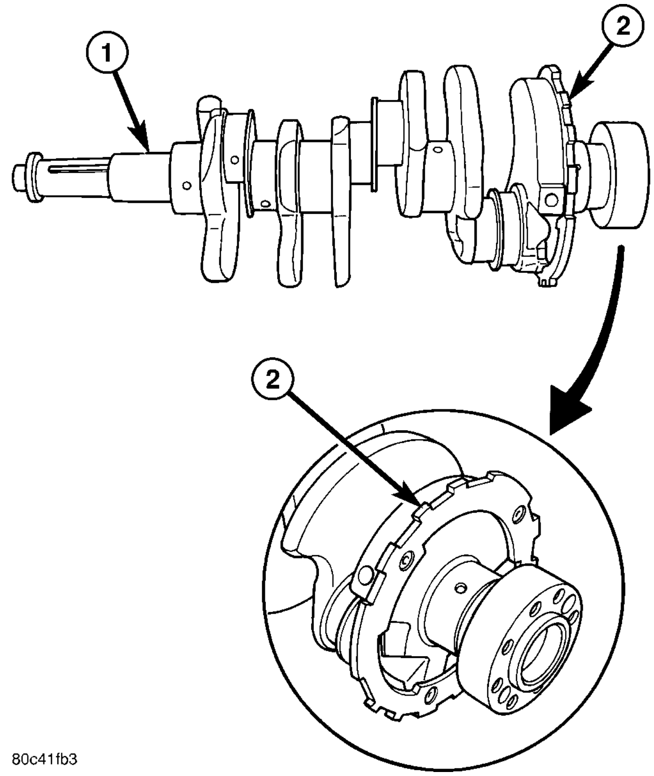


Fig. 38 Crankshaft and Target Ring

1 - CRANKSHAFT
2 - CRANKSHAFT POSITION SENSOR TARGET RING

CAUTION: The bedplate to cylinder block mating surface is a critical sealing surface. Do not pry on or damage this surface in anyway.

NOTE: The bedplate contains the lower main bearing halves. Use care when handling bedplate as not to drop or damage bearing halves. Installing main bearing halves in the wrong position will cause severe damage to the crankshaft.

NOTE: The bedplate has pry points cast into it. Use these points only. The pry points are shown below.

(5) Carefully pry on the pry points (Fig. 39) to loosen the bedplate then remove the bedplate.

CAUTION: When removing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

(6) Remove the crankshaft.

(7) Remove the crankshaft tone wheel.

CRANKSHAFT (Continued)

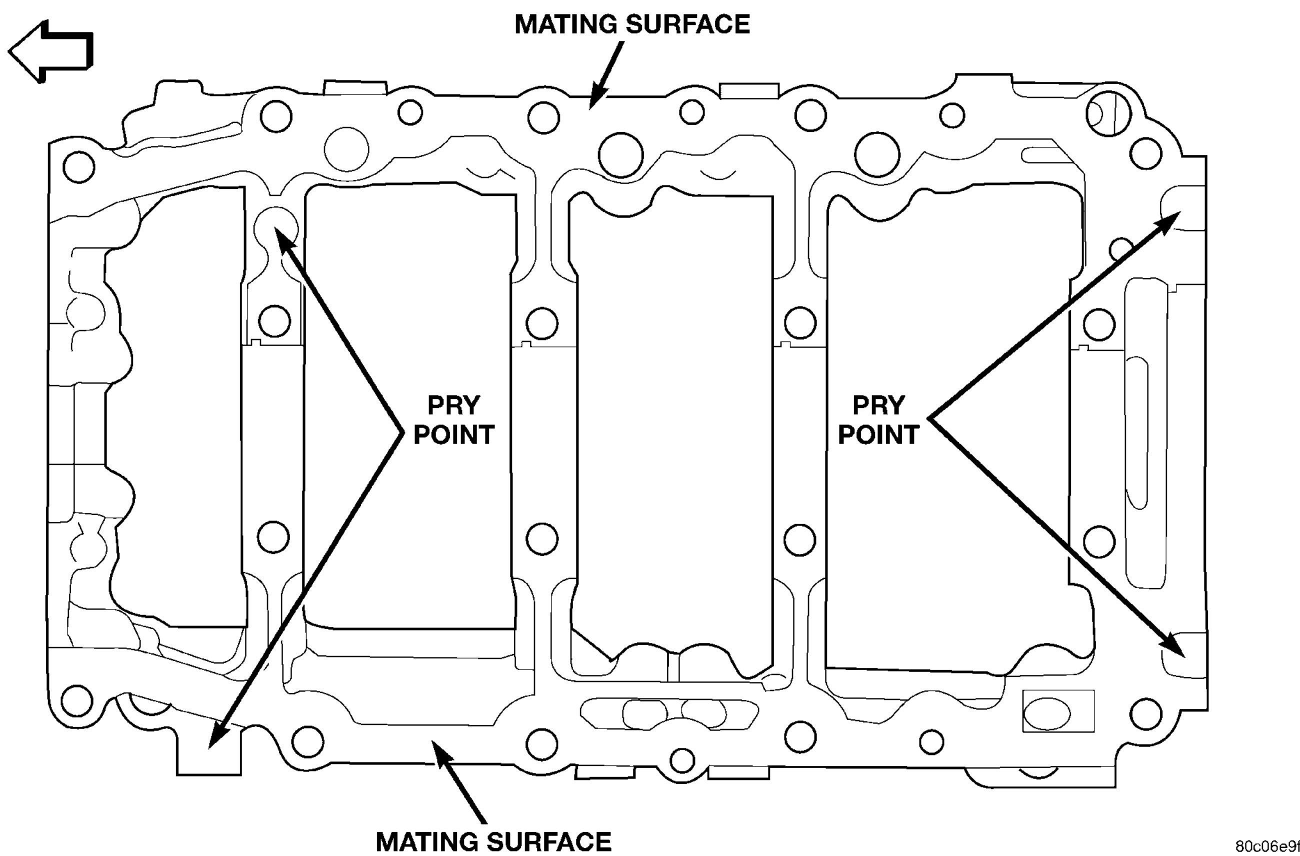


Fig. 39 BEDPLATE PRY POINT LOCATION

INSPECTION

NOTE: Thoroughly inspect the connecting rod bearing bores and main bearing bores for scoring, blueing or severe scratches. Further disassembly may be required.

If connecting rod bearing bores show damage, the cylinder heads must be removed to service the piston and rod assemblies. If the bedplate or the cylinder block main bearing bores show damage the engine must be replaced.

(1) If required, remove the main bearing halves from the cylinder block and bedplate.

(2) Thoroughly clean the bedplate to cylinder block sealing surfaces and main bearing bores. Remove all oil and sealant residue.

(3) Inspect the bedplate main bearing bores for cracks, scoring or severe blueing. If either condition exists the engine must be replaced.

(4) Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing. If either condition exist replace the thrust washer.

(5) Inspect the oil pan gasket/windage tray for splits, tears or cracks in the gasket sealing surfaces. Replace gasket as necessary.

INSTALLATION

CAUTION: Main bearings are select fit. Refer to Crankshaft Main Bearings in this section for proper bearing selections.

CAUTION: When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

NOTE: Apply sealant to the tone wheel retaining screws prior to installation.

(1) Lubricate upper main bearing halves with clean engine oil.

(2) Install the crankshaft tone wheel. Torque the mounting screws to 15 N·m (11 ft. lbs.).

(3) Position crankshaft in cylinder block.

(4) Install the thrust washers (Fig. 40).

CAUTION: The bedplate to cylinder block mating surface must be coated with Mopar® Engine RTV sealant prior to installation. Failure to do so will cause severe oil leaks.

CRANKSHAFT (Continued)

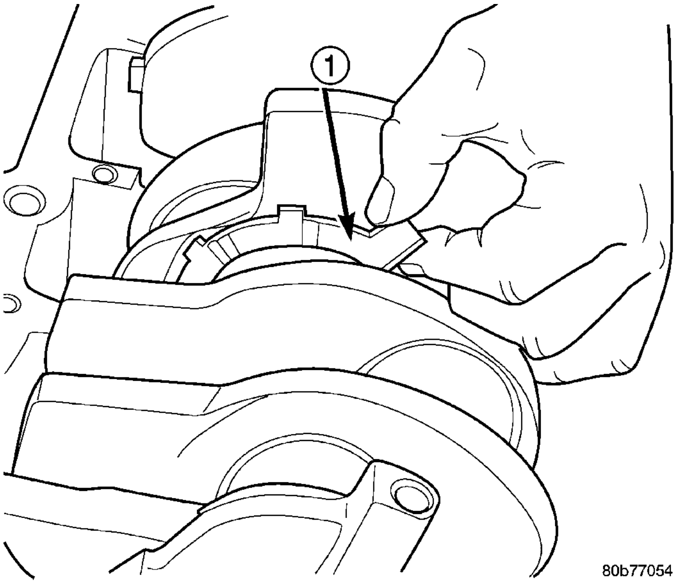


Fig. 40 Crankshaft Thrust Washer Installation

1 - CRANKSHAFT THRUST WASHER

NOTE: Make sure that the bedplate and cylinder block sealing surfaces are clean and free of oil or other contaminants. Contaminants on the sealing surfaces may cause main bearing distortion and/or oil leaks.

(5) Apply a 2.5mm (0.100 inch) bead of Mopar® Engine RTV sealant to the cylinder block-to-bedplate mating surface as shown (Fig. 41).

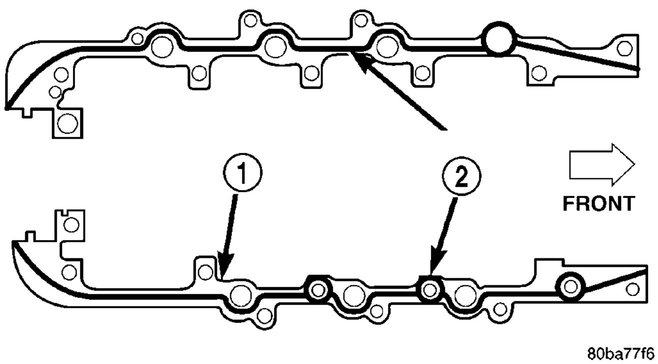


Fig. 41 Cylinder Block-to-Bedplate Sealant Bead Location

1 - CYLINDER BLOCK
2 - SEALANT BEAD LOCATION

(6) Coat the crankshaft main bearing journals with clean engine oil and position the bedplate onto the cylinder block.

NOTE: Lubricate the bedplate retaining bolts with clean engine oil prior to installation.

(7) Install the bedplate retaining bolts, making sure to place the stud bolts in the correct location, Torque the bolts in the sequence shown (Fig. 42).

- Hand tighten bolts **1D, 1G and 1F** until the bedplate contacts the block.
- Tighten bolts **1A–1J** to 54 N·m (40 ft. lbs.)
- Tighten bolts **1–8** to 7 N·m (5 ft. lbs.)
- Turn bolts **1–8** an additional 90°.
- Tighten bolts **A–E** 27 N·m (20 ft. lbs.).

(8) Measure crankshaft end play. Refer to Crankshaft Main Bearings in this section for procedure.

(9) Install the connecting rods and measure side clearance. Refer to Connecting Rod Bearings in this section for procedure.

(10) Position the oil pan gasket/windage tray, using a new o-ring, install the oil pickup tube. Torque the bolt to 28N·n (20 ft. lbs.) torque the nuts to 28N·m (20 ft. lbs.).

(11) Install the oil pan. Torque the retaining bolts to 15 N·m (11 ft. lbs.) in the sequence shown.

(12) Install the engine.

CRANKSHAFT MAIN BEARINGS

STANDARD PROCEDURE

MAIN BEARING - FITTING

SELECT FIT IDENTIFICATION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft position sensor target wheel has grade identification marks stamped into it (Fig. 43). These marks are read from left to right, corresponding with journal number 1, 2, 3, 4. The crankshaft position sensor target wheel is mounted to the number 6 counter weight on the crankshaft.

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block. Refer to CRANKSHAFT.

Clean the oil off the main bearing journal.

CRANKSHAFT MAIN BEARINGS (Continued)

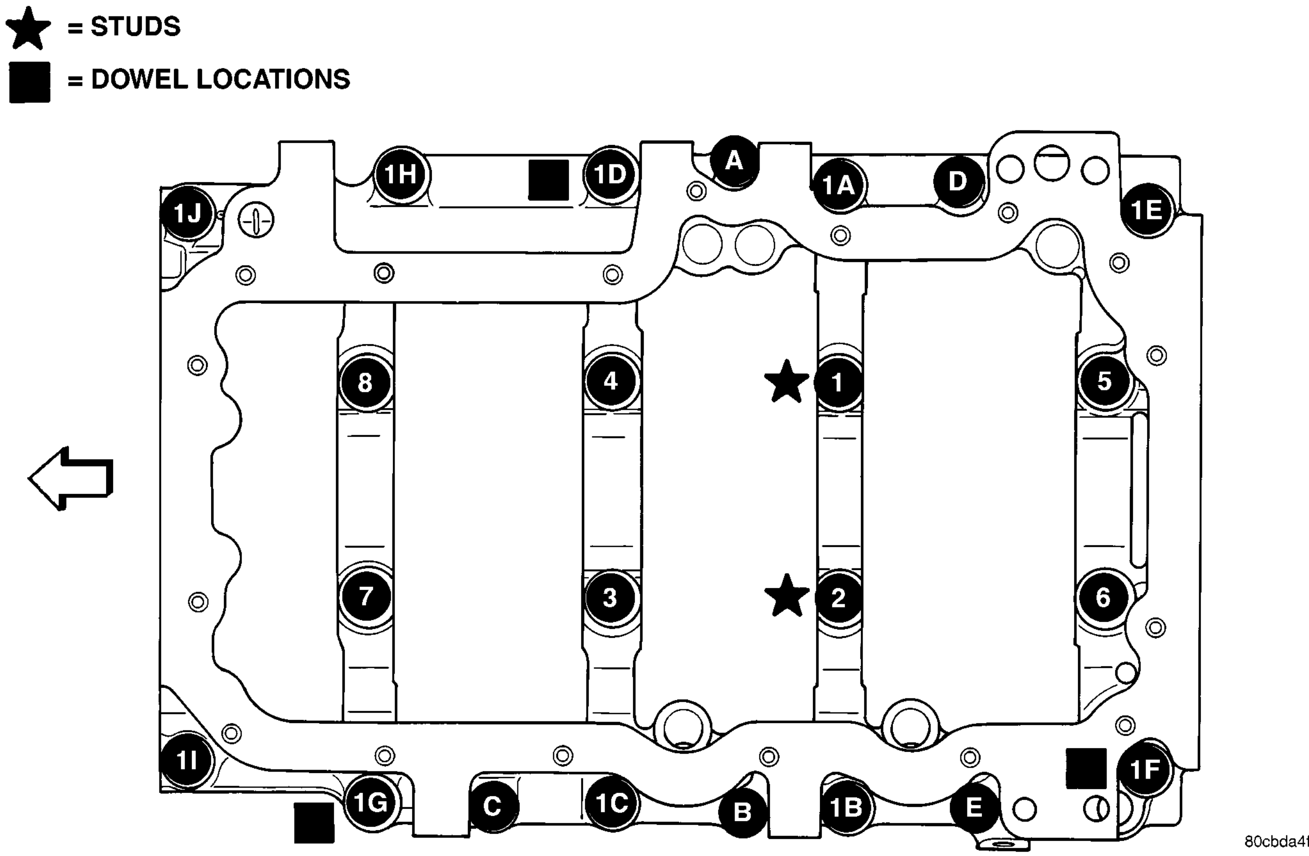


Fig. 42 BEDPLATE TIGHTENING SEQUENCE

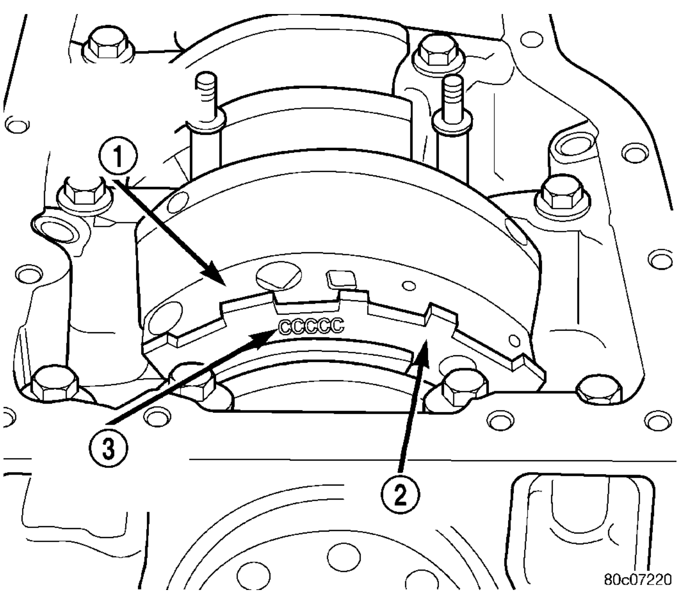


Fig. 43 Main Bearing Markings on Target Wheel -Typical

1 - REARMOST CRANKSHAFT COUNTER WEIGHT
2 - TARGET WHEEL
3 - MAIN BEARING SELECT FIT MARKINGS

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Install the crankshaft into the cylinder block. Refer to CRANKSHAFT.

Check crankshaft end play. Refer to CHECKING CRANKSHAFT END PLAY.

CRANKSHAFT MAIN BEARINGS (Continued)

CRANKSHAFT MAIN BEARING SELECTION

(1) Service main bearings are available in four grades. The chart below identifies the four service grades available.

Crankshaft MARKING	JOURNAL SIZE SIZE mm (in.)	
″R″ Size	63.488 - 63.496 mm (2.4995 - 2.4998 in.)	
″S″ Size	63.496 - 63.500 mm (2.4998 - 2.4999 in.)	
″T″ Size	63.500 - 63.504 mm (2.4999 - 2.501 in.)	
″U″ Size	63.504 - 63.512 mm (2.5001 - 2.5004 in.)	
Bearing size		
Bearing Code	Size	Application
Upper Bearing		
A	.2.443 - 2.447 mm (.0961 - .0963 in.)	Use with crankshaft size ″R″
B	2.439 - 2.443 mm (0.960 - .0961 in.)	Use with crankshaft ″S, T″
C	2.435 - 2.439 mm (.0958 - .0960 in.)	Use with crankshaft ″U″
Lower Bearing Main ″1″ and ″4″		
″1″	2.441 - 2.447 mm (.0961 -.0963 in.)	Use with crankshaft ″R, S″
″2″	2.435 - 2.441 mm (.0958 - .0962 in.)	Use with crankshaft ″T, U″
Lower Main Bearing ″2″ and ″3″		
″3″	2.429 - 2.435 mm (.0956 - .0958 in.)	Use with crankshaft ″R, S″
″4″	2.423 - 2.429 mm (.0953 - .0956 in.)	Use with crankshaft ″T, U″

Crankshaft MARKING	JOURNAL SIZE SIZE mm (in.)
Bearing Clearances	
Main ″1, 4″	
Crankshaft ″R″	.004 - .034 mm (.00015 - .0013 in.)
Crankshaft ″S″	.004 - .030 mm (.00015 - .0011 in.)
Crankshaft ″T″	.006 - .032 mm (.0002 - .0012 in.)
Crankshaft ″U″	.002 - .032 mm (.00007 -. 0012 in.)
Main ″2, 3″	
Crankshaft ″R″	.016 - .046 mm (.0006 - .0018 in.)
Crankshaft ″S″	.016 - .042 mm (.00062 - .016 in.)
Crankshaft ″T″	.018 - .044 mm (.0007 - .0017 in.)
Crankshaft ″U″	.014 - .044 mm (.0005 - .0017 in.)

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(3) Remove A/C compressor mouning fasteners and set aside.
(4) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(5) Remove upper radiator hose.
(6) Disconnect electrical connector for fan mounted inside radiator shroud.
(7) Remove radiator shroud attaching fasteners.
(8) Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

CRANKSHAFT OIL SEAL - FRONT (Continued)

(9) Remove crankshaft damper bolt.

(10) Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (Fig. 44).

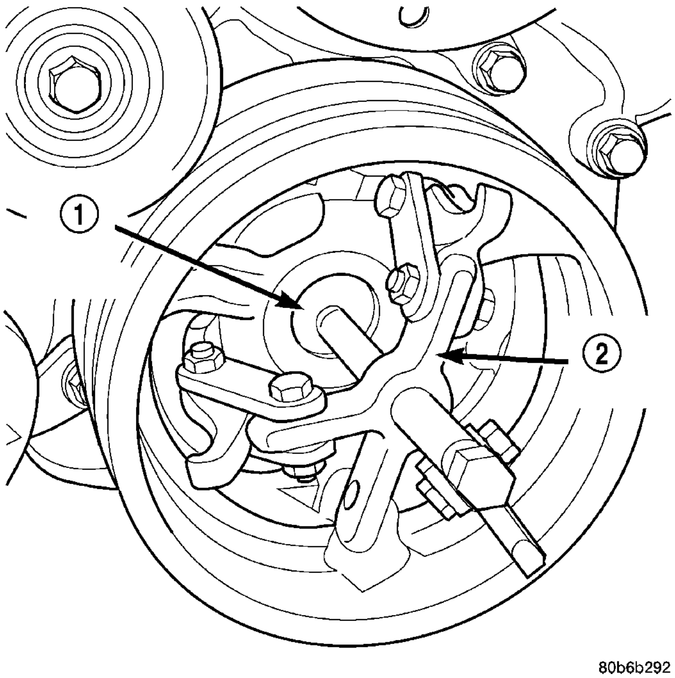


Fig. 44 Crankshaft Damper — Removal

1 - SPECIAL TOOL 8513 INSERT
2 - SPECIAL TOOL 1026

(11) Using Special Tool 8511, remove crankshaft front seal (Fig. 45).

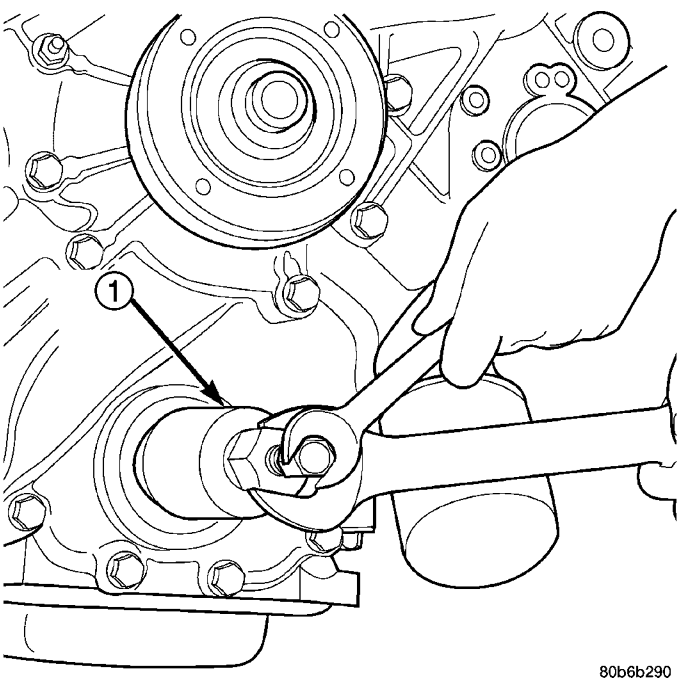


Fig. 45 Crankshaft Front Seal Removal

1 - SPECIAL TOOL 8511

INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

(1) Using Special Tool 8348 and 8512, install crankshaft front seal (Fig. 46).

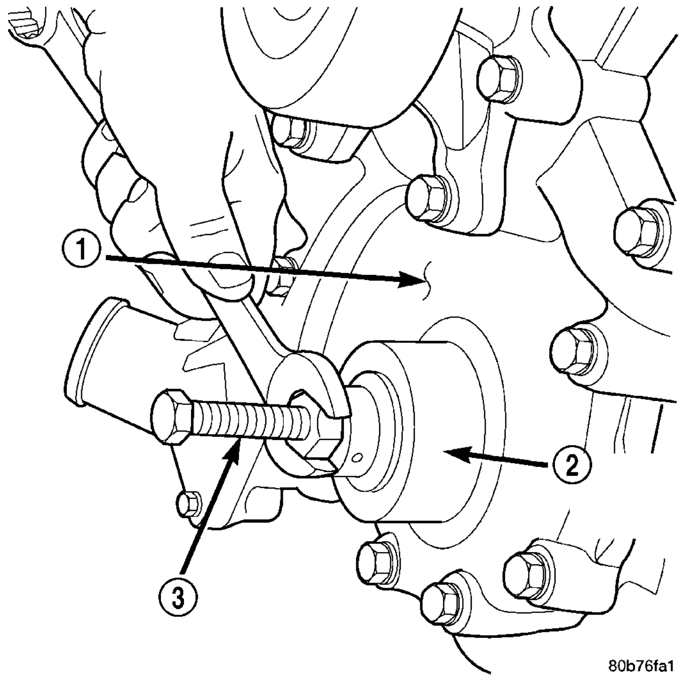


Fig. 46 Crankshaft Front Seal Installation

1 - TIMING CHAIN COVER
2 - SPECIAL TOOL 8348
3 - SPECIAL TOOL 8512

(2) Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(3) Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(4) Install upper radiator hose.

(5) Install A/C compressor and tighten fasteners to 54 N·m (40 ft. lbs.).

(6) Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(7) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(8) Connect negative cable to battery.

CRANKSHAFT OIL SEAL - REAR

REMOVAL

NOTE: This procedure can be performed in vehicle.

(1) If being preformed in vehicle, remove the transmission.

(2) Remove the flexplate (Refer to 9 - ENGINE/ ENGINE BLOCK/FLEX PLATE - REMOVAL).

NOTE: The crankshaft oil seal CAN NOT be reused after removal.

NOTE: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.

(3) Using Special Tool 8506 (Fig. 47), remove the crankshaft rear oil seal.

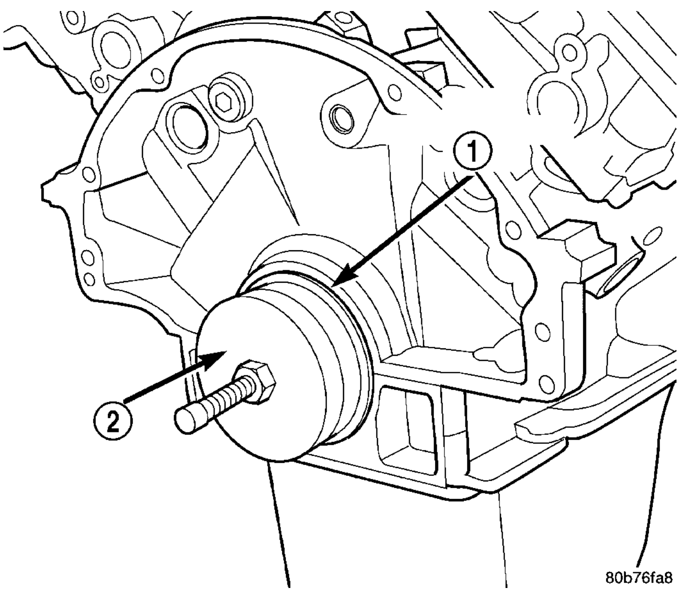


Fig. 47 Crankshaft Rear Oil Seal Removal

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8506

INSTALLATION

(1) Position the magnetic seal guide Special Tool 8349–2 (Fig. 48) onto the crankshaft rear face. Then position the crankshaft rear oil seal onto the guide.

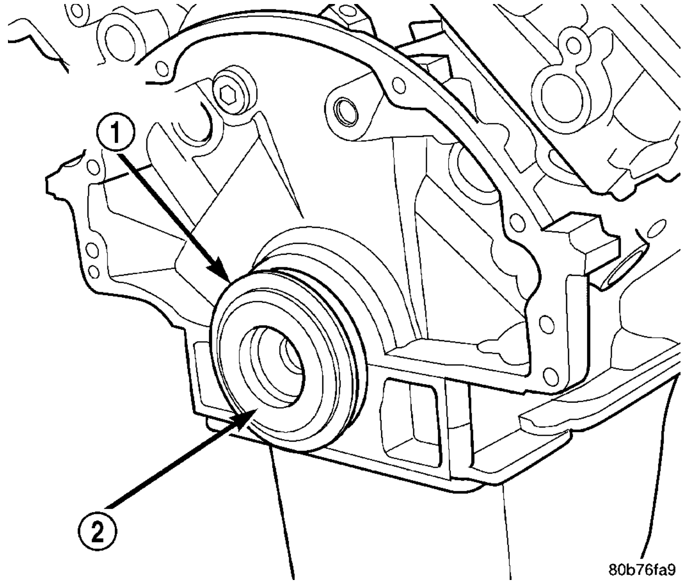


Fig. 48 Crankshaft Rear Oil Seal Guide Special Tool 8349–2 and Oil

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349–2 GUIDE

(2) Using Special Tools 8349 Crankshaft Rear Oil Seal Installer and C-4171 Driver Handle (Fig. 49), with a hammer, tap the seal into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.

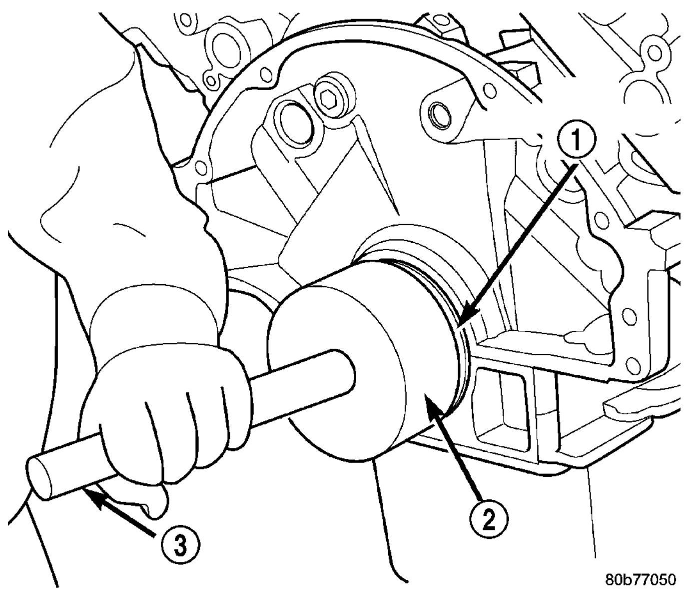


Fig. 49 Crankshaft Rear Oil Seal Installation

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349–1 INSTALLER
3 - SPECIAL TOOL C-4171 HANDLE

(3) Install the flexplate.

(4) Install the transmission.

FLEX PLATE

REMOVAL

(1) Remove the transmission.
(2) Remove the bolts and flexplate.

INSTALLATION

(1) Position the flexplate onto the crankshaft and install the bolts hand tight.
(2) Tighten the flexplate retaining bolts to 95 N·m (70 ft. lbs.) in the sequence shown (Fig. 50).
(3) Install the transmission.

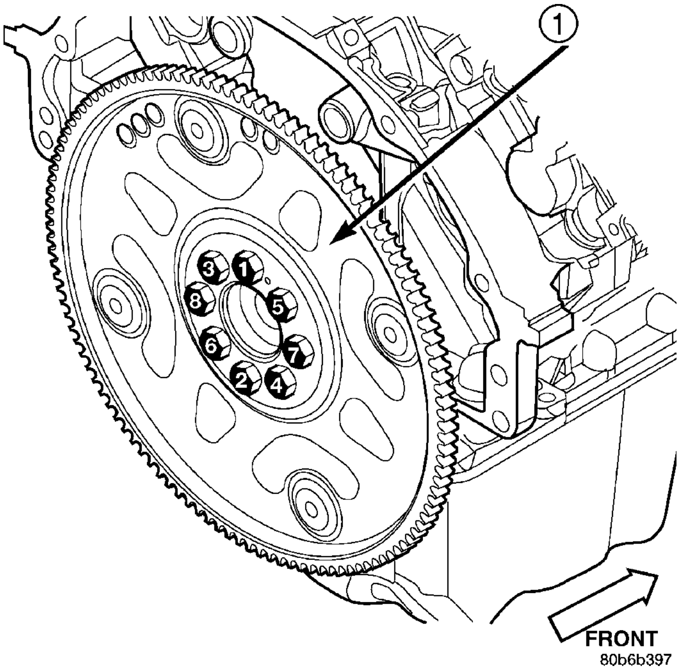


Fig. 50 Flexplate Tightening Sequence

1 - FLEXPLATE

PISTON & CONNECTING ROD

DESCRIPTION

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons are made of a high strength aluminum alloy. The connecting rods are made of forged powdered metal, with a "fractured cap" design. A full floating piston pin is used to attach the piston to the connecting rod (Fig. 51).

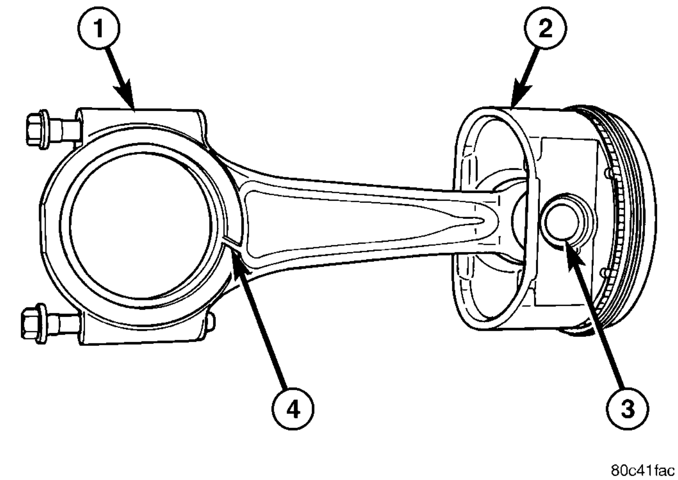


Fig. 51 PISTON AND ROD ASSEMBLY

1 - CONNECTING ROD
2 - PISTON
3 - PISTON PIN
4 - OIL SLINGER SLOT

STANDARD PROCEDURE

CONNECTING ROD BEARING FITTING

Inspect the connecting rod bearings for scoring. Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 52). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs (Fig. 53).

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

(1) Wipe the oil from the connecting rod journal.
(2) Lubricate the upper bearing insert and position in connecting rod. Center bearing insert in connecting rod (Fig. 54)
(3) Use piston ring compressor and Guide Pins Special Tool 8507 (Fig. 55) to install the rod and piston assemblies. The oil slinger slots in the rods must face front of the engine. The "F"'s near the piston wrist pin bore should point to the front of the engine.

PISTON & CONNECTING ROD (Continued)

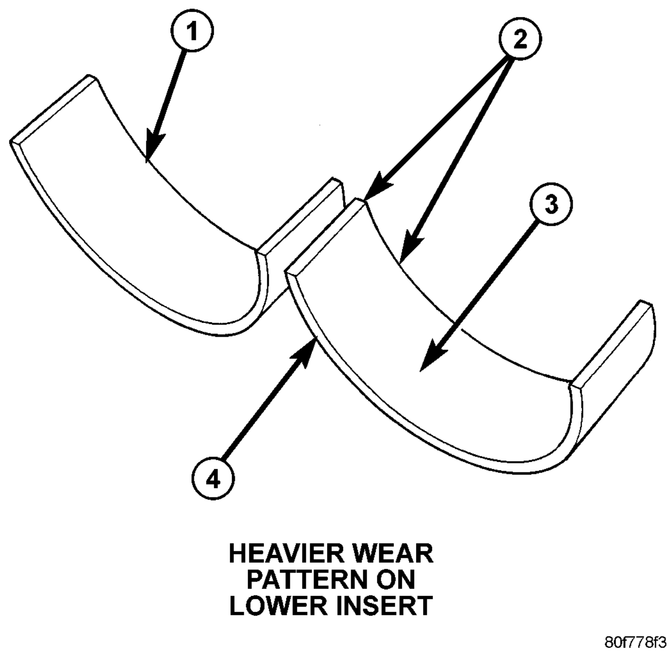


Fig. 52 Connecting Rod Bearing Inspection

1 - UPPER BEARING HALF
2 - MATING EDGES
3 - GROOVES CAUSED BY ROD BOLTS SCRATCHING JOURNAL DURING INSTALLATION
4 - WEAR PATTERN - ALWAYS GREATER ON UPPER BEARING
5 - LOWER BEARING HALF

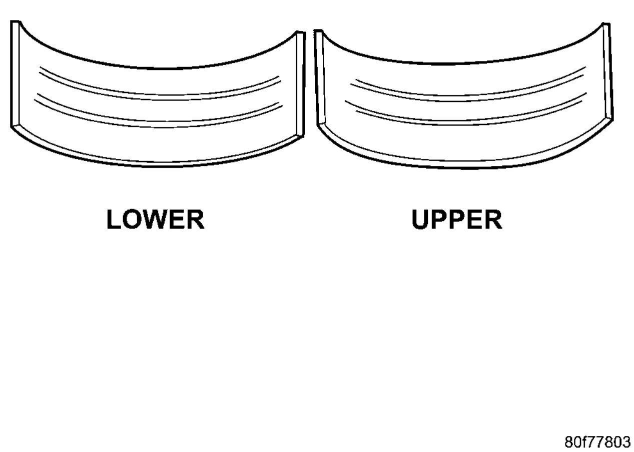


Fig. 53 Scoring Caused by Insufficient Lubrication or Damaged Crankshaft Journal

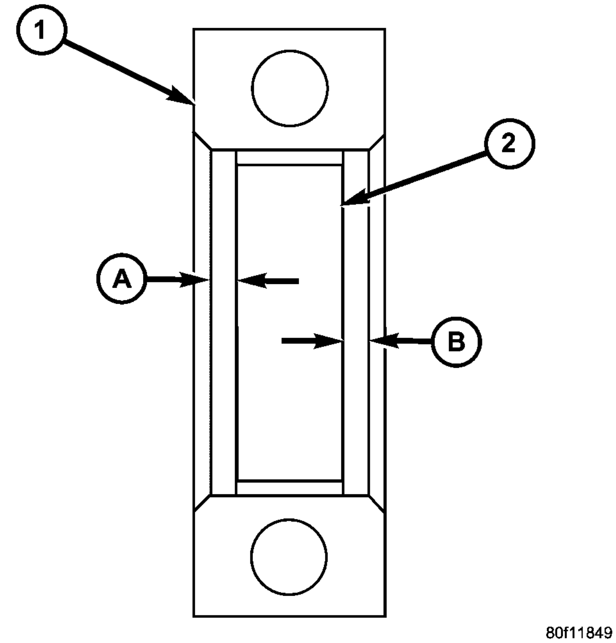


Fig. 54 Bearing Insert Location

1 - CONNECTING ROD
2 - BEARING INSERT
3 - A MINUS B, LESS THEN .50 mm (.0196 in.)

(4) Install the lower bearing insert in the bearing cap. Center bearing insert in connecting rod (Fig. 54). The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(5) Install bearing cap and connecting rod on the journal and tighten bolts to 27 N·m (20 ft. lbs.) plus a 90° turn. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(6) Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (Fig. 56). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

(7) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

PISTON & CONNECTING ROD (Continued)

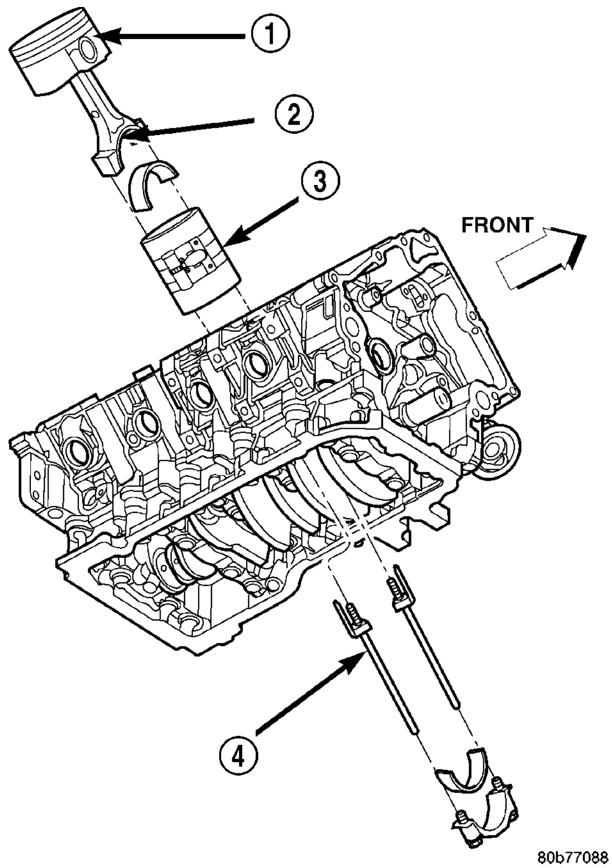


Fig. 55 Piston and Connecting Rod - Installation - Typical

1 - “F” TOWARD FRONT OF ENGINE
2 - OIL SLINGER SLOT
3 - RING COMPRESSOR
4 - SPECIAL TOOL 8507

(8) If bearing-to-journal clearance exceeds the specification, determine which services bearing set to use the bearing sizes are as follows:

Bearing Mark	SIZE	USED WITH JOURNAL SIZE
.025 US	.025 mm (.001 in.)	57.883-57.871 mm (2.2788-2.2783 in.)
Std.	STANDARD	57.908-57.892 mm (2.2798-2.2792 in.)
.250 US	.250 mm (.010 in.)	57.658-57.646 mm (2.27-2.2695 in.)

(9) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(10) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 27 N·m (20 ft. lbs.) plus a 90° turn.

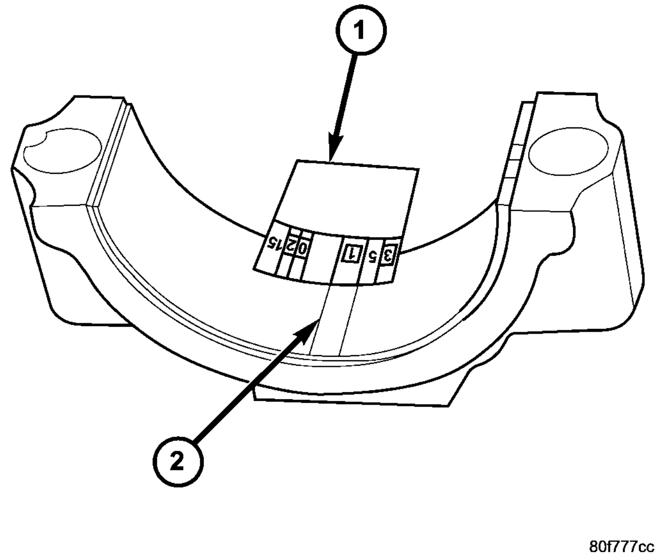


Fig. 56 Measuring Bearing Clearance with Plastigage

1 - PLASTIGAGE SCALE
2 - COMPRESSED PLASTIGAGE

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange (Fig. 57). Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

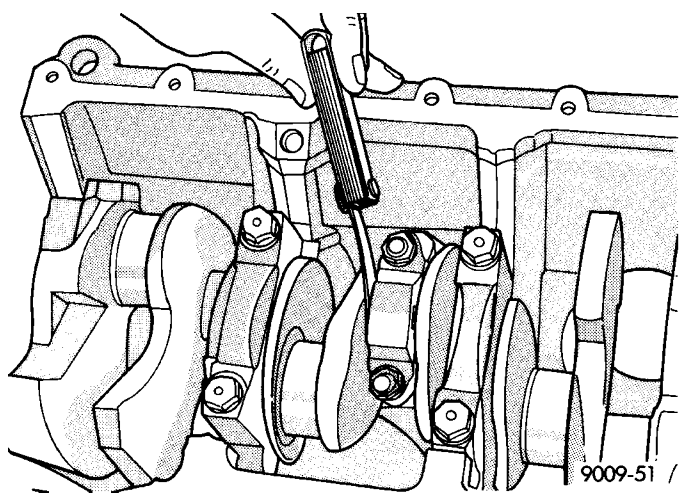


Fig. 57 Checking Connecting Rod Side Clearance - Typical

PISTON & CONNECTING ROD (Continued)

STANDARD PROCEDURE - PISTON FITTING

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 59).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results (Fig. 58). Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

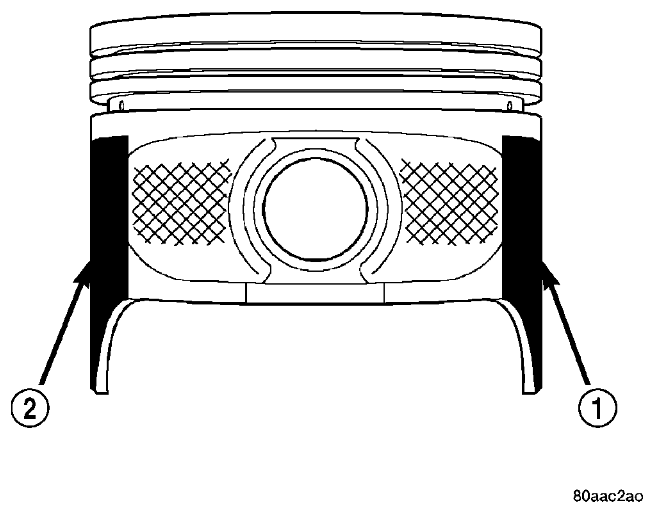


Fig. 58 DO NOT MEASURE MOLY COATED PISTON

1 - MOLY COATED
2 - MOLY COATED

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the following components:

• Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

• Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) -

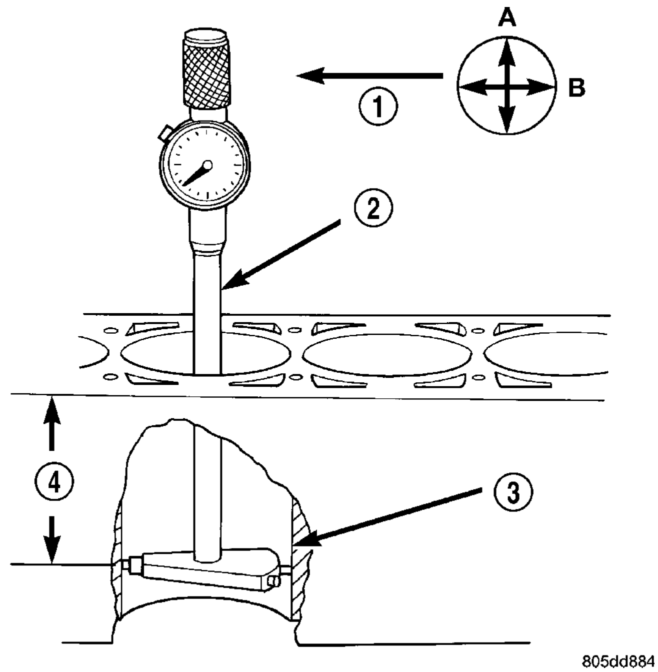


Fig. 59 Bore Gauge - Typical

1 - FRONT
2 - BORE GAUGE
3 - CYLINDER BORE
4 - 38 MM
(1.5 in)

REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

• Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

• Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(3) If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

(4) Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

PISTON & CONNECTING ROD (Continued)

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

(5) Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

(6) Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

(1) Using a suitable cleaning solvent clean the pistons in warm water and towel dry.

(2) Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

(1) Before installing piston and connecting rod assemblies into the bore, install the piston rings.

(2) Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**

(3) Position bearing onto connecting rod. Ensure that tabs in bearing shell aligns with slots in connecting rod. Verify that parting line of bearing is aligned with parting line of connecting rod.

(4) Lubricate bearing surface with clean engine oil.

(5) Install Special Tool 8507 Connecting Rod Guides into connecting rod bolt threads (Fig. 60).

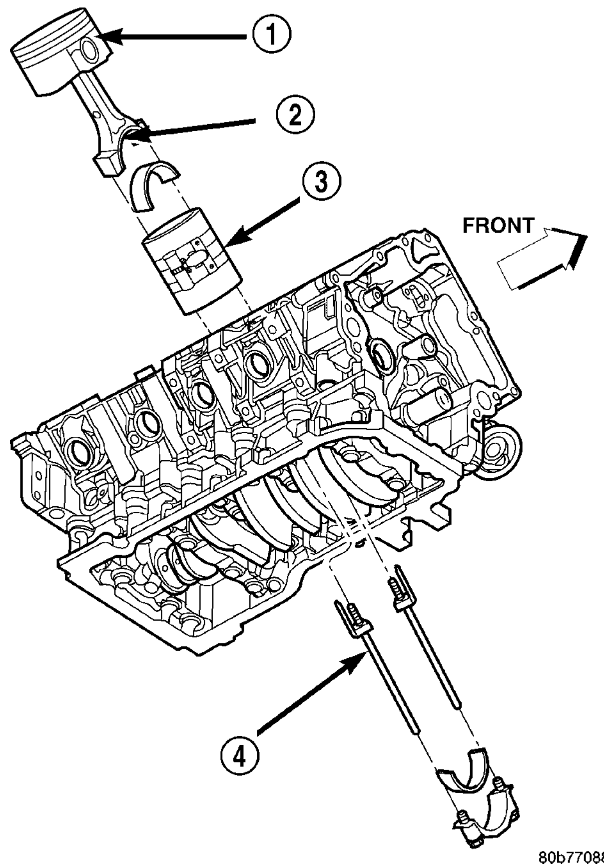


Fig. 60 Piston and Connecting Rod - Installation - Typical

1 - "F" TOWARD FRONT OF ENGINE
2 - OIL SLINGER SLOT
3 - RING COMPRESSOR
4 - SPECIAL TOOL 8507

(6) The pistons are marked on the piston pin bore surface with an raised "F" indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks. The connecting rod oil slinger slot faces the front of the engine (Fig. 61).

(7) Wipe cylinder bore clean and lubricate with engine oil.

(8) Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.

(9) Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

PISTON & CONNECTING ROD (Continued)

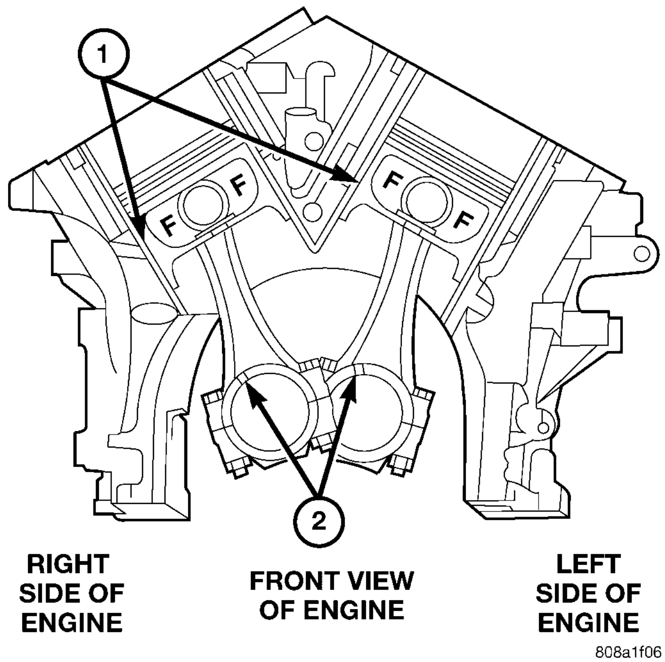


Fig. 61 Piston and Connecting Rod Orientation

1 - MAJOR THRUST SIDE OF PISTON
2 - OIL SLINGER SLOT

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

(10) Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N·m (20 ft. lbs.) plus 90°.

(11) Install the following components:

- Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
- Timing chain and cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
- Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
- Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(12) Fill crankcase with proper engine oil to correct level.

(13) Connect negative cable to battery.

PISTON RINGS

STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

(1) Wipe the cylinder bore clean.

(2) Insert the ring in the cylinder bore.

NOTE: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

(3) Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.

(4) Using a feeler gauge check the ring end gap (Fig. 62). Replace any rings not within specification.

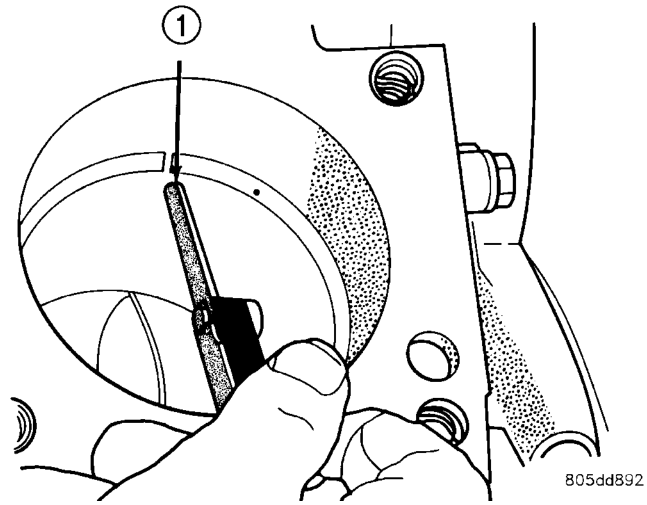


Fig. 62 Ring End Gap Measurement - Typical

1 - FEELER GAUGE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

(5) Measure the ring side clearance as shown (Fig. 63)make sure the feeler gauge fits snugly between the ring land and the ring. Replace any ring not within specification.

(6) Rotate the ring around the piston, the ring must rotate in the groove with out binding.

PISTON RINGS (Continued)

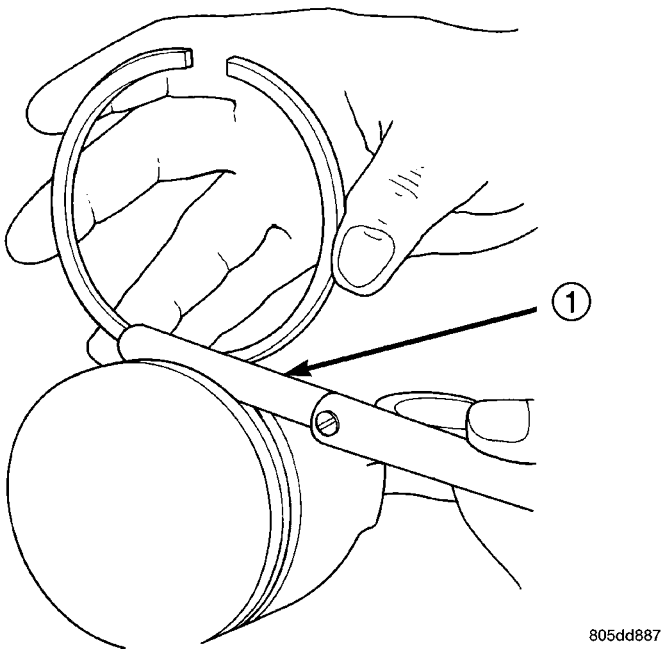


Fig. 63 Measuring Piston Ring Side Clearance

1 - FEELER GAUGE

PISTON RING SPECIFICATION CHART

Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	.051-.094mm (0.0020- .0037 in.)	0.11mm (0.004 in.)
Intermediate Ring	0.04-0.08mm (0.0016-0.0031 in.)	0.10mm (0.004 in.)
Oil Control Ring (Steel Rails)	.019-.229mm (.0007-.0090 in.)	.25mm (0.010 in.)
Ring Position	**Ring Gap**	**Wear Limit**
Upper Ring	0.20-0.36mm (0.0079-0.0142 in.)	0.43mm (0.0142 in.)
Intermediate Ring	0.37-0.63mm (0.015-0.026 in.)	0.74mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.025-0.76mm (0.0099- 0.030 in.)	1.55mm (0.061 in.)

(7) The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

NOTE: Piston rings are installed in the following order:
- **Oil ring expander.**
- **Upper oil ring side rail.**
- **Lower oil ring side rail.**
- **No. 2 Intermediate piston ring.**
- **No. 1 Upper piston ring.**

(8) Install the oil ring expander.

(9) Install upper side rail (Fig. 64) by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

(10) Install No. 2 intermediate piston ring using a piston ring installer (Fig. 65).

(11) Install No. 1 upper piston ring using a piston ring installer (Fig. 65).

(12) Position piston ring end gaps as shown in (Fig. 66). It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.

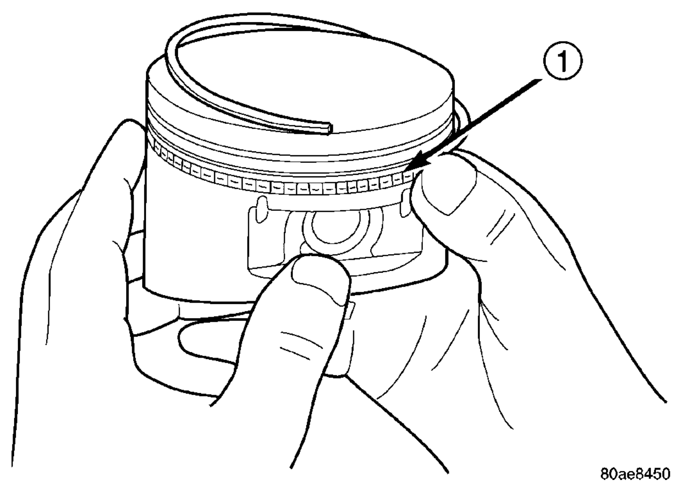


Fig. 64 Side Rail—Installation

1 - SIDE RAIL END

PISTON RINGS (Continued)

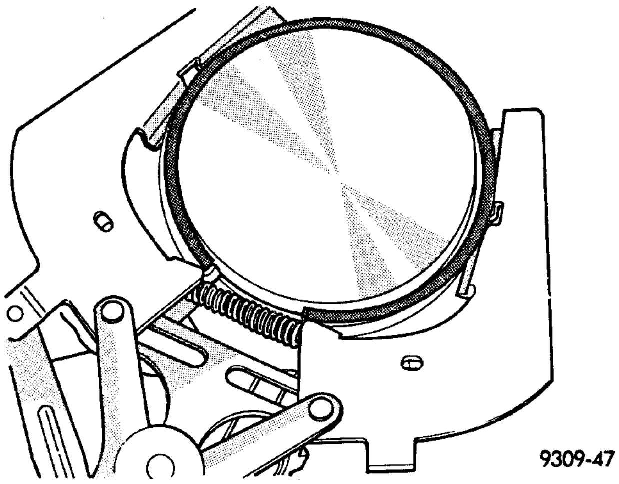


Fig. 65 Upper and Intermediate Rings—Installation

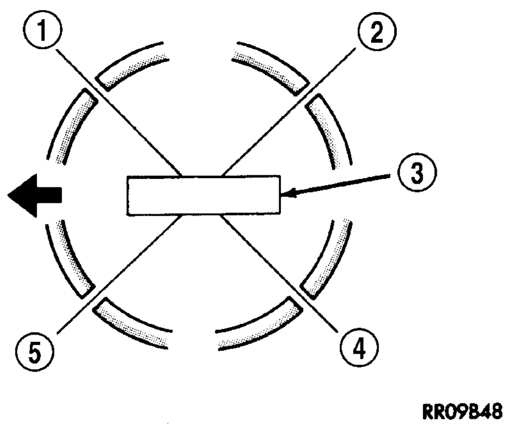


Fig. 66 Piston Ring End Gap Position

1 - SIDE RAIL UPPER
2 - NO. 1 RING GAP
3 - PISTON PIN
4 - SIDE RAIL LOWER
5 - NO. 2 RING GAP AND SPACER EXPANDER GAP

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

NOTE: Transmission cooler line snaps into shroud lower right hand corner.

(3) Remove crankshaft damper bolt.

(4) Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (Fig. 67).

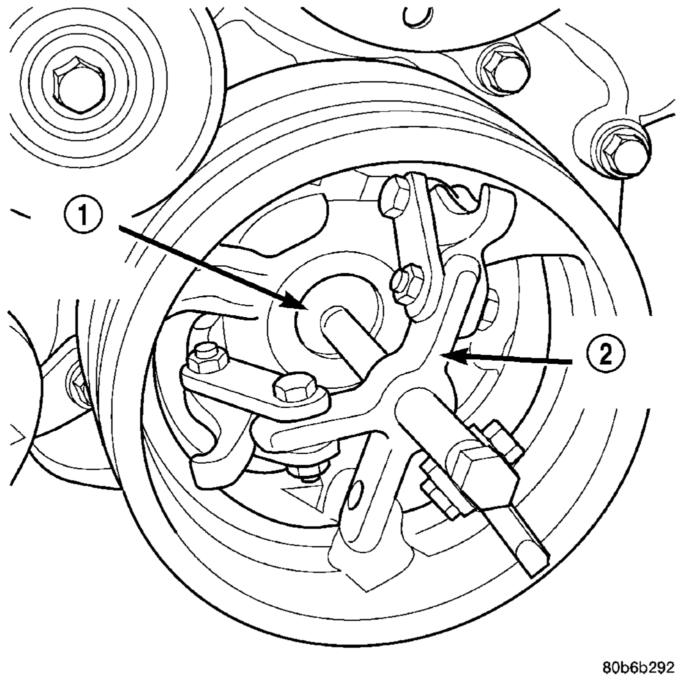


Fig. 67 Crankshaft Damper—Removal

1 - SPECIAL TOOL 8513 INSERT
2 - SPECIAL TOOL 1026

INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

(1) Align crankshaft damper slot with key in crankshaft. Slide damper onto crankshaft slightly.

CAUTION: Special Tool 8512A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

(2) Assemble Special Tool 8512–A as follows, The nut is threaded onto the shaft first. Then the roller bearing is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST**face the nut). Then the hardened washer slides onto the threaded rod (Fig. 68). Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or (Loctite No. 771).

(3) Using Special Tool 8512A, press damper onto crankshaft (Fig. 69).

VIBRATION DAMPER (Continued)

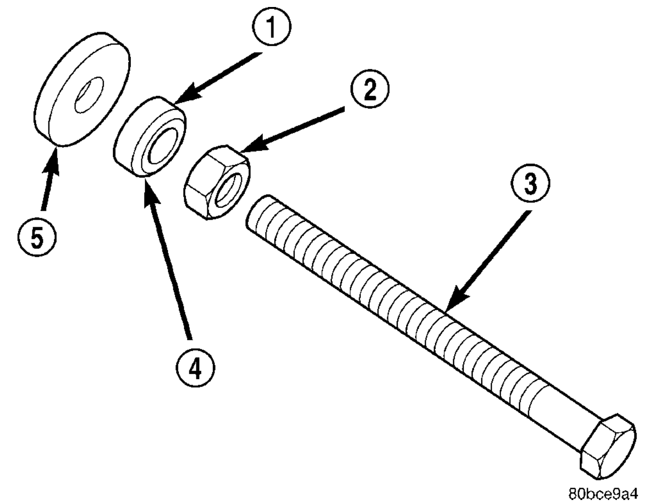


Fig. 68 Proper Assembly Method for Special Tool 8512–A

1 - BEARING
2 - NUT
3 - THREADED ROD
4 - BEARING HARDENED SURFACE (FACING NUT)
5 - HARDENED WASHER

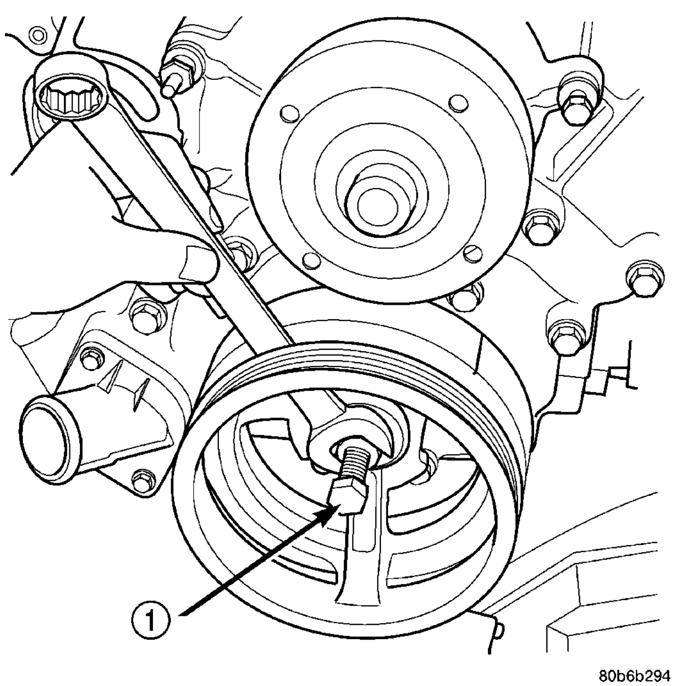


Fig. 69 Crankshaft Damper Installation

1 - SPECIAL TOOL 8512A

(4) Install then tighten crankshaft damper bolt to 175 N·m (130 ft. lbs.).

(5) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(6) Connect negative cable to battery.

STRUCTURAL COVER

DESCRIPTION

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine bedplate.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove the bolts retaining structural cover (Fig. 70).

(3) Remove the structural cover.

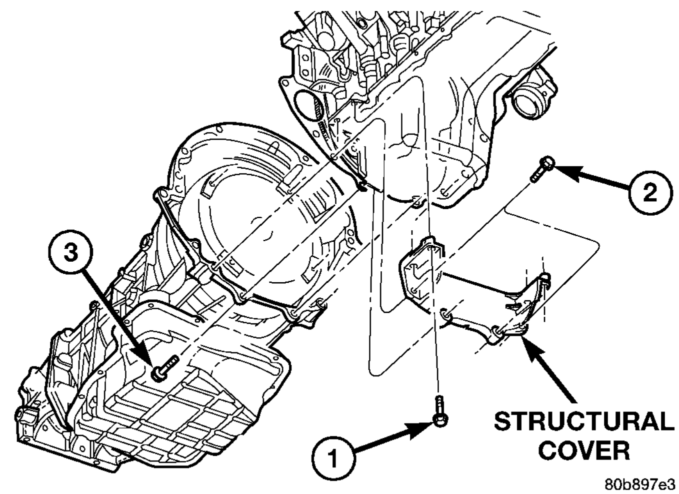


Fig. 70 Structural Cover

1 - BOLT
2 - BOLT
3 - BOLT

INSTALLATION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.

(1) Position the structural cover in the vehicle.

(2) Install all bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.

(3) Install the cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

STRUCTURAL COVER (Continued)

(4) Starting with the two rear cover-to-engine bolts, tighten bolts (1) (Fig. 71) to 54 N·m (40 ft. lbs.), then tighten bolts (2) (Fig. 71) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.

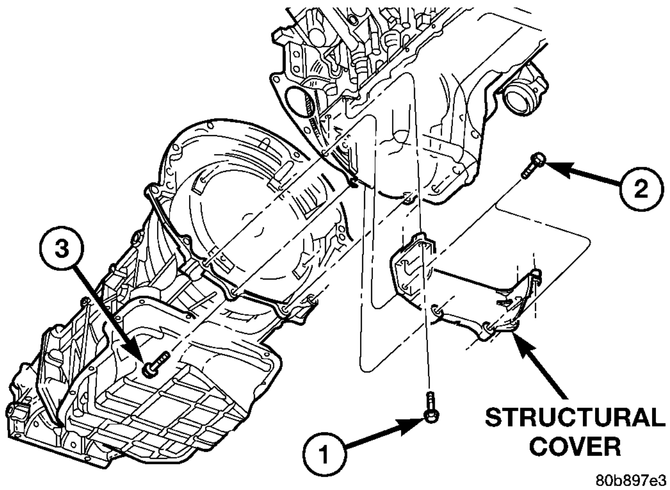


Fig. 71 Structural Cover

1 - BOLT
2 - BOLT
3 - BOLT

FRONT MOUNT

REMOVAL

(1) Disconnect the negative cable from the battery.

CAUTION: Remove the fan blade, fan clutch and fan shroud before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

(2) Remove the fan blade, fan clutch and fan shroud. Refer to COOLING SYSTEM for procedure.
(3) Remove the engine oil filter.
(4) Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
(5) Remove the four (4) cylinder block-to-insulator mount bolts and the nut from the engine insulator mount through bolt.
(6) Using the jack, raise the engine high enough to remove the engine insulator mount through bolt and the insulator mount (Fig. 72) and (Fig. 73).

INSTALLATION

(1) Position the insulator mount and install the insulator mount through bolt.
(2) Lower the engine until the cylinder block-to-insulator mount bolts can be installed.
(3) Remove the jack and block of wood.
(4) Torque the cylinder block-to-insulator mount bolts to 61 N·m (45 ft. lbs.).
(5) Install and torque the through bolt retaining nut to 61 N·m (45 ft. lbs.).

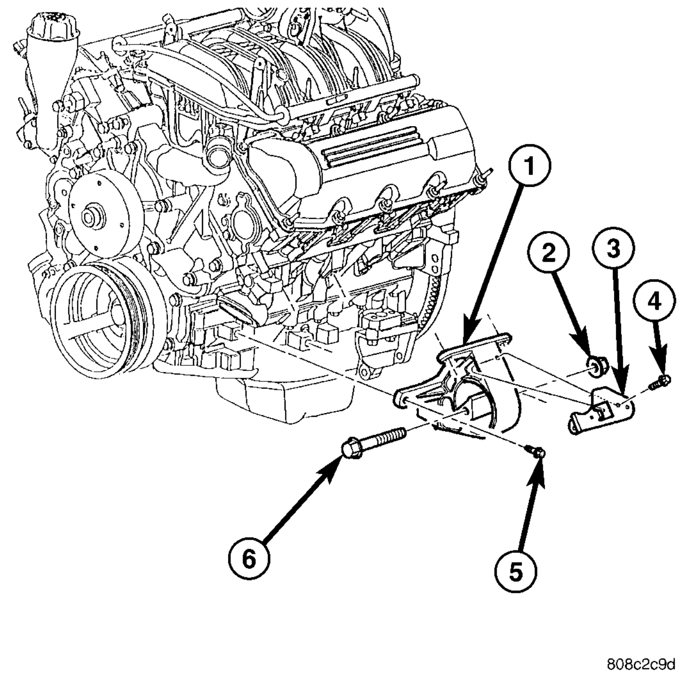


Fig. 72 Engine Insulator Mount 3.7 Left

1 -MOUNT
2 - NUT
3 - SHIELD
4 - FASTENER
5 - BOLT
6 - THRU BOLT

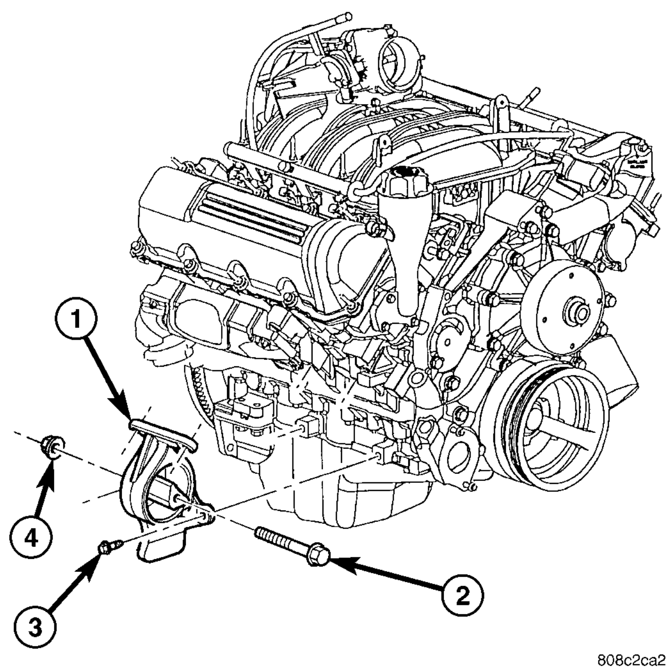


Fig. 73 Engine Insulator Mount 3.7 Right

1 - MOUNT
2 - THRU BOLT
3 - BOLT
4 - NUT

(6) Install the fan blade, fan clutch and fan shroud.

REAR MOUNT

REMOVAL

NOTE: A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

(1) Disconnect negative cable from battery.
(2) Raise the vehicle and support the transmission.
(3) Remove the nuts holding the support cushion to the crossmember. Remove the crossmember.

MANUAL TRANSMISSION

a. Remove the support cushion nuts and remove the cushion.
b. Remove the transmission support bracket bolts and remove the bracket from the transmission.

AUTOMATIC TRANSMISSION

c. Remove the support cushion bolts and remove the cushion and the support bracket from the transmission (4WD) or from the adaptor bracket (2WD).
d. On 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission. Remove the adaptor bracket.

INSTALLATION

MANUAL TRANSMISSION:

(1) Install the support cushion to the transmission (Fig. 74)or (Fig. 75). Install the bolts and tighten.
(2) Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
(3) Install crossmember-to-sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.
(4) Remove the transmission support.
(5) Lower the vehicle.
(6) Connect negative cable to battery.

AUTOMATIC TRANSMISSION:

(1) Install the transmission mount to transmission (Fig. 76) and (Fig. 77). Install the bolts.
(2) Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
(3) Remove the transmission support.
(4) Lower the vehicle.
(5) Connect negative cable to battery.

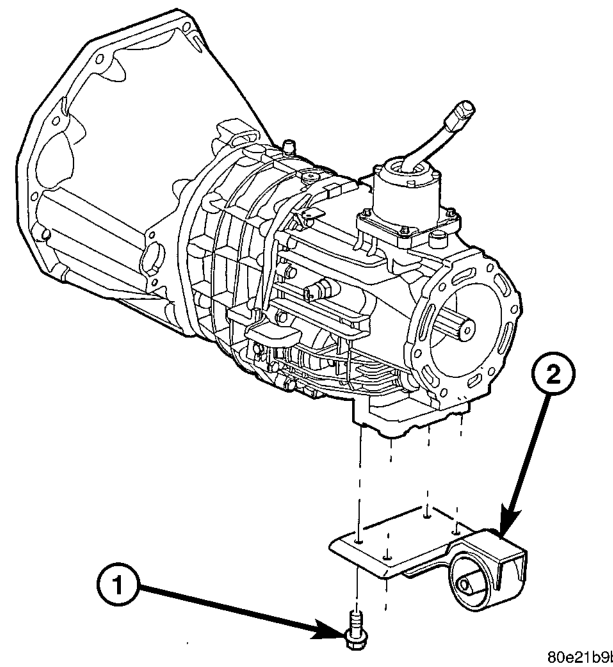


Fig. 74 TRANSMISSION MOUNT-2.4L MANUAL TRANS

1 - TRANSMISSION MOUNT
2 - MOUNTING BOLT

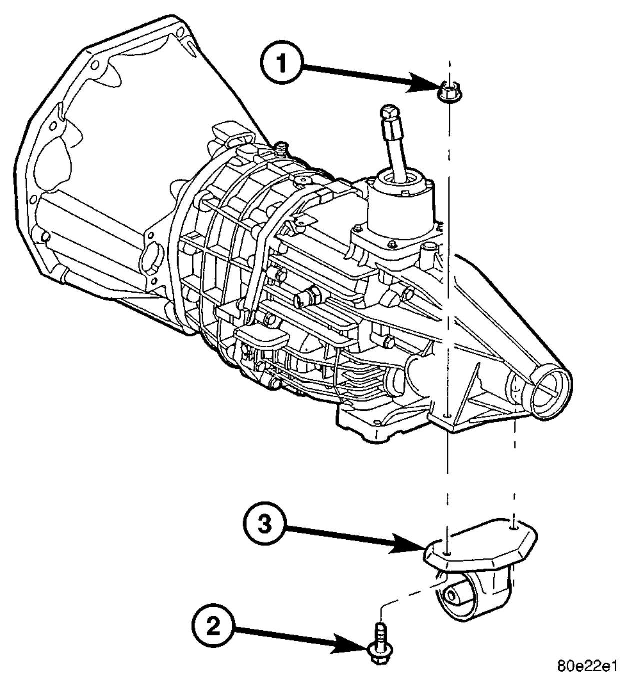


Fig. 75 TRANSMISSION MOUNT 3.7L MANUAL TRANS 2WD

1 - NUT
2 - BOLT
3 - TRANS MOUNT

REAR MOUNT (Continued)

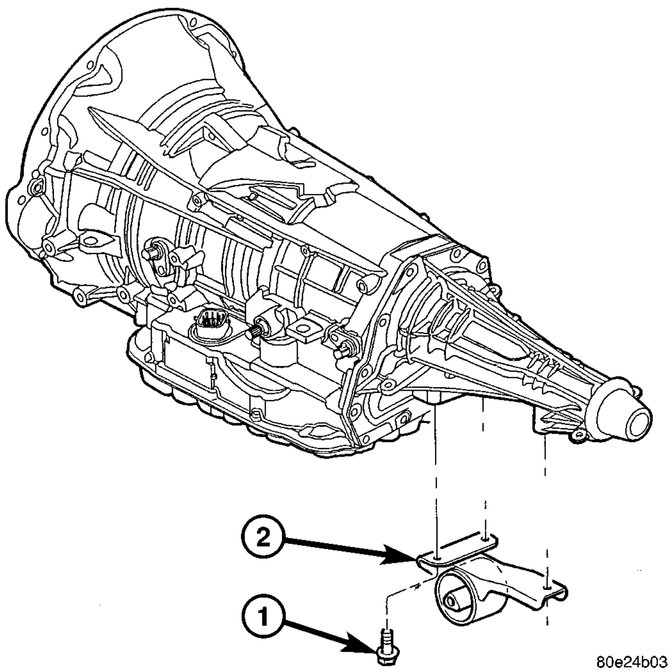


Fig. 76 TRANSMISSION MOUNT 3.7L 2WD AUTO TRANS

1 - BOLT
2 - MOUNT

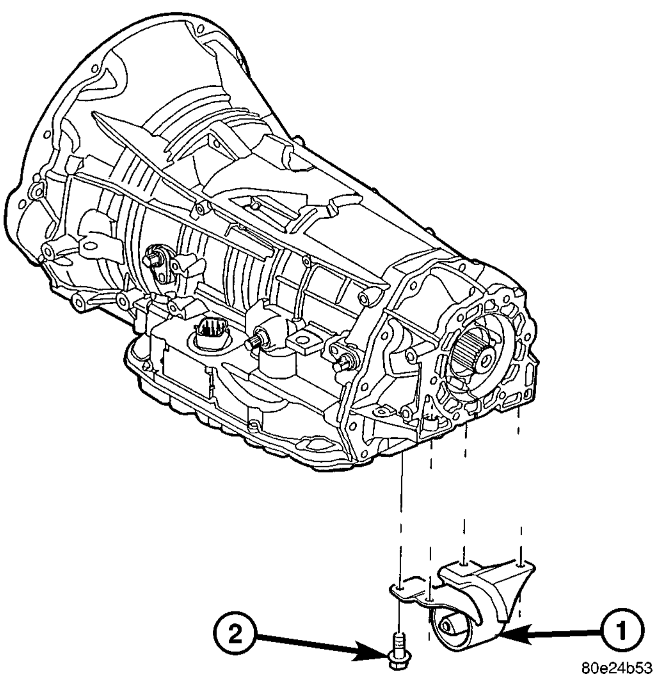


Fig. 77 TRANSMISSION MOUNT 3.7L 4WD AUTO TRANS

1 - MOUNT
2 - BOLT

LUBRICATION

DESCRIPTION

The lubrication system is a full flow filtration pressure feed type.

OPERATION

Oil from the oil pan is pumped by a gerotor type oil pump directly mounted to the crankshaft nose. Oil pressure is controlled by a relief valve mounted inside the oil pump housing. For lubrication flow refer to (Fig. 78)

The camshaft exhaust valve lobes and rocker arms are lubricated through a small hole in the rocker arm; oil flows through the lash adjuster then through the rocker arm and onto the camshaft lobe. Due to the orientation of the rocker arm, the camshaft intake lobes are not lubed in the same manner as the exhaust lobes. The intake lobes are lubed through internal passages in the camshaft. Oil flows through a bore in the number 3 camshaft bearing bore, and as the camshaft turns, a hole in the camshaft aligns with the hole in the camshaft bore allowing engine oil to enter the camshaft tube. The oil then exits through 1.6mm (0.063 in.) holes drilled into the intake lobes, lubricating the lobes and the rocker arms.

LUBRICATION (Continued)

ENGINE LUBRICATION FLOW CHART - BLOCK: TABLE 1

FROM	TO
Oil Pickup Tube	Oil Pump
Oil Pump	Oil Filter
Oil Filter	Block Main Oil Gallery
Block Main Oil Gallery	1. Crankshaft Main Journal 2. Left Cylinder Head* 3. Right Cylinder Head* 4. Counterbalance Shaft Rear Journal
Crankshaft Main Journals	Crankshaft Rod Journals
Crankshaft Number One Main Journal	1. Front Timing Chain Idler Shaft 2. Counterbalance Shaft - Front Journal 3. Both Secondary Chain Tensioners
Left Cylinder Head	Refer to Engine Lubrication Flow Chart - Cylinder Heads: Table 2
Right Cylinder Head	Refer to Engine Lubrication Flow Chart - Cylinder Heads: Table 2
* The cylinder head gaskets have an oil restricter to control oil flow to the cylinder heads	

ENGINE LUBRICATION FLOW CHART - CYLINDER HEADS: TABLE 2

FROM	TO
Cylinder Head Oil Port (in bolt hole)	Diagonal Cross Drilling to Main Oil Gallery
Main Oil Gallery (drilled through head from rear to front)	1. Base of Camshaft Towers 2. Lash Adjuster Towers
Base of Camshaft Towers	Vertical Drilling Through Tower to Camshaft Bearings**
Lash Adjuster Towers	Diagonal Drillings to Hydraulic Lash Adjuster Pockets
** The number three camshaft bearing journal feeds oil into the hollow camshaft tubes. Oil is routed to the intake lobes, which have oil passages drilled into them to lubricate the rocker arms.	

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.

LUBRICATION (Continued)

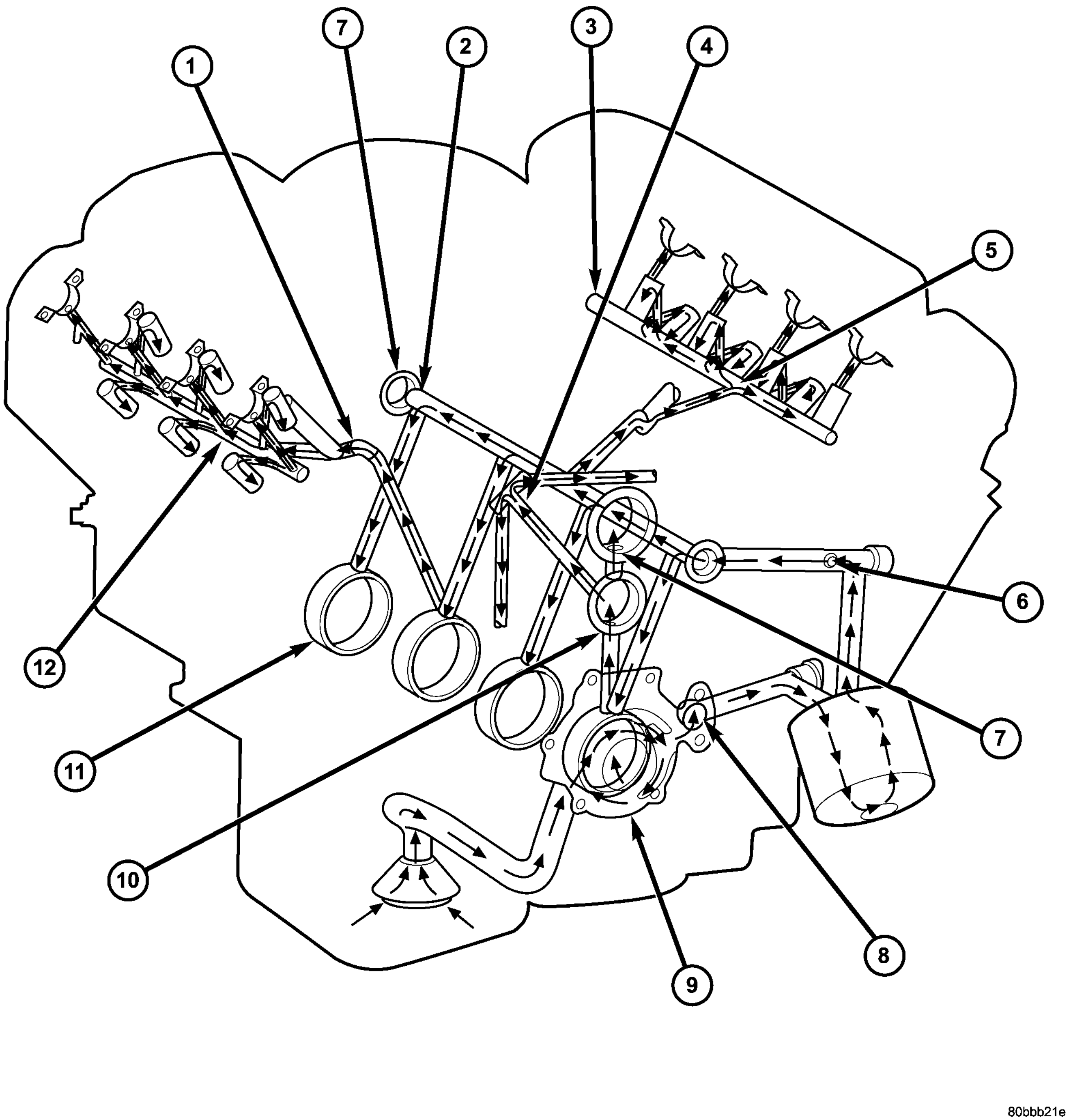


Fig. 78 LUBRICATION OIL FLOW

1 - OIL FLOW TO RIGHT CYLINDER HEAD
2 - CYLINDER BLOCK MAIN OIL GALLERY
3 - LEFT CYLINDER HEAD OIL GALLERY
4 - OIL FLOW TO BOTH SECONDARY TENSIONERS
5 - OIL FLOW TO LEFT CYLINDER HEAD
6 - OIL PRESSURE SENSOR LOCATION
7 - OIL FLOW TO COUNTER BALANCE SHAFT
8 - OIL PUMP OUTLET TO CYLINDER BLOCK
9 - OIL PUMP
10 - OIL FLOW TO CRANKSHAFT MAIN JOURNALS
11 - CRANKSHAFT MAIN BEARING JOURNALS
12 - RIGHT CYLINDER HEAD OIL GALLERY

(3) Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

LUBRICATION (Continued)

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(5) If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

(7) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit (Fig. 79)and install gauge assembly C-3292.

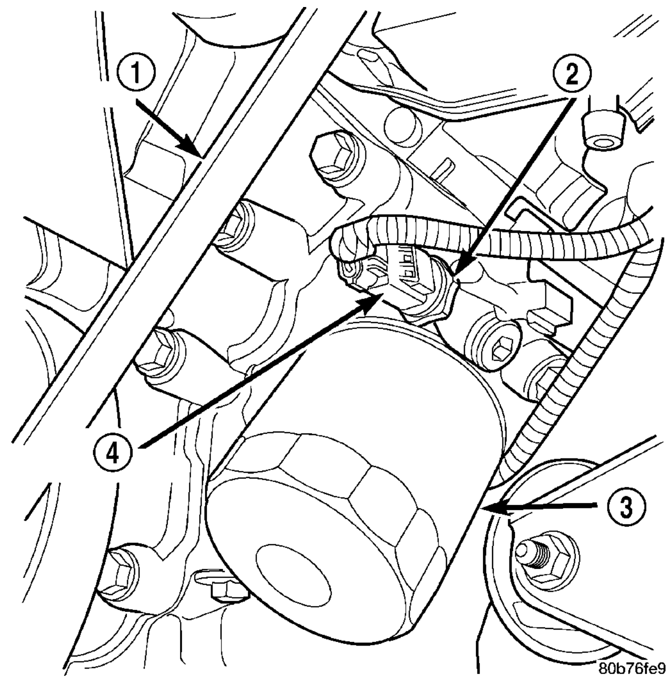


Fig. 79 OIL PRESSURE SENDING UNIT -TYPICAL

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

(2) Run engine until thermostat opens.

(3) Oil Pressure:

- Curb Idle–25 kPa (4 psi) minimum
- 3000 rpm–170 - 758 kPa (25 - 110 psi)

(4) If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

LUBRICATION (Continued)

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.

(4) If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.

(7) After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

OIL

STANDARD PROCEDURE - ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR® provides engine oils that conform to this service grade.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30 in the 3.7L engines. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 80).

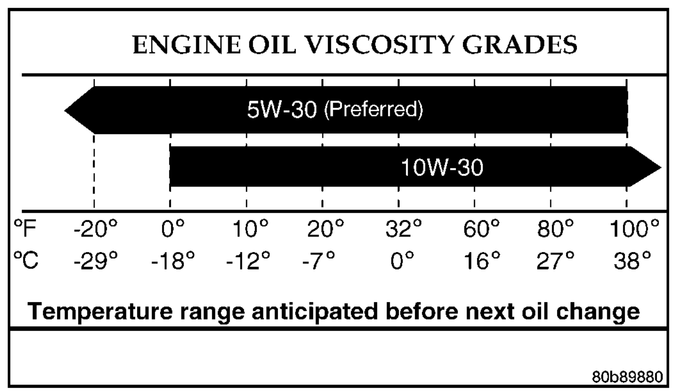


Fig. 80 Temperature/Engine Oil Viscosity - 3.7L Engine

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 81).

OIL LEVEL INDICATOR (DIPSTICK)

The engine oil level indicator is located on the right side of the the 3.7L engine.

OIL (Continued)

9400-9

Fig. 81 Engine oil Container Standard Notations

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, take oil level reading.

(6) Add oil if level is below the SAFE ZONE on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Remove oil fill cap.

(3) Hoist and support vehicle on safety stands.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Remove oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(8) Install a new oil filter.

(9) Lower vehicle and fill crankcase with 5 quarts of the specified type of engine oil described in this section.

(10) Install oil fill cap.

(11) Start engine and inspect for leaks.

(12) Stop engine and inspect oil level.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

OIL FILTER

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

(1) Position a drain pan under the oil filter.

(2) Using a suitable oil filter wrench loosen filter.

(3) Rotate the oil filter counterclockwise (Fig. 82)to remove it from the cylinder block oil filter boss.

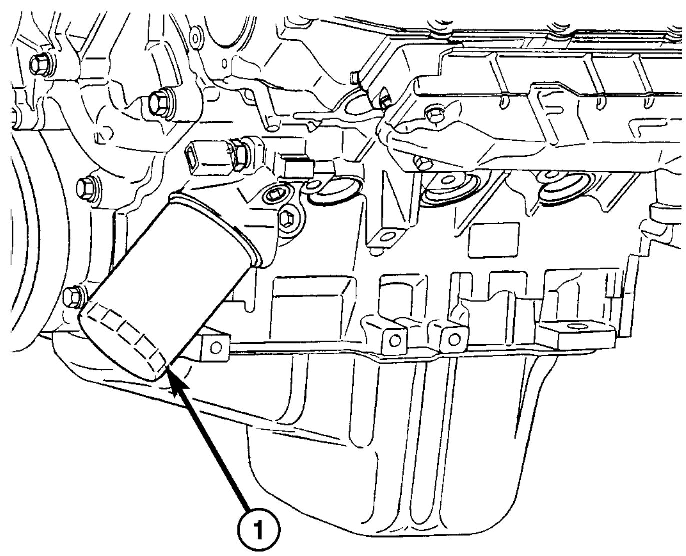


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Fig. 82 Oil Filter - 3.7L Engine

1 - ENGINE OIL FILTER

(4) When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

OIL FILTER (Continued)

NOTE: Make sure filter gasket was removed with filter.

(5) With a wiping cloth, clean the gasket sealing surface of oil and grime.

INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil.

(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 83) hand tighten filter one full turn, do not over tighten.

(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

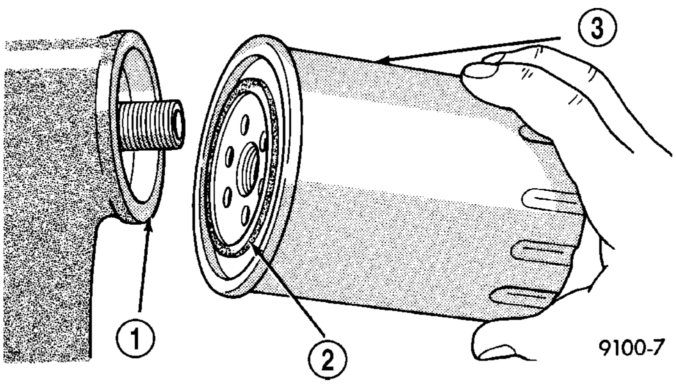

Fig. 83 Oil Filter Sealing Surface-Typical

1 - SEALING SURFACE
2 - RUBBER GASKET
3 - OIL FILTER

OIL PAN

DESCRIPTION

The engine oil pan is made of laminated steel and has a single plane sealing surface. The sandwich style oil pan gasket has an integrated windage tray and steel carrier (Fig. 84). The sealing area of the gasket is molded with rubber and is designed to be reused as long as the gasket is not cut, torn or ripped.

REMOVAL

REMOVAL

(1) Disconnect and isolate negative battery cable.

(2) Install engine support fixture.

(3) Raise and support vehicle.

(4) Remove front wheel assemblies.

(5) Remove skid plate (if equipped).(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - REMOVAL)

(6) Drain engine oil.

(7) Mark adjustment cam position of front lower control arm bolts.

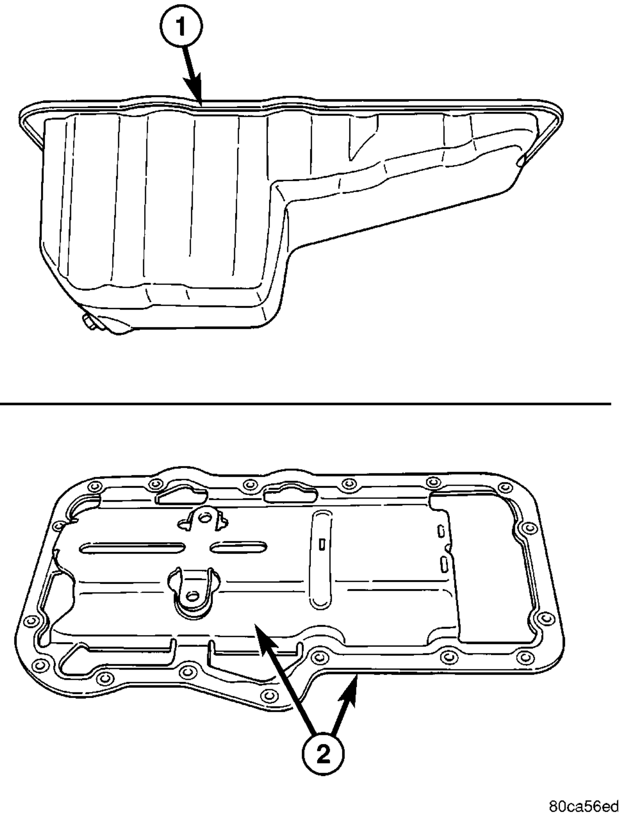

Fig. 84 Oil Pan And Gasket

1 - OIL PAN
2 - WINDAGE TRAY AND INTEGRATED OIL PAN GASKET

(8) Remove front lower control arm bolts.(Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL)

(9) Disconnect LH tie rod.(Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL)

(10) Disconnect LH lower ball joint(Refer to 2 - SUSPENSION/FRONT/LOWER BALL JOINT - REMOVAL)

(11) Disconnect LH strut clevis(Refer to 2 - SUSPENSION/FRONT/CLEVIS BRACKET - REMOVAL)

(12) Remove LH front axle(Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)

(13) Remove front axle brace bolts.

(14) Remove front prop shaft.(Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(15) Drain front axle.

(16) Using a transmission jack, support front axle.

(17) Remove axle bracket bolts.(Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - REMOVAL)

(18) With RH axle still in place, remove front differential.

(19) Remove transmission oil cooler line bracket.

OIL PAN (Continued)

(20) Remove engine to transmission stiffening bracket.

(21) Position Special Tool 8534 on fender lip and align the slots in the brackets with the fender mounting holes.

(22) Secure brackets to the fender using four M6 X 1.0 X 25 MM flanged cap screws.

(23) Tighten the thumbscrews to secure the sleeves to the support tube.

(24) Secure the support tube in an upright position.

(25) Assemble the flat washer, thrust bearing, hook and T handle.

(26) Using the M10 X 1.75 mm flanged nut supplied with the support fixture, secure the chain to the front engine lifting stud.

(27) Loosen engine mounts.

(28) Remove oil pan bolts.

(29) Seperate oil pan from engine.

(30) Move oil pan to one side, remove oils sump bolt and windage tray bolts,

NOTE: Do not pry on oil pan or oil pan gasket. Gasket is integral to engine windage tray and does not come out with oil pan (Fig. 85).

(31) Move the oil pan and windage tray toward front of vehicle and remove from vehicle.

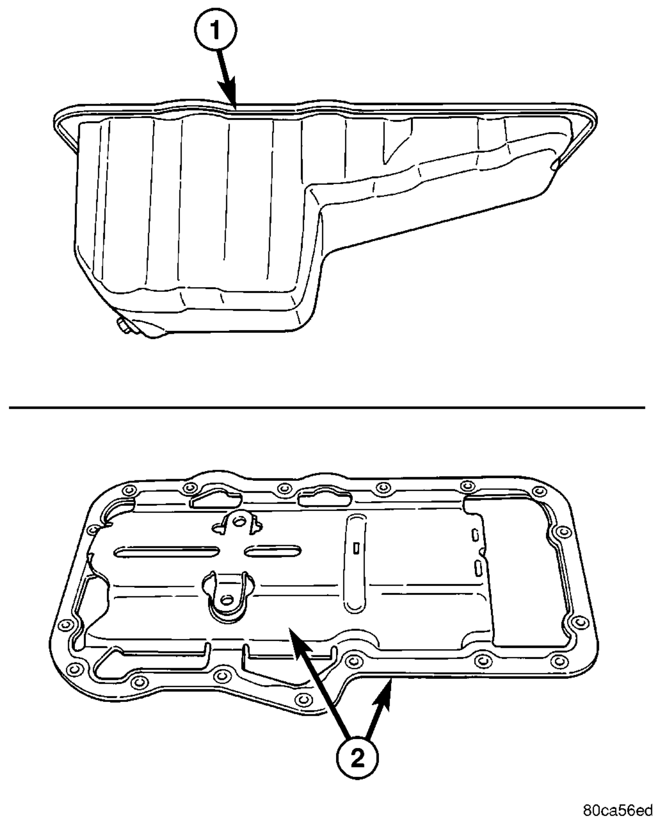

Fig. 85 Oil Pan And Gasket

1 - OIL PAN
2 - WINDAGE TRAY AND INTEGRATED OIL PAN GASKET

REMOVAL - 4x4

(1) Disconnect Battery.

(2) Install Engine Support Fixture, special Tool 8534.

(3) Raise and support vehicle.

(4) Remove front wheel and tire assemblies.

(5) Remove skid plate (if equipped).

(6) Drain engine oil.

(7) Remove engine to transmission structural cover, (if equipped).

(8) Remove transmission oil cooler line bracket.

(9) Remove the front axle assembly from the vehicle(Refer to 3 - DIFFERENTIAL & DRIVELINE/ FRONT AXLE - REMOVAL).

(10) Loosen both engine mount through bolts.

(11) Lower the vehicle.

NOTE: It is not necessary to remove the viscous fan , or fan shroud, for oil pan removal.

(12) Raise the engine using Engine Support Fixture, special Tool 8534, until the viscous fan almost touches the fan shroud.

(13) Raise the vehicle.

(14) Remove the oil pan bolts.

(15) Separate the oil pan from the engine.

(16) Remove the (2) nuts and (1) bolt holding the oil pump pick-up tube, and windage tray in place.

NOTE: It will be necessary to move the oil pan from side to side to gain access to these fasteners.

(17) Drop the oil pump pick-up tube into the oil pan, and remove the oil pan, pick-up tube, and the windage tray, as an assembly, from the front of the vehicle.

CLEANING

(1) Clean oil pan in solvent and wipe dry with a clean cloth.

(2) Clean the oil pan gasket surface. **DO NOT** use a grinder wheel or other abrasive tool to clean sealing surface.

(3) Clean oil screen and tube thoroughly in clean solvent.

INSPECTION

(1) Inspect oil drain plug and plug hole for stripped or damaged threads. Repair as necessary.

(2) Inspect the oil pan mounting flange for bends or distortion. Straighten flange, if necessary.

OIL PAN (Continued)

INSTALLATION

INSTALLATION

(1) Clean the oil pan gasket mating surface of the bedplate and oil pan.

(2) Clean the oil pan and block gasket mating surfaces.

(3) Inspect integrated oil pan gasket, and replace as necessary.

(4) Drop the oil pump pick-up tube into the oil pan, and install the oil pan, pick-up tube, and the windage tray, as an assembly, from the front of the vehicle.

(5) Install the windage tray, then the oil pump pick-up tube, and the (2) nuts and (1) bolt holding the oil pump pick-up tube, in place.

NOTE: It will be necessary to move the oil pan from side to side to gain access to these fasteners.

(6) Torque the pick-up tube fasteners.

(1) Install the oil pan.

(2) Install and torque the oil pan bolts. (Fig. 86).

(3) Install the engine to transmission structural cover, (if equipped).

(4) Lower engine, and remove Special Tool 8534.

(5) Lower the vehicle.

(6) Lower the engine using Engine Support Fixture, special Tool # 8534.

(7) Remove the Engine Support Fixture, special Tool # 8534.

(8) Raise the vehicle.

(9) Tighten both engine mount through bolts.

(10) Install the transmission oil cooler line bracket.

(11) Lower the vehicle.

(12) Refill engine oil.

(13) Reconnect battery.

(14) Start engine and check for leaks.

INSTALLATION - 4x4

(1) Inspect oil pan gasket for defects, and replace if necessary.

(2) Clean the oil pan and block gasket mating surfaces.

(3) Drop the oil pump pick-up tube into the oil pan, and install the oil pan, pick-up tube, and the windage tray, as an assembly, from the front of the vehicle.

(4) Install the windage tray, then the oil pump pick-up tube, and the (2) nuts and (1) bolt holding the oil pump pick-up tube, in place.

NOTE: It will be necessary to move the oil pan from side to side to gain access to these fasteners.

(5) Torque the pick-up tube fasteners.

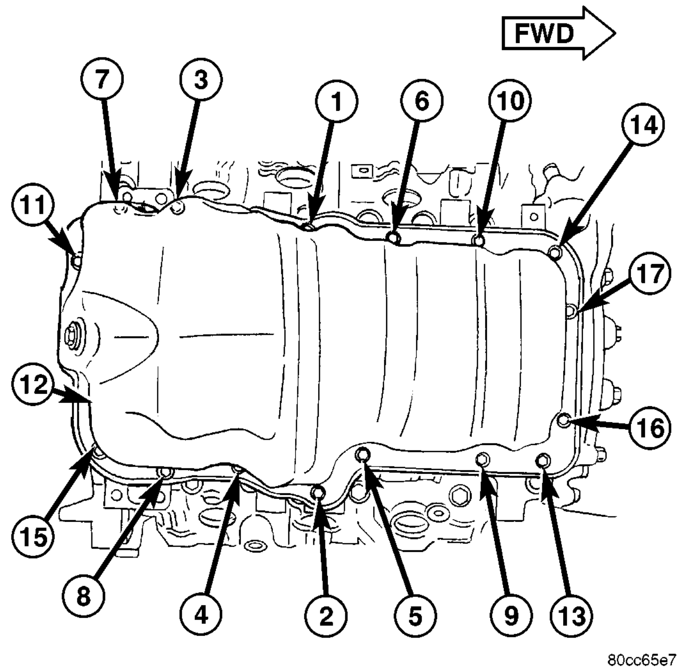

Fig. 86 Oil Pan Mounting Bolt Sequence

(6) Install the oil pan.

(7) Install and torque the oil pan bolts.

(8) Install the engine to transmission structural cover, (if equipped).

(9) Lower the vehicle.

(10) Lower the engine using Engine Support Fixture, special Tool # 8534.

(11) Remove the Engine Support Fixture, special Tool # 8534.

(12) Raise the vehicle.

(13) Tighten both engine mount through bolts.

(14) Install the transmission oil cooler line bracket.

(15) Install the front axle assembly to the vehicle(Refer to 3 - DIFFERENTIAL & DRIVELINE/ FRONT AXLE - INSTALLATION).

(16) Install the skid plate (if equipped).

(17) Install the front wheel and tire assemblies.

(18) Lower the vehicle.

(19) Refill engine oil.

(20) Reconnect battery.

(21) Start engine, and check for leaks.

OIL PRESSURE SENSOR/ SWITCH

DESCRIPTION

The 3–wire, solid-state engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OIL PRESSURE SENSOR/SWITCH (Continued)

OPERATION

The oil pressure sensor uses three circuits. They are:

- A 5–volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3–wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5–volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

REMOVAL

(1) Disconnect the negative cable from the battery.
(2) Raise vehicle on hoist.
(3) Remove front splash shield.
(4) Disconnect oil pressure sender wire (Fig. 87).
(5) Remove the pressure sender (Fig. 87).

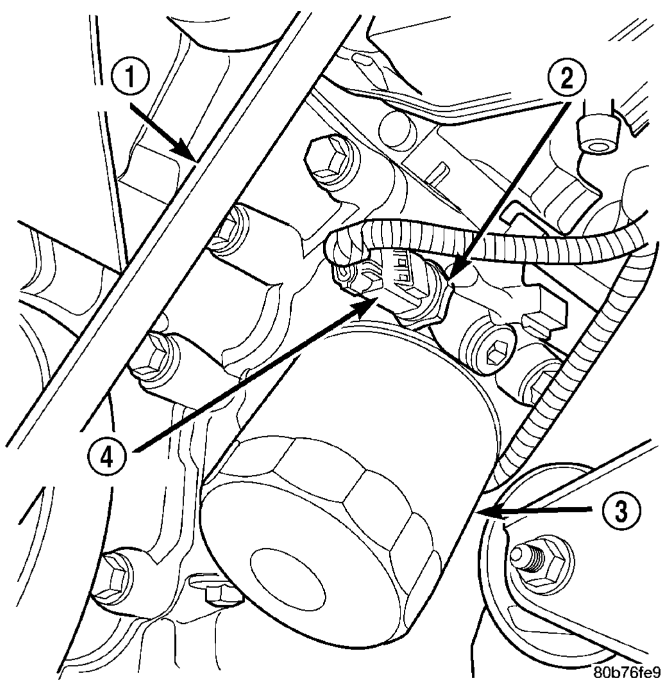

Fig. 87 OIL PRESSURE SENDING UNIT

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

INSTALLATION

(1) Install oil pressure sender.
(2) Connect oil pressure sender wire.
(3) Install front splash shield.
(4) Lower vehicle.
(5) Connect the negative battery cable.

OIL PUMP

REMOVAL

(1) Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(2) Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(3) Remove the timing chains and tensioners (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(4) Remove the four bolts, primary timing chain tensioner and the oil pump.

DISASSEMBLY

(1) Remove oil pump cover screws and lift off cover plate.

(2) Remove pump inner and outer rotors.

NOTE: Once the oil pressure relief valve, cup plug, and pin are removed, the pump assembly must be replaced.

(3) If it is necessary to remove the pressure relief valve, drive the roll pin from pump housing and remove cup plug, spring and valve.

INSPECTION

CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

(1) Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.

(2) Lay a straight edge across the pump cover surface (Fig. 88). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between the cover and the straight edge the oil pump assembly should be replaced.

(3) Measure the thickness of the outer rotor (Fig. 89). If the outer rotor thickness measures at 12.005 mm (0.472 in.) or less the oil pump assembly must be replaced.

OIL PUMP (Continued)

(4) Measure the diameter of the outer rotor. If the outer rotor diameter measures at 85.925 mm (3.382 in.) or less the oil pump assembly must be replaced.

(5) Measure the thickness of the inner rotor (Fig. 90). If the inner rotor thickness measures at 12.005 mm (0.472 in.) or less then the oil pump assembly must be replaced.

(6) Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body (Fig. 91). If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.

(7) Install the inner rotor in the into the oil pump body. Measure the clearance between the inner and outer rotors (Fig. 92). If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.

(8) Place a straight edge across the body of the oil pump (between the bolt holes), if a feeler gauge of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced (Fig. 93).

NOTE: The 3.7L Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

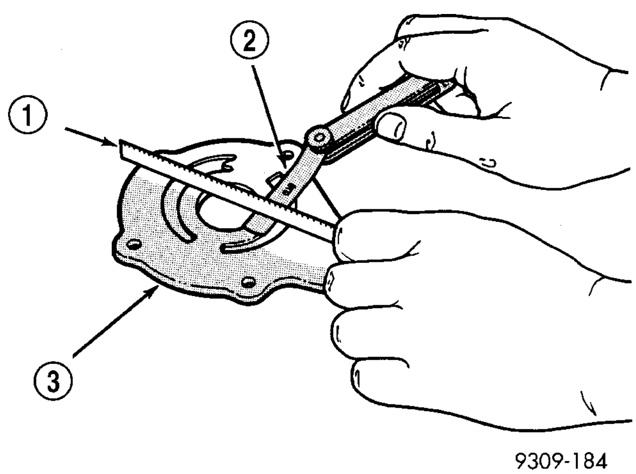

Fig. 88 Checking Oil Pump Cover Flatness

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

ASSEMBLY

(1) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

(2) Install inner and outer rotors

(3) Install oil pump cover plate and install cover bolts and tighten them to 12 N·m (105 in. lbs.).

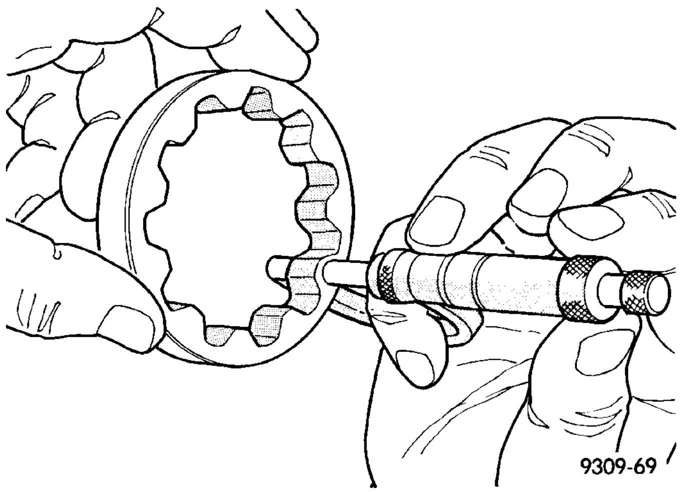

Fig. 89 Measuring Outer Rotor Thickness

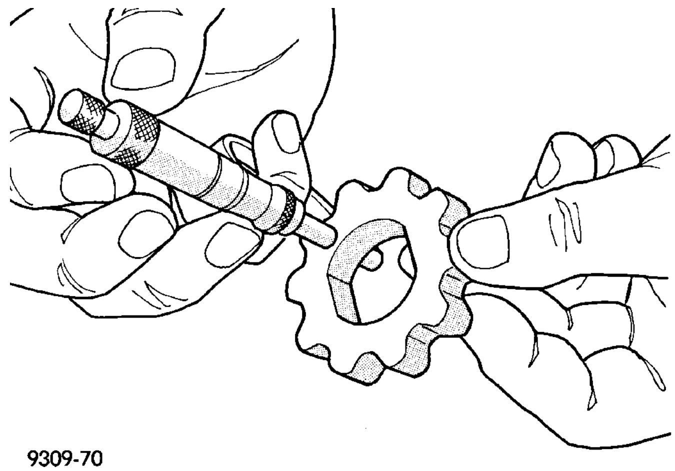

Fig. 90 Measuring Inner Rotor Thickness

(4) Prime oil pump before installation by filling rotor cavity with engine oil.

(5) If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other causes for oil pressure loss.

INSTALLATION

(1) Position the oil pump onto the crankshaft and install two oil pump retaining bolts.

(2) Position the primary timing chain tensioner and install the two retaining bolts.

(3) Tighten the oil pump and primary timing chain tensioner retaining bolts to 28 N·m (250 in. lbs.) in the sequence shown (Fig. 94).

(4) Install the secondary timing chain tensioners and timing chains (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(5) Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

OIL PUMP (Continued)

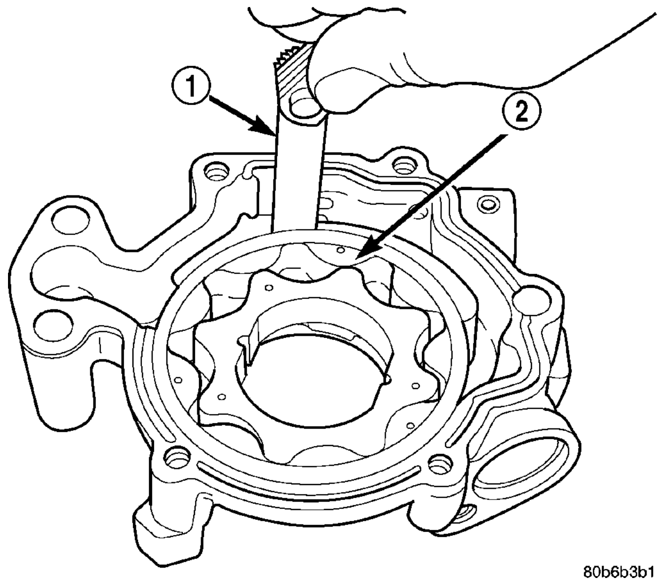

Fig. 91 Measuring Outer Rotor Clearance in

1 - FEELER GAUGE
2 - OUTER ROTOR

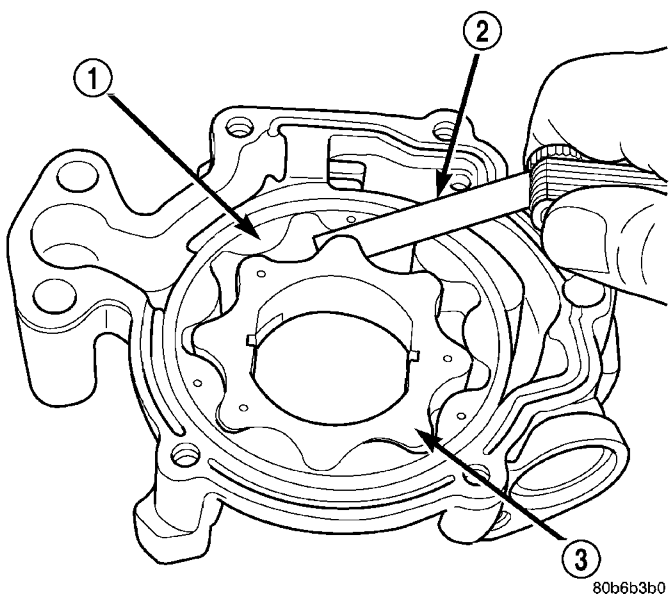

Fig. 92 Measuring Clearance Between Rotors

1 - OUTER ROTOR
2 - FEELER GAUGE
3 - INNER ROTOR

(6) Install the pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

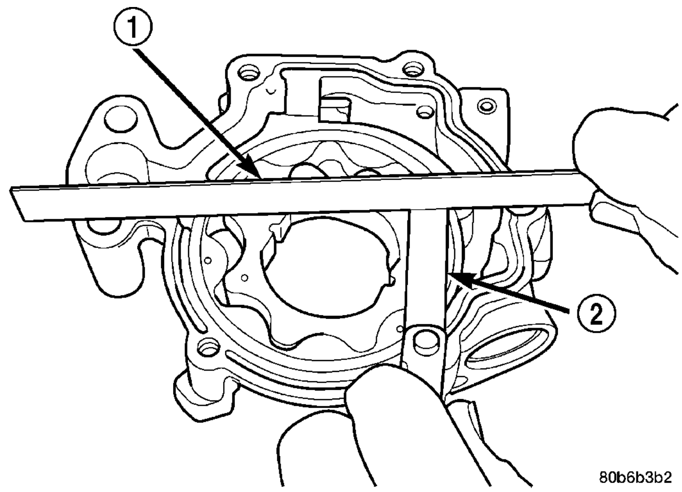

Fig. 93 Measuring Clearance Over Rotors

1 - STRAIGHT EDGE
2 - FEELER GAUGE

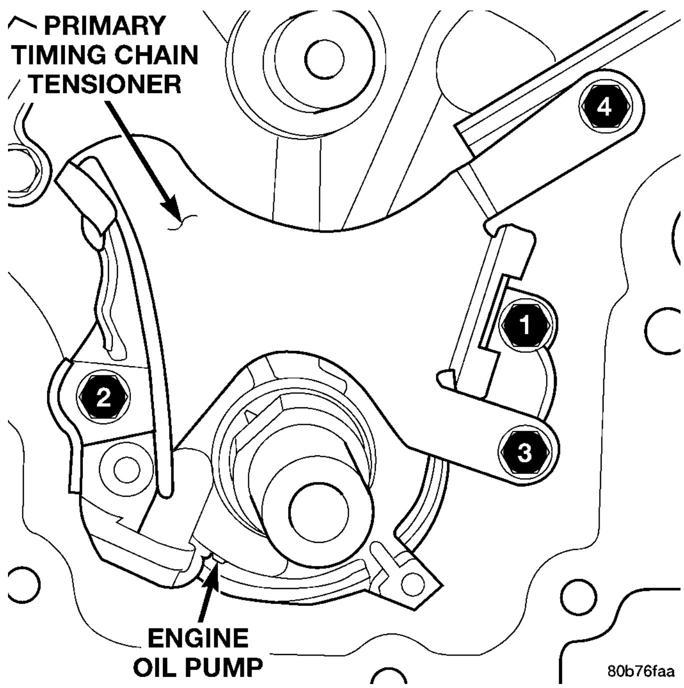

Fig. 94 Oil Pump And Primary Timing Chain Tensioner Tightening Sequence

INTAKE MANIFOLD

DESCRIPTION

The intake manifold (Fig. 95) is made of a composite material and features 300 mm (11.811 in.) long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of six individual press in place port gaskets to prevent leaks. The throttle body attaches directly to the intake manifold. Eight studs and two bolts are used to fasten the intake to the head.

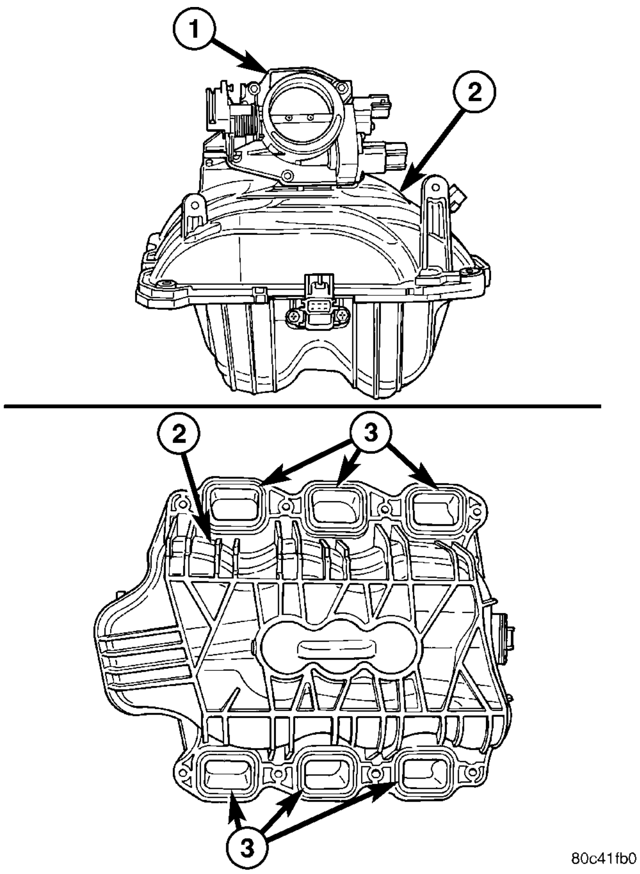

Fig. 95 Intake Manifold

1 - THROTTLE BODY
2 - INTAKE MANIFOLD
3 - INTAKE PORT GASKETS

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.

(2) Spray a small stream of water (spray bottle) at the suspected leak area.

(3) If engine RPM'S change, the area of the suspected leak has been found.

(4) Repair as required.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove resonator assembly and air inlet hose.

(3) Disconnect throttle and speed control cables.

(4) Disconnect electrical connectors for the following components: Refer to FUEL SYSTEM for component locations.

- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Coolant Temperature (CTS) Sensor
- Idle Air Control (IAC) Motor

(5) Disconnect vapor purge hose, brake booster hose, speed control servo hose, positive crankcase ventilation (PCV) hose.

(6) Disconnect generator electrical connections.

(7) Disconnect air conditioning compressor electrical connections.

(8) Disconnect left and right radio suppressor straps.

(9) Disconnect and remove ignition coil towers.

(10) Remove top oil dipstick tube retaining bolt and ground strap.

(11) Bleed fuel system. Refer to FUEL SYSTEM.

(12) Remove fuel rail.

(13) Remove throttle body assembly and mounting bracket.

(14) Drain cooling system below coolant temperature level. Refer to COOLING SYSTEM.

(15) Remove the heater hoses from the engine front cover and the heater core.

(16) Unclip and remove heater hoses and tubes from intake manifold.

(17) Remove coolant temperature sensor. Refer to FUEL SYSTEM.

(18) Remove intake manifold retaining fasteners in reverse order of tightening sequence.

(19) Remove intake manifold.

INSTALLATION

(1) Install intake manifold gaskets.

(2) Install intake manifold.

(3) Install intake manifold retaining bolts and tighten in sequence shown in to 12 N·m (105 in. lbs.) (Fig. 96).

(4) Install left and right radio suppressor straps.

(5) Install throttle body assembly.

(6) Connect throttle cable and speed control cable to throttle body.

INTAKE MANIFOLD (Continued)

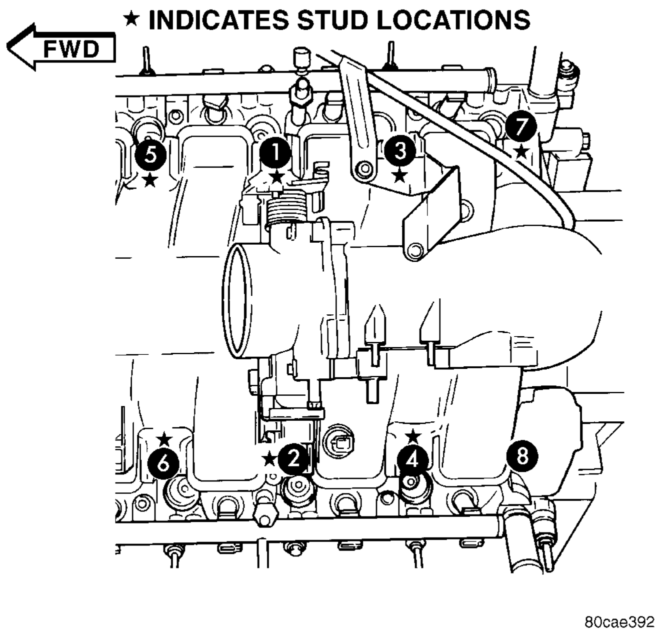

Fig. 96 Intake Manifold Tightening Sequence

(7) Install fuel rail.

(8) Install ignition coil towers.

(9) Position and install heater hoses and tubes onto intake manifold.

(10) Install the heater hoses to the heater core and engine front cover.

(11) Connect electrical connectors for the following components:

- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Coolant Temperature (CTS) Sensor
- Idle Air Control (IAC) Motor
- Ignition coil towers
- Fuel injectors

(12) Install top oil dipstick tube retaining bolt and ground strap.

(13) Connect generator electrical connections.

(14) Connect Vapor purge hose, Brake booster hose, Speed control servo hose, Positive crankcase ventilation (PCV) hose.

(15) Fill cooling system.

(16) Install resonator assembly and air inlet hose.

(17) Connect negative cable to battery.

EXHAUST MANIFOLD

DESCRIPTION

The exhaust manifolds (Fig. 97) are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields (Fig. 98) are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

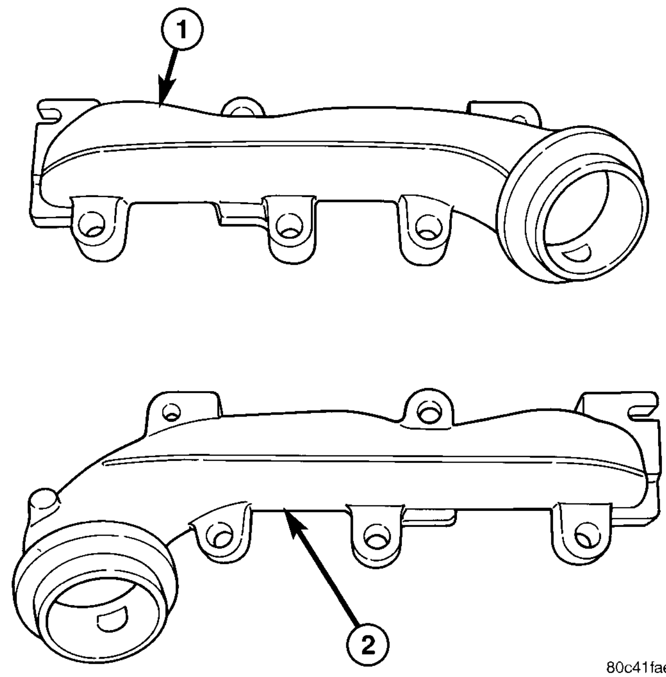

Fig. 97 EXHAUST MANIFOLDS

1 - LEFT SIDE EXHAUST MANIFOLD
2 - RIGHT SIDE EXHAUST MANIFOLD

REMOVAL

RIGHT EXHAUST MANIFOLD

(1) Disconnect the negative cable from the battery.

(2) Raise and support the vehicle.

(3) Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.

(4) Lower the vehicle.

(5) Remove the exhaust heat shield (Fig. 99).

(6) Remove bolts, nuts and washers attaching manifold to cylinder head.

(7) Remove manifold and gasket from the cylinder head.

EXHAUST MANIFOLD (Continued)

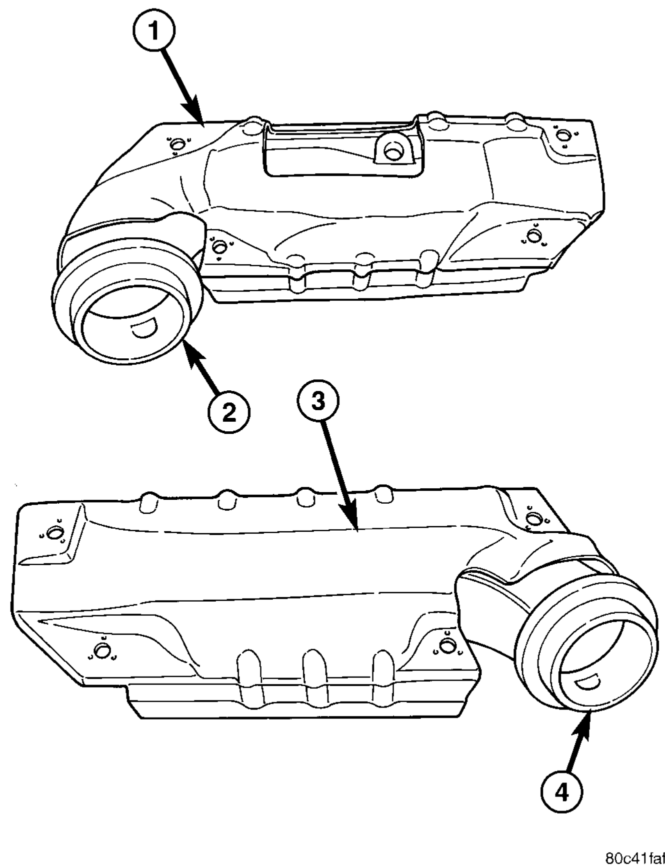

Fig. 98 Exhaust Manifold Heat Shields

1 - RIGHT SIDE EXHAUST MANIFOLD HEAT SHIELD
2 - RIGHT SIDE EXHAUST MANIFOLD FLANGE
3 - LEFT SIDE EXHAUST MANIFOLD HEAT SHIELD
2 - LEFT SIDE EXHAUST MANIFOLD FLANGE

LEFT EXHAUST MANIFOLD

(1) Disconnect the negative cable from the battery.

(2) Raise and support the vehicle.

(3) Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.

(4) Lower the vehicle.

(5) Remove the exhaust heat shields (Fig. 100).

(6) Remove bolts, nuts and washers attaching manifold to cylinder head.

(7) Remove manifold and gasket from the cylinder head.

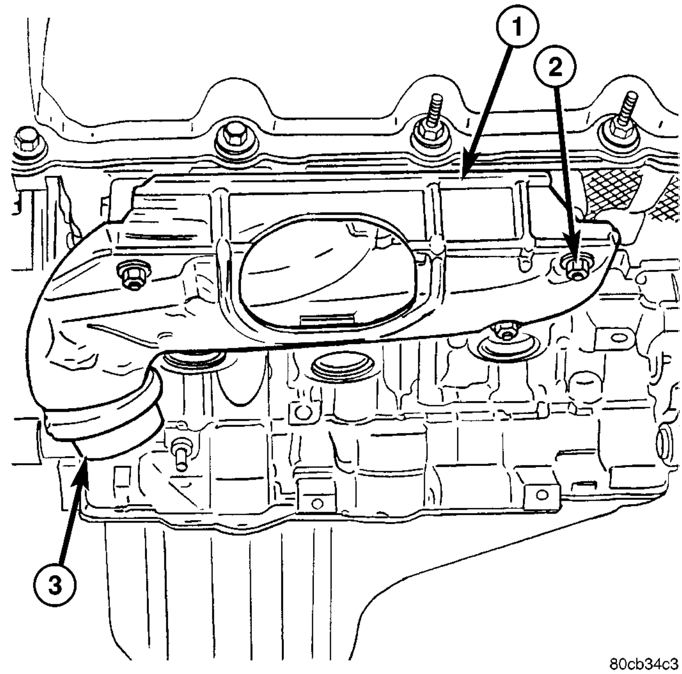

Fig. 99 Exhaust Manifold Right

1 - HEAT SHIELD
2 - NUTS
3 - MANIFOLD FLANGE

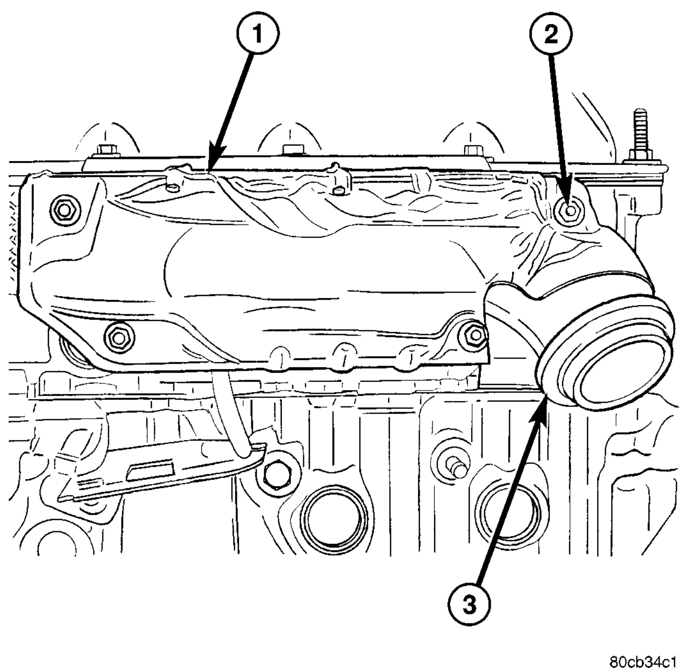

Fig. 100 Exhaust Manifold left

1 - HEAT SHIELD
2 - NUTS
3 - MANIFOLD FLANGE

INSTALLATION

RIGHT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

(1) Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install conical washers and nuts on these studs .

(2) Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N·m (18 ft. lbs.) torque.

(3) Install the exhaust heat shields.

(4) Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

(5) Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N·m (25 ft. lbs.) torque.

LEFT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

(1) Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install conical washers and nuts on these studs .

(2) Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N·m (18 ft. lbs.) torque.

(3) Install the exhaust heat shields.

(4) Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

(5) Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N·m (25 ft. lbs.) torque.

VALVE TIMING

DESCRIPTION

The timing drive system has been designed to provide quiet performance and reliability to support a **non-free wheeling** engine. Specifically the intake valves are non-free wheeling and can be easily damaged with forceful engine rotation if camshaft-to-crankshaft timing is incorrect. The timing drive system consists of a primary chain, two secondary timing chain drives (Fig. 101) and a counterbalance shaft drive.

OPERATION

The primary timing chain is a single inverted tooth chain type. The primary chain drives the large 50 tooth idler sprocket directly from a 25 tooth crankshaft sprocket. Primary chain motion is controlled by a pivoting leaf spring tensioner arm and a fixed guide. The arm and the guide both use nylon plastic wear faces for low friction and long wear. The primary chain receives oil splash lubrication from the secondary chain drive and designed oil pump leakage. The idler sprocket assembly connects the primary chain drive, secondary chain drives, and the counterbalance shaft. The idler sprocket assembly consists of two integral 26 tooth sprockets a 50 tooth sprocket and a helical gear that is press-fit to the assembly. The spline joint for the 50 tooth sprocket is a non – serviceable press fit anti rattle type. A spiral ring is installed on the outboard side of the 50 tooth sprocket to prevent spline disengagement. The idler sprocket assembly spins on a stationary idler shaft. The idler shaft is a light press-fit into the cylinder block. A large washer on the idler shaft bolt and the rear flange of the idler shaft are used to control sprocket thrust movement. Pressurized oil is routed through the center of the idler shaft to provide lubrication for the two bushings used in the idler sprocket assembly.

VALVE TIMING (Continued)

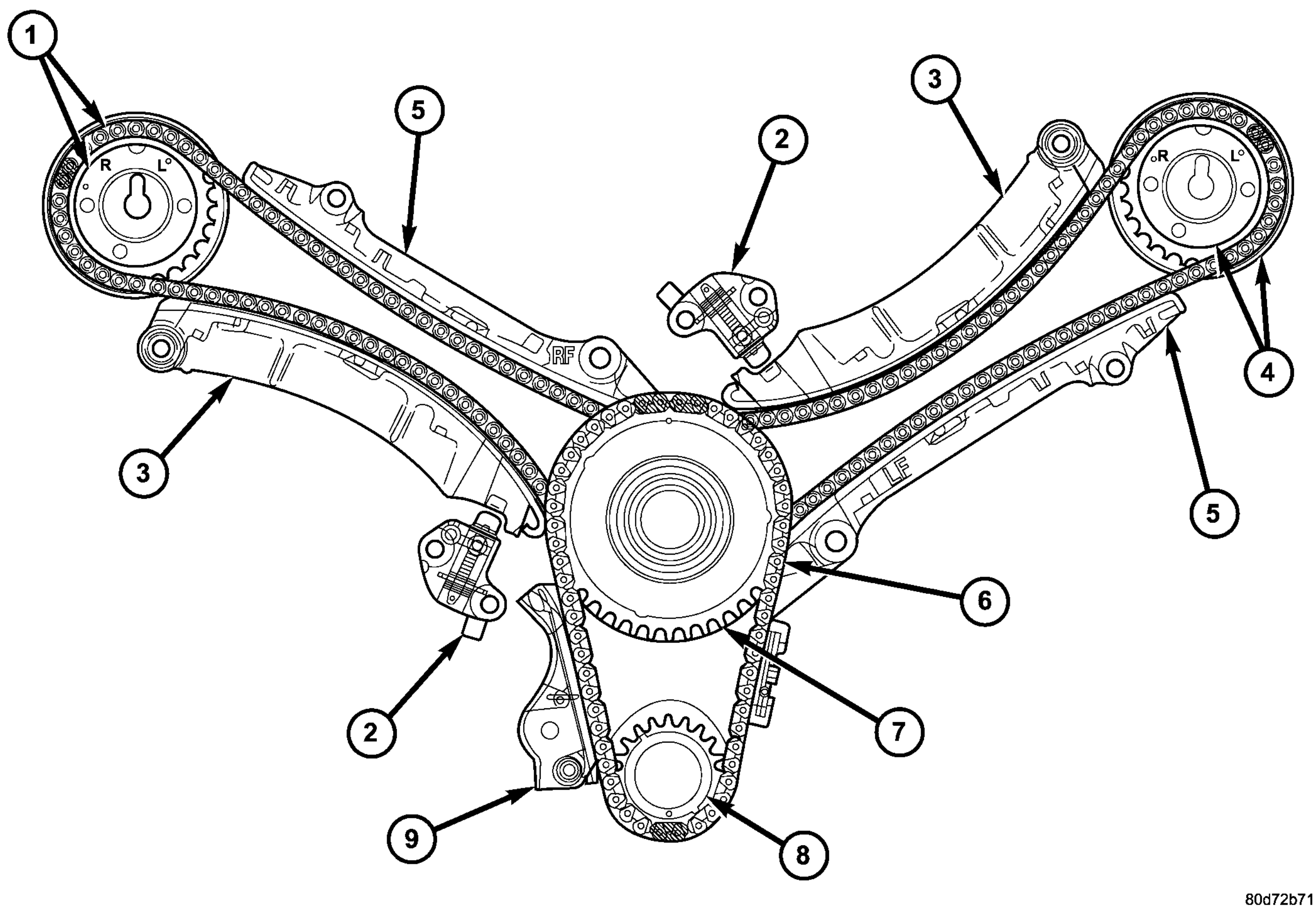

Fig. 101 Timing Drive System

1 - RIGHT CAMSHAFT SPROCKET AND SECONDARY CHAIN
2 - SECONDARY TIMING CHAIN TENSIONER (LEFT AND RIGHT SIDE NOT INTERCHANGEABLE)
3 - SECONDARY TENSIONER ARM
4 - LEFT CAMSHAFT SPROCKET AND SECONDARY CHAIN
5 - CHAIN GUIDE (LEFT AND RIGHT SIDE ARE NOT INTERCHANGEABLE)
6 - PRIMARY CHAIN
7 - IDLER SPROCKET
8 - SNUBBER
9 - CRANKSHAFT SPROCKET
10 - PRIMARY CHAIN TENSIONER

There are two secondary drive chains, both are roller type, one to drive the camshaft in each SOHC cylinder head. There are no shaft speed changes in the secondary chain drive system. Each secondary chain drives a 26 tooth cam sprocket directly from the 26 tooth sprocket on the idler sprocket assembly. A fixed chain guide and a hydraulic oil damped tensioner are used to maintain tension in each secondary chain system. The hydraulic tensioners for the secondary chain systems are fed pressurized oil from oil reservoir pockets in the block. Each tensioner incorporates a controlled leak path through a device known as a vent disc located in the nose of the piston to manage chain loads. Each tensioner also has a mechanical ratchet system that limits chain slack if the tensioner piston bleeds down after engine shut down. The tensioner arms and guides also utilize nylon wear faces for low friction and long wear. The secondary timing chains receive lubrication from a small orifice in the tensioners. This orifice is protected from clogging by a fine mesh screen which is located on the back of the hydraulic tensioners.

VALVE TIMING (Continued)

STANDARD PROCEDURE

MEASURING TIMING CHAIN WEAR

NOTE: This procedure must be performed with the timing chain cover removed.

(1) Remove the timing chain cover. Refer to Timing Chain Cover in this section for procedure.

(2) To determine if the secondary timing chains are worn, rotate the engine clockwise until maximum tensioner piston extension is obtained. Measure the distance between the secondary timing chain tensioner housing and the step ledge on the piston. The measurement at point (A) must be less than 15mm (.5906 inches).

(3) If the measurement exceeds the specification the secondary timing chains are worn and require replacement. Refer to Timing Chain and Sprockets in this section for procedure.

SERVICE PROCEDURE - TIMING VERIFICATION

CAUTION: The 3.7L is a non free-wheeling design engine. Therefore, correct engine timing is critical.

NOTE: Components referred to as left hand or right hand are as viewed from the drivers position inside the vehicle.

NOTE: The blue link plates on the chains and the dots on the camshaft drive sprockets may not line up during the timing verification procedure. The blue link plates are lined up with the sprocket dots only when re-timing the complete timing drive. Once the timing drive is rotated blue link-to-dot alignment is no longer valid.

Engine base timing can be verified by the following procedure:

(1) Remove the cylinder head covers. Refer to the procedure in this section.

(2) Using a mirror, locate the TDC arrow on the front cover (Fig. 102). Rotate the crankshaft until the mark on the crankshaft damper is aligned with the TDC arrow on the front cover. The engine is now at TDC.

(3) Note the location of the V6 mark stamped into the camshaft drive gears. If the V6 mark on each camshaft drive gear is at the twelve o'clock position, the engine is at TDC on the exhaust stroke. If the V6 mark on each gear is at the six o'clock position, the engine is at TDC on the compression stroke. (Fig. 106)

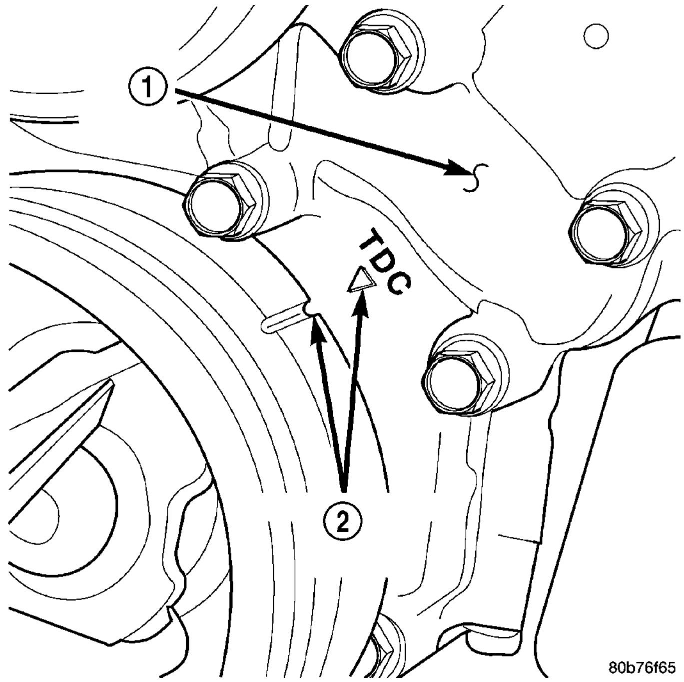

Fig. 102 Engine Top Dead Center (TDC) Indicator Mark

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

(4) If both of the camshaft drive gears are off in the same or opposite directions, the primary chain or both secondary chains are at fault. Refer to Timing Chain and Sprockets procedure in this section.

(5) If only one of the camshaft drive gears is off and the other is correct, the problem is confined to one secondary chain. Refer to Single camshaft timing, in this procedure.

(6) If both camshaft drive gear V6 marks are at the twelve o'clock or the six o'clock position the engine base timing is correct. Reinstall the cylinder head covers.

COUNTER BALANCE SHAFT TIMING

(1) Ensure that the engine is at TDC with both camshaft sprocket V6 marks in the 12 o'clock position. (Fig. 106)

(2) Look down the left cylinder head chain cavity. The timing dot on the counter balance shaft drive gear should be in the 6 o'clock position (Fig. 103).

TIMING - SINGLE CAMSHAFT

NOTE: to adjust the timing on one camshaft, preform the following procedure.

(1) Using Chain Tensioner Wedge (Fig. 105), Special Tool 8379, stabilize the secondary chain drive. For reference purposes, mark the chain-to-sprocket position. (Fig. 104)

VALVE TIMING (Continued)

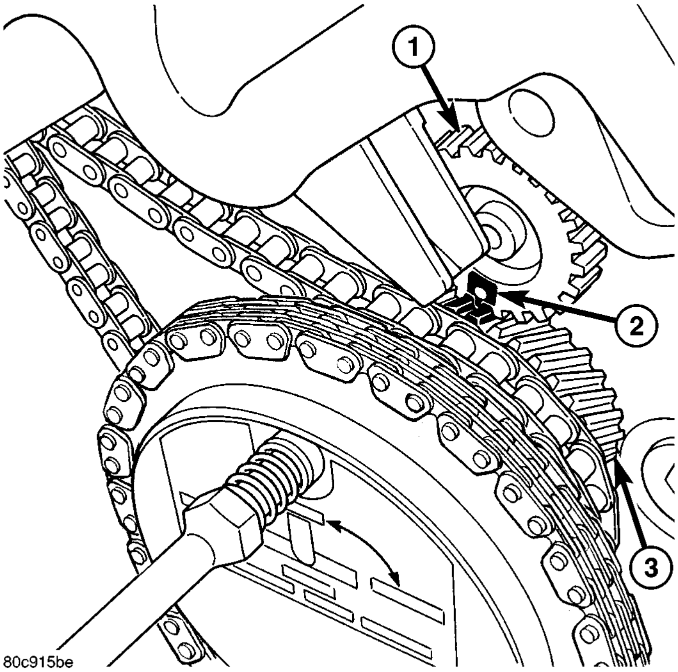

Fig. 103 COUNTERBALANCE SHAFT ALIGNMENT MARKS

1 - COUNTERBALANCE SHAFT GEAR
2 - TIMING MARK
3 - IDLER SPROCKET GEAR

(2) Remove the camshaft drive gear retaining bolt.

(3) Carefully remove the camshaft drive gear from the camshaft.

(4) Re-index the camshaft drive gear in the chain until the V6 mark is at the same position as the V6 mark on the opposite camshaft drive gear.

(5) Using Special Tool 8428 Camshaft Wrench, rotate the camshaft until the alignment dowel on the camshaft is aligned with the slot in the camshaft drive gear.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

(6) Position the camshaft drive gear onto the camshaft, remove oil from bolt then install the retaining bolt. Using Special Tools, Spanner Wrench 6958 with Adapter Pins 8346 and a suitable torque wrench, Tighten retaining bolt to 122 N·m (90 ft. Lbs.).

(7) Remove Special Tool 8379.

(8) Rotate the crankshaft two full revolutions, then verify that the camshaft drive gear V6 marks are in fact aligned.

(9) Install the cylinder head covers. Refer to Cylinder Head Cover in this section.

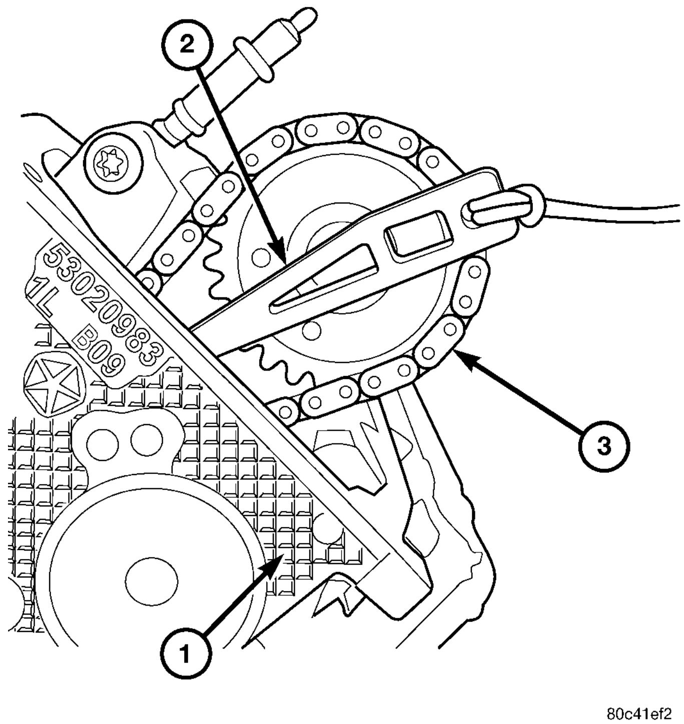

Fig. 104 SECURING TIMING CHAIN TENSIONER USING TIMING CHAIN WEDGE

1 - CYLINDER HEAD
2 -SPECIAL TOOL 8379
3 - TIMING CHAIN

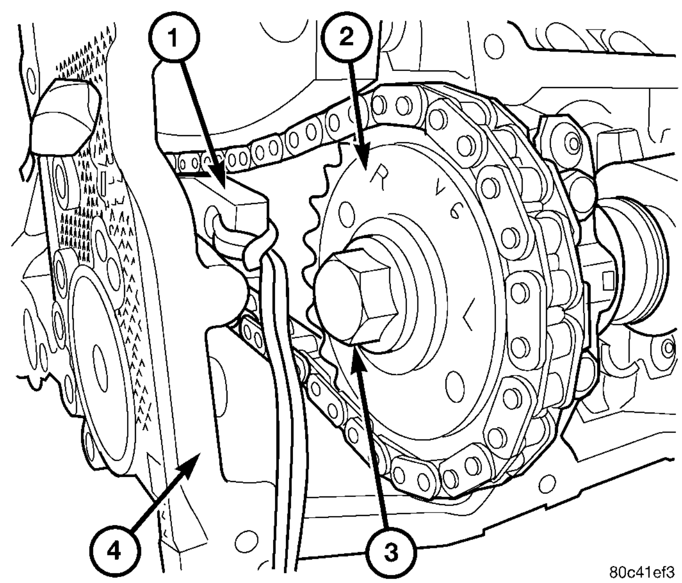

Fig. 105 CAMSHAFT DRIVE GEAR REMOVAL/ INSTALLATION

1 - SPECIAL TOOL 8279 TIMING CHAIN WEDGE
2 - CAMSHAFT DRIVE GEAR
3 - RETAINING BOLT
4 - CYLINDER HEAD

VALVE TIMING (Continued)

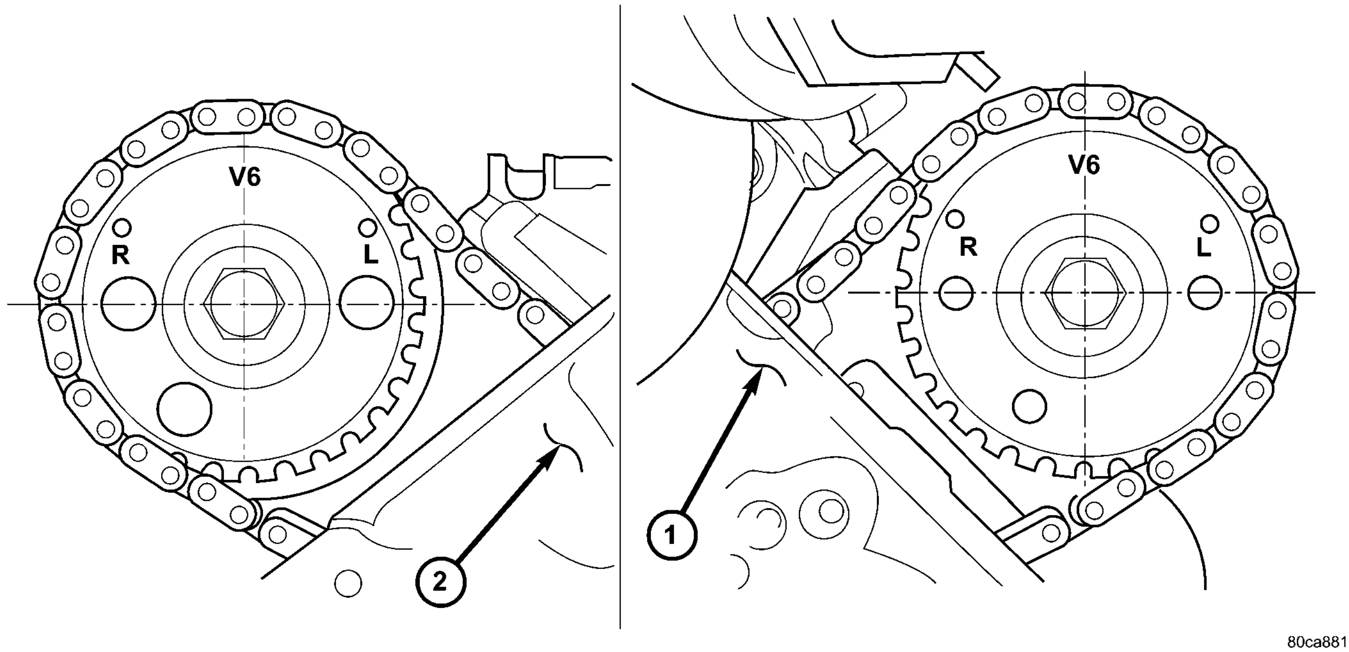

Fig. 106 CAMSHAFT SPROCKET V6 MARKS (#1 TDC, Exhaust stroke)

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

BALANCE SHAFT

REMOVAL

(1) Remove the primary and secondary timing chains. Refer to TIMING CHAIN and SPROCKET.

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.Remove the retaining bolt from the counterbalance shaft thrust plate (Fig. 107).

(2) Using Special Tool 8641 Counterbalance shaft remover/installer tool, remove the counterbalance shaft from the engine (Fig. 108).

INSTALLATION

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.

(1) Coat counterbalance shaft bearing journals with clean engine oil.

NOTE: The balance shaft is heavy, and care should be used when installing shaft, so bearings are not damaged.

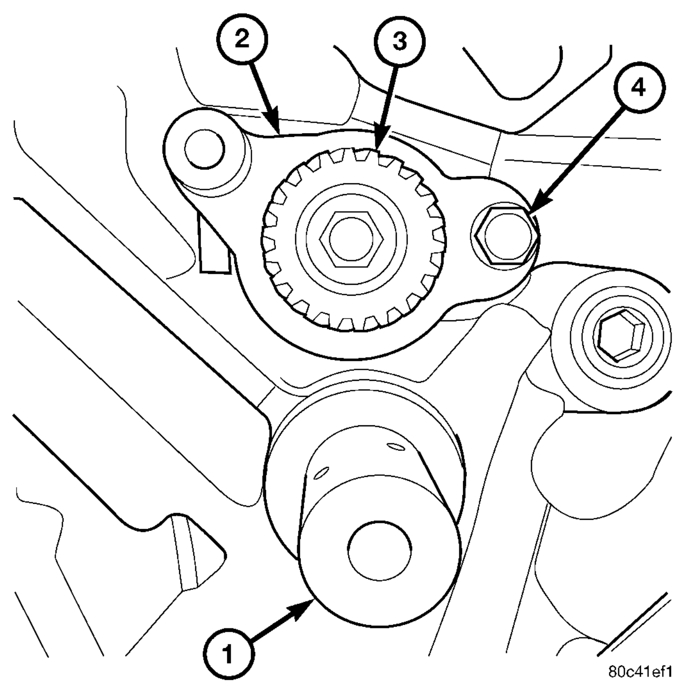

Fig. 107 Counterbalance Shaft Retaining Plate

1 - IDLER SHAFT
2 - COUNTERBALANCE SHAFT THRUST PLATE
3 - COUNTERBALANCE SHAFT DRIVE GEAR
4 - RETAINING BOLT

BALANCE SHAFT (Continued)

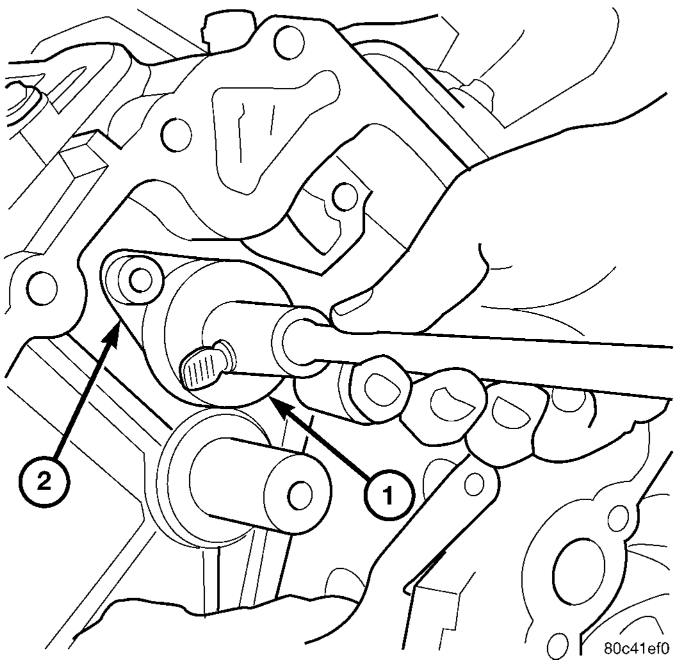

Fig. 108 Counterbalance Shaft Removal/Installation Tool

1 - COUNTERBALANCE SHAFT REMOVAL AND INSTALLATION TOOL
2 - COUNTERBALANCE SHAFT THRUST PLATE

(2) Using Special Tool 8641 Counterbalance shaft remover/installer tool, carefully install counterbalance shaft into engine.

(3) Install Counterbalance shaft thrust plate retaining bolt finger tight.Do not tighten bolt at this time.

(4) Position the right side of the thrust plate with the right chain guide bolt, install bolt finger tight.

(5) Torque the thrust plate retaining bolt to 28 N·m (250 in. lbs.).

(6) Remove the chain guide bolt so that guide can be installed.

TIMING BELT / CHAIN COVER(S)

REMOVAL

(1) Disconnect the battery negative cable.

(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove electric cooling fan and fan shroud assembly.

(4) Remove fan and fan drive assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).

(5) Disconnect both heater hoses at timing cover.

(6) Disconnect lower radiator hose at engine.

(7) Remove accessory drive belt tensioner assembly (Fig. 109).

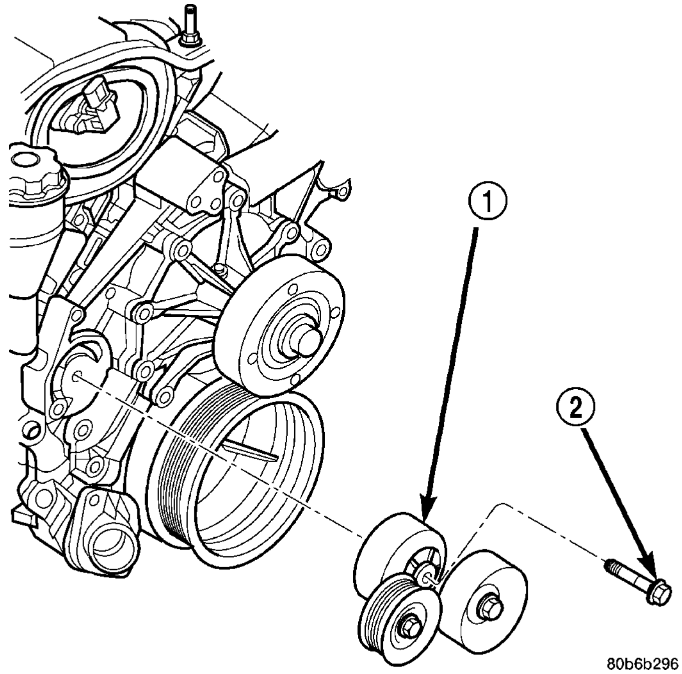

Fig. 109 Accessory Drive Belt Tensioner

1 - TENSIONER ASSEMBLY
2 - FASTENER TENSIONER TO FRONT COVER

(8) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(9) Remove the generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).

(10) Remove A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).

CAUTION: The 3.7L engine uses an anerobic sealer instead of a gasket to seal the front cover to the engine block, from the factory. For service, Mopar® Engine RTV sealant must be substituted.

NOTE: It is not necessary to remove the water pump for timing cover removal.

(11) Remove the bolts holding the timing cover to engine block. (Fig. 110).

(12) Remove the timing cover.

INSTALLATION

CAUTION: Do not use oil based liquids to clean timing cover or block surfaces. Use only rubbing alcohol, along with plastic or wooden scrapers. Use no wire brushes or abrasive wheels or metal scrapers, or damage to surfaces could result.

TIMING BELT / CHAIN COVER(S) (Continued)

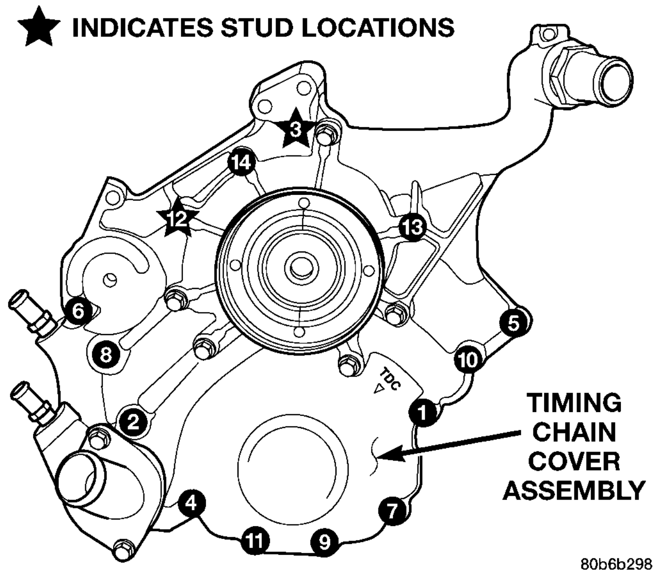

Fig. 110 Timing Chain Cover Fasteners - Typical

(1) Clean timing chain cover and block surface using rubbing alcohol.

CAUTION: The 3.7L uses a special anerobic sealer instead of a gasket to seal the timing cover to the engine block, from the factory. For service repairs, Mopar® Engine RTV must be used as a substitute.

(2) Inspect the water passage o-rings for any damage, and replace as necessary.

(3) Apply Mopar® Engine RTV sealer to the front cover following the path below, using a 3 to 4mm thick bead (Fig. 111).

(4) Install cover. Tighten flange head fasteners in sequence as shown in (Fig. 112) to 58 N·m (43 ft. lbs.).

(5) Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(6) Install the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

(7) Install the generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).

(8) Install accessory drive belt tensioner assembly (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION).

(9) Install radiator upper and lower hoses.

(10) Install both heater hoses.

(11) Install electric fan shroud and viscous fan drive assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).

(12) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(13) Connect the battery negative cable.

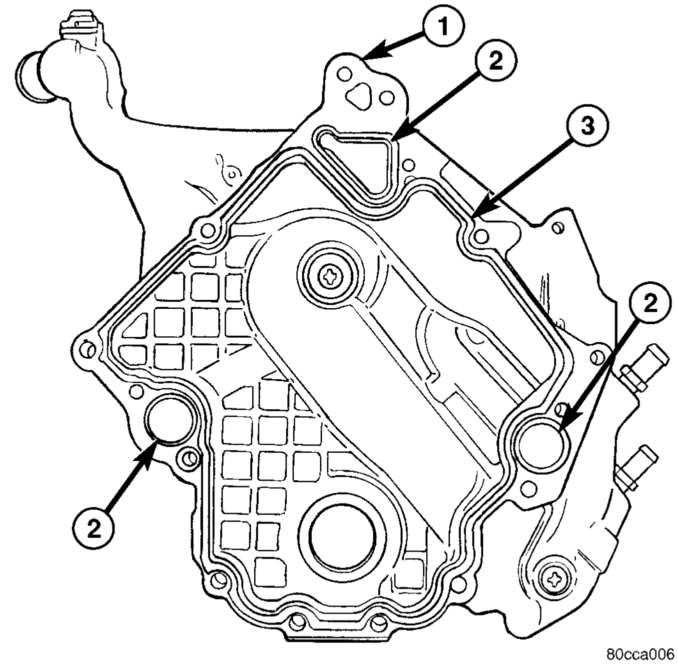

Fig. 111 Timing Cover Sealant

1 - TIMING CHAIN COVER
2 - WATER PASSAGE ORING
3 - MOPAR® ENGINE RTV SEALER

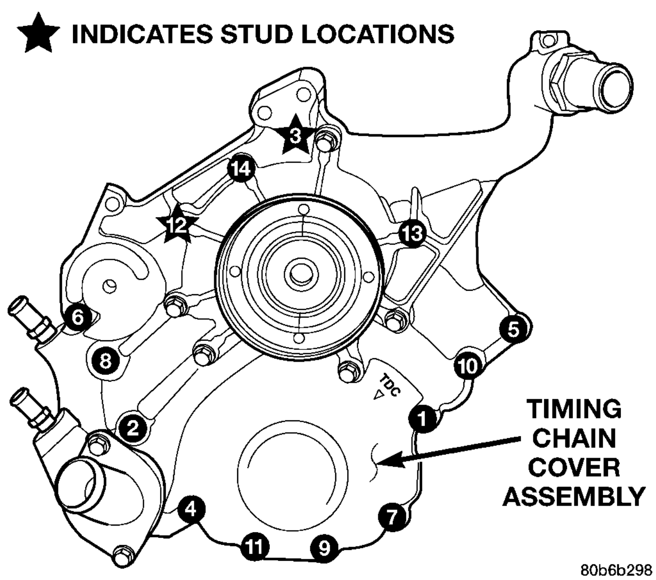

Fig. 112 Timing Chain Cover Fasteners - Typical

IDLER SHAFT

REMOVAL

(1) Remove the primary and secondary timing chains and sprockets. Refer to procedure in this section.

NOTE: To remove the idler shaft, it is necessary to tap threads into the shaft, to install the removal tool.

IDLER SHAFT (Continued)

(2) Using a 12 mm X 1.75 tap, cut threads in the idler shaft center bore.

(3) Cover the radiator core with a suitable cover.

CAUTION: Use care when removing the idler shaft, Do not strike the radiator cooling fins with the slide hammer.

(4) Using Special Tool 8517 Slide Hammer, remove the idler shaft.

INSTALLATION

(1) Thoroughly clean the idler shaft bore.

(2) Position the idler shaft in the bore.

NOTE: The two lubrication holes in the idler shaft do not require any special alignment.

NOTE: Before using the retaining bolt to install the idler shaft, coat the threads and the pilot on the idler shaft, with clean engine oil.

(3) Using the primary idler sprocket retaining bolt and washer, carefully draw the idler shaft into the bore until fully seated.

(4) Coat the idler shaft with clean engine oil.

(5) Install the timing chains and sprockets. Refer to procedure in this section.

TIMING BELT/CHAIN AND SPROCKET(S)

REMOVAL

(1) Disconnect negative cable from battery.

(2) Drain cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove right and left cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(4) Remove radiator fan shroud(Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(5) Rotate engine until timing mark on crankshaft damper aligns with TDC mark on timing chain cover (Fig. 114) and the camshaft sprocket “V6” marks are at the 12 o'clock position (#1 TDC exhaust stroke) (Fig. 113).

(6) Remove power steering pump(Refer to 19 - STEERING/PUMP - REMOVAL).

(7) Remove access plug from left and right cylinder heads for access to chain guide fasteners (Fig. 115).

(8) Remove the oil fill housing to gain access to the right side tensioner arm fastener.

(9) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) and timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(10) Collapse and pin primary chain tensioner.

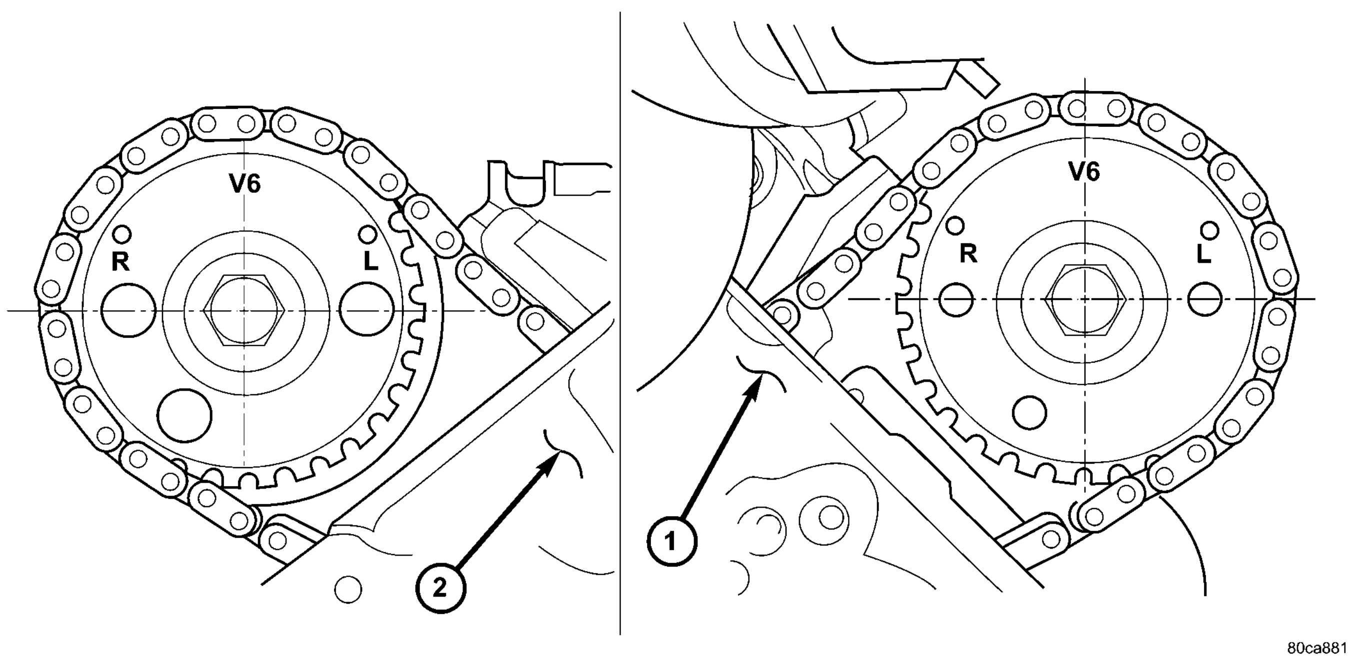

Fig. 113 Camshaft Sprocket V6 Marks (#1 TDC, Exhaust stroke)

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

TIMING BELT/CHAIN AND SPROCKET(S) (Continued)

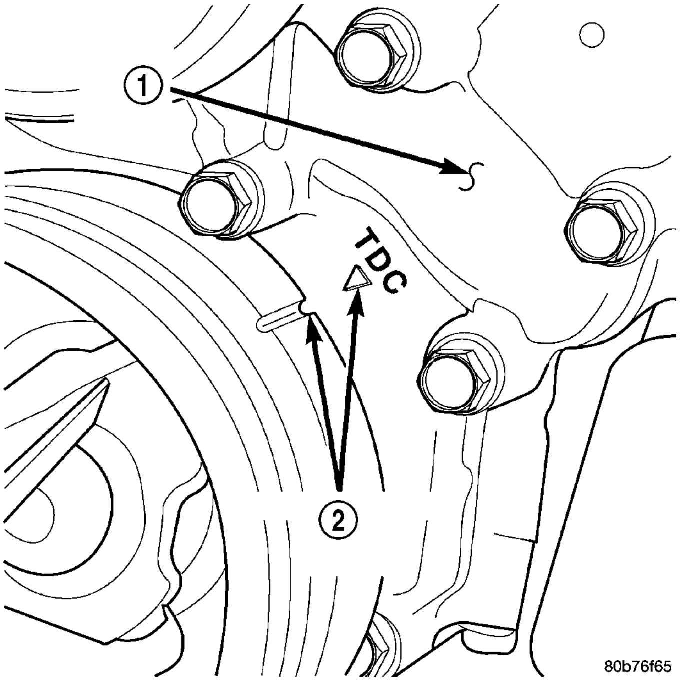

Fig. 114 Engine Top Dead Center

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

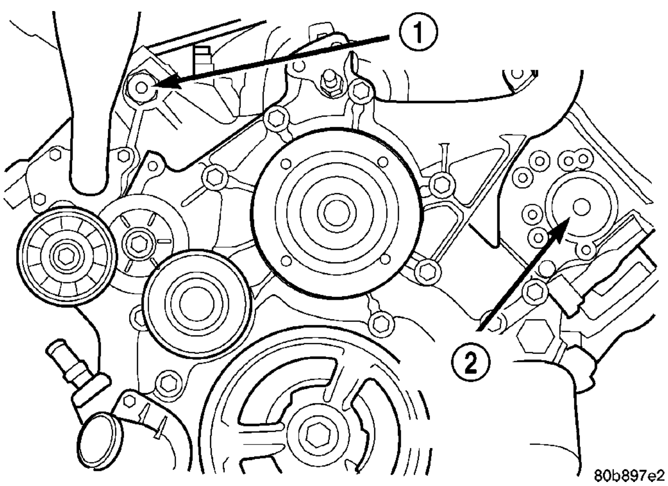

Fig. 115 Cylinder Head Access Plugs

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

CAUTION: Plate behind left secondary chain tensioner could fall into oil pan. Therefore, cover pan opening.

(11) Remove secondary chain tensioners.
(12) Remove camshaft position sensor (Fig. 116).

CAUTION: Care should be taken not to damage camshaft target wheel. Do not hold target wheel while loosening or tightening camshaft sprocket. Do not place the target wheel near a magnetic source of any kind. A damaged or magnetized target wheel could cause a vehicle no start condition.

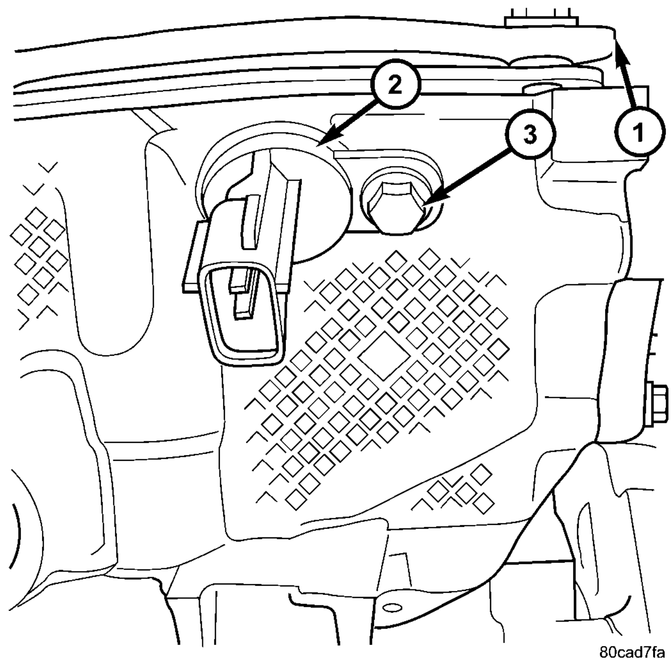

Fig. 116 Camshaft Position Sensor

1 - CYLINDER HEAD
2 - CAMSAHFT POSITION SENSOR
2 - SCREW

CAUTION: Do not forcefully rotate the camshafts or crankshaft independently of each other. Damaging intake valve to piston contact will occur. Ensure negative battery cable is disconnected to guard against accidental starter engagement.

(13) Remove left and right camshaft sprocket bolts.
(14) While holding the left camshaft steel tube with Special Tool 8428 Camshaft Wrench, remove the left camshaft sprocket. Slowly rotate the camshaft approximately 5 degrees clockwise to a neutral position.
(15) While holding the right camshaft steel tube with Special Tool 8428 Camshaft Wrench, remove the right camshaft sprocket.
(16) Remove idler sprocket assembly bolt.
(17) Slide the idler sprocket assembly and crank sprocket forward simultaneously to remove the primary and secondary chains.
(18) Remove both pivoting tensioner arms and chain guides.
(19) Remove primary chain tensioner.

INSPECTION

Inspect the following components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.
- Idler sprocket assembly bushing and shaft for excessive wear.
- Idler sprocket assembly spline joint. The joint should be tight with no backlash or axial movement.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep. If plastic face is severely grooved or melted, the tensioner lube jet may be clogged. The tensioner should be replaced.
- Secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner tensioner arm and chain should be replaced.
- Primary chain tensioner plastic faces. Replace as required.

INSTALLATION

(1) Using a vise, lightly compress the secondary chain tensioner piston until the piston step is flush with the tensioner body. Using a pin or suitable tool, release ratchet pawl by pulling pawl back against spring force through access hole on side of tensioner. While continuing to hold pawl back, Push ratchet device to approximately 2 mm from the tensioner body. Install Special Tool 8514 lock pin into hole on front of tensioner (Fig. 117). Slowly open vise to transfer piston spring force to lock pin.

(2) Position primary chain tensioner over oil pump and insert bolts into lower two holes on tensioner bracket. Tighten bolts to 28 N·m (250 in. lbs.).

NOTE: Left and right chain guides are not interchangeable.

(3) Install right side chain tensioner arm. Install torx® bolt. Tighten torx® bolt to 28 N·m (250 in. lbs.).

CAUTION: The silver bolts retain the guides to the cylinder heads and the black bolts retain the guides to the engine block.

(4) Install the left side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

(5) Install left side chain tensioner arm, and torx® bolt. Tighten torx® bolt to 28 N·m (250 in. lbs.).

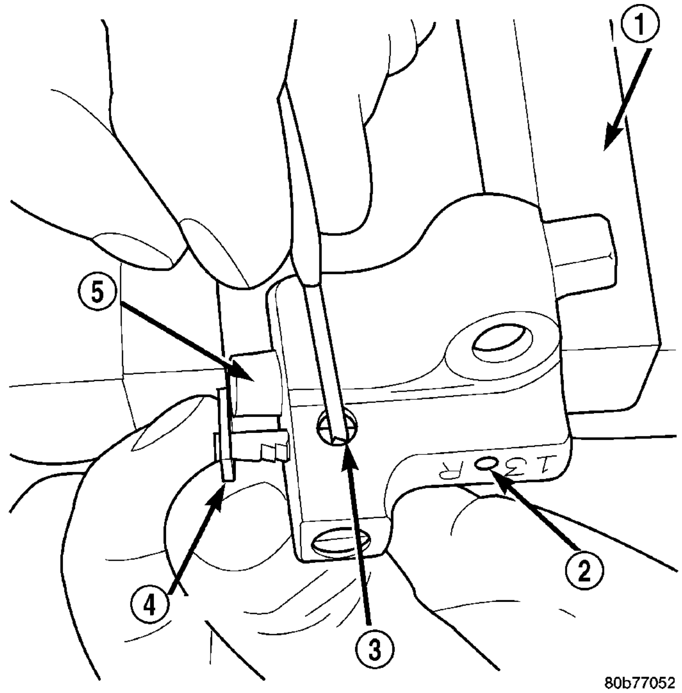

Fig. 117 Resetting Secondary Chain Tensioners

1 - VISE
2 - INSERT LOCK PIN
3 - RATCHET PAWL
4 - RATCHET
5 - PISTON

(6) Install the right side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

(7) Install both secondary chains onto the idler sprocket. Align two plated links on the secondary chains to be visible through the two lower openings on the idler sprocket (4 o'clock and 8 o'clock). Once the secondary timing chains are installed, position special tool 8429 to hold chains in place for installation.

(8) Align primary chain double plated links with the timing mark at 12 o'clock on the idler sprocket. Align the primary chain single plated link with the timing mark at 6 o'clock on the crankshaft sprocket.

(9) Lubricate idler shaft and bushings with clean engine oil.

NOTE: The idler sprocket must be timed to the counterbalance shaft drive gear before the idler sprocket is fully seated.

TIMING BELT/CHAIN AND SPROCKET(S) (Continued)

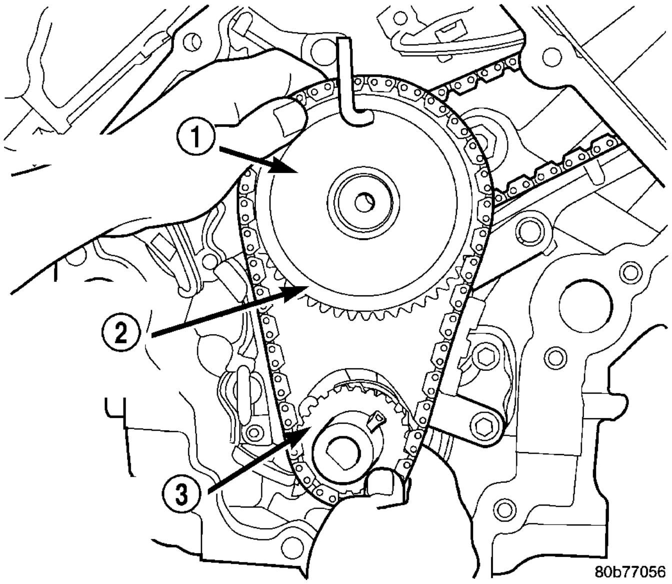

Fig. 118 Installing Idler Gear, Primary and Secondary Timing Chains

1 - SPECIAL TOOL 8429
2 - PRIMARY CHAIN IDLER SPROCKET
3 - CRANKSHAFT SPROCKET

(10) Install all chains, crankshaft sprocket, and idler sprocket as an assembly (Fig. 118). After guiding both secondary chains through the block and cylinder head openings, affix chains with a elastic strap or equivalent. This will maintain tension on chains to aid in installation. Align the timing mark on the idler sprocket gear to the timing mark on the counterbalance shaft drive gear, then seat idler sprocket fully (Fig. 119). Before installing idler sprocket bolt, lubricate washer with oil, and tighten idler sprocket assembly retaining bolt to 34 N·m (25 ft. lbs.).

NOTE: It will be necessary to slightly rotate camshafts for sprocket installation.

(11) Align left camshaft sprocket “L” dot to plated link on chain.

(12) Align right camshaft sprocket “R” dot to plated link on chain.

CAUTION: Remove excess oil from the camshaft sprocket bolt. Failure to do so can result in overtorque of bolt resulting in bolt failure.

(13) Remove Special Tool 8429, then attach both sprockets to camshafts. Remove excess oil from bolts, then Install sprocket bolts, but do not tighten at this time.

(14) Verify that all plated links are aligned with the marks on all sprockets and the “V6” marks on camshaft sprockets are at the 12 o’clock position.

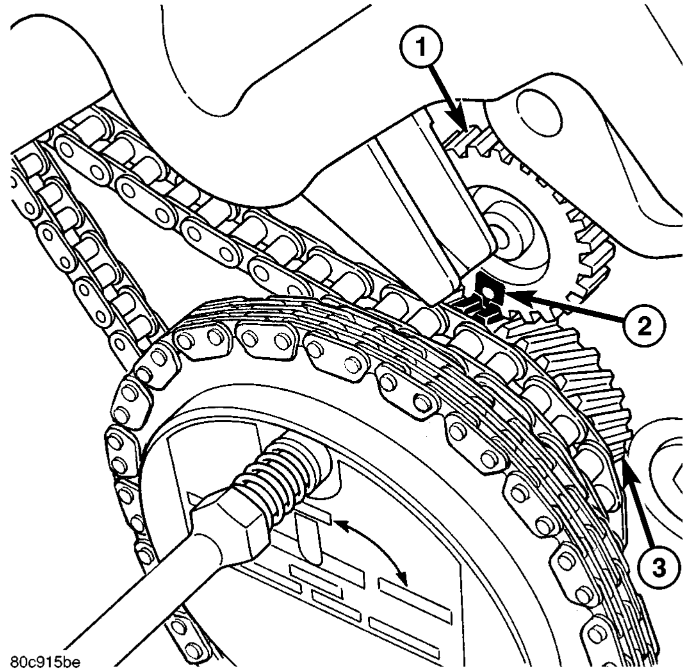

Fig. 119 Counterbalance Shaft Alignment Marks

1 - COUNTERBALANCE SHAFT GEAR
2 - TIMING MARK
3 - IDLER SPROCKET GEAR

CAUTION: Ensure the plate between the left secondary chain tensioner and block is correctly installed.

(15) Install both secondary chain tensioners. Tighten bolts to 28 N·m (250 in. lbs.).

NOTE: Left and right secondary chain tensioners are not common.

(16) Remove all locking pins (3) from tensioners.

CAUTION: After pulling locking pins out of each tensioner, DO NOT manually extend the tensioner(s) ratchet. Doing so will over tension the chains, resulting in noise and/or high timing chain loads.

(17) Using Special Tool 6958, Spanner with Adaptor Pins 8346, tighten left (Fig. 120) and right (Fig. 121). camshaft sprocket bolts to 122 N·m (90 ft. lbs.).

(18) Rotate engine two full revolutions. Verify timing marks are at the follow locations:

- primary chain idler sprocket dot is at 12 o’clock
- primary chain crankshaft sprocket dot is at 6 o’clock
- secondary chain camshaft sprockets “V6” marks are at 12 o’clock
- counterbalancer shaft drive gear dot is aligned to the idler sprocket gear dot

(19) Lubricate all three chains with engine oil.

TIMING BELT/CHAIN AND SPROCKET(S) (Continued)

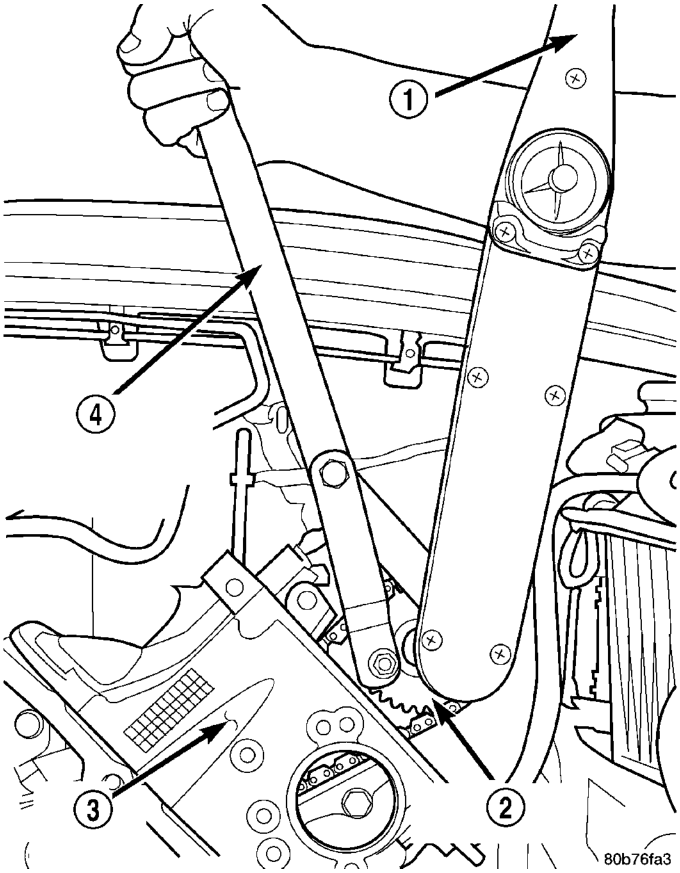

Fig. 120 Tightening Left Side Camshaft Sprocket Bolt

1 - TORQUE WRENCH
2 - CAMSHAFT SPROCKET
3 - LEFT CYLINDER HEAD
4 - SPECIAL TOOL 6958 SPANNER WITH ADAPTER PINS 8346

(20) After installing all chains, it is recommended that the idler gear end play be checked (Fig. 122). The end play must be within 0.10–0.25 mm (0.004–0.010 in.). If not within specification, the idler gear must be replaced.

(21) Install timing chain cover and crankshaft damper. Refer to procedures.

(22) Install cylinder head covers. Refer to procedures.

NOTE: Before installing threaded plug in right cylinder head, the plug must be coated with sealant to prevent leaks.

(23) Coat the large threaded access plug with **Mopar® Thread Sealant with Teflon**, then install into the right cylinder head and tighten to 81 N·m (60 ft. lbs.).

(24) Install the oil fill housing.

(25) Install access plug in left cylinder head.

(26) Install power steering pump.

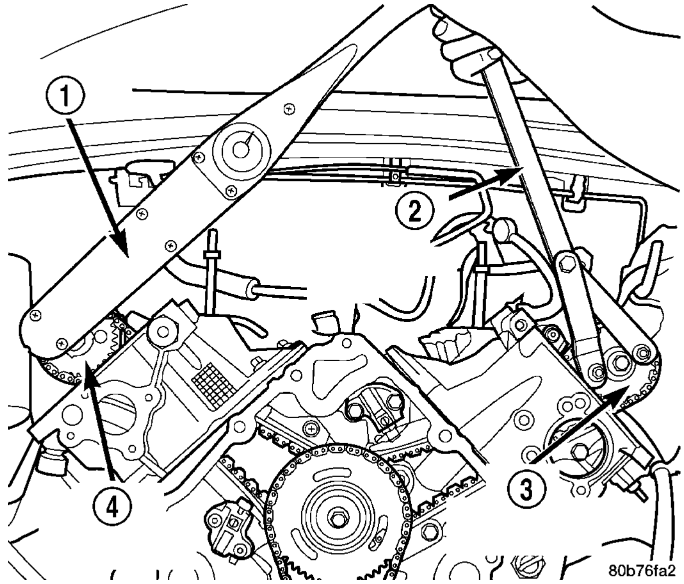

Fig. 121 Tightening Right Side Camshaft Sprocket Bolt

1 - TORQUE WRENCH
2 - SPECIAL TOOL 6958 WITH ADAPTER PINS 8346
3 - LEFT CAMSHAFT SPROCKET
4 - RIGHT CAMSHAFT SPROCKET

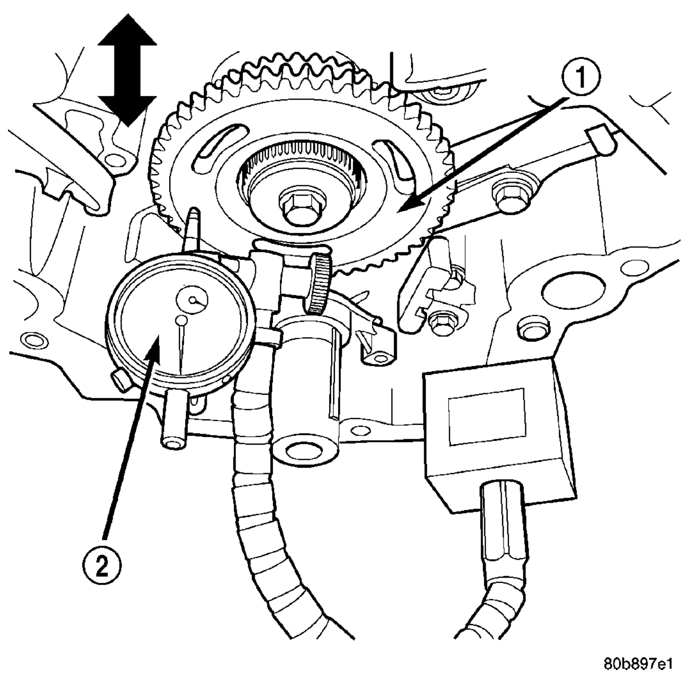

Fig. 122 Measuring Idler Gear End Play

1 - IDLER SPROCKET ASSEMBLY
2 - DIAL INDICATOR

(27) Fill cooling system.

(28) Connect negative cable to battery.

EXHAUST SYSTEM

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EXHAUST SYSTEM

DESCRIPTION

The basic exhaust system consists of an engine exhaust manifold, exhaust down pipe, exhaust pipe, exhaust heat shield(s), muffler and exhaust tailpipe

The exhaust system uses a single muffler.

The exhaust system must be properly aligned to prevent stress, leakage and body contact. If the system contacts any body panel, it will transfer objectionable noises originating from the engine to the body.

When inspecting an exhaust system, critically inspect for cracked or loose joints, stripped screw or bolt threads, corrosion damage and worn, cracked or broken hangers. Replace all components that are badly corroded or damaged. DO NOT attempt to repair.

When replacement is required, use original equipment parts (or equivalent). This will assure proper alignment and provide acceptable exhaust noise levels.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan exhaust heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.

EXHAUST SYSTEM (Continued)

DIAGNOSIS AND TESTING - EXHAUST SYSTEM

EXHAUST SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE OR LEAKING EXHAUST GASES	1. Leaks at pipe joints.	1. Tighten clamps/bolts to specified torque at leaking joints.
	2. Rusted or blown out muffler.	2. Replace muffler. Inspect exhaust system.
	3. Broken or rusted out exhaust pipe.	3. Replace exhaust pipe.
	4. Exhaust pipe leaking at manifold flange.	4. Tighten/replace flange attaching nuts/bolts.
	5. Exhaust manifold cracked or broken.	5. Replace exhaust manifold.
	6. Leak between exhaust manifold and cylinder head.	6. Tighten exhaust manifold to cylinder head bolts.
	7. Catalytic converter rusted or blown out.	7. Replace catalytic converter assy.
	8. Restriction in exhaust system.	8. Remove restriction, if possible. Replace restricted part if necessary.
CAUTION: When servicing and replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or sensor.		

CATALYTIC CONVERTER

DESCRIPTION - CATALYTIC CONVERTER

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

CAUTION: DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

50 State emission vehicles incorporate two mini catalytic converters located after the exhaust manifolds and before the inline catalytic converter.

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

(1) Raise and support the vehicle.
(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
(3) Remove the bolts from the crossover pipe to the catalytic converter connection.
(4) Disconnect oxygen sensor wiring.
(5) Loosen and remove the nuts from the clamp that hold the catalytic converter to the exhaust pipe flange connection.

2.4L ENGINES

(1) Disconnect the oxygen sensors.

CATALYTIC CONVERTER (Continued)

(2) Remove the two bolts and flanged nuts at the manifold (Fig. 1).

(3) Lower the catalyst assembly and slide out of the mount at the transmission (if equipped).

(4) Remove the catalyst assembly from the vehicle.

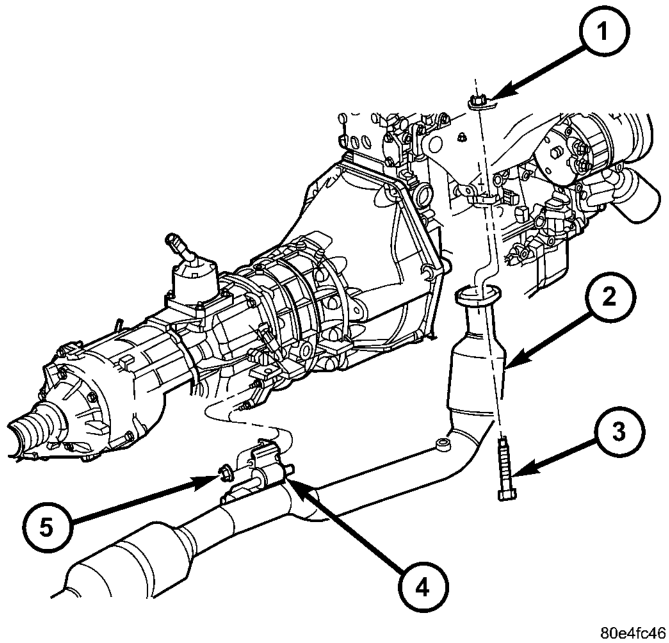

Fig. 1 2.4L CATALYST ASSEMBLY - 4x4

1- FLANGED NUT
2- CATALYST ASSEMBLY
3- BOLT
4- HANGER
5- NUT

3.7L ENGINES

NOTE: Do not remove nut from T-Bolt. Only remove nut far enough, so that the T end can be removed from the clamp.

(1) Remove the T bolt end of the fastener, from the clamp.

(2) Spread the clamp, and remove the catalytic converter from the vehicle.

(3) Discard the clamp (Fig. 2).

NOTE: The catalytic converter to exhaust manifold clamp is not reusable. Always use a new clamp when reinstalling the catalytic converter.

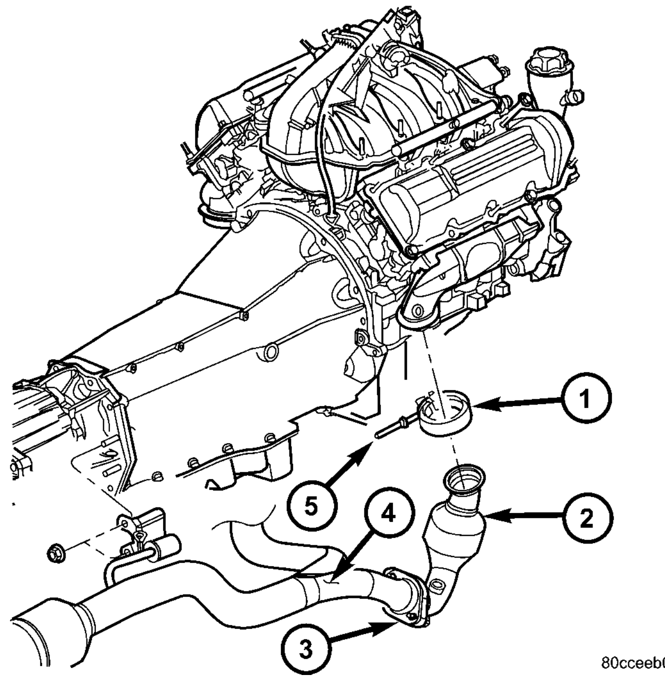

Fig. 2 Catalyst Removal

1 - V-Clamp
2 - Catalytic Converter
3 - Flange
4 - Crossover Pipe
5 - T-Bolt

INSPECTION

Look at the stainless steel body of the converter, inspect for bulging or other distortion that could be a result of overheating. If the converter has a heat shield attached make sure it is not bent or loose.

If you suspect internal damage to the catalyst, tapping the bottom of the catalyst with a rubber mallet may indicate a damaged core.

INSTALLATION

(1) Position the front pipe onto the exhaust manifold flange connection. Tighten the clamp to 10 N·m (95 in. lbs.) torque.

(2) Install the bolts at the muffler and front pipe connection. Tighten the clamp nuts to 27 N·m (19 ft. lbs.) torque.

(3) Connect oxygen sensor wiring.

(4) Lower the vehicle.

(5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

CROSS-OVER PIPE

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Raise and support the vehicle.
(2) Saturate the bolts and nuts with lubricant. Allow 5 minutes for penetration.
(3) Remove the retaining fasteners holding crossover pipe to exhaust pipe.
(4) Remove the fasteners from the crossover pipe to the catalytic converter connection.
(5) Remove the crossove pipe from the hanger insulator (Fig. 3).

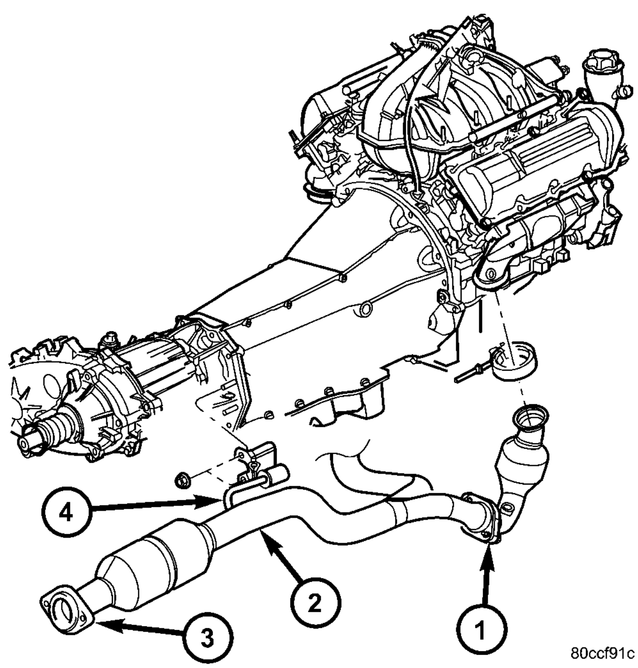

Fig. 3 Crossover Pipe

1 - Crossover-toCatalytic Converter flange
2 - Crossover Pipe
3 - Crossover Pipe to Tail Pipe Flange
4 - Hanger Bracket

INSTALLATION

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Install the crossove pipe into the hanger insulator.
(2) Install and torque the fasteners in the crossover pipe to the left and right catalytic converter connection.
(3) Install and torque the retaining fasteners holding the crossover pipe to exhaust pipe.
(4) Lower vehicle..
(5) Start engine and check for leaks.

EXHAUST PIPE-2.4L

REMOVAL

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

(1) Raise and support the vehicle.
(2) Saturate the studs and nuts with a Mopar® rust penetrant. Allow 5 minutes for penetration.

EXHAUST PIPE-2.4L (Continued)

(3) Remove the oxygen sensors from the exhaust pipe and the catalytic converter.

(4) Disconnect the exhaust pipe from the engine exhaust manifold (Fig. 4).

(5) Remove catalytic converter to muffler flange retaining nuts (Fig. 4).

(6) Slide exhaust pipe rearward until exhaust pipe hanger disengages from transmission support. Remove exhaust pipe and catalytic converter from vehicle.

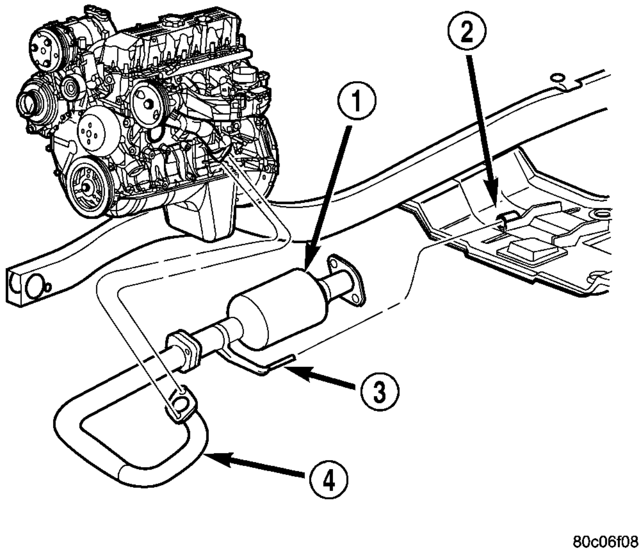

Fig. 4 EXHAUST PIPE AND CATALYTIC CONVERTER

1 - CATALYTIC CONVERTER
2 - TRANSMISSION SUPPORT
3 - EXHAUST HANGER
4 - EXHAUST PIPE

INSTALLATION

(1) Position exhaust pipe and catalytic converter into vehicle.

(2) Insert exhaust pipe hanger into transmission support (Fig. 4).

(3) Install exhaust pipe onto exhaust manifold **DO NOT** tighten bolts at this time.

(4) Position muffler flange onto catalytic converter flange and install retaining bolts and nuts. **DO NOT** tighten nuts at this time.

(5) Make sure the exhaust system is aligned and has the proper clearance. The minimum clearance is 25mm (1 inch).

(6) Tighten muffler to catalytic converter flange retaining nuts to 21 N·m (16 ft. lbs.).

(7) Tighten exhaust pipe to exhaust manifold mounting bolts to 31 N·m (23 ft. lbs.).

(8) Install the oxygen sensors in the exhaust pipe and catalytic converter.

(9) Lower vehicle.

(10) Start engine check for leaks.

HEAT SHIELDS

DESCRIPTION

Heat shields are needed to protect both the vehicle and the environment from the high temperatures developed by the catalytic converter. The catalytic converter releases additional heat into the exhaust system. Under severe operating conditions, the temperature increases in the area of the converter. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency (Fig. 5).

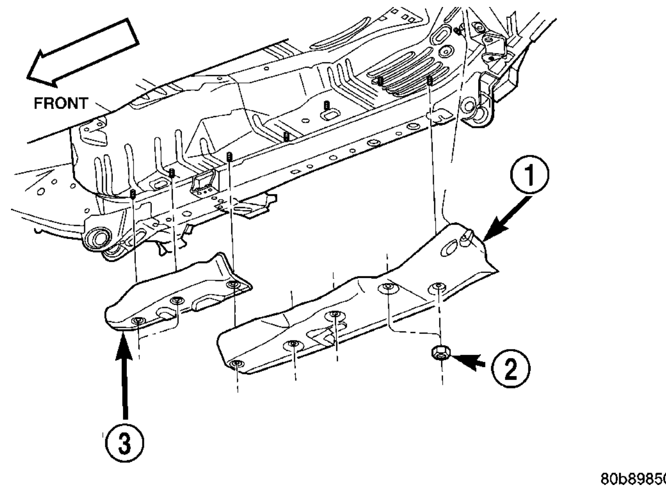

Fig. 5 Front and Rear Floor Pan Heat Shields Typical

1 - REAR FLOOR PAN HEAT SHIELD
2 - HEAT SHIELD RETAINING NUTS
3 - FRONT FLOOR PAN HEAT SHIELD

MUFFLER

DESCRIPTION

The 2.4L and 3.7L engine uses a galvanized steel muffler (Fig. 6) to control exhaust noise levels and exhaust back pressure.

REMOVAL

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are either clamped together or welded together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINE.

MUFFLER (Continued)

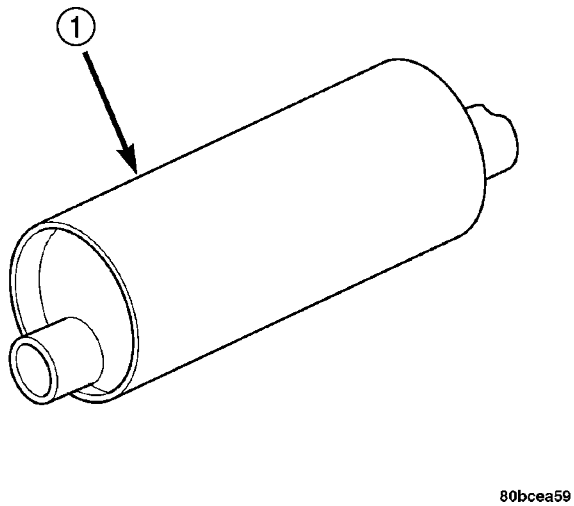

Fig. 6 Muffler - Typical

1 - MUFFLER

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector. Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

(1) Raise and support the vehicle.

(2) Remove the mounting nuts from the muffler to front pipe flange (Fig. 7).

(3) Disconnect front tailpipe hanger from the insulator (Fig. 7).

(4) Remove the tailpipe from the rear tailpipe hanger (Fig. 7).

(5) Remove the muffler and tailpipe assembly from the vehicle.

INSTALLATION

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are either clamped together or welded together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINE.

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector. Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

(1) Position muffler and tailpipe assembly into vehicle.

(2) Install rear hanger into isolator.

(3) Install front hanger into isolator.

(4) Make sure the exhaust system is in proper alignment. There should be at least 25mm (1 inch) clearance between the exhaust components and any surrounding components.

(5) Tighten muffler to front pipe nuts to 28.5 N·m (21 ft. lbs.).

(6) Tighten tailpipe clamp to 27 N·m (16 ft. lbs.).

MUFFLER (Continued)

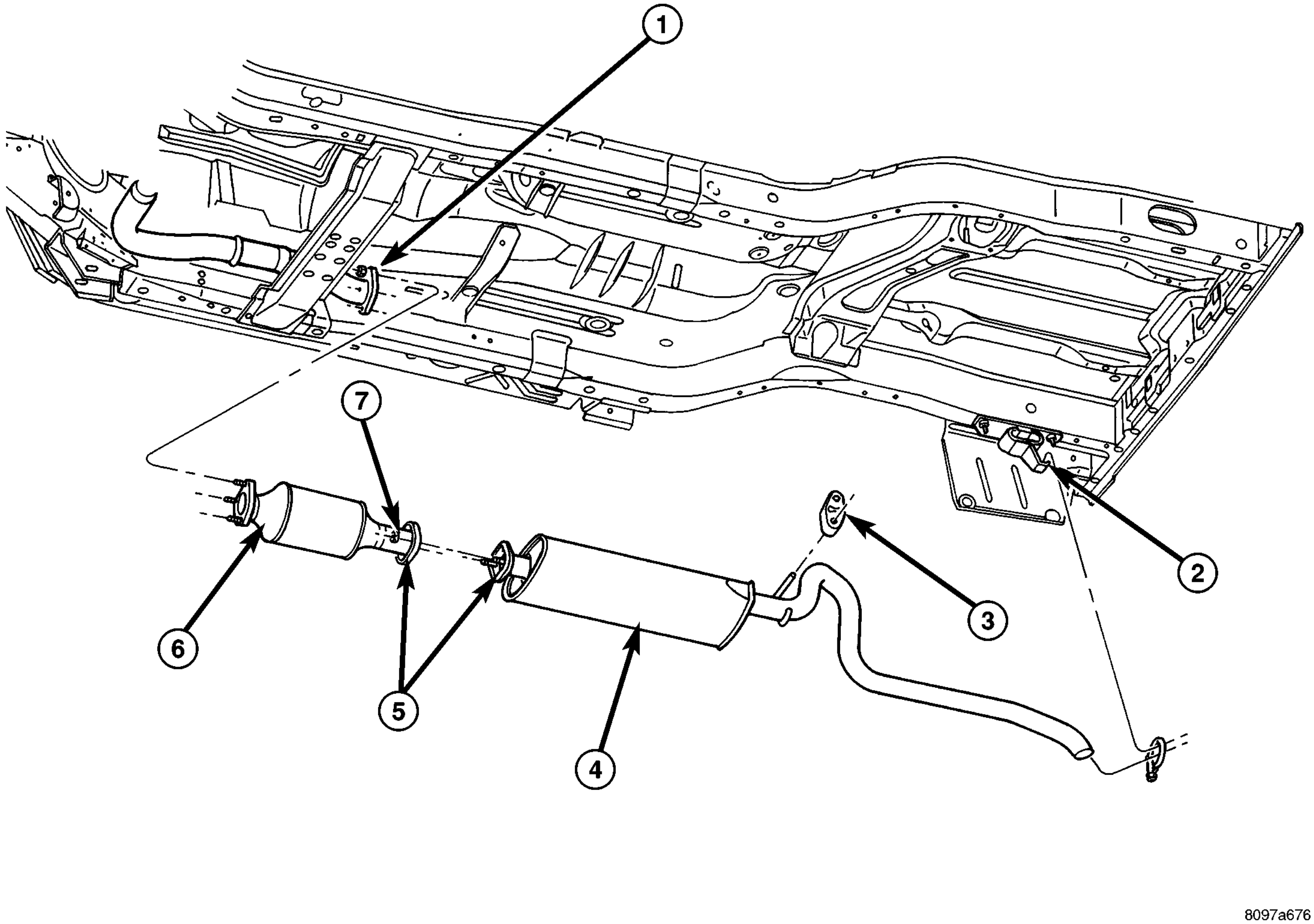

Fig. 7 Muffler/Tailpipe Removal and Installation

1 - EXHAUST PIPE FLANGE JOINT
2 - REAR TAILPIPE HANGER
3 - FRONT TAILPIPE HANGER
4 - MUFFLER
5 - FLANGE JOINT
6 - CATALYTIC CONVERTER
7 - NUT

FRAMES & BUMPERS

TABLE OF CONTENTS

FRONT FASCIA

REMOVAL

(1) Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)

(2) Raise and support vehicle.

(3) Remove the front wheel opening flare moldings. (Refer to 23 - BODY/EXTERIOR/FRONT WHEEL OPENING FLARE MOLDINGS - REMOVAL)

(4) Remove the four screws through the lower air dam (Fig. 1).

(5) Disconnect the electrical connectors:

- Fascia to grille opening reinforcement. (Fig. 1)
- Side repeater lights, both sides, if equipped. (Fig. 2)

(6) Remove the six push pins from the grill support.

(7) Remove the rivets attaching the air dam to the wheelhouse splash shield.

(8) Release the support tabs beneath the headlamps.

(9) Release the inner support clips from within the fascia between the lights (Fig. 2).

(10) Remove the fascia.

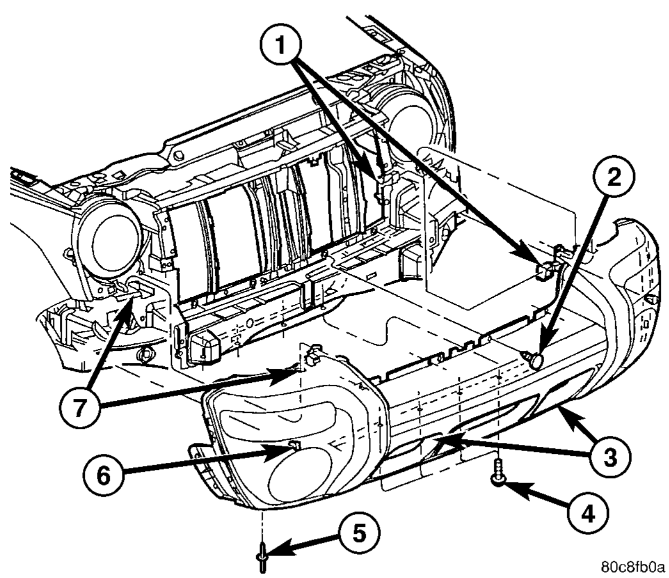

Fig. 1 FRONT FASCIA

1 - ELECTRICAL CONNECTOR
2 - PUSH PINS
3 - FRONT FASCIA ASSEMBLY
4 - LOWER SCREWS
5 - PLASTIC RIVETS (2)
6 - INNER SUPPORT CLIPS
7 - SUPPORT TABS

FRONT FASCIA (Continued)

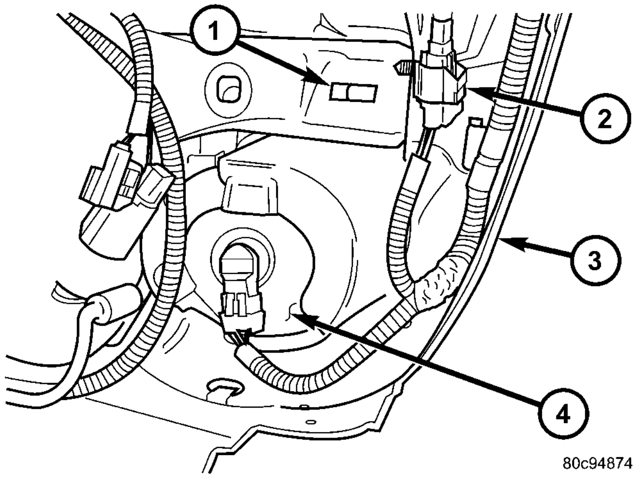

Fig. 2 FASCIA INNER SUPPORT

1 - INNER SUPPORT CLIP
2 - SIDE REPEATER CONNECTOR (IF EQUIPPED)
3 - FASCIA ASSEMBLY
4 - FOG LAMP

INSTALLATION

(1) Install the fascia.

(2) Connect the electrical connectors.

- Side repeater lights, both sides, if equipped.
- Fascia to grille opening reinforcement.

(3) Install the six push pin fasteners into the grill support.

(4) Install the four screws through the lower air damn.

(5) Install new rivets attaching the air dam to the wheelhouse splash shield.

(6) Install the front wheel opening flare moldings. (Refer to 23 - BODY/EXTERIOR/WHEEL OPENING FLARE MOLDING - INSTALLATION)

(7) Install the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)

REAR FASCIA

REMOVAL

(1) Remove the wheel flares (rear). (Refer to 23 - BODY/EXTERIOR/REAR WHEEL OPENING FLARE MOLDINGS - REMOVAL)

(2) Remove the rear lamp units. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR LAMP UNIT - REMOVAL)

(3) Remove the four side bolts. (Fig. 3)

(4) Remove the four bottom rivets.

(5) Remove the 3 bolts along the upper edge.

(6) Separate the side plastic retainers and remove the fascia from the vehicle.

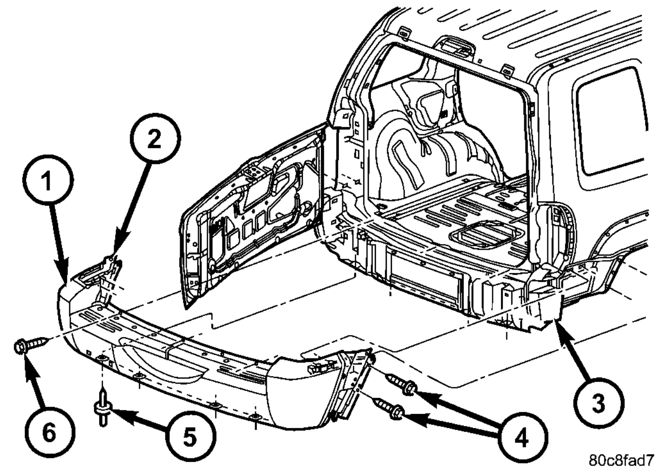

Fig. 3 REAR FASCIA

1 - REAR FASCIA ASSEMBLY
2 - PLASTIC RETAINERS
3 - FASCIA SUPPORT BRACKET
4 - SIDE BOLTS
5 - RIVETS
6 - UPPER BOLTS

INSTALLATION

NOTE: Fascia must be pushed completely forward to allow the plastic retainers full engagement in their respective slots.

(1) Install the fascia and insert the plastic retainers.

(2) Install the three upper bolts.

(3) Install the four side bolts.

(4) Install four bottom rivets.

(5) Install the rear lamp units. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR LAMP UNIT - INSTALLATION)

(6) Install the rear half wheel opening flares. (Refer to 23 - BODY/EXTERIOR/WHEEL OPENING FLARE MOLDING - INSTALLATION)

REAR FASCIA SUPPORT

REMOVAL

(1) Remove the rear fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL)

(2) Remove the six rivets and remove the fascia support (Fig. 4).

REAR FASCIA SUPPORT (Continued)

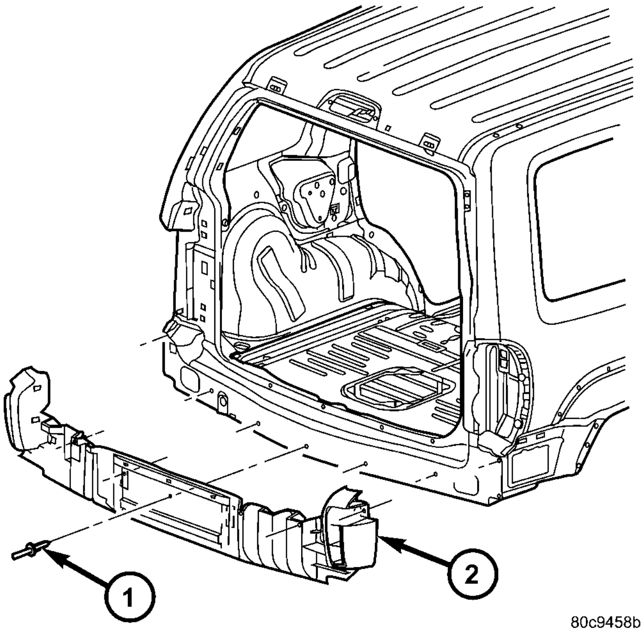

Fig. 4 REAR FASCIA SUPPORT

1 - RIVETS
2 - SUPPORT

INSTALLATION

(1) Install the fascia support onto the vehicle and install six new rivets.

(2) Install the rear fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION)

REAR FASCIA - STEP PAD

REMOVAL

(1) Remove the rear fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL)

(2) Remove the rain diverter. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - RAIN DIVERTER - REMOVAL)

(3) Remove the retaining clips and remove the step pads.

INSTALLATION

(1) Install the step pads and new retainer clips.

(2) Install the rain diverter. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - RAIN DIVERTER - INSTALLATION)

(3) Install the rear fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION)

REAR FASCIA - RAIN DIVERTER

REMOVAL

(1) Open the swing gate.

(2) Remove the three rivets from the diverter and remove the diverter. (Fig. 5)

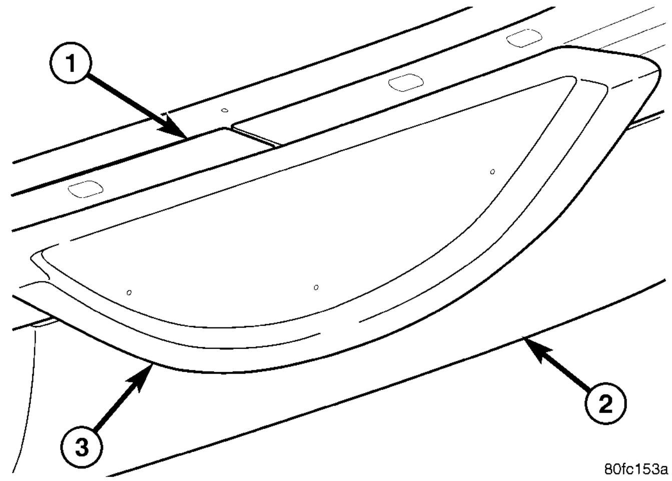

Fig. 5 RAIN DIVERTER

1 - STEP PAD
2 - REAR FASCIA
3 - RAIN DIVERTER

INSTALLATION

(1) Install the diverter and install new rivets.

FRAME

SPECIFICATIONS

SPECIFICATIONS - FRAME DIMENSIONS

Frame dimensions are listed in metric scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location.

VEHICLE PREPARATION

Position the vehicle on a level work surface. Using screw or bottle jacks, adjust the vehicle PLP heights to the specified dimension above a level work surface. Vertical dimensions can be taken from the work surface to the locations indicated were applicable.

NOTE: All measurements are in MM.

DIMENSION ILLUSTRATIONS

DESCRIPTION	FIGURE
TOP VIEW	(6)
SIDE VIEW	(7)

FRAME (Continued)

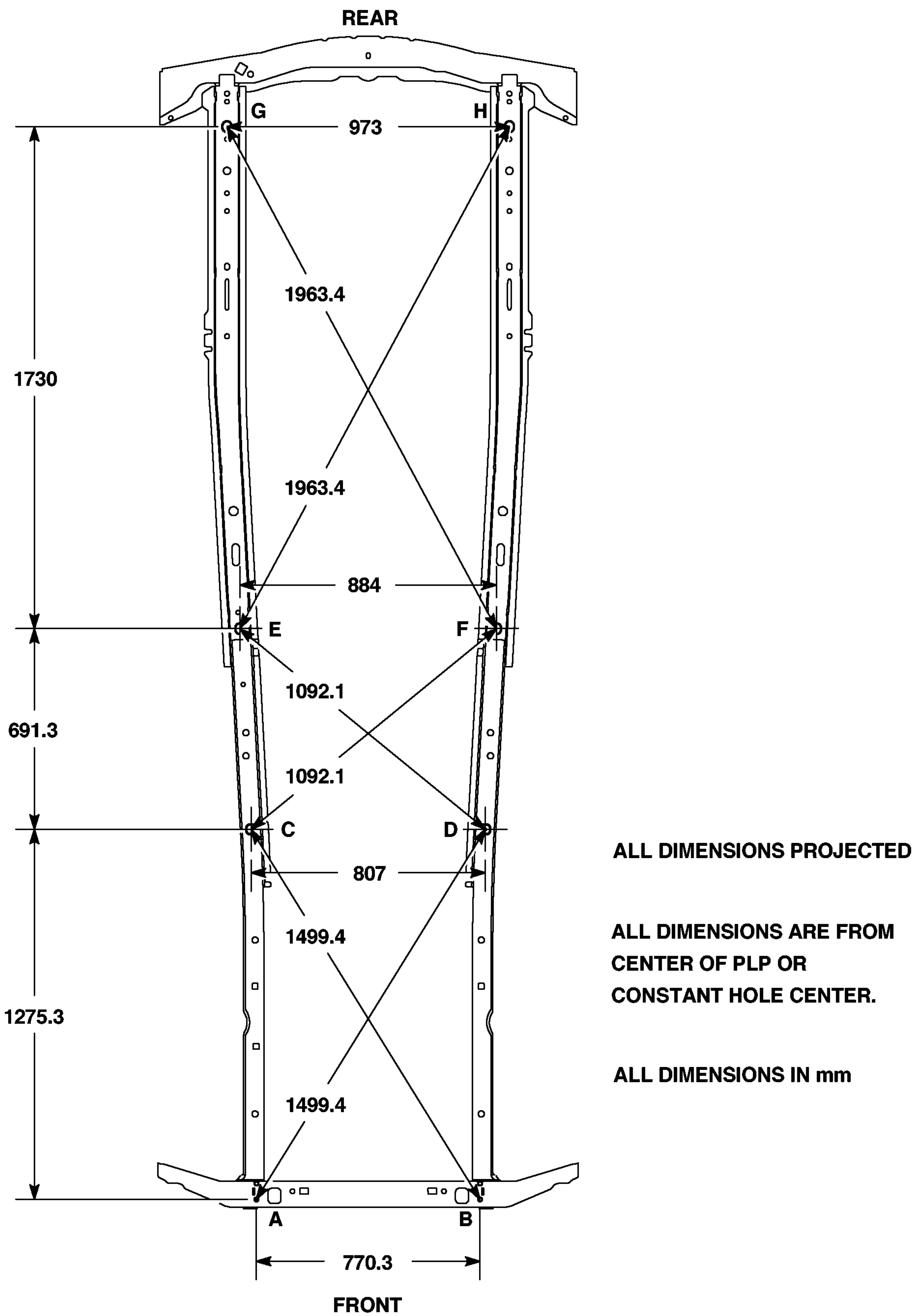

Fig. 6 TOP VIEW

FRAME (Continued)

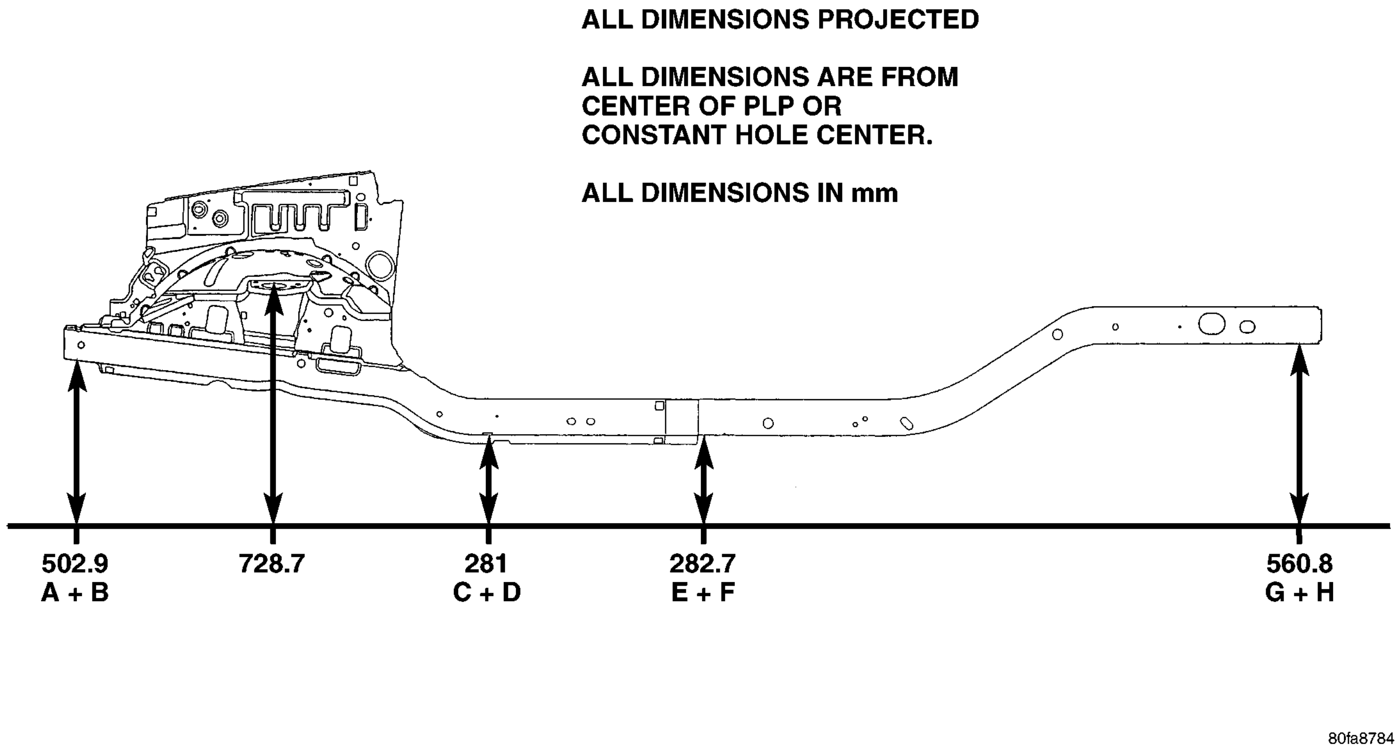

Fig. 7 SIDE VIEW

SPECIFICATIONS - TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
ENGINE CRADLE CROSSMEMBER INNER RAIL BOLTS	47	35	—
ENGINE CRADLE CROSSMEMBER MOUNTING BOLTS	122	90	—
ENGINE MOUNT THROUGH BOLTS/NUTS	88	65	—
FRONT SKID PLATE BOLTS	61	45	—
FRONT TOW HOOK NUTS/BOLT	61	45	—
FUEL TANK SKID PLATE	88	65	—
REAR CROSSMEMBER BOLTS	47	35	—
REAR TOW HOOK BOLTS	88	65	—
TRAILER HITCH BOLTS	88	65	—
TRANSFER CASE SKID PLATE BOLTS	34	25	—
TRANSMISSION MOUNT THROUGH BOLT/NUT	88	65	—

FRONT SKID PLATE

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the skid plate bolts and remove the skid plate. (Fig. 8)

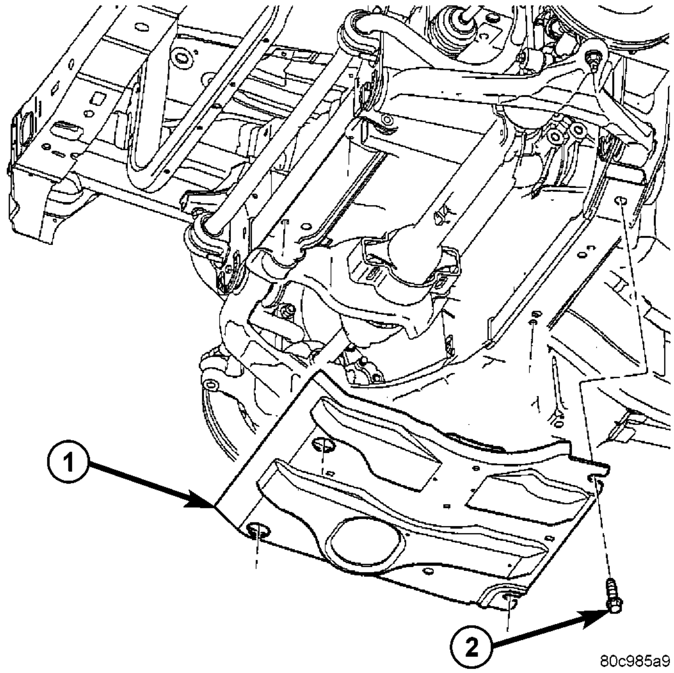

Fig. 8 SKID PLATE

1 - SKID PLATE
2 - BOLTS (4)

INSTALLATION

(1) Install the skid plate.

(2) Install the bolts and tighten to 61 N·m (45 ft. lbs.).

ENGINE CRADLE CROSSMEMBER

REMOVAL

(1) Install engine support tool 8534 or equivalent.

(2) Raise and support the vehicle.

(3) Remove the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL)

(4) Remove the sway bar. (Refer to 2 - SUSPENSION/FRONT/STABILIZER BAR - REMOVAL)

(5) Remove the front axle, if equipped. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - REMOVAL)

(6) Remove the power steering rack. (Refer to 19 - STEERING/GEAR - REMOVAL)

(7) Loosen the engine mount through bolts.

(8) Support the engine cradle with a suitable lifting device.

(9) Using a grease pencil or equivalent, mark the location of the engine support cradle.

(10) Remove the engine cradle bolts and remove the engine cradle.

INSTALLATION

(1) Raise and support the vehicle.

(2) Using a suitable lifting device raise the engine cradle into the vehicle while lining up the engine mount through bolts.

(3) Align the engine cradle to the marks made during removal and install the mounting and inner rail bolts.

(4) Tighten the mounting bolts to 122 N·m (90 ft. lbs.).

(5) Tighten the inner rail bolts to 47 N·m (35 ft. lbs.).

(6) Tighten the engine mount through bolts to 88 N·m (65 ft. lbs.).

(7) Install the power steering rack. (Refer to 19 - STEERING/GEAR - INSTALLATION)

(8) Install the front axle, if equipped. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - INSTALLATION)

(9) Install the stabilizer bar. (Refer to 2 - SUSPENSION/FRONT/STABILIZER BAR - INSTALLATION)

(10) Install the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION)

(11) Lower the vehicle and remove the engine support tool.

TRANSFER CASE SKID PLATE

REMOVAL

(1) Remove the bolts and remove the skid plate. (Fig. 9)

INSTALLATION

(1) Install the skid plate.

(2) Install the bolts and tighten to 34 N·m (25 ft. lbs.).

TRANSFER CASE SKID PLATE (Continued)

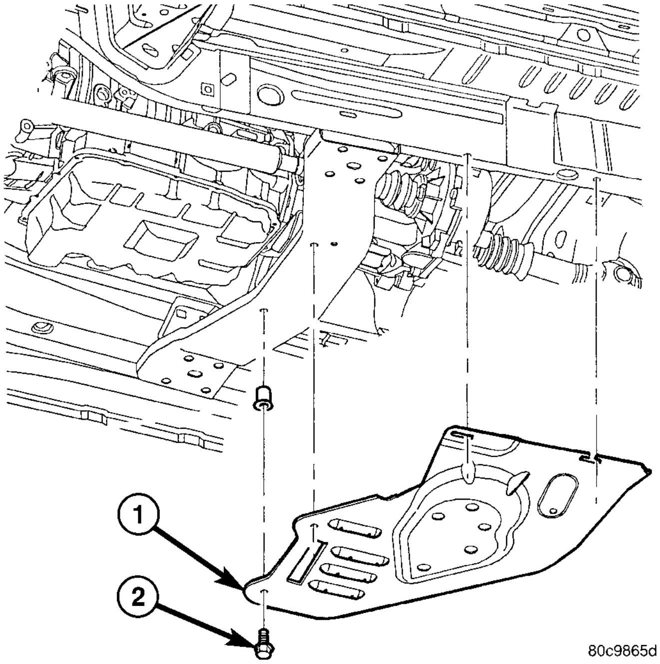

Fig. 9 SKID PLATE

1 - SKID PLATE
2 - BOLTS

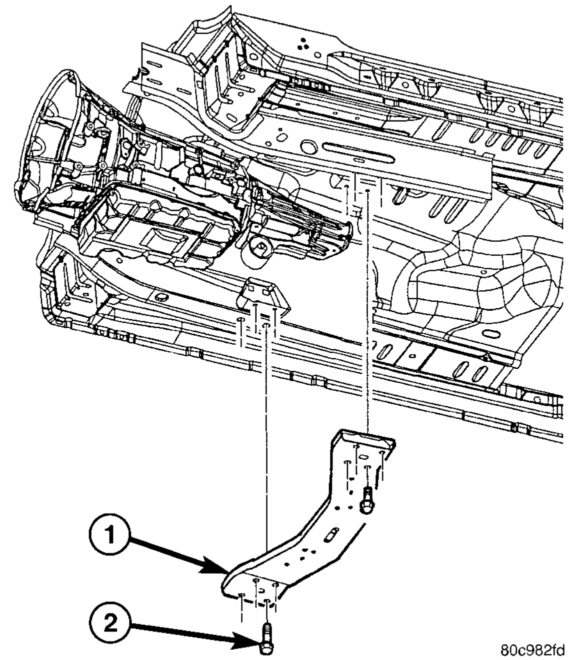

Fig. 10 CROSS MEMBER

1 - CROSSMEMBER
2 - BOLTS

REAR CROSSMEMBER

REMOVAL

(1) Raise and support the vehicle.
(2) Support the transmission with a suitable lifting device.
(3) Remove the transmission mount through bolt.
(4) Remove the crossmember bolts and remove the crossmember. (Fig. 10)

INSTALLATION

(1) Install the crossmember and install the bolts.
(2) Tighten the bolts to 47 N·m (35 ft. lbs.)
(3) Install transmission mount through bolt and tighten to 88 N·m (65 ft. lbs.).

FRONT TOW HOOK

REMOVAL

NOTE: Front fascia must be removed to replace the stud plate. (Refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - REMOVAL)

(1) Remove the nuts and bolt and remove the tow eye/hook. (Fig. 11)

INSTALLATION

(1) Install the stud plate if previously removed.
(2) Install the tow eye/hook.

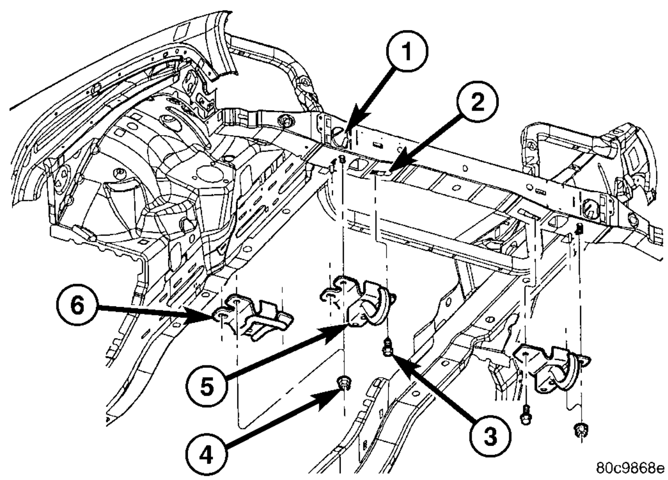

Fig. 11 TOW HOOKS/EYE

1 - STUD PLATE
2 - U-NUT
3 - BOLTS
4 - NUTS
5 - TOW HOOK
6 - TOW EYE

(3) Install the nuts and bolt and tighten to 61 N·m (45 ft. lbs.).
(4) Install the front fascia if the stud plate was replaced. (Refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - INSTALLATION)

REAR TOW HOOK

REMOVAL

(1) Remove the bolts and remove the tow hook/eye. (Fig. 12)

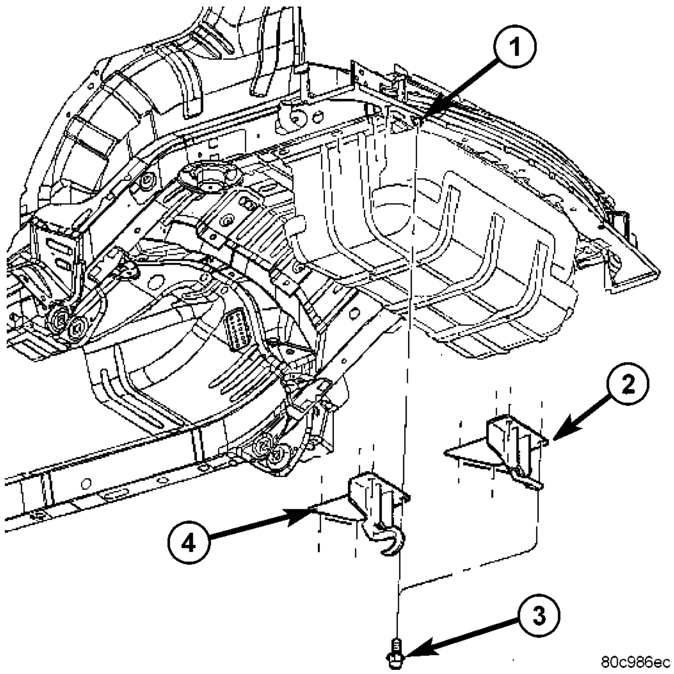

Fig. 12 TOW HOOK/EYE

1 - U-NUT
2 - TOW EYE
3 - BOLTS
4 - TOW HOOK

INSTALLATION

(1) Install the tow hook/eye.
(2) Install the bolts and tighten to 88 N·m (65 ft. lbs.).

TRAILER HITCH

REMOVAL

(1) Remove the tow hooks, if equipped. (Refer to 13 - FRAME & BUMPERS/FRAME/REAR TOW HOOK - REMOVAL)
(2) Disconnect trailer electrical connector.
(3) Support the hitch with a suitable lifting device.
(4) Remove the bolts and remove the trailer hitch. (Fig. 13)

INSTALLATION

(1) Support the hitch with a suitable lifting device and install the hitch.
(2) Install the bolts and tighten to 88 N·m (65 ft. lbs.)
(3) Connect the electrical connector.

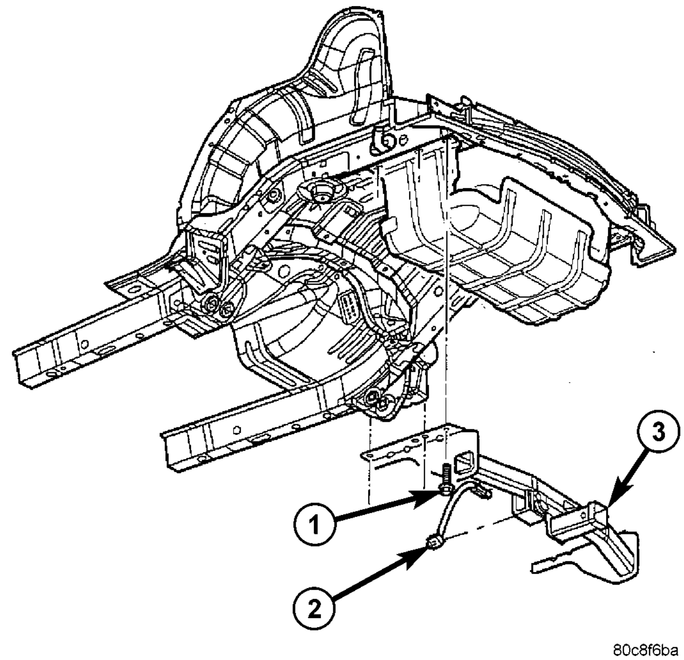

Fig. 13 TRAILER HITCH

1 - BOLTS
2 - TRAILER LIGHTS ELECTRICAL CONNECTOR
3 - TRAILER HITCH

FUEL TANK SKID PLATE

REMOVAL

(1) Raise and support the vehicle.
(2) Support the skid plate with a suitable lifting device.
(3) Remove the trailer hitch, if equipped. (Refer to 13 - FRAME & BUMPERS/FRAME/TRAILER HITCH - REMOVAL)
(4) Remove the tow hooks, if not previously removed. (Refer to 13 - FRAME & BUMPERS/FRAME/REAR TOW HOOK - REMOVAL)
(5) Remove the bolts and remove the fuel tank skid plate.

INSTALLATION

(1) Install the skid plate and support with a suitable lifting device.
(2) Install the trailer hitch, if equipped. (Refer to 13 - FRAME & BUMPERS/FRAME/TRAILER HITCH - INSTALLATION)
(3) Install the tow hooks, if equipped. (Refer to 13 - FRAME & BUMPERS/FRAME/REAR TOW HOOK - INSTALLATION)
(4) Install the bolts and tighten to 88 N·m (65 ft. lbs.).

FUEL SYSTEM

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FUEL DELIVERY

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FUEL DELIVERY

DESCRIPTION

The fuel delivery system consists of:

- the 2–section fuel pump module containing the electric fuel pump, fuel pressure regulator, fuel gauge sending unit (fuel level sensor) and a fuel filter located inside the lower section of pump module
- fuel tubes/lines/hoses
- A separately mounted main fuel filter
- quick-connect fittings
- fuel injector rail
- fuel tank
- fuel tank filler/vent tube assembly
- fuel tank filler tube cap
- accelerator pedal
- throttle cable

Certain fuel delivery components can be found in (Fig. 1).

OPERATION

Fuel is picked up in the fuel tank by the fuel pump module. This module is located on the bottom of the fuel tank.

A fuel return system is provided within the fuel pump module using check valves. A separate fuel return line from the engine to the tank is not used.

The fuel pressure regulator and the main fuel filter are not combined. They are separate items.

The fuel tank assembly consists of: the fuel tank, fuel pump module assembly, fuel pump module lock ring/gasket, ORVR components. Refer to 25, Emission Control System for ORVR information.

A fuel filler/vent tube assembly using a pressure/vacuum, 1/4 turn fuel filler cap is used. The fuel filler tube contains a flap door located below the fuel fill cap. A one-way check valve is installed into the tanks fuel fill fitting.

Also to be considered part of the fuel system is the evaporation control system and ORVR system. This is designed to reduce the emission of fuel vapors into the atmosphere. The description and function of the Evaporative Control System is found in 25, Emission Control Systems.

Both fuel filters (mounted to front of fuel tank, and inside the bottom fuel pump module) are designed for extended service. They do not require normal scheduled maintenance. The bottom section of the fuel pump module (with included filter) should only be replaced if a diagnostic procedure indicates to do so. Also, the fuel filter mounted to the front of the fuel tank should only be replaced if a diagnostic procedure indicates to do so.

STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE

Use following procedure if the fuel injector rail is, or is not equipped with a fuel pressure test port.

(1) Remove fuel fill cap.

(2) Remove fuel pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.

(3) Start and run engine until it stalls.

(4) Attempt restarting engine until it will no longer run.

(5) Turn ignition key to OFF position.

CAUTION: Steps 1, 2, 3 and 4 must be performed to relieve high pressure fuel from within fuel rail. Do not attempt to use following steps to relieve this pressure as excessive fuel will be forced into a cylinder chamber.

(6) Unplug connector from any fuel injector.

(7) Attach one end of a jumper wire with alligator clips (18 gauge or smaller) to either injector terminal.

(8) Connect other end of jumper wire to positive side of battery.

(9) Connect one end of a second jumper wire to remaining injector terminal.

CAUTION: Powering an injector for more than a few seconds will permanently damage the injector.

(10) Momentarily touch other end of jumper wire to negative terminal of battery for no more than a few seconds.

(11) Place a rag or towel below fuel line quick-connect fitting at fuel rail.

(12) Disconnect quick-connect fitting at fuel rail. Refer to Quick-Connect Fittings.

(13) Return fuel pump relay to PDC.

(14) One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. The DRB® scan tool must be used to erase a DTC.

SPECIFICATIONS

FUEL SYSTEM PRESSURE

339 kPa +/- 34 kPa (49.2 psi +/- 2 psi).

FUEL DELIVERY (Continued)

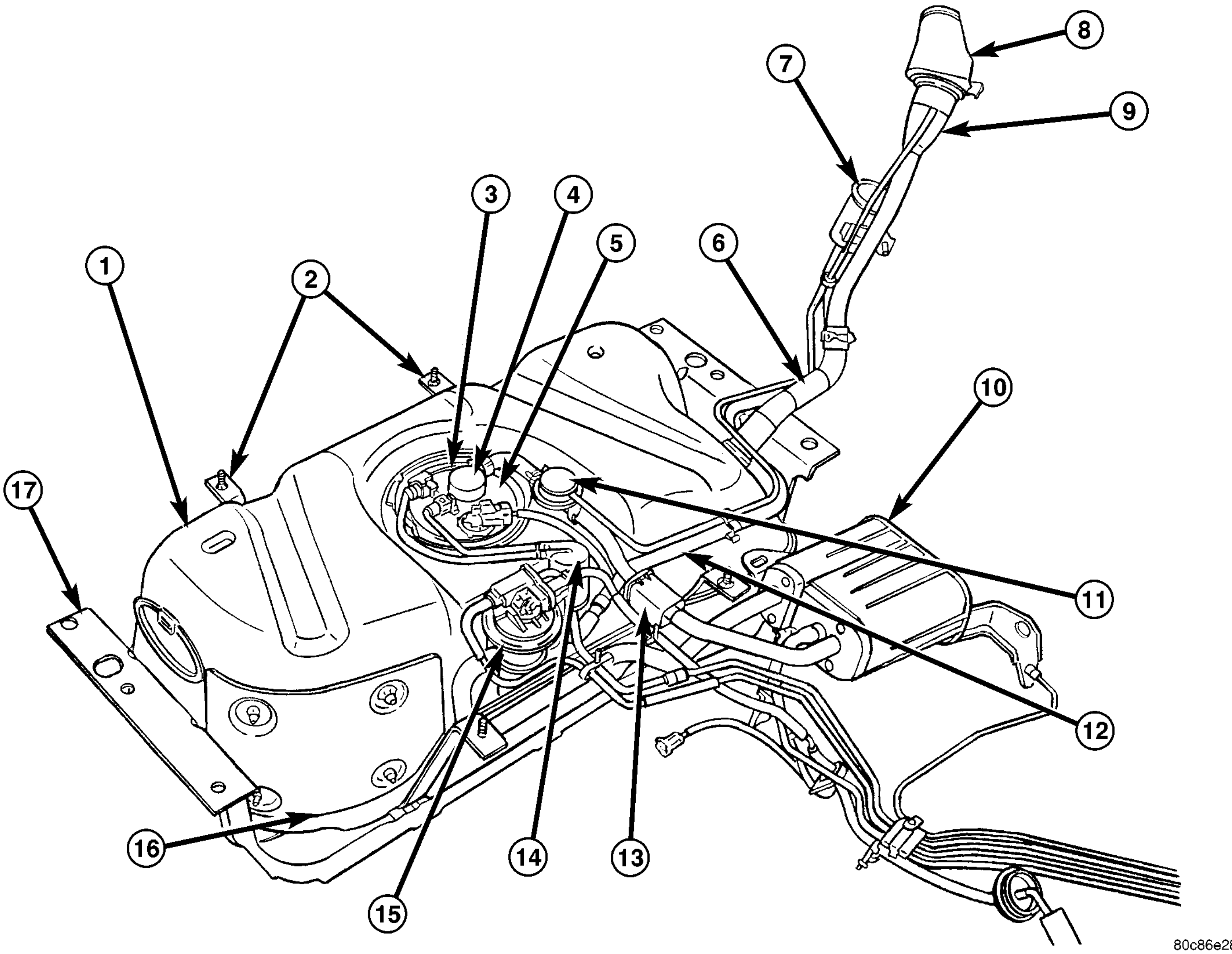


Fig. 1 FUEL DELIVERY COMPONENTS

1 - FUEL TANK
2 - FUEL TANK STRAPS
3 - FUEL PUMP MODULE LOCK RING
4 - CHECK (CONTROL) VALVE
5 - FUEL PUMP MODULE FLANGE
6 - FUEL FILL HOSE
7 - FRESH AIR FILTER
8 - FUEL FILL CAP/BEZEL
9 - FUEL FILL TUBE
10 - EVAP CANISTER
11 - FLOW MANAGEMENT VALVE
12 - FRESH AIR TUBE
13 - HOSE SLEEVE
14 - FUEL FILTER
15 - LEAK DETECTION PUMP
16 - HEAT SHIELD
17 - SKID PLATE

FUEL DELIVERY (Continued)

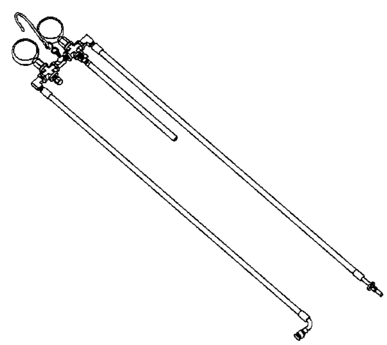
TORQUE

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Accelerator Pedal Bracket Mounting Nuts	12	-	105
Crankshaft Position Sensor - 2.4L	28	21	-
Crankshaft Position Sensor - 3.7L	28	21	-
Camshaft Position Sensor - 2.4L	12	-	106
Camshaft Position Sensor - 3.7L	12	-	106
Engine Coolant Temperature Sensor	11	-	96
EVAP Canister-to-Body Bolts	48	35	-
EVAP Canister-to-Canis. Bracket Bolt/Nut	11	-	100
Fuel Filler Hose Clamp at Tank	3	-	30
Fuel Filler Housing-to-Body Screws	2	-	17
Fuel Filter Mounting Nut at Tank	5.5	-	49
Fuel Pump Module Access Plate Nuts	3	-	26
Fuel Rail Mounting Bolts - 3.7L	11	-	100
Fuel Rail Mounting Bolts - 2.4L	28	-	250
Fuel Tank Heat Sheild Nuts	5.5	-	49
Fuel Tank Mounting Strap Bolts	61	45	-
Fuel Tank Skid Plate and Trailer Hitch	88	65	-
IAC Motor Mounting Screws	7	-	60
Leak Detection Pump Mounting Bracket-to-Fuel Tank Nuts	5.5	-	49
Leak Detection Pump-to-Bracket Nuts	1.2	-	11
Map Sensor Mounting Screws	3	-	25
PCM-to-Mounting Bracket Mounting Screws	4	-	35
Power Steering Pressure Switch	14-22	-	124-195
TPS Mounting Screws	7	-	60
Throttle Body Mounting Bolts	11	-	100
Oxygen Sensors	30	22	-

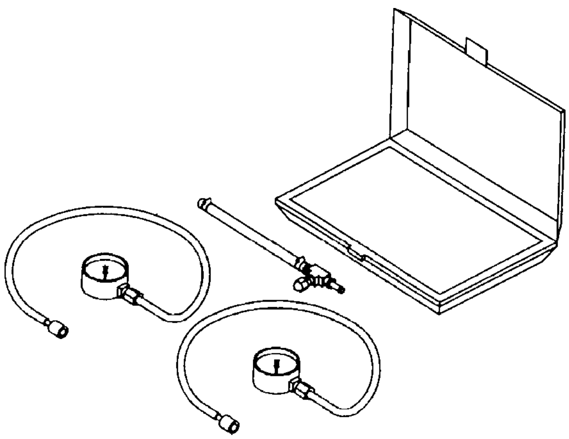
FUEL DELIVERY (Continued)

SPECIAL TOOLS

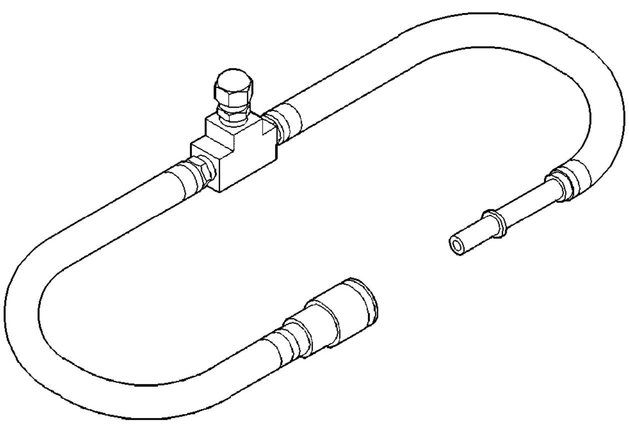
FUEL SYSTEM



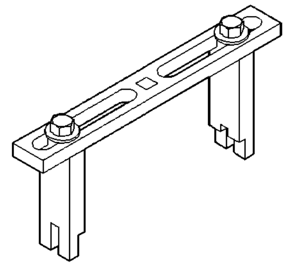
FUEL PRESSURE TESTER - #8978



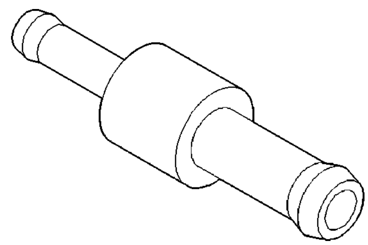
TEST KIT, FUEL PRESSURE, 8.0L ENGINE - #5069



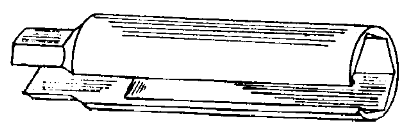
ADAPTERS, FUEL PRESSURE TEST, 8.0L - #6539 AND/OR #6631



SPANNER WRENCH - #6856



FITTING, AIR METERING - #6714



O2S (OXYGEN SENSOR) REMOVER/INSTALLER - #C-4907

FLOW MANAGEMENT VALVE

DESCRIPTION

The flow management valve is a part of the ORVR system. This plastic valve is placed inline between the fuel tank vent fitting and the EVAP canister. It is located on top of the fuel tank (Fig. 1).

OPERATION

The flow management valve (Fig. 1) is one of the components used in the ORVR system. The valve meters the flow of fuel vapors to the EVAP canister during vehicle run and refueling. Pressure from the tank during refueling opens the main port valve and allows vapors to enter the EVAP canister. During vehicle run, the vapors are metered through an orifice to the EVAP canister. It is also used as a liquid separator to keep liquid fuel out of the EVAP canister.

FLOW MANAGEMENT VALVE (Continued)

REMOVAL

The flow management valve is located on top of the fuel tank (Fig. 1).

(1) Four cargo holdown clamps are located inside the vehicle on the floor of the rear cargo area. Remove the 2 rearward mounted clamps by drilling out the clamp rivets.

(2) Fold carpeting forward to gain access to fuel pump module access plate (Fig. 2).

(3) Remove 4 fuel pump module access plate nuts (Fig. 2).

(4) While applying heat from a heat gun, carefully pry up fuel pump module access plate. Take care not to bend plate.

(5) Disconnect flow management valve hose clamp and hose (Fig. 3) at pump module fitting. Also disconnect small recirculation line at top half of management valve.

(6) Raise vehicle.

(7) Disconnect opposite end of flow management valve hose at EVAP canister (Fig. 1).

(8) Remove valve and 2 hoses as an assembly.

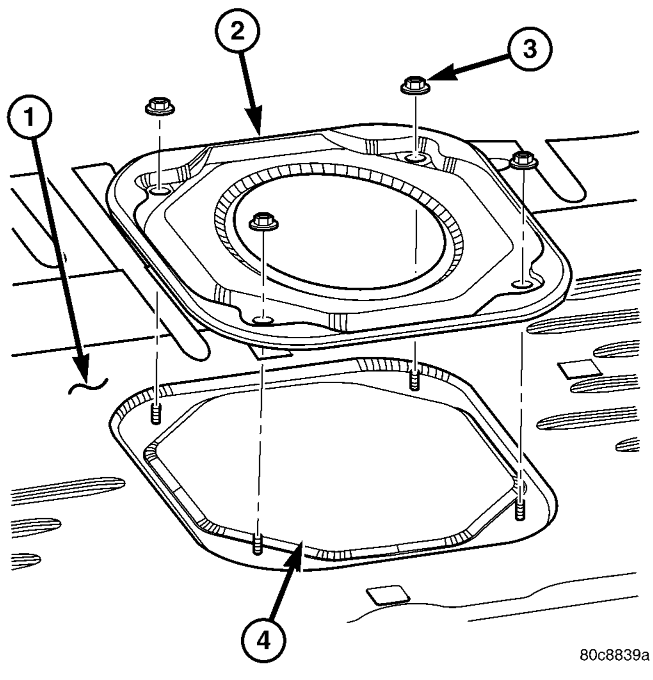


Fig. 2 ACCESS PLATE

1 - FLOORPAN AT REAR
2 - FUEL PUMP MODULE ACCESS PLATE
3 - NUTS (4)
4 - OPENING TO PUMP MODULE

INSTALLATION

(1) Raise vehicle.

(2) Attach 2 large hoses and 1 small line to flow management valve. Position this assembly to top of fuel tank.

(3) Connect valve hose at EVAP canister.

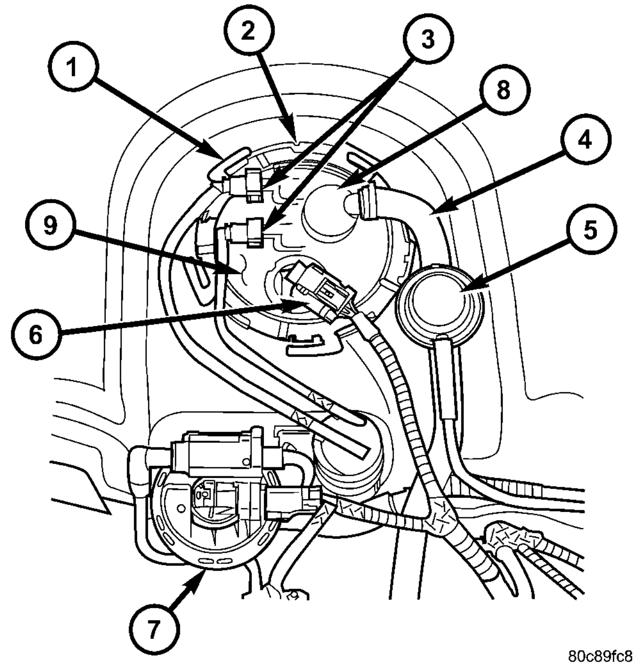


Fig. 3 TOP OF FUEL PUMP MODULE

1 - LOCK RING
2 - ALIGNMENT NOTCH
3 - FUEL FILTER FITTINGS (2)
4 - ORVR SYSTEM HOSE AND CLAMP
5 - FLOW MANAGEMENT VALVE
6 - ELECTRICAL CONNECTOR
7 - LEAK DETECTION PUMP
8 - FUEL TANK CHECK (CONTROL) VALVE
9 - FUEL PUMP MODULE (UPPER SECTION)

(4) Lower vehicle.

(5) Attach valve hose and clamp to top of fuel pump module.

(6) Apply silicone sealant to bottom of fuel pump module metal access plate.

(7) Install fuel pump module metal access plate and 4 nuts. Tighten nuts to 3 N·m (26 in. lbs.) torque.

(8) Position carpet and install 2 new cargo clamp rivets.

FUEL FILTER

DESCRIPTION

The fuel pressure regulator and fuel filter are not combined on this vehicle. The main fuel filter is attached to the front of the fuel tank (Fig. 1) and is a serviceable/replaceable item. Also refer to Inlet Filter and Fuel Pressure Regulator.

REMOVAL

The main fuel filter is attached to the front of fuel tank (Fig. 1). Three fuel lines are used at filter.

FUEL FILTER (Continued)

Fuel tank removal will not be necessary for fuel filter removal. Access is from rear cargo area.

WARNING: THE FUEL SYSTEM MAY BE UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING MOST FUEL SYSTEM COMPONENTS, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

(1) Release fuel system pressure.

(2) Four cargo holdown clamps are located inside vehicle on floor of rear cargo area. Two of these four clamps must be removed. Remove 2 rearward mounted clamps by drilling out clamp rivets.

(3) Fold carpeting forward to gain access to fuel pump module access plate (Fig. 4).

(4) Remove 4 fuel pump module access plate nuts (Fig. 4).

(5) While applying heat from a heat gun, carefully pry up metal fuel pump module access plate. Take care not to bend plate.

(6) Clean top of fuel pump module area around fuel line connection points.

(7) Disconnect 2 fuel lines at fuel pump module (Fig. 5) by pressing on tabs at side of fitting.

(8) Raise vehicle.

(9) Place drain pan under fuel filter.

(10) A third fuel line is attached to bottom of filter (Fig. 6). The disconnection point for this 3rd line is approximately 1 foot towards front of vehicle. Clean fuel line connection point before disconnection. Disconnect by pressing on tabs at side of fitting.

(11) Disconnect 3rd fuel line from body retention clip. Place a small screwdriver into side of clip and twist for removal.

(12) Remove filter ground strap at fuel tank mounting strap.

(13) Remove 1 filter mounting nut (Fig. 6) and remove filter.

INSTALLATION

(1) Raise vehicle.

(2) Position fuel lines on filter towards top of fuel tank.

(3) Position filter to mounting stud on front of fuel tank.

(4) Install filter mounting nut and tighten. Refer to torque specifications.

(5) A third fuel line is attached to bottom of filter. The connection point for this 3rd line is approximately 1 foot towards front of vehicle. Connect by snapping together.

(6) Connect 3rd fuel line to body retention clip (snaps in).

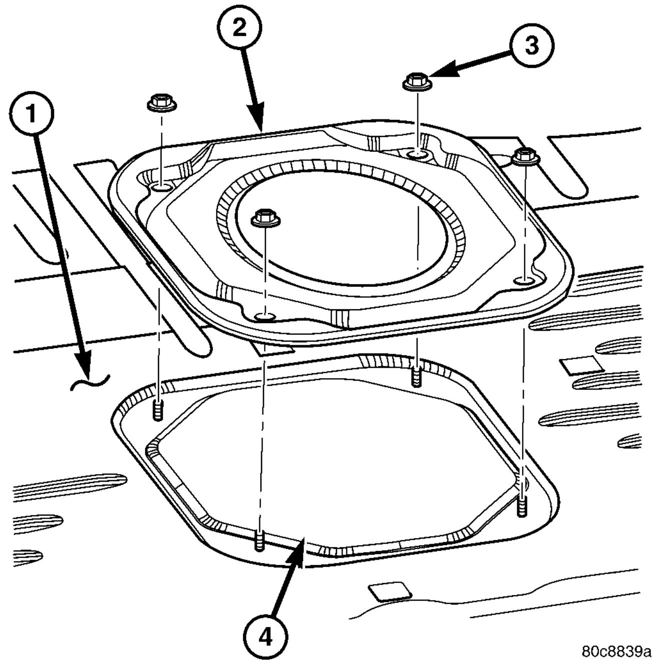


Fig. 4 ACCESS PLATE

1 - FLOORPAN AT REAR
2 - FUEL PUMP MODULE ACCESS PLATE
3 - NUTS (4)
4 - OPENING TO PUMP MODULE

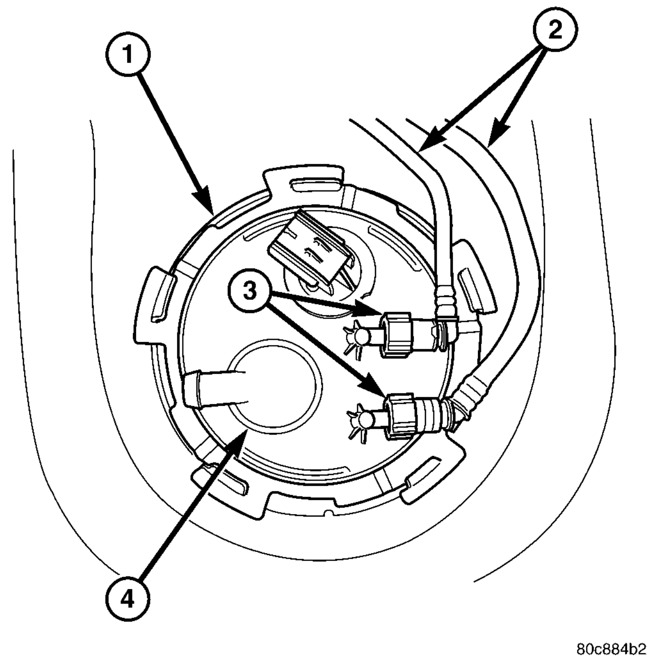


Fig. 5 FUEL LINES AT PUMP MODULE

1 - FUEL PUMP MODULE LOCKRING
2 - FUEL LINES TO FUEL FILTER (2)
3 - QUICK-CONNECT FITTINGS (2)
4 - ROLLOVER VALVE

(7) Attach filter ground strap to tank mounting strap.

FUEL FILTER (Continued)

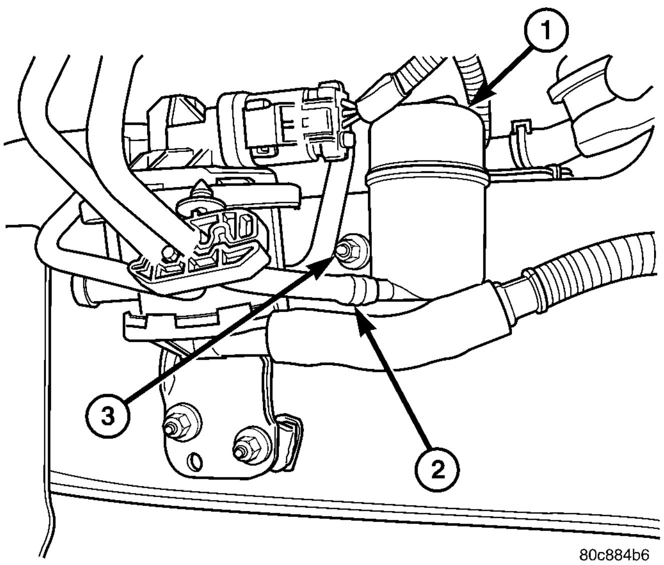


Fig. 6 FUEL FILTER LOCATION

1 - FUEL FILTER
2 - 3RD FUEL LINE TO ENGINE
3 - FILTER MOUNTING NUT

(8) Lower vehicle.

(9) Attach (snap on) 2 filter fuel lines at fuel pump module fittings.

(10) Start engine and check fuel line fittings for leaks.

(11) Apply silicone sealant to fuel pump module metal access plate.

(12) Install fuel pump module metal access plate and 4 nuts. Tighten 4 nuts. Refer to torque specifications.

(13) Position carpet and install 2 new cargo clamp rivets in each cargo holdown clamp.

FUEL LEVEL SENDING UNIT / SENSOR

DESCRIPTION

The fuel gauge sending unit (fuel level sensor) is attached to the side of the fuel pump module. The sending unit consists of a float, an arm, and a variable resistor track (card).

OPERATION

The fuel pump module has 4 different circuits (wires). Two of these circuits are used for the fuel gauge sending unit for fuel gauge operation, and for certain OBD II emission requirements. The other 2 wires are used for electric fuel pump operation.

For Fuel Gauge Operation: A constant current source of approximately 32 milliamps is supplied to the resistor track on the fuel gauge sending unit. This is fed directly from the Powertrain Control Module (PCM). **NOTE: For diagnostic purposes, this 12V power source can only be verified with the circuit opened (fuel pump module electrical connector unplugged). With the connectors plugged, output voltages will vary from about 0.6 volts at FULL, to about 8.6 volts at EMPTY (about 8.6 volts at EMPTY for Jeep models, and about 7.0 volts at EMPTY for Dodge Truck models).** The resistor track is used to vary the voltage (resistance) depending on fuel tank float level. As fuel level increases, the float and arm move up, which decreases voltage. As fuel level decreases, the float and arm move down, which increases voltage. The varied voltage signal is returned back to the PCM through the sensor return circuit.

Both of the electrical circuits between the fuel gauge sending unit and the PCM are hard-wired (not multi-plexed). After the voltage signal is sent from the resistor track, and back to the PCM, the PCM will interpret the resistance (voltage) data and send a message across the multi-plex bus circuits to the instrument panel cluster. Here it is translated into the appropriate fuel gauge level reading. Refer to Instrument Panel for additional information.

For OBD II Emission Monitor Requirements: The PCM will monitor the voltage output sent from the resistor track on the sending unit to indicate fuel level. The purpose of this feature is to prevent the OBD II system from recording/setting false misfire and fuel system monitor diagnostic trouble codes. The feature is activated if the fuel level in the tank is less than approximately 15 percent of its rated capacity. If equipped with a Leak Detection Pump (EVAP system monitor), this feature will also be activated if the fuel level in the tank is more than approximately 85 percent of its rated capacity.

REMOVAL

The fuel level sending unit (fuel level sensor) and float assembly is located on the side of the lower section of the fuel pump module. The lower section of the fuel pump module is located within the fuel tank.

(1) Remove lower section of fuel pump module from fuel tank. Refer to Fuel Pump Module Removal/Installation.

(2) To remove sending unit from pump module, lift on plastic locking tab (Fig. 7) while sliding sending unit upwards.

(3) Disconnect 4–wire electrical connector (Fig. 8) from bottom of upper section of fuel pump module. Separate necessary sending unit wiring.

FUEL LEVEL SENDING UNIT / SENSOR (Continued)

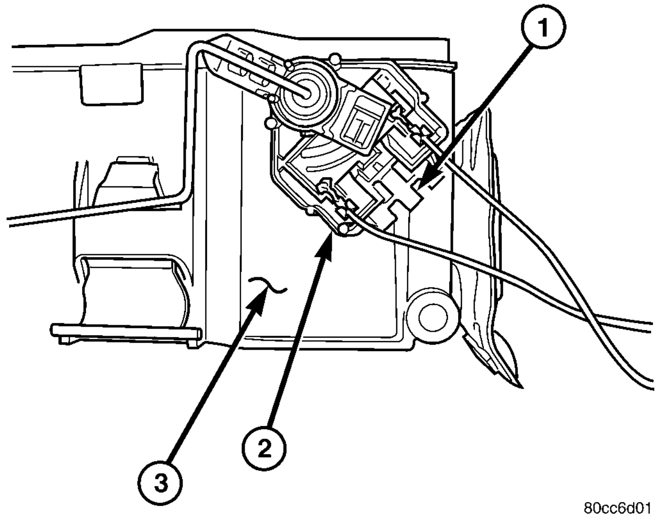


Fig. 7 FUEL LEVEL SENDING UNIT

1 - LIFT TAB HERE FOR REMOVAL
2 - FUEL LEVEL SENDING UNIT
3 - LOWER SECTION OF PUMP MODULE

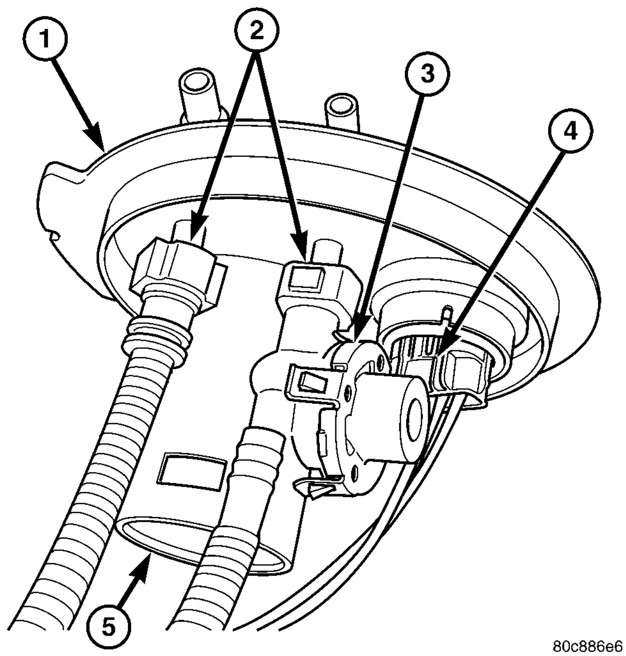


Fig. 8 FUEL PRESSURE REGULATOR/SENDING UNIT ELECTRICAL CONNECTOR

1 - UPPER SECTION OF PUMP MODULE
2 - QUICK-CONNECT FITTINGS
3 - FUEL PRESSURE REGULATOR
4 - 4-WIRE ELECTRICAL CONNECTOR
5 - FUEL TANK CHECK (CONTROL) VALVE

INSTALLATION

(1) Connect necessary wiring into electrical connectors. Connect 4–wire connector to upper section of pump module.

(2) Position sending unit to pump module. Slide and snap into place.

(3) Install lower section of fuel pump module. Refer to Fuel Pump Module Removal/Installation.

FUEL LINES

DESCRIPTION

Also refer to Quick-Connect Fittings.

WARNING: THE FUEL SYSTEM MAY BE UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS, LINES, OR MOST COMPONENTS, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps.

QUICK CONNECT FITTING

DESCRIPTION

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal. Refer to Quick-Connect Fittings Removal/Installation for more information.

CAUTION: The interior components (o-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

QUICK CONNECT FITTING (Continued)

STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

Also refer to Fuel Tubes/Lines/Hoses and Clamps.

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Safety latch clips are used on certain components/lines. Certain fittings may require use of a special tool for disconnection.

DISCONNECTING

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSE, FITTING OR LINE, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

CAUTION: The interior components (o-rings, spacers) of some types of quick-connect fitting are not serviced separately. If service parts are not available, do not attempt to repair a damaged fitting or fuel line. If repair is necessary, replace complete fuel line assembly.

(1) Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure.

(2) Disconnect negative battery cable from battery.

(3) Clean fitting of any foreign material before disassembly.

(4) **2–Button Type Fitting:** This type of fitting is equipped with a push-button located on each side of quick-connect fitting (Fig. 9). Press on both buttons simultaneously for removal. Special tools are not required for disconnection.

(5) **Pinch-Type Fitting:** This fitting is equipped with two finger tabs. Pinch both tabs together while removing fitting (Fig. 10). Special tools are not required for disconnection.

(6) **Single-Tab Type Fitting:** This type of fitting is equipped with a single pull tab (Fig. 11). The tab is removable. After tab is removed, quick-connect fitting can be separated from fuel system component. Special tools are not required for disconnection.

(a) Press release tab on side of fitting to release pull tab (Fig. 12). **If release tab is not pressed prior to releasing pull tab, pull tab will be damaged.**

(b) While pressing release tab on side of fitting, use screwdriver to pry up pull tab (Fig. 12).

(c) Raise pull tab until it separates from quick-connect fitting (Fig. 13).

(7) **Two-Tab Type Fitting:** This type of fitting is equipped with tabs located on both sides of fitting (Fig. 14). The tabs are supplied for disconnecting quick-connect fitting from component being serviced.

(a) To disconnect quick-connect fitting, squeeze plastic retainer tabs (Fig. 14) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer.

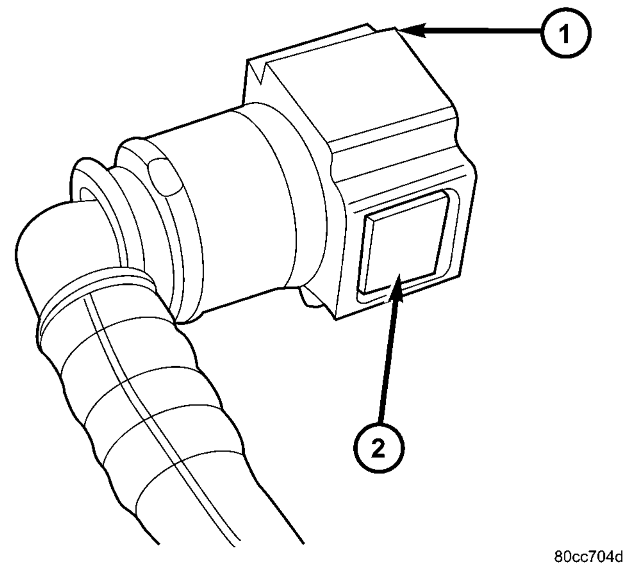


Fig. 9 2-BUTTON TYPE FITTING

1 - QUICK-CONNECT FITTING
2 - PUSH-BUTTONS (2)

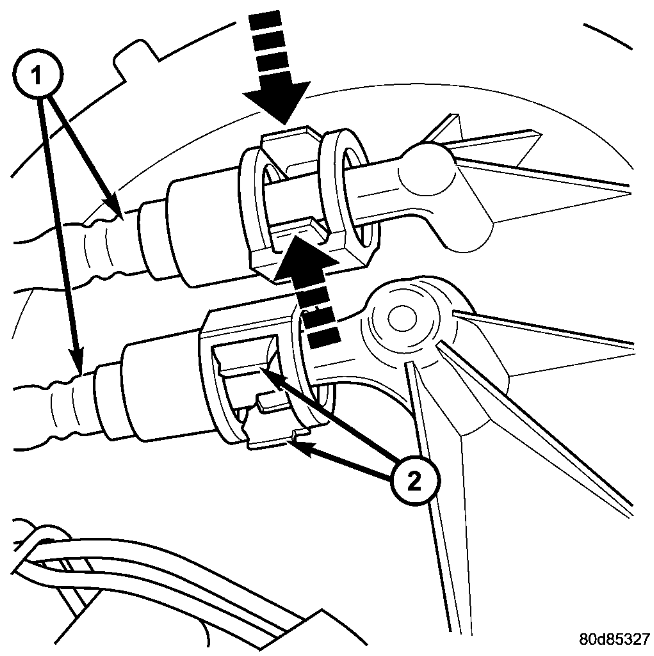


Fig. 10 PINCH TYPE QUICK-CONNECT FITTING

1 - QUICK-CONNECT FITTINGS
2 - PINCH TABS

QUICK CONNECT FITTING (Continued)

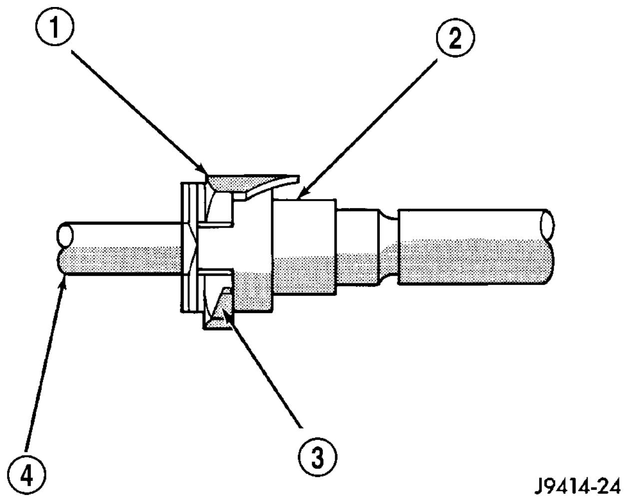


Fig. 11 SINGLE-TAB TYPE FITTING

1 - PULL TAB
2 - QUICK-CONNECT FITTING
3 - PRESS HERE TO REMOVE PULL TAB
4 - INSERTED TUBE END

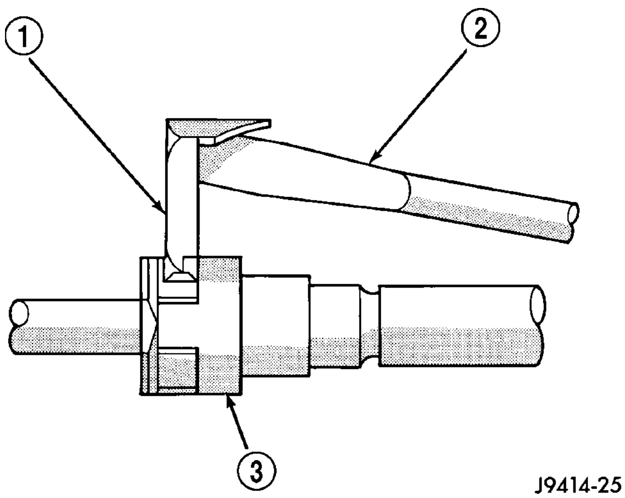


Fig. 12 DISCONNECTING SINGLE-TAB TYPE FITTING

1 - PULL TAB
2 - SCREWDRIVER
3 - QUICK-CONNECT FITTING

(b) Pull fitting from fuel system component being serviced.

(c) The plastic retainer will remain on component being serviced after fitting is disconnected. The o-rings and spacer will remain in quick-connect fitting connector body.

(8) **Plastic Retainer Ring Type Fitting:** This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 15) usually black in color.

(a) To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic

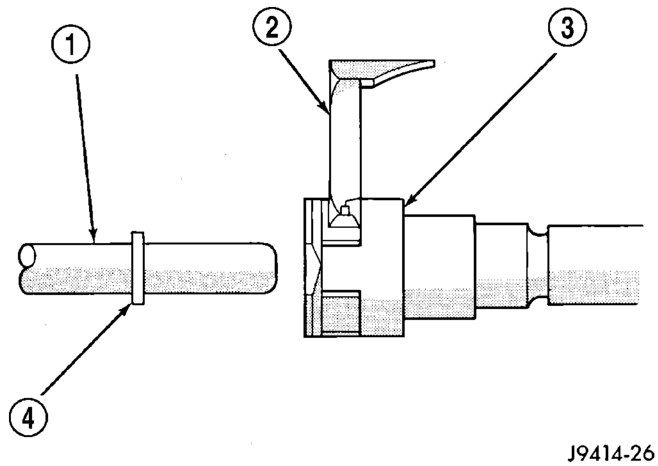


Fig. 13 REMOVING PULL TAB

1 - FUEL TUBE OR FUEL SYSTEM COMPONENT
2 - PULL TAB
3 - QUICK-CONNECT FITTING
4 - FUEL TUBE STOP

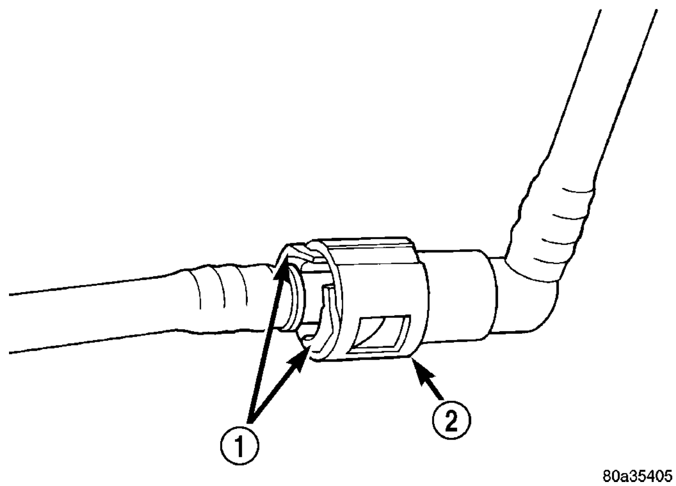


Fig. 14 TYPICAL 2–TAB TYPE FITTING

1 - TAB(S)
2 - QUICK-CONNECT FITTING

retainer ring into fitting (Fig. 15). With plastic ring depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**

(b) After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.

(c) Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

(9) **Latch Clips:** Depending on vehicle model and engine, 2 different types of safety latch clips are used (Fig. 16) or (Fig. 17). Type-1 is tethered to fuel line

QUICK CONNECT FITTING (Continued)

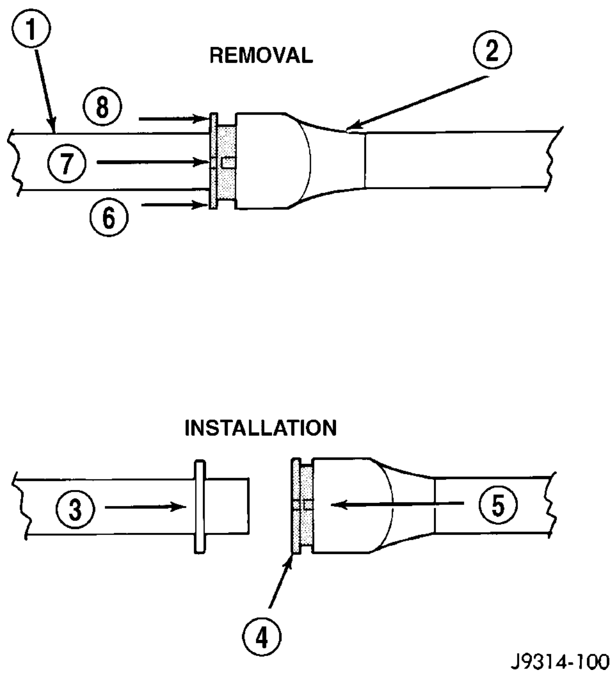


Fig. 15 PLASTIC RETAINER RING TYPE FITTING

1 - FUEL TUBE
2 - QUICK CONNECT FITTING
3 - PUSH
4 - PLASTIC RETAINER
5 - PUSH
6 - PUSH
7 - PUSH
8 - PUSH

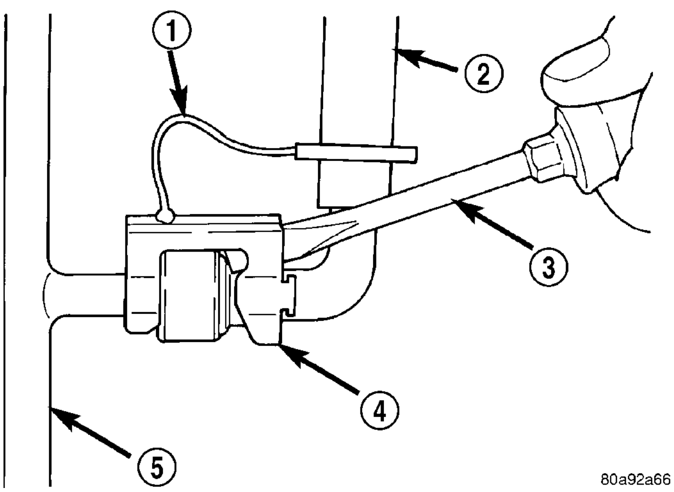


Fig. 16 LATCH CLIP-TYPE 1

1 - TETHER STRAP
2 - FUEL LINE
3 - SCREWDRIVER
4 - LATCH CLIP
5 - FUEL RAIL

and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.

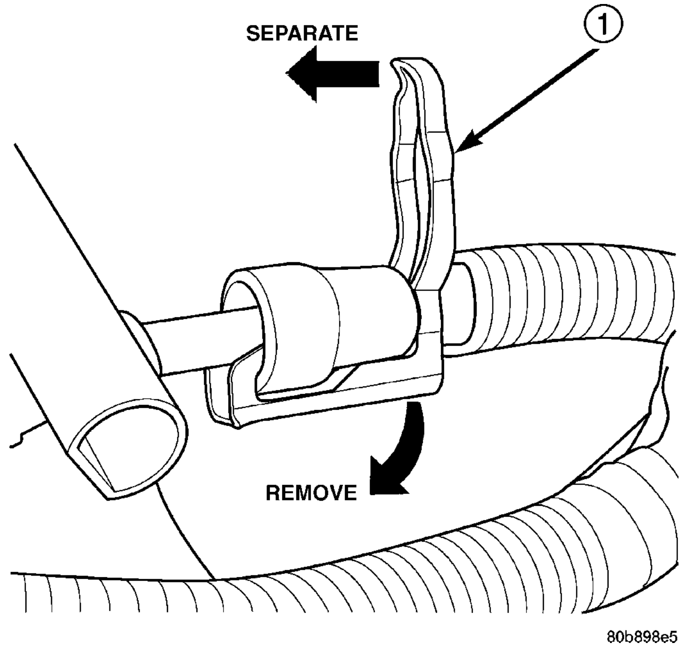


Fig. 17 LATCH CLIP-TYPE 2

1 - LATCH CLIP

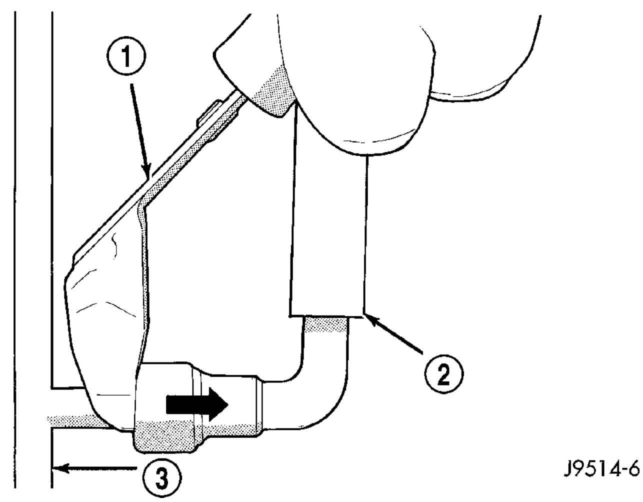


Fig. 18 FUEL LINE DISCONNECTION USING SPECIAL TOOL

1 - SPECIAL FUEL LINE TOOL
2 - FUEL LINE
3 - FUEL RAIL

(a) Type 1: Pry up on latch clip with a screwdriver (Fig. 16).

(b) Type 2: Separate and unlatch 2 small arms on end of clip (Fig. 17) and swing away from fuel line.

(c) Slide latch clip toward fuel rail while lifting with screwdriver.

(d) Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (Fig. 18). Use tool to release locking fingers in end of line.

QUICK CONNECT FITTING (Continued)

(e) With special tool still inserted, pull fuel line from fuel rail.

(f) After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.

(10) Disconnect quick-connect fitting from fuel system component being serviced.

CONNECTING

(1) Inspect quick-connect fitting body and fuel system component for damage. Replace as necessary.

(2) Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.

(3) Insert quick-connect fitting into fuel tube or fuel system component until built-on stop on fuel tube or component rests against back of fitting.

(4) Continue pushing until a click is felt.

(5) Single-tab type fitting: Push new tab down until it locks into place in quick-connect fitting.

(6) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(7) Latch Clip Equipped: Install latch clip (snaps into position). **If latch clip will not fit, this indicates fuel line is not properly installed to fuel rail (or other fuel line). Recheck fuel line connection.**

(8) Connect negative cable to battery.

(9) Start engine and check for leaks.

FUEL PRESSURE REGULATOR

DESCRIPTION

The fuel pressure regulator is located on the bottom of the upper section of the fuel pump module. The fuel filter **is not combined** into the pressure regulator on this model.

OPERATION

The fuel pressure regulator is a mechanical device that is not controlled by engine vacuum or the Powertrain Control Module (PCM).

The regulator is calibrated to maintain fuel system operating pressure of approximately 339 kPa +/- 34 kPa (49.2 psi +/- 5 psi) at the fuel injectors. It contains a diaphragm, calibrated springs and a fuel return valve.

The main fuel filter **is not combined** within the fuel pressure regulator as in other Jeep® models. Three different fuel filters are used: 1. a serviceable, separate, externally mounted, main fuel filter; 2. a non-serviceable primary filter located on the bottom of the electric fuel pump; 3. a non-serviceable secondary filter attached to the side of the fuel pump module.

Fuel Flow: Fuel migrates into the fuel pump module reservoir through a one-way check valve located on the bottom of the module. This check valve prevents the reservoir from running empty such as when going up or down hills with a low amount of fuel in the tank. A primary fuel filter (sock) is located at the bottom of the electric fuel pump. Fuel is drawn in through this filter, and up to the electric fuel pump. High pressure fuel (unregulated) is supplied from the electric fuel pump through a high-pressure line to one of 3 fittings on the main fuel filter. If fuel pressure at the pressure regulator exceeds approximately 49 psi, an internal diaphragm within the regulator closes, and excess fuel is routed through a second fitting on the main fuel filter, and back into the fuel tank (the fuel pressure regulator is installed into the return side of the system). Pressure regulated fuel is then delivered from the third fitting on the fuel filter, up to and through the fuel rail, and on to the fuel injectors.

A secondary fuel filter is attached to the side of the fuel pump module. High-pressure from the electric fuel pump causes a siphoning action across a passage connected to this filter, and fuel is drawn into the fuel pump module reservoir. This is used to help keep the module reservoir full of fuel.

The fuel pressure regulator also acts as a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine. A second check valve is located at the outlet of the fuel pump module housing. **Refer to Fuel Pump - Description and Operation for more information. Also refer to the Fuel Pressure Leak Down Test, and the Fuel Pump Pressure Tests.**

A separate fuel return line from the engine is not used with this system.

REMOVAL

The fuel pressure regulator is located in the fuel tank. It is attached to the bottom of the upper section of the fuel pump module with a quick-connect fitting (Fig. 19). The fuel pump module is supplied in 2 sections (upper and lower). To replace the pressure regulator, the bottom section of the fuel pump module must be replaced.

(1) Remove upper and lower sections of fuel pump module from fuel tank. Refer to Fuel Pump Module Removal/Installation.

(2) Replace lower section of fuel pump module (includes fuel pressure regulator).

FUEL PRESSURE REGULATOR (Continued)

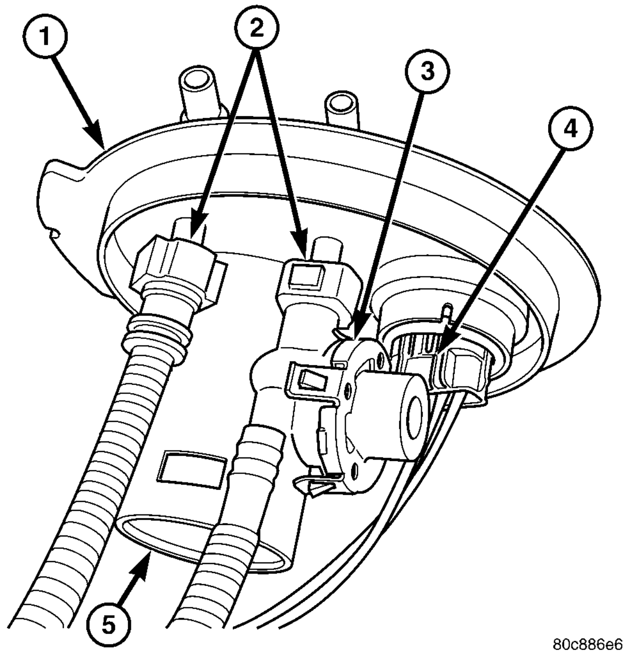


Fig. 19 FUEL PRESSURE REGULATOR/SENDING UNIT ELECTRICAL CONNECTOR

1 - UPPER SECTION OF PUMP MODULE
2 - QUICK-CONNECT FITTINGS
3 - FUEL PRESSURE REGULATOR
4 - 4-WIRE ELECTRICAL CONNECTOR
5 - FUEL TANK CHECK (CONTROL) VALVE

INSTALLATION

The fuel pressure regulator is located in the fuel tank. It is attached to the bottom of the upper section of the fuel pump module with a quick-connect fitting. The fuel pump module is supplied in 2 sections (upper and lower). To replace the pressure regulator, the bottom section of the fuel pump module must be replaced.

(1) Replace lower section of fuel pump module (includes fuel pressure regulator).

(2) Install upper and lower sections of fuel pump module to fuel tank. Refer to Fuel Pump Module Installation.

FUEL PUMP

DESCRIPTION

The electric fuel pump is located inside of the fuel pump module. A 12 volt, permanent magnet, electric motor powers the fuel pump. The electric fuel pump is not a separate, serviceable component.

OPERATION

Voltage to operate the electric pump is supplied through the fuel pump relay.

Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

Check Valve Operation: The bottom section of the fuel pump module contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** Refer to the Fuel Pressure Leak Down Test for more information.

The electric fuel pump is not a separate, serviceable component.

FUEL PUMP MODULE

DESCRIPTION

The fuel pump module assembly is located in the fuel tank (Fig. 1). The assembly is divided into 2–sections, upper and lower. The lower section is locked to the bottom of the fuel tank. The complete assembly contains the following components:

- A fuel pressure regulator
- A separate fuel pick-up, or inlet filter
- An electric fuel pump
- A lockring to retain upper section of pump module to tank
- A rollover valve
- A vent fitting for ORVR system
- A soft gasket between tank flange and module
- A fuel gauge sending unit (fuel level sensor)
- Two fuel line connections (supply and return)

The fuel gauge sending unit may be serviced separately. If the electrical fuel pump, primary inlet filter or fuel pressure regulator require service, the lower section of the fuel pump module must be replaced.

OPERATION

Refer to Fuel Pump, Inlet Filter, Fuel Pressure Regulator and Fuel Gauge Sending Unit.

REMOVAL

The fuel pump module is divided into 2 sections, upper and lower. To service the check (control) valve, replace only the upper section. To service the fuel gauge sending unit, remove the upper section. To service the electric fuel pump, fuel pressure regulator or primary inlet filter, remove both sections and replace lower section.

FUEL PUMP MODULE (Continued)

Fuel tank removal will not be necessary for fuel pump module removal. Access is from rear cargo area.

(1) Four cargo holdown clamps are located inside the vehicle on the floor of the rear cargo area. Remove the 2 rearward mounted clamps by drilling out the clamp rivets.

(2) Fold carpeting forward to gain access to fuel pump module access plate (Fig. 20).

(3) Remove 4 fuel pump module access plate nuts (Fig. 20).

(4) While applying heat from a heat gun, carefully pry up fuel pump module access plate. Take care not to bend plate.

(5) Thoroughly clean area around top of pump module to prevent contaminants from entering fuel tank or fuel lines.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING THE FUEL PUMP MODULE, FUEL SYSTEM PRESSURE MUST BE RELEASED.

(6) Release fuel system pressure. Refer to Fuel System Pressure Release procedure.

(7) Disconnect 2 fuel lines at fuel pump module (Fig. 21) by pressing on 2 buttons at sides of fitting.

(8) Disconnect electrical connector (Fig. 21) at top of fuel pump module by sliding red colored tab first to unlock, and push grey colored tab down for removal.

(9) Disconnect ORVR hose clamp and hose (Fig. 21) at pump module fitting.

(10) Remove module lockring (Fig. 21) using a brass drift and hammer (counter-clockwise).

(11) Carefully lift upper section of pump module (Fig. 21) from fuel tank exposing connections **(lift upper section from tank very slowly until rubber gasket can be retained. If not, gasket will fall into fuel tank.)**

(a) Disconnect electrical connector (Fig. 22) at bottom of upper pump module section.

(b) Disconnect fuel pressure regulator (Fig. 22) at bottom of upper pump module section. Press on 2 locking tabs.

(c) Disconnect fuel return line (Fig. 22) at bottom of upper pump module section. Press on 2 locking tabs.

(d) Remove upper section of pump module (Fig. 23) from fuel tank.

(12) Using an approved gas holding tank, drain fuel tank through pump module opening. **If check (control) valve, or, only upper section of pump module is being serviced, tank draining is not necessary. If any other fuel pump module component is being serviced, the tank must be completely drained to the bottom.**

(13) To remove lower section of pump module from fuel tank:

(a) Using finger pressure, push on plastic release tab (Fig. 24) while sliding lock tab upward.

(b) The sides of pump module are equipped with tension springs (Fig. 24). These springs hold module to bottom of fuel tank into 2 formed guides (Fig. 25). Release module assembly from these 2 guides by sliding toward right side of fuel tank.

(c) Lift assembly from fuel tank.

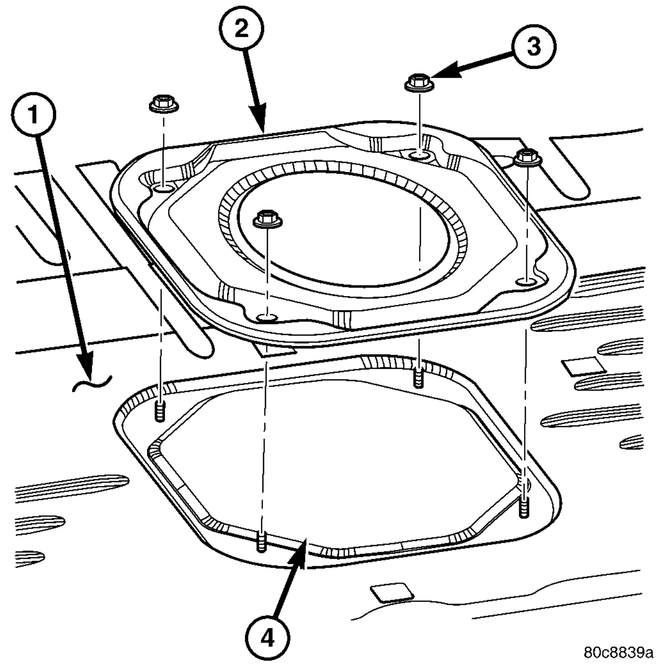


Fig. 20 ACCESS PLATE

1 - FLOORPAN AT REAR
2 - FUEL PUMP MODULE ACCESS PLATE
3 - NUTS (4)
4 - OPENING TO PUMP MODULE

INSTALLATION

CAUTION: Whenever fuel pump module is serviced, pump module gasket must be replaced.

(1) Position lower section of fuel pump module assembly into fuel tank.

(2) The bottom of fuel tank has 2 formed guides. Lock module assembly into these 2 guides by sliding toward left side of fuel tank.

(3) Push down on plastic tab to lock module to fuel tank guides.

(4) Connect fuel supply line to bottom of upper pump module section.

(5) Connect fuel pressure regulator to bottom of upper pump module section.

(6) Connect electrical connector to bottom of upper pump module section.

FUEL PUMP MODULE (Continued)

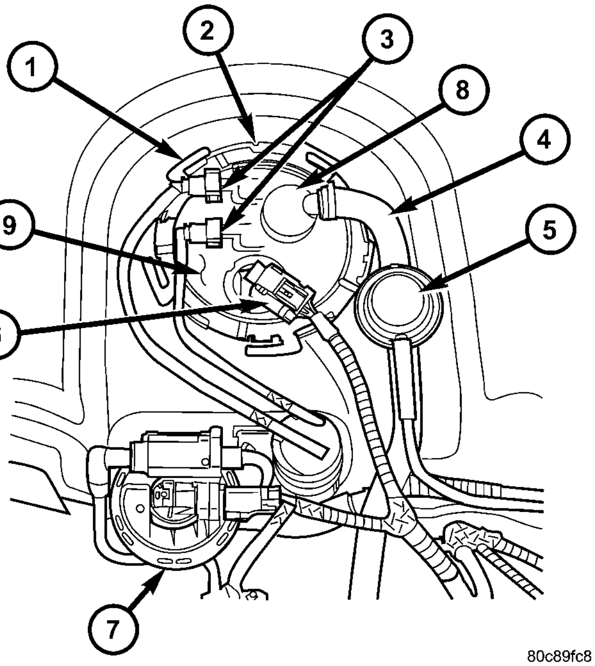


Fig. 21 TOP OF FUEL PUMP MODULE

1 - LOCK RING
2 - ALIGNMENT NOTCH
3 - FUEL FILTER FITTINGS (2)
4 - ORVR SYSTEM HOSE AND CLAMP
5 - FLOW MANAGEMENT VALVE
6 - ELECTRICAL CONNECTOR
7 - LEAK DETECTION PUMP
8 - FUEL TANK CHECK (CONTROL) VALVE
9 - FUEL PUMP MODULE (UPPER SECTION)

(7) Position pump module into fuel tank. Notch on module must be facing rear of tank.

(8) Position lock ring to module. Tap lockring using a brass drift and hammer (clockwise) until rotated up to built-on stops.

(9) Attach (snap on) 2 fuel filter fuel lines to top of fuel pump module.

(10) Connect hoses/lines to ORVR components.

(11) Fill fuel tank with fuel.

(12) Start engine and check for fuel leaks.

(13) Apply silicone sealant to bottom of fuel pump module metal access plate.

(14) Install fuel pump module metal access plate and 4 nuts. Tighten nuts to 3 N·m (26 in. lbs.) torque.

(15) Position carpet and install 2 new cargo clamp rivets into each cargo holdown clamp.

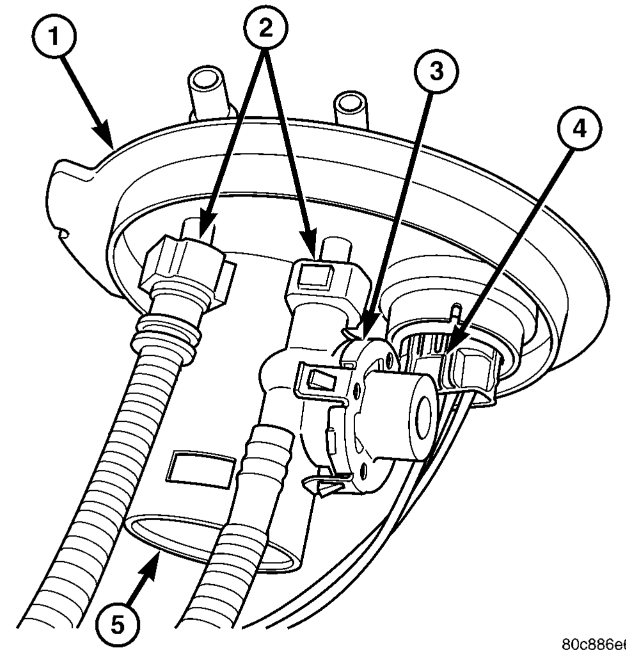


Fig. 22 FUEL PRESSURE REGULATOR/SENDING UNIT ELECTRICAL CONNECTOR

1 - UPPER SECTION OF PUMP MODULE
2 - QUICK-CONNECT FITTINGS
3 - FUEL PRESSURE REGULATOR
4 - 4-WIRE ELECTRICAL CONNECTOR
5 - FUEL TANK CHECK (CONTROL) VALVE

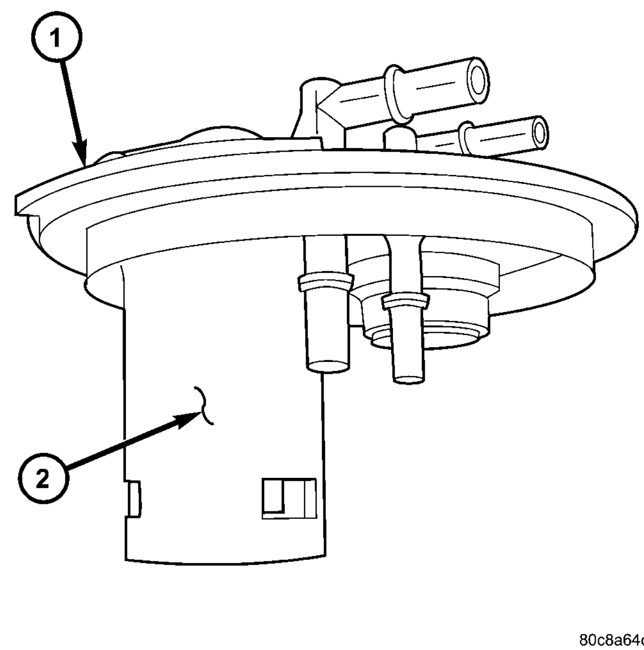


Fig. 23 UPPER SECTION - FUEL PUMP MODULE

1 - UPPER SECTION - FUEL PUMP MODULE
2 - FUEL TANK CHECK (CONTROL) VALVE

FUEL RAIL (Continued)

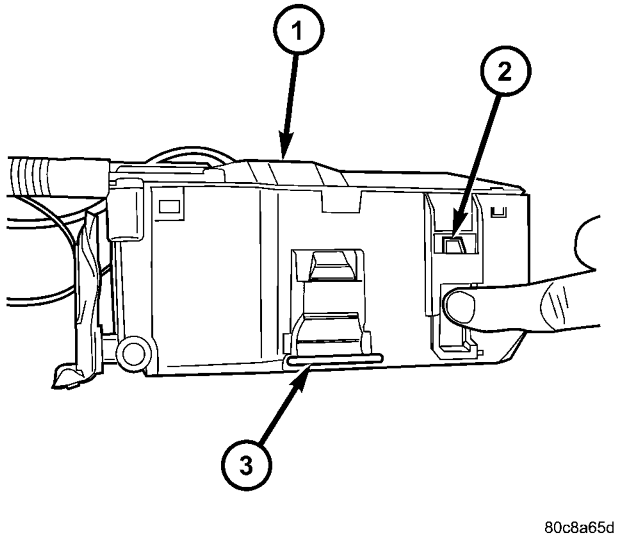


Fig. 24 LOWER SECTION - FUEL PUMP MODULE

1 - LOWER SECTION - FUEL PUMP MODULE
2 - RELEASE LOCK AND TAB
3 - TENSION SPRINGS

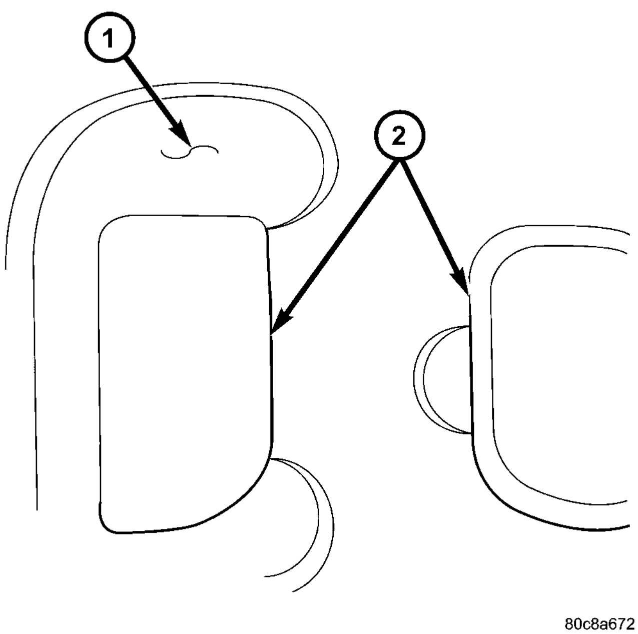


Fig. 25 FUEL PUMP MODULE GUIDES (IN FUEL TANK)

1 - FUEL TANK (INSIDE/LOWER)
2 - FUEL PUMP MODULE GUIDES

FUEL RAIL

DESCRIPTION

2.4L

The fuel injector rail is used to mount the fuel injectors to the engine (Fig. 26). On the 2.4L 4-cylinder engine, a **fuel damper** is located near the front of the fuel rail (Fig. 26).

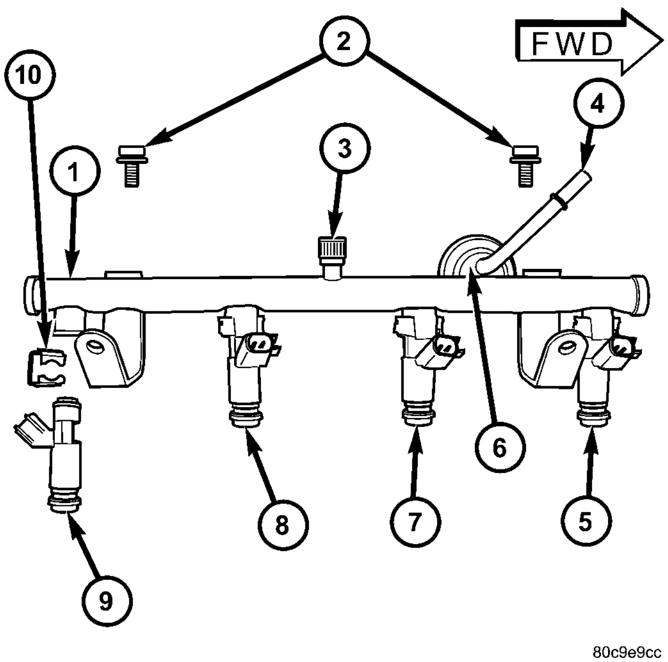


Fig. 26 FUEL RAIL - 2.4L

1 - FUEL RAIL
2 - MOUNTING BOLTS
3 - TEST PORT
4 - QUICK-CONNECT FITTING
5 - INJ. #1
6 - DAMPER
7 - INJ #2
8 - INJ #3
9 - INJ #4
10- INJECTOR RETAINING CLIP

3.7L

The fuel injector rail is mounted to the intake manifold (Fig. 27). It is used to mount the fuel injectors to the engine. The rail is equipped with a test port (Fig. 28) to check/test fuel system pressure.

A fuel rail mounted, fuel damper is not used with this engine.

FUEL RAIL (Continued)

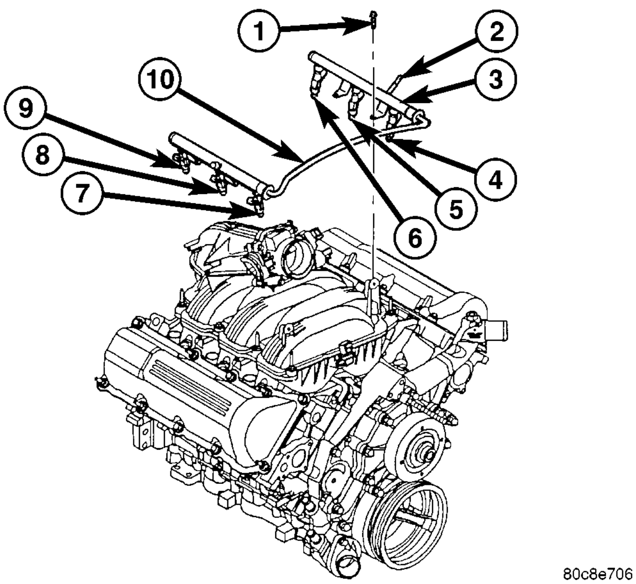


Fig. 27 FUEL RAIL - 3.7L

1 - MOUNTING BOLTS (4)
2 - QUICK-CONNECT FITTING
3 - FUEL RAIL
4 - INJ. #1
5 - INJ. #3
6 - INJ. #5
7 - INJ. #2
8 - INJ. #4
9 - INJ. #6
10 - CONNECTOR TUBE

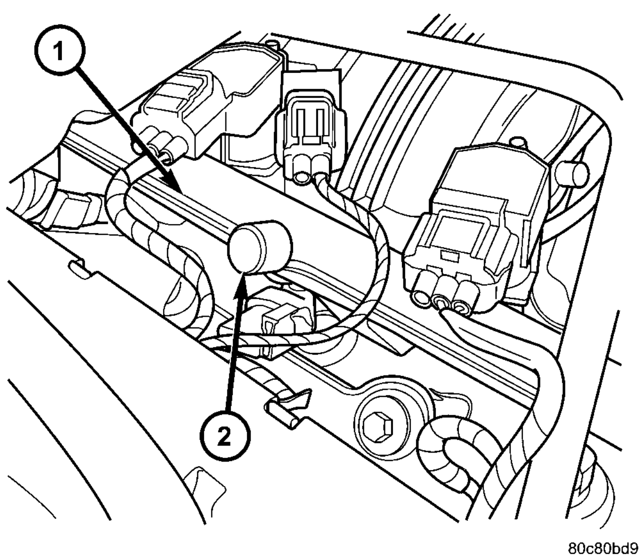


Fig. 28 FUEL RAIL TEST PORT - 3.7L

1 - FUEL RAIL
2 - TEST PORT

OPERATION

2.4L

The fuel injector rail supplies the necessary fuel to each individual fuel injector.

The fuel damper is used only to help control fuel pressure pulsations. These pulsations are the result of the firing of the fuel injectors. It is **not used** as a fuel pressure regulator. The fuel pressure regulator is **not mounted** to the fuel rail on any engine. It is located on the fuel tank mounted fuel pump module. Refer to Fuel Pressure Regulator for additional information.

The fuel rail is not repairable.

A quick-connect fitting with a safety latch is used to attach the fuel line to the fuel rail.

3.7L

High pressure fuel from the fuel pump is routed to the fuel rail. The fuel rail then supplies the necessary fuel to each individual fuel injector.

A quick-connect fitting with a safety latch is used to attach the fuel line to the fuel rail.

The fuel rail is not repairable.

REMOVAL

2.4L

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

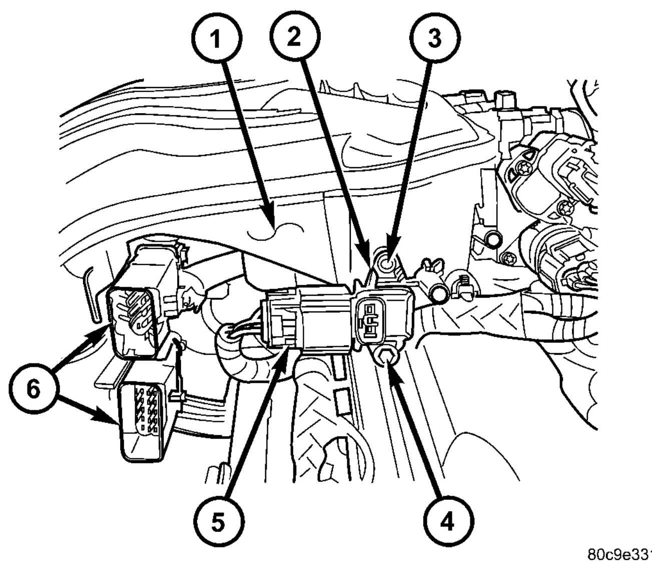


Fig. 29 MAP SENSOR LOCATION - 2.4L

1 - REAR OF INTAKE MANIFOLD
2 - MAP SENSOR
3 - ALIGNMENT PIN
4 - MOUNTING BOLT (TORX)
5 - ELECTRICAL CONNECTOR
6 - MAIN ENGINE HARNESS CONNECTORS

FUEL RAIL (Continued)

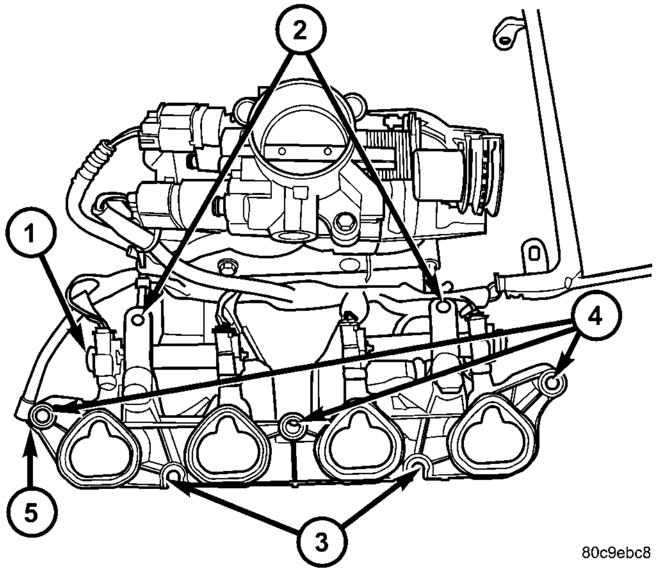


Fig. 30 FUEL RAIL MOUNTING - 2.4L

1 - FUEL RAIL
2 - INJECTION HARNESS CLIPS
3 - LOWER MOUNTING HOLES
4 - UPPER MOUNTING HOLES
5 - INTAKE MANIFOLD

The fuel rail can be removed without removing the intake manifold if the following procedures are followed.

(1) Remove fuel tank filler tube cap.

(2) Perform Fuel System Pressure Release Procedure.

(3) Remove negative battery cable at battery.

(4) Remove air duct at throttle body.

(5) Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.

(6) Remove necessary vacuum lines at throttle body.

(7) Drain engine coolant and remove thermostat and thermostat housing.

(8) Remove PCV hose and valve at valve cover.

(9) Remove 3 upper intake manifold mounting bolts (Fig. 30), but only loosen 2 lower bolts about 2 turns.

(10) Disconnect 2 main engine harness connectors at rear of intake manifold (Fig. 29).

(11) Disconnect 2 injection wiring harness clips at harness mounting bracket (Fig. 30).

(12) Disconnect electrical connectors at all 4 fuel injectors. To remove connector refer to (Fig. 32). Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.

(13) Remove 2 injection rail mounting bolts (Fig. 26).

(14) Gently rock and pull fuel rail until fuel injectors just start to clear machined holes in intake manifold.

(15) Remove fuel rail (with injectors attached) from intake manifold.

(16) If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

3.7L

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tube (Fig. 31). Due to design of tube, it does not use any clamps. Never attempt to install a clamping device of any kind to tube. When removing fuel rail assembly for any reason, be careful not to bend or kink tube.

(1) Remove fuel tank filler tube cap.

(2) Perform Fuel System Pressure Release Procedure.

(3) Remove negative battery cable at battery.

(4) Remove air duct at throttle body air box.

(5) Remove air box at throttle body.

(6) Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.

(7) Remove necessary vacuum lines at throttle body.

(8) Disconnect electrical connectors at all 6 fuel injectors. To remove connector refer to (Fig. 32). Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.

(9) Disconnect electrical connectors at throttle body sensors.

(10) Remove 6 ignition coils. Refer to Ignition Coil Removal/Installation.

(11) Remove 4 fuel rail mounting bolts (Fig. 31).

(12) Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.

FUEL RAIL (Continued)

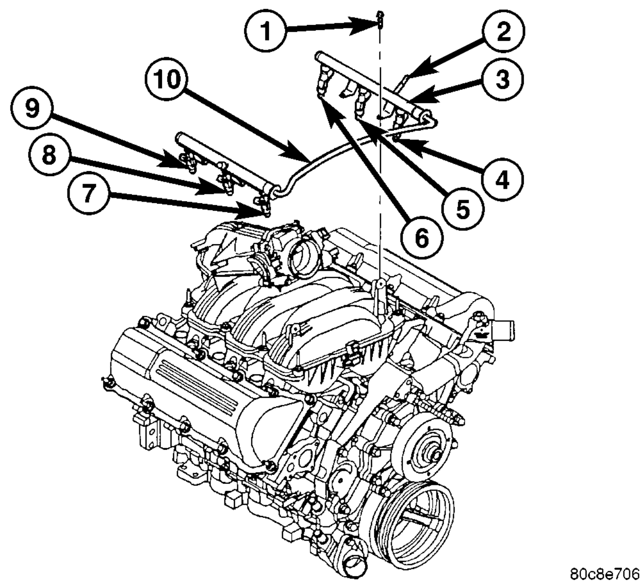


Fig. 31 FUEL RAIL REMOVE/INSTALL - 3.7L

1 - MOUNTING BOLTS (4)
2 - QUICK-CONNECT FITTING
3 - FUEL RAIL
4 - INJ. #1
5 - INJ. #3
6 - INJ. #5
7 - INJ. #2
8 - INJ. #4
9 - INJ. #6
10 - CONNECTOR TUBE

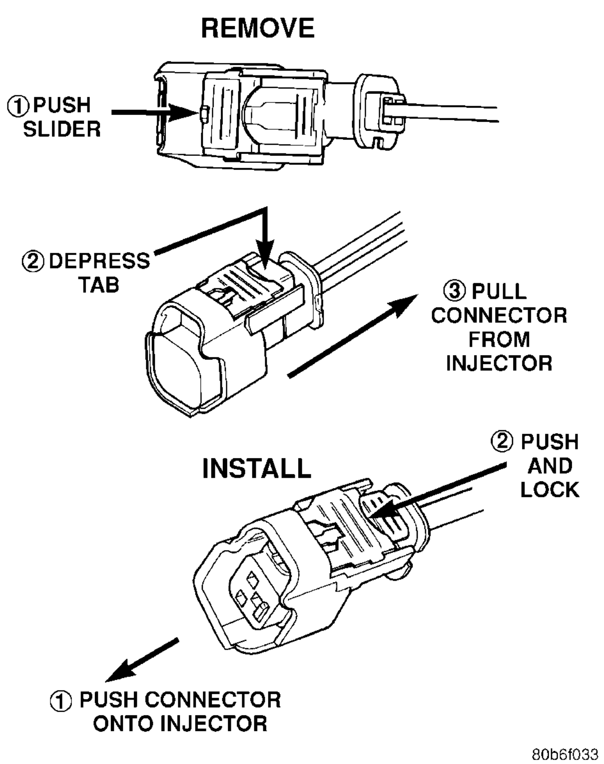


Fig. 32 REMOVE/INSTALL INJECTOR CONNECTOR

(13) Remove fuel rail (with injectors attached) from engine.

(14) If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

INSTALLATION

2.4L Engine

(1) If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.

(2) Clean out fuel injector machined bores in intake manifold.

(3) Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.

(4) Position fuel rail/fuel injector assembly to machined injector openings in intake manifold.

(5) Guide each injector into cylinder head. Be careful not to tear injector o-rings.

(6) Push fuel rail down until fuel injectors have bottomed on shoulders.

(7) Install 2 fuel rail mounting bolts and tighten. Refer to torque specifications.

(8) Connect electrical connectors at all fuel injectors. To install connector, refer to (Fig. 32). Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.

(9) Snap 2 injection wiring harness clips (Fig. 30) into brackets.

(10) Connect 2 main engine harness connectors at rear of intake manifold (Fig. 29).

(11) Tighten 5 intake manifold mounting bolts. Refer to Engine Torque Specifications.

(12) Install PCV valve and hose.

(13) Install thermostat and radiator hose. Fill with coolant. Refer to Cooling.

(14) Connect necessary vacuum lines to throttle body.

(15) Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.

(16) Install air duct to throttle body.

(17) Connect battery cable to battery.

(18) Start engine and check for leaks.

3.7L Engine

(1) If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.

(2) Clean out fuel injector machined bores in intake manifold.

(3) Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.

(4) Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.

(5) Guide each injector into cylinder head. Be careful not to tear injector o-rings.

FUEL RAIL (Continued)

(6) Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.

(7) Install 4 fuel rail mounting bolts and tighten. Refer to torque specifications.

(8) Install 6 ignition coils. Refer to Ignition Coil Removal/Installation.

(9) Connect electrical connectors to throttle body.

(10) Connect electrical connectors at all fuel injectors. To install connector, refer to (Fig. 32). Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.

(11) Connect necessary vacuum lines to throttle body.

(12) Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.

(13) Install air box to throttle body.

(14) Install air duct to air box.

(15) Connect battery cable to battery.

(16) Start engine and check for leaks.

FUEL TANK

DESCRIPTION

The fuel tank is constructed of a plastic material. Its main functions are for fuel storage and for placement of the fuel pump module, and certain ORVR components.

OPERATION

All models pass a full 360 degree rollover test without fuel leakage. To accomplish this, fuel and vapor flow controls are required for all fuel tank connections.

A check (control) valve is mounted into the top section of the 2–piece fuel pump module. Refer to Fuel Tank Check Valve for additional information.

An evaporation control system is connected to the fuel tank to reduce emissions of fuel vapors into the atmosphere. When fuel evaporates from the fuel tank, vapors pass through vent hoses or tubes to a charcoal canister where they are temporarily held. When the engine is running, the vapors are drawn into the intake manifold. Certain models are also equipped with a self-diagnosing system using a Leak Detection Pump (LDP) and/or an ORVR system. Refer to Emission Control System for additional information.

REMOVAL

Fuel Tank Draining

WARNING: THE FUEL SYSTEM MAY BE UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL TANK.

Two different procedures may be used to drain fuel tank: removing fuel pump module access plate, or using DRB® scan tool. Due to a one-way check valve installed into the fuel fill opening fitting at the tank (Fig. 33), the tank cannot be drained conventionally at the fill cap.

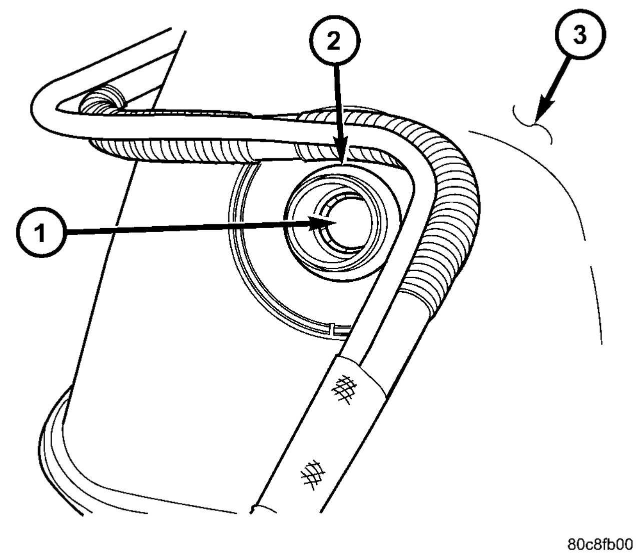


Fig. 33 FUEL FILL CHECK VALVE

1 - ONE-WAY CHECK VALVE
2 - FUEL FILL FITTING
3 - SIDE OF FUEL TANK

The quickest draining procedure involves removing fuel pump module access plate.

As an alternative procedure, the electric fuel pump may be activated allowing tank to be drained at fuel rail connection. Refer to DRB scan tool for fuel pump activation procedures. Before disconnecting fuel line at fuel rail, release fuel pressure. Refer to the Fuel System Pressure Release Procedure for procedures. Attach end of special test hose tool number 6541, 6539, 6631 or 6923 at fuel rail disconnection (tool number will depend on model and/or engine application). Position opposite end of this hose tool to an approved gasoline draining station. Activate fuel pump and drain tank until empty.

If electric fuel pump is not operating, fuel pump module access plate must be removed for fuel draining. Refer to following procedures.

FUEL TANK (Continued)

Fuel tank removal will not be necessary for fuel tank draining. Access for draining is from rear cargo area.

(1) Open all windows in vehicle to allow for air ventilation.

(2) Four cargo holdown clamps are located inside the vehicle on the floor of the rear cargo area. Remove the 2 rearward mounted clamps by drilling out the clamp rivets.

(3) Fold carpeting forward to gain access to fuel pump module access plate (Fig. 34).

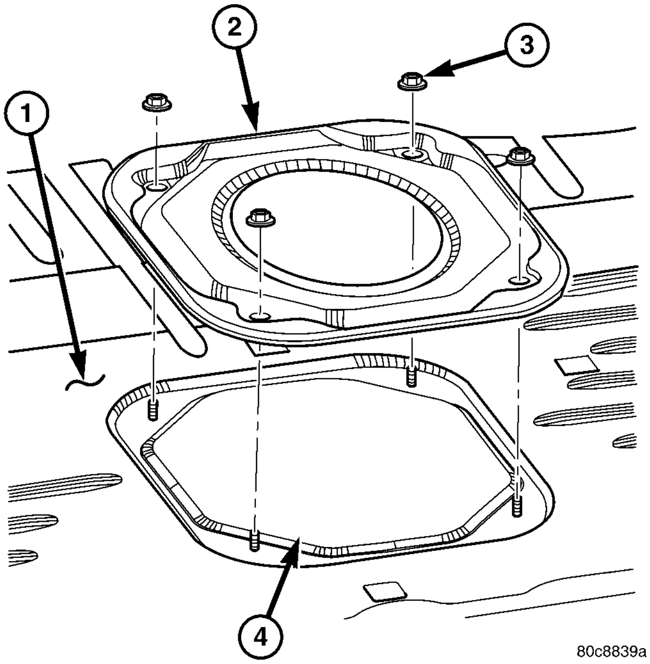


Fig. 34 ACCESS PLATE

1 - FLOORPAN AT REAR
2 - FUEL PUMP MODULE ACCESS PLATE
3 - NUTS (4)
4 - OPENING TO PUMP MODULE

(4) Remove 4 fuel pump module access plate nuts (Fig. 34).

(5) While applying heat from a heat gun, carefully pry up fuel pump module access plate. Take care not to bend plate.

(6) Thoroughly clean area around top of pump module to prevent contaminants from entering fuel tank or fuel lines.

(7) Release fuel system pressure.

(8) Disconnect 2 fuel lines (Fig. 35) at fuel pump module by pressing on tabs at side of fitting.

(9) Disconnect electrical connector (Fig. 35). Slide red tab first to unlock, and push grey tab down for removal.

(10) Disconnect ORVR hose (Fig. 35) at pump module fitting.

(11) Remove module lockring (Fig. 35) using a brass drift and hammer (counter-clockwise).

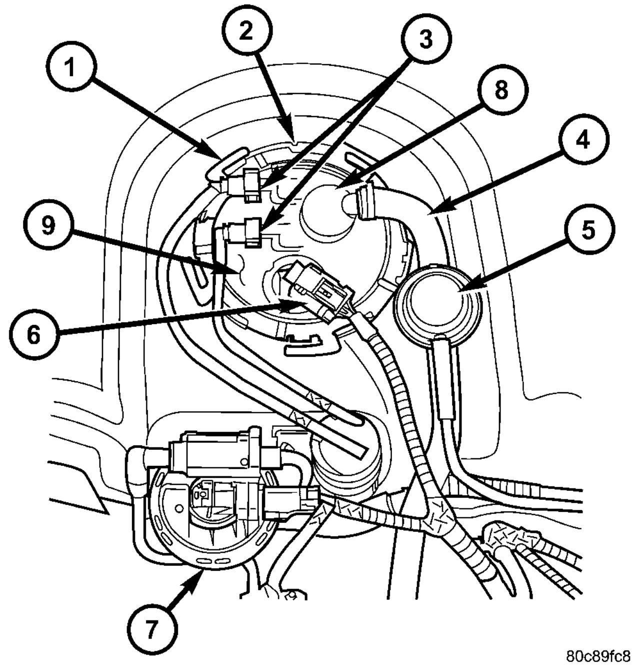


Fig. 35 TOP OF FUEL PUMP MODULE

1 - LOCK RING
2 - ALIGNMENT NOTCH
3 - FUEL FILTER FITTINGS (2)
4 - ORVR SYSTEM HOSE AND CLAMP
5 - FLOW MANAGEMENT VALVE
6 - ELECTRICAL CONNECTOR
7 - LEAK DETECTION PUMP
8 - FUEL TANK CHECK (CONTROL) VALVE
9 - FUEL PUMP MODULE (UPPER SECTION)

(12) Carefully lift upper section of pump module from fuel tank a few inches **(lift upper section from tank very slowly until rubber gasket can be retained. If not, gasket will fall into fuel tank).**

(13) Using an approved gas holding tank, drain fuel tank through fuel pump module opening.

Tank Removal

(1) After draining tank, temporarily place upper section of fuel pump module back into fuel tank.

(2) Raise vehicle.

(3) If equipped, remove fuel tank skid plate and tow hooks. Certain equipment packages will also require removal of the trailer hitch. Refer to Tow Hooks, Trailer Hitch or Skid Plate in 23, Body for removal/installation procedures.

(4) Disconnect fuel filter ground strap.

(5) Disconnect fuel filter outlet line from body retention clip located on frame near front/center of tank (Fig. 36). Place a small screwdriver into side of clip and twist for removal. Also disconnect Leak Detection Pump (LDP) line (Fig. 36) from this clip.

(6) Remove both 3/4” hoses at sides of Leak Detection Pump (LDP) (Fig. 36).

FUEL TANK (Continued)

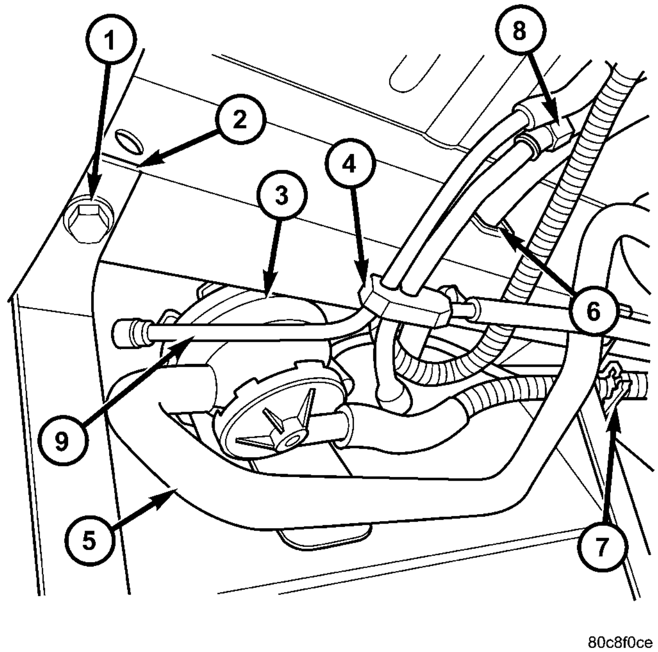


Fig. 36 FRONT OF FUEL TANK

1 - TANK MOUNTING BOLTS (4)
2 - TANK MOUNTING STRAPS (2)
3 - LEAK DETECTION PUMP (LDP)
4 - BODY RETENTION CLIP (CENTER)
5 - LDP HOSES
6 - HOSE TO FUEL MANAGEMENT VALVE
7 - BODY RETENTION CLIP (LEFT/FRONT)
8 - QUICK-CONECT FITTING
9 - LDP LINE

(7) Disconnect 3/4” flow management valve hose (Fig. 36) at EVAP canister.

(8) Remove fuel fill hose clamp (Fig. 37) at fuel tank, and disconnect hose from fuel tank.

(9) A third fuel line is attached to bottom of fuel filter. The disconnection point (quick-connect fitting) for this 3rd line is approximately 1 foot from front of tank towards front of vehicle (Fig. 36). Clean connection point before disconnection. Disconnect by pressing on tabs at side of quick-connect fitting. Also disconnect LDP vent line near this same point.

(10) Disconnect 2 vacuum/vent hoses from plastic retention clip at left/front of fuel tank line (Fig. 36).

(11) Support tank with a hydraulic jack.

(12) Remove 4 fuel tank strap bolts (Fig. 36) (2 at front of tank; 2 at rear of tank), and remove both tank support straps (Fig. 36).

(13) Carefully lower tank a few inches and disconnect electrical connector at top of LDP (Fig. 38). To disconnect electrical connector: Push upward on red colored tab to unlock. Push on black colored tab while removing connector.

(14) Continue lowering tank while guiding remaining hoses and lines.

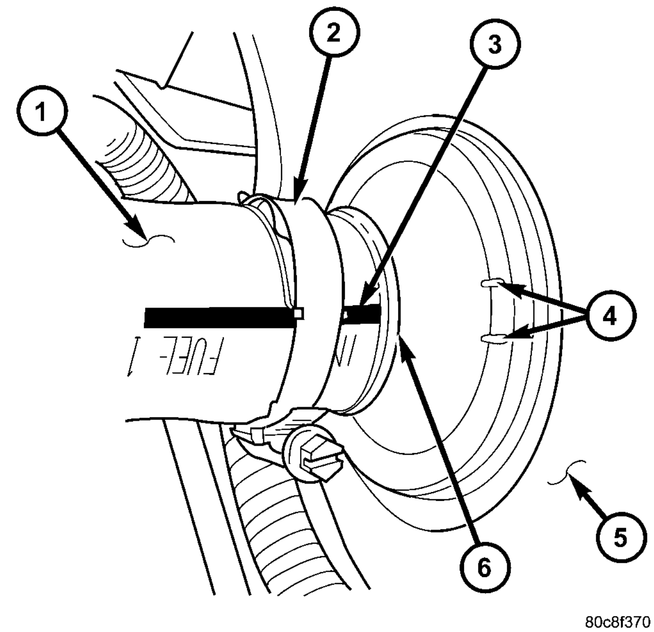


Fig. 37 FUEL FILL HOSE AT TANK

1 - FUEL FILL HOSE AT TANK
2 - HOSE CLAMP
3 - WHITE PAINTED INDEX MARK
4 - ALIGNMENT NOTCHES
5 - LEFT SIDE OF FUEL TANK
6 - FUEL FILL FITTING

(15) If fuel tank is to be replaced, remove LDP, fuel filter and fuel pump module from tank. Refer to Leak Detection Pump, Fuel Filter and Fuel Pump Module Removal/Installation procedures.

INSTALLATION

(1) If fuel tank is to be replaced, install LDP, fuel filter and fuel pump module to tank. Refer to Leak Detection Pump, Fuel Filter and Fuel Pump Module Removal/Installation procedures.

(2) Position fuel tank to hydraulic jack.

(3) Raise tank while carefully guiding vent tubes/hoses through frame rail and crossmember. Before tank reaches body, connect electrical connector to Leak Detection Pump (LDP).

(4) Continue raising tank until positioned to body.

(5) Attach two fuel tank mounting straps and 4 mounting bolts. Tighten bolts to 61 N·m (45 ft. lbs.) torque.

(6) Connect 2 hoses to body retention clip at left/front of tank.

(7) Connect fuel filter fuel line to main fuel line (snaps together). After connecting, snap this line into body retention clip. Also connect LDP vacuum hose near this point.

(8) Install fuel fill hose and hose clamp to fuel tank fitting. Rotate hose until white painted index mark on hose (Fig. 37) is located between alignment

FUEL TANK (Continued)

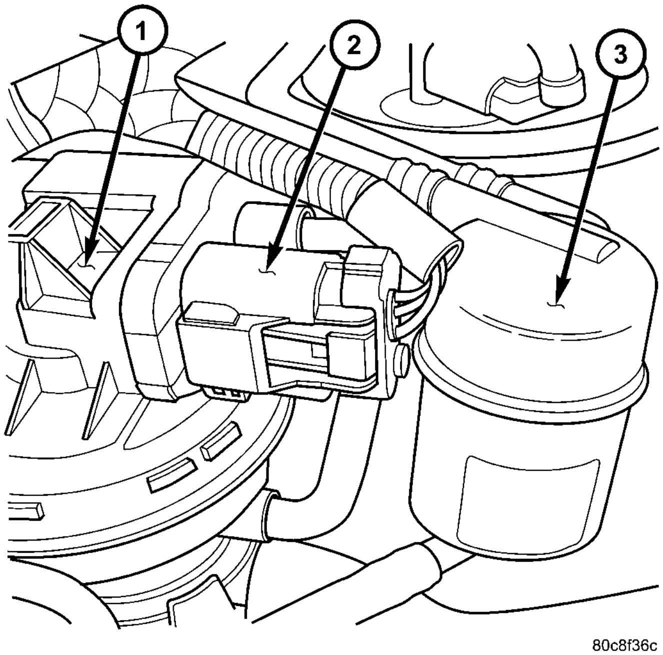


Fig. 38 LDP ELECTRICAL CONNECTOR

1 - LEAK DETECTION PUMP (LDP)
2 - ELECTRICAL CONNECTOR
3 - FUEL FILTER

notches on fuel tank fitting. Tighten clamp to 3.4 N·m (30 in. lbs.) torque.

(9) Connect fresh air and recirculation lines to fuel fill tube.

(10) Connect 3/4” lines to Leak Detection Pump (LDP).

(11) Connect 3/4” flow management valve hose to EVAP canister.

(12) Snap remaining lines into body retention clip at front/center of fuel tank.

(13) If equipped, install fuel tank skid plate, trailer hitch and tow hooks. Refer to Tow Hooks, Trailer Hitch or Skid Plate in 23, Body for removal/ installation procedures.

(14) Lower vehicle.

(15) Attach (snap on) 2 fuel filter fuel lines to top of fuel pump module.

(16) Install electrical connector to top of fuel pump module.

(17) Connect negative battery cable to battery.

(18) Fill fuel tank with fuel.

(19) Start engine and check for fuel leaks near top of module.

(20) Apply silicone sealant to bottom of fuel pump module metal access plate.

(21) Install fuel pump module metal access plate and 4 nuts. Tighten nuts to 3 N·m (26 in. lbs.) torque.

(22) Position carpet and install 2 new cargo clamp rivets into each cargo holdown clamp.

FUEL TANK CHECK VALVE

DESCRIPTION

The fuel tank is equipped with a check valve. The valve (also referred to as a control valve) is located in the top section of the fuel pump module assembly (Fig. 1).

OPERATION

The fuel tank check valve (also referred to as either a control valve, one-way check valve or float valve) will prevent fuel flow through the fuel tank vent in the event of an accidental vehicle rollover. It is also used as a part of the ORVR system. The EVAP canister and ORVR system draw fuel vapors from the fuel tank through this valve. Refer to ORVR in Emissions for additional information.

The valve may be serviced by replacing the upper section of the fuel pump module assembly.

REMOVAL

The fuel tank check (control) valve is attached into the top section of the fuel pump module (Fig. 39). If replacement is necessary, the top section of the fuel pump module must be replaced. Refer to Fuel Pump Module Removal/Installation.

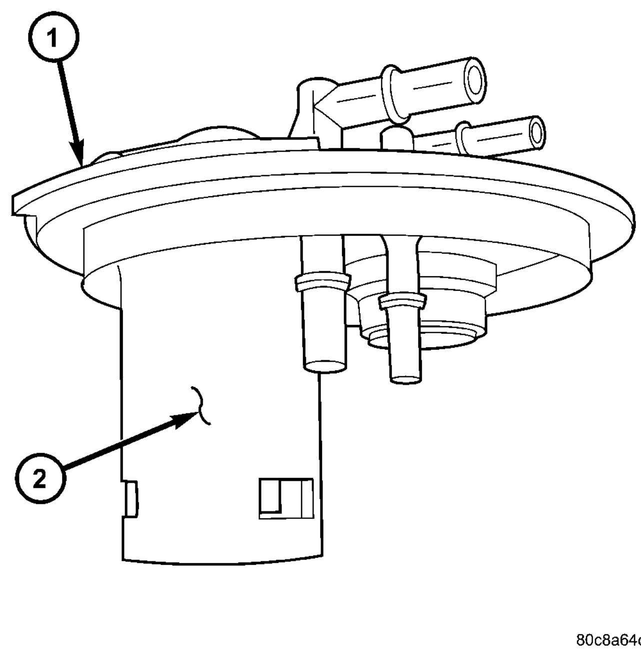


Fig. 39 UPPER SECTION - FUEL PUMP MODULE

1 - UPPER SECTION - FUEL PUMP MODULE
2 - FUEL TANK CHECK (CONTROL) VALVE

INSTALLATION

The fuel tank check (control) valve is attached to the top section of the fuel pump module. If replace-

FUEL TANK CHECK VALVE (Continued)

ment is necessary, the top section of the fuel pump module must be replaced. Refer to Fuel Pump Module Removal/Installation.

INLET FILTER

REMOVAL

The fuel pump inlet filter is located on the bottom/side of the lower fuel pump module section (Fig. 40). The fuel pump module assembly is located in the fuel tank.

(1) Remove lower section of fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(2) Remove filter by prying from pump module with 2 small screwdrivers. Filter is snapped to module with 2 release tabs (Fig. 40).

(3) Clean filter entrance into pump module opening.

INSTALLATION

(1) Snap new filter to bottom of fuel pump module.

(2) Install lower section of fuel pump module. Refer to Fuel Pump Module Removal/Installation.

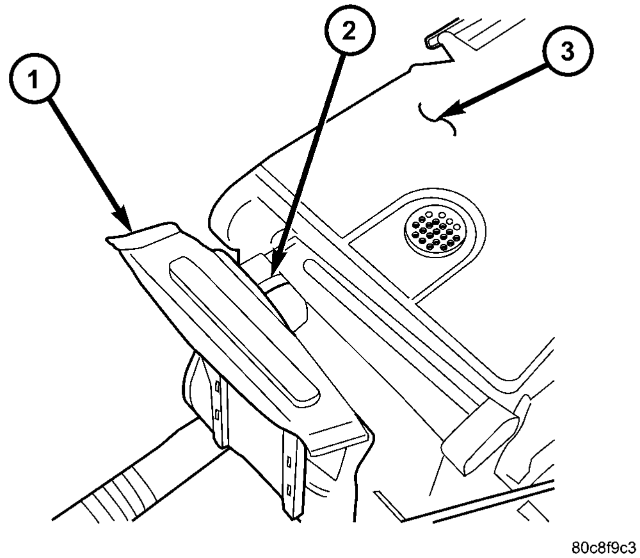


Fig. 40 INLET FILTER

1 - INLET FILTER
2 - RELEASE TABS (2)
3 - BOTTOM OF FUEL PUMP MODULE

FUEL INJECTION

TABLE OF CONTENTS

FUEL INJECTION

DESCRIPTION

The Powertrain Control Module (PCM) operates the fuel injection system. Refer to Powertrain Control Module in Electronic Control Modules for information.

ACCELERATOR PEDAL

REMOVAL

The accelerator pedal is serviced as a complete assembly including the bracket.

The accelerator pedal is connected to the upper part of the accelerator pedal arm by a plastic retainer (clip) (Fig. 1). This plastic retainer snaps into the top of the accelerator pedal arm.

(1) From inside the vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of accelerator pedal arm (Fig. 1). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove 2 accelerator pedal mounting bracket nuts. Remove accelerator pedal assembly.

INSTALLATION

(1) Place accelerator pedal assembly over 2 studs (Fig. 1) protruding from floor pan.

(2) Install 2 mounting nuts. Refer to torque specifications.

(3) Slide throttle cable into opening slot in top of pedal arm.

(4) Push plastic cable retainer (clip) into accelerator pedal arm opening until it snaps into place.

(5) Before starting engine, operate accelerator pedal to check for any binding.

ACCELERATOR PEDAL (Continued)

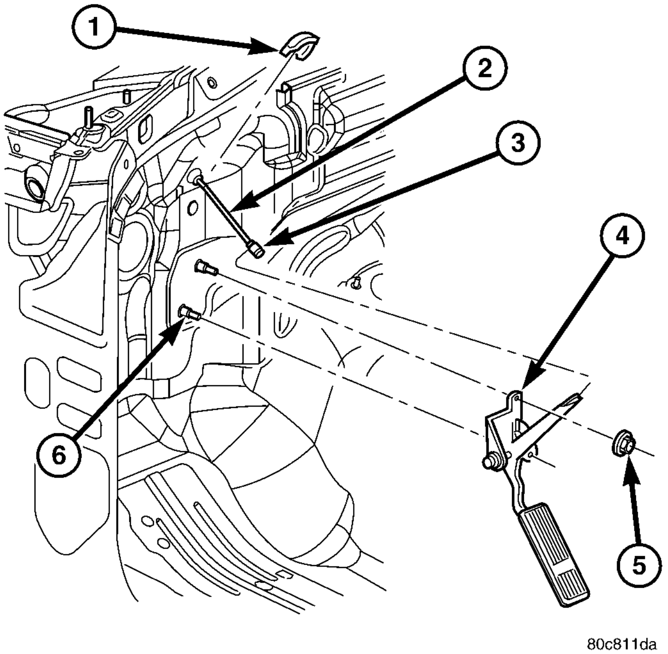


Fig. 1 ACCELERATOR PEDAL/BRACKET ASSEMBLY

1 - METAL THROTTLE CABLE CLIP
2 - THROTTLE CABLE
3 - PLASTIC CABLE RETAINER
4 - PEDAL/BRACKET ASSEMBLY
5 - PEDAL MOUNTING NUTS (2)
6 - PEDAL MOUNTING STUDS (2)

CRANKSHAFT POSITION SENSOR

DESCRIPTION

2.4L

The Crankshaft Position (CKP) sensor is mounted into the right front side of the cylinder block (Fig. 2). It is positioned and bolted into a machined hole.

3.7L

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block (Fig. 3). It is positioned and bolted into a machined hole.

OPERATION

2.4L

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

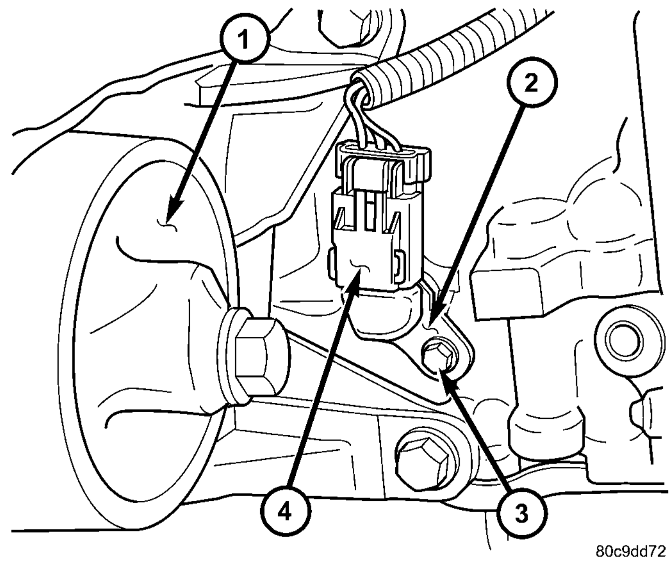


Fig. 2 CKP SENSOR LOCATION-2.4L

1 - RIGHT FRONT ENGINE MOUNT
2 - CKP SENSOR
3 - MOUNTING BOLT
4 - ELECTRICAL CONNECTOR

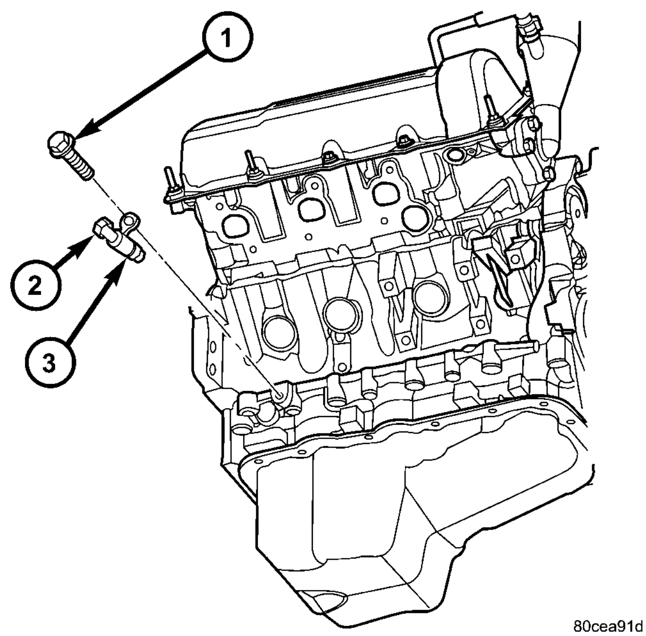


Fig. 3 CKP - 3.7L

1 - MOUNTING BOLT
2 - CKP SENSOR
3 - O-RING

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel (targetwheel) is a part of the engine crankshaft (Fig. 4). This tonewheel has sets of notches at its outer edge.

CRANKSHAFT POSITION SENSOR (Continued)

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

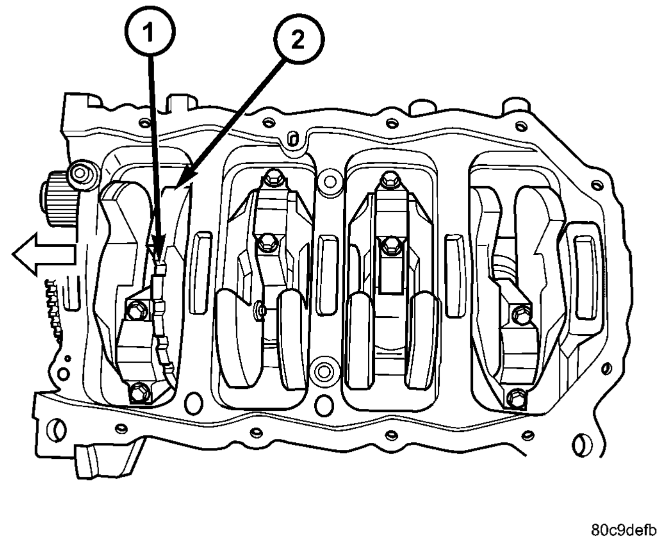


Fig. 4 CKP OPERATION-2.4L

1 - NOTCHES
2 - CRANKSHAFT

3.7L

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel (targetwheel) is bolted to the engine crankshaft (Fig. 5). This tonewheel has sets of notches at its outer edge (Fig. 5).

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

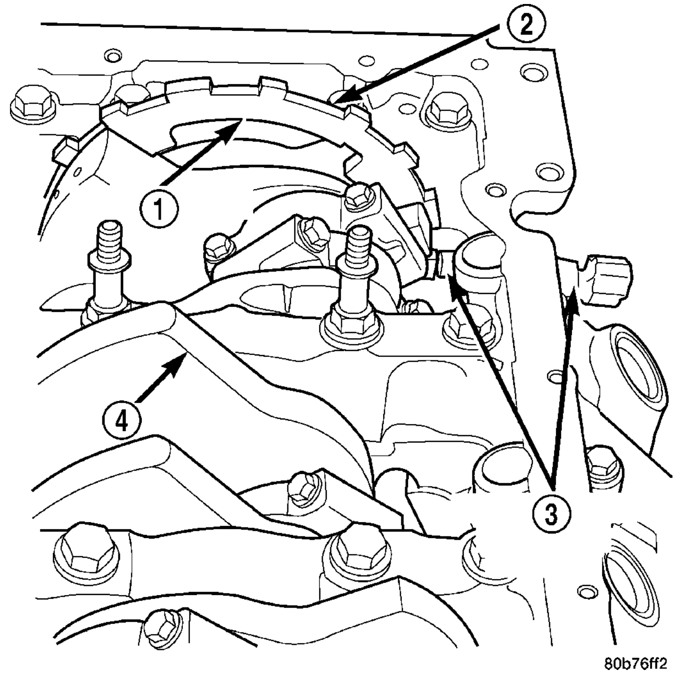


Fig. 5 CKP OPERATION-3.7L

1 - TONEWHEEL
2 - NOTCHES
3 - CRANKSHAFT POSITION SENSOR
4 - CRANKSHAFT

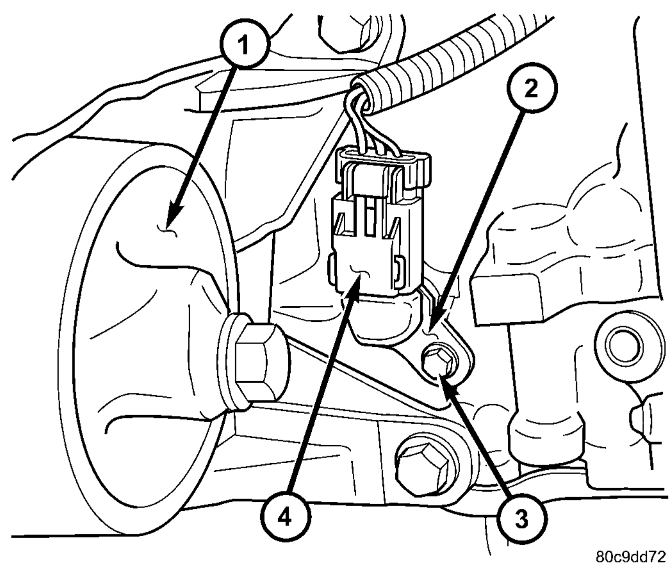


Fig. 6 CKP SENSOR LOCATION-2.4L

1 - RIGHT FRONT ENGINE MOUNT
2 - CKP SENSOR
3 - MOUNTING BOLT
4 - ELECTRICAL CONNECTOR

REMOVAL

2.4L

The Crankshaft Position (CKP) sensor is mounted into the right front side of the cylinder block (Fig. 6). It is positioned and bolted into a machined hole.

(1) Disconnect sensor electrical connector.
(2) Remove sensor bolt.
(3) Carefully twist sensor from cylinder block.
(4) Check condition of sensor o-ring (Fig. 7).

CRANKSHAFT POSITION SENSOR (Continued)

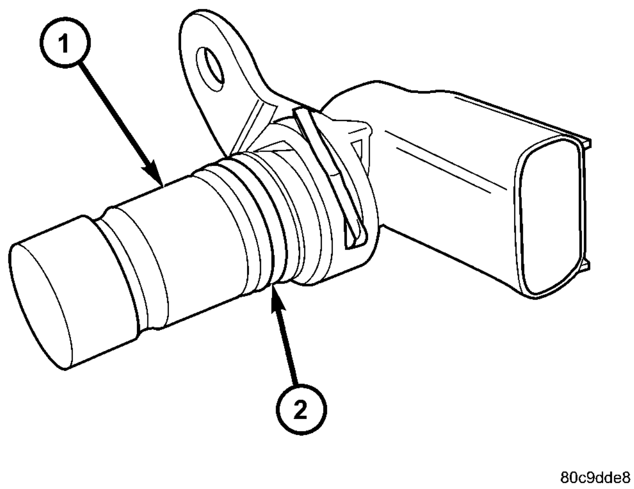


Fig. 7 CKP AND O-RING-2.4L

1 - CKP SENSOR
2 - O-RING

3.7L

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block (Fig. 8). It is positioned and bolted into a machined hole.

(1) Raise vehicle.

(2) Disconnect sensor electrical connector.

(3) Remove sensor mounting bolt (Fig. 8).

(4) Carefully twist sensor from cylinder block.

(5) Check condition of sensor o-ring.

INSTALLATION

2.4L

(1) Clean out machined hole in engine block.

(2) Apply a small amount of engine oil to sensor o-ring.

(3) Install sensor into engine block with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

(4) Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.

(5) Connect electrical connector to sensor.

3.7L

(1) Clean out machined hole in engine block.

(2) Apply a small amount of engine oil to sensor o-ring.

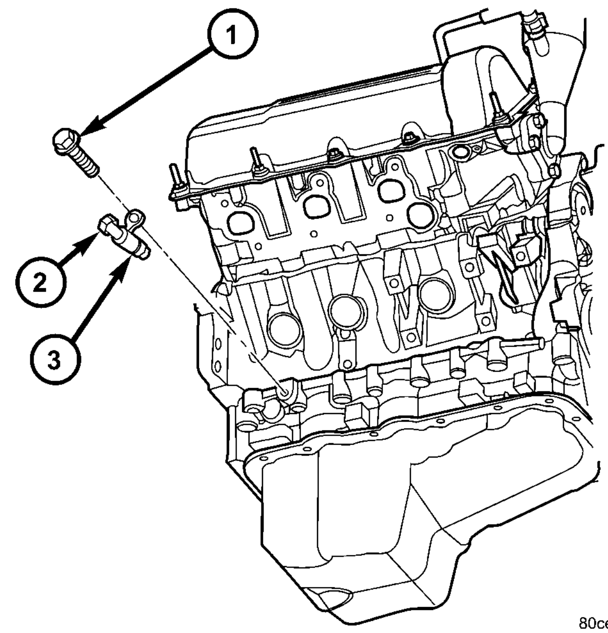


Fig. 8 CKP - 3.7L

1 - MOUNTING BOLT
2 - CKP SENSOR
3 - O-RING

(3) Install sensor into engine block with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

(4) Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.

(5) Connect electrical connector to sensor.

(6) Lower vehicle.

FUEL INJECTOR

DESCRIPTION

An individual fuel injector (Fig. 9) is used for each individual cylinder.

OPERATION

OPERATION - FUEL INJECTOR

The top (fuel entry) end of the injector (Fig. 9) is attached into an opening on the fuel rail.

The fuel injectors are electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short

FUEL INJECTOR (Continued)

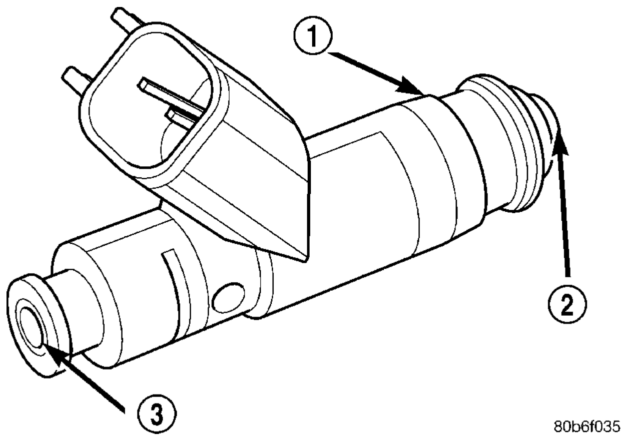


Fig. 9 FUEL INJECTOR — TYPICAL

distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

The nozzle (outlet) ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

OPERATION - PCM OUTPUT

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector with its respective cylinder number.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage (12 volts +) is supplied to the injectors through the ASD relay. The ASD relay will shutdown the 12 volt power source to the fuel injectors if the PCM senses the ignition is on, but the engine is not running. This occurs after the engine has not been running for approximately 1.8 seconds.

The PCM determines injector on-time (pulse width) based on various inputs.

REMOVAL

(1) Remove fuel rail. Refer to Fuel Injector Rail Removal.

(2) Disconnect clip(s) that retain fuel injector(s) to fuel rail (Fig. 10).

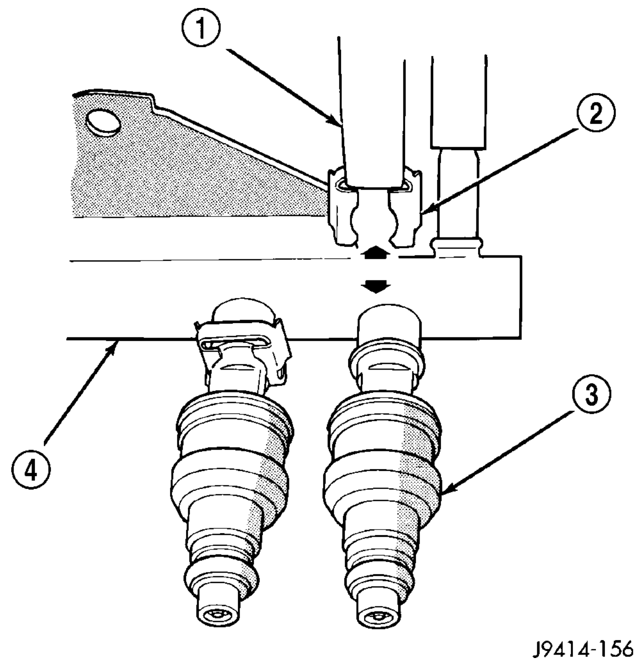


Fig. 10 INJECTOR RETAINING CLIP

1 - PLIERS
2 - INJECTOR CLIP
3 - FUEL INJECTOR
4 - FUEL RAIL - TYPICAL

INSTALLATION

(1) Install fuel injector(s) into fuel rail assembly and install retaining clip(s).

(2) If same injector(s) is being reinstalled, install new o-ring(s).

(3) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(4) Install fuel rail. Refer to Fuel Rail Installation.

(5) Start engine and check for fuel leaks.

FUEL PUMP RELAY

DESCRIPTION

The 5–pin, 12–volt, fuel pump relay is located in the Power Distribution Center (PDC). Refer to the label on the PDC cover for relay location.

OPERATION

The Powertrain Control Module (PCM) energizes the electric fuel pump through the fuel pump relay. The fuel pump relay is energized by first applying battery voltage to it when the ignition key is turned ON, and then applying a ground signal to the relay from the PCM.

Whenever the ignition key is turned ON, the electric fuel pump will operate. But, the PCM will shutdown the ground circuit to the fuel pump relay in approximately 1–3 seconds unless the engine is operating or the starter motor is engaged.

REMOVAL

The fuel pump relay is located in the Power Distribution Center (PDC) (Fig. 11). Refer to label on PDC cover for relay location.

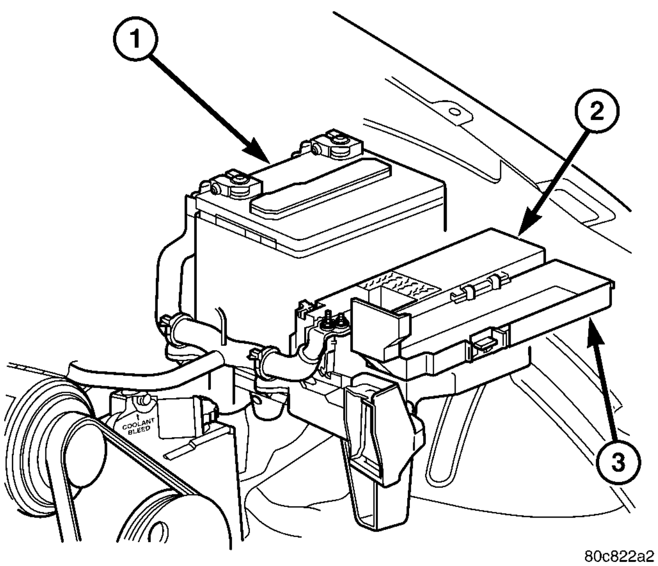


Fig. 11 POWER DISTRIBUTION CENTER (PDC)

1 - BATTERY
2 - PDC
3 - PDC COVER

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

The fuel pump relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

(1) Install relay to PDC.

(2) Install cover to PDC.

IDLE AIR CONTROL MOTOR

DESCRIPTION

The IAC stepper motor is mounted to the throttle body, and regulates the amount of air bypassing the control of the throttle plate. As engine loads and ambient temperatures change, engine rpm changes. A pintle on the IAC stepper motor protrudes into a passage in the throttle body, controlling air flow through the passage. The IAC is controlled by the Powertrain Control Module (PCM) to maintain the target engine idle speed.

OPERATION

At idle, engine speed can be increased by retracting the IAC motor pintle and allowing more air to pass through the port, or it can be decreased by restricting the passage with the pintle and diminishing the amount of air bypassing the throttle plate.

The IAC is called a stepper motor because it is moved (rotated) in steps, or increments. Opening the IAC opens an air passage around the throttle blade which increases RPM.

The PCM uses the IAC motor to control idle speed (along with timing) and to reach a desired MAP during decel (keep engine from stalling).

The IAC motor has 4 wires with 4 circuits. Two of the wires are for 12 volts and ground to supply electrical current to the motor windings to operate the stepper motor in one direction. The other 2 wires are also for 12 volts and ground to supply electrical current to operate the stepper motor in the opposite direction.

To make the IAC go in the opposite direction, the PCM just reverses polarity on both windings. If only 1 wire is open, the IAC can only be moved 1 step (increment) in either direction. To keep the IAC motor in position when no movement is needed, the PCM will energize both windings at the same time. This locks the IAC motor in place.

In the IAC motor system, the PCM will count every step that the motor is moved. This allows the PCM to determine the motor pintle position. If the memory is cleared, the PCM no longer knows the position of the pintle. So at the first key ON, the PCM drives the IAC motor closed, regardless of where it was before. This zeros the counter. From

IDLE AIR CONTROL MOTOR (Continued)

this point the PCM will back out the IAC motor and keep track of its position again.

When engine rpm is above idle speed, the IAC is used for the following:

- Off-idle dashpot (throttle blade will close quickly but idle speed will not stop quickly)
- Deceleration air flow control
- A/C compressor load control (also opens the passage slightly before the compressor is engaged so that the engine rpm does not dip down when the compressor engages)
- Power steering load control

The PCM can control polarity of the circuit to control direction of the stepper motor.

IAC Stepper Motor Program: The PCM is also equipped with a memory program that records the number of steps the IAC stepper motor most recently advanced to during a certain set of parameters. For example: The PCM was attempting to maintain a 1000 rpm target during a cold start-up cycle. The last recorded number of steps for that may have been 125. That value would be recorded in the memory cell so that the next time the PCM recognizes the identical conditions, the PCM recalls that 125 steps were required to maintain the target. This program allows for greater customer satisfaction due to greater control of engine idle.

Another function of the memory program, which occurs when the power steering switch (if equipped), or the A/C request circuit, requires that the IAC stepper motor control engine rpm, is the recording of the last targeted steps into the memory cell. The PCM can anticipate A/C compressor loads. This is accomplished by delaying compressor operation for approximately 0.5 seconds until the PCM moves the IAC stepper motor to the recorded steps that were loaded into the memory cell. Using this program helps eliminate idle-quality changes as loads change. Finally, the PCM incorporates a ″No-Load″ engine speed limiter of approximately 1800 - 2000 rpm, when it recognizes that the TPS is indicating an idle signal and IAC motor cannot maintain engine idle.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the IAC motor through the PCM.

REMOVAL

2.4L

The Idle Air Control (IAC) motor is located on the rear side of the throttle body (Fig. 12).

(1) Disconnect electrical connector from IAC motor.

(2) Remove two mounting bolts (screws).

(3) Remove IAC motor from throttle body.

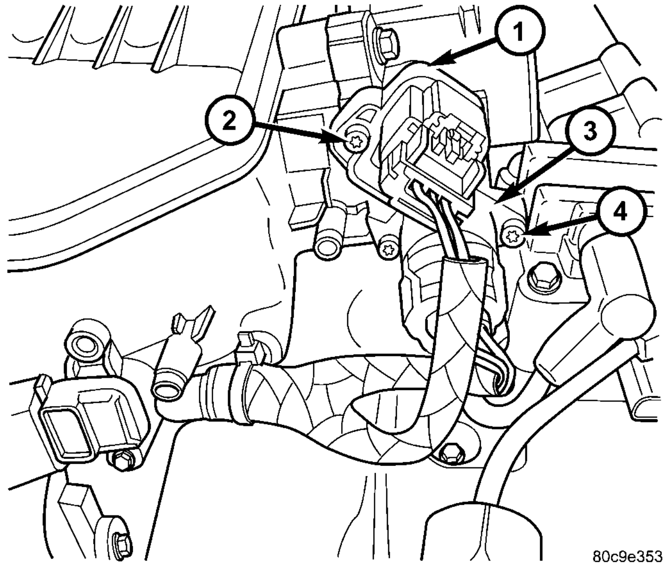


Fig. 12 TPS/IAC MOTOR - 2.4L

1 - THROTTLE POSITION SENSOR (TPS)
2 - MOUNTING SCREWS
3 - IDLE AIR CONTROL MOTOR (IAC)
4 - MOUNTING SCREWS

3.7L

The Idle Air Control (IAC) motor is located on the side of the throttle body (Fig. 13).

(1) Disconnect electrical connector from IAC motor.

(2) Remove two mounting bolts (screws).

(3) Remove IAC motor from throttle body.

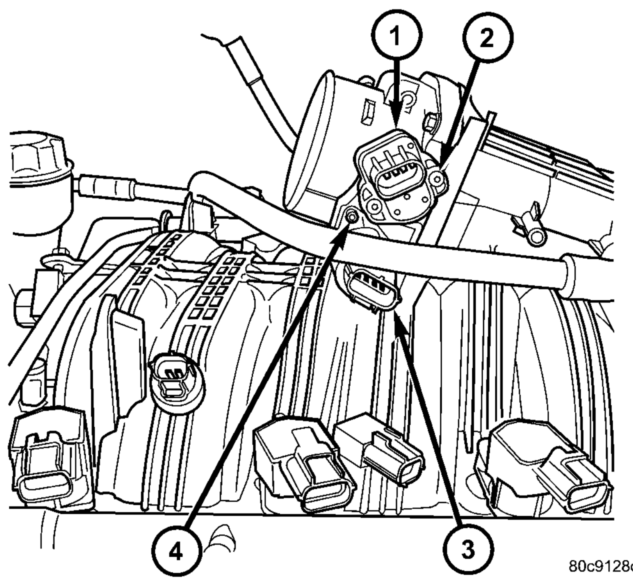


Fig. 13 TPS/IAC MOTOR - 3.7L

1 - THROTTLE POSITION SENSOR (TPS)
2 - MOUNTING SCREWS
3 - IDLE AIR CONTROL MOTOR (IAC)
4 - MOUNTING SCREWS

IDLE AIR CONTROL MOTOR (Continued)

INSTALLATION

2.4L

The Idle Air Control (IAC) motor is located on the rear side of the throttle body.

(1) Install IAC motor to throttle body.

(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.

(3) Install electrical connector.

3.7L

The Idle Air Control (IAC) motor is located on the side of the throttle body (Fig. 13).

(1) Install IAC motor to throttle body.

(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.

(3) Install electrical connector.

INTAKE AIR TEMPERATURE SENSOR

DESCRIPTION

The 2–wire Intake Manifold Air Temperature (IAT) sensor is installed in the intake manifold with the sensor element extending into the air stream.

The IAT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as intake manifold temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

The IAT sensor provides an input voltage to the Powertrain Control Module (PCM) indicating the density of the air entering the intake manifold based upon intake manifold temperature. At key-on, a 5–volt power circuit is supplied to the sensor from the PCM. The sensor is grounded at the PCM through a low-noise, sensor-return circuit.

The PCM uses this input to calculate the following:

• Injector pulse-width

• Adjustment of spark timing (to help prevent spark knock with high intake manifold air-charge temperatures)

The resistance values of the IAT sensor is the same as for the Engine Coolant Temperature (ECT) sensor.

REMOVAL

2.4L

The intake manifold air temperature (IAT) sensor is installed into the intake manifold plenum at the rear end of the intake manifold (Fig. 14).

(1) Disconnect electrical connector from IAT sensor.

(2) Clean dirt from intake manifold at sensor base.

(3) Gently lift on small plastic release tab (Fig. 14) or (Fig. 15) and rotate sensor about 1/4 turn counterclockwise for removal.

(4) Check condition of sensor o-ring (Fig. 15).

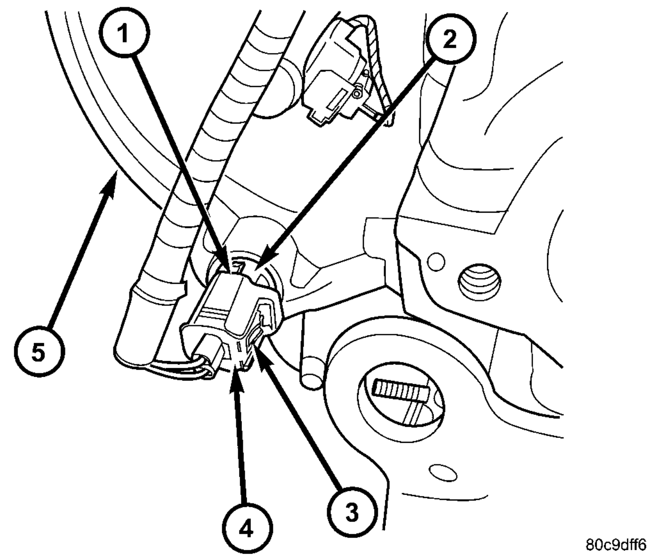


Fig. 14 IAT SENSOR LOCATION-2.4L

1 - RELEASE TAB
2 - IAT SENSOR
3 - PRESS HERE FOR REMOVAL
4 - ELECTRICAL CONNECTOR
5 - REAR END OF INTAKE MANIFOLD

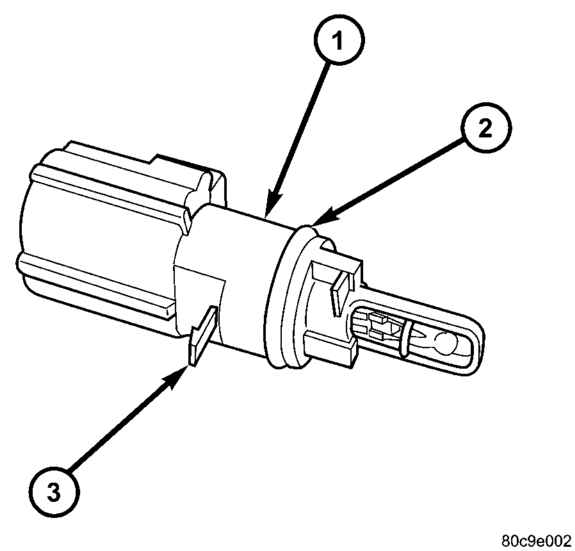


Fig. 15 IAT SENSOR TAB / O-RING

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

3.7L

The intake manifold air temperature (IAT) sensor is installed into the left side of intake manifold plenum (Fig. 16).

(1) Disconnect electrical connector from IAT sensor.

(2) Clean dirt from intake manifold at sensor base.

(3) Gently lift on small plastic release tab (Fig. 16) or (Fig. 15) and rotate sensor about 1/4 turn counterclockwise for removal.

(4) Check condition of sensor o-ring.

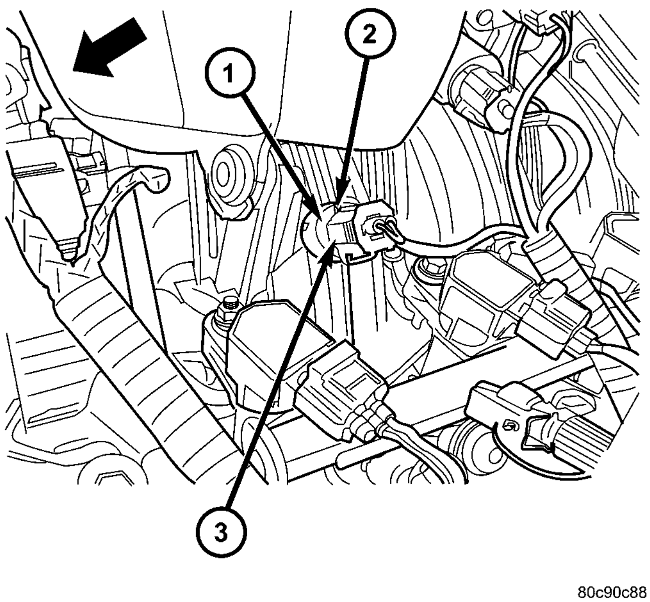


Fig. 16 IAT SENSOR LOCATION- 3.7L

1 - IAT SENSOR
2 - RELEASE TAB
3 - ELECTRICAL CONNECTOR

INSTALLATION

2.4L

The intake manifold air temperature (IAT) sensor is installed into the intake manifold plenum at the rear end of the intake manifold.

(1) Check condition of sensor o-ring.

(2) Clean sensor mounting hole in intake manifold.

(3) Position sensor into intake manifold and rotate clockwise until past release tab.

(4) Install electrical connector.

3.7L

The intake manifold air temperature (IAT) sensor is installed into the left side of intake manifold plenum (Fig. 16).

(1) Check condition of sensor o-ring.

(2) Clean sensor mounting hole in intake manifold.

(3) Position sensor into intake manifold and rotate clockwise until past release tab (Fig. 16).

(4) Install electrical connector.

MAP SENSOR

DESCRIPTION

2.4L

The Manifold Absolute Pressure (MAP) sensor is mounted into the rear of the intake manifold with 1 screw.

3.7L

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold with 2 screws.

OPERATION

The MAP sensor is used as an input to the Powertrain Control Module (PCM). It contains a silicon based sensing unit to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When manifold absolute pressure (MAP) equals Barometric pressure, the pulse width will be at maximum.

A 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0–15 psi, the voltage changes 4.0V. To operate the sensor, it is supplied a regulated 4.8 to 5.1 volts. Ground is provided through the low-noise, sensor return circuit at the PCM.

The MAP sensor input is the number one contributor to fuel injector pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or at a higher altitude, because the air density changes with altitude. It will also help to correct for varying barometric pressure. Barometric pressure and altitude have a direct inverse correlation; as altitude goes up, barometric goes down. At key-on, the PCM powers up and looks at MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure (relative to altitude). Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key-on. The difference between current voltage and what it was at key-on, is manifold vacuum.

MAP SENSOR (Continued)

During key-on (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring a known good sensor.

As the altitude increases, the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key-on, the barometric pressure needs to be updated. Any time the PCM sees Wide Open Throttle (WOT), based upon Throttle Position Sensor (TPS) angle and RPM, it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor input to aid in calculating the following:

- Manifold pressure
- Barometric pressure
- Engine load
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (certain automatic transmissions only)
- Idle speed
- Decel fuel shutoff

The MAP sensor signal is provided from a single piezoresistive element located in the center of a diaphragm. The element and diaphragm are both made of silicone. As manifold pressure changes, the diaphragm moves causing the element to deflect, which stresses the silicone. When silicone is exposed to stress, its resistance changes. As manifold vacuum increases, the MAP sensor input voltage decreases proportionally. The sensor also contains electronics that condition the signal and provide temperature compensation.

The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; meaning as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is approximately 29.92 in Hg. For every 100 feet of altitude, barometric pressure drops 0.10 in. Hg. If a storm goes through, it can change barometric pressure from what should be present for that altitude. You should know what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

2.4L

The Manifold Absolute Pressure (MAP) sensor is mounted into the rear of the intake manifold (Fig. 17). An o-ring is used to seal the sensor to the intake manifold (Fig. 19).

(1) Disconnect electrical connector at sensor.
(2) Clean area around MAP sensor.
(3) Remove sensor mounting screw (TORX head).
(4) Remove MAP sensor from intake manifold.
(5) Check condition of sensor o-ring (Fig. 19).

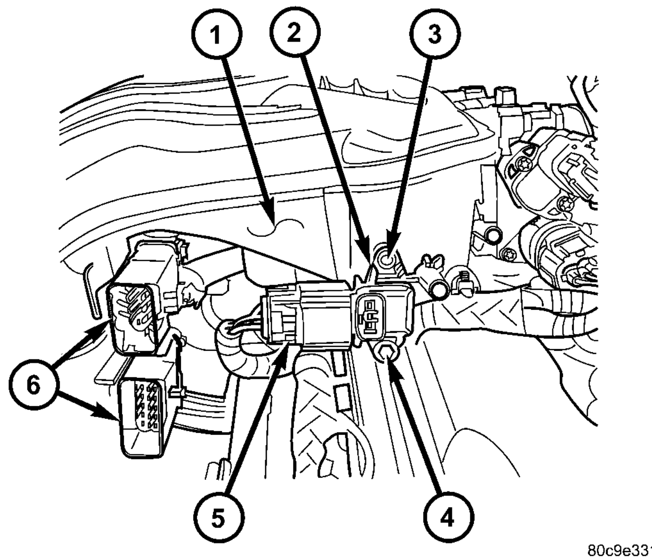


Fig. 17 MAP SENSOR LOCATION-2.4L

1 - REAR OF INTAKE MANIFOLD
2 - MAP SENSOR
3 - ALIGNMENT PIN
4 - MOUNTING BOLT (TORX)
5 - ELECTRICAL CONNECTOR
6 - MAIN ENGINE HARNESS CONNECTORS

3.7L

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold (Fig. 18). An o-ring is used to seal the sensor to the intake manifold (Fig. 19).

(1) Disconnect electrical connector at sensor.
(2) Clean area around MAP sensor.
(3) Remove 2 sensor mounting screws.
(4) Remove MAP sensor from intake manifold.
(5) Check condition of sensor o-ring (Fig. 19).

MAP SENSOR (Continued)

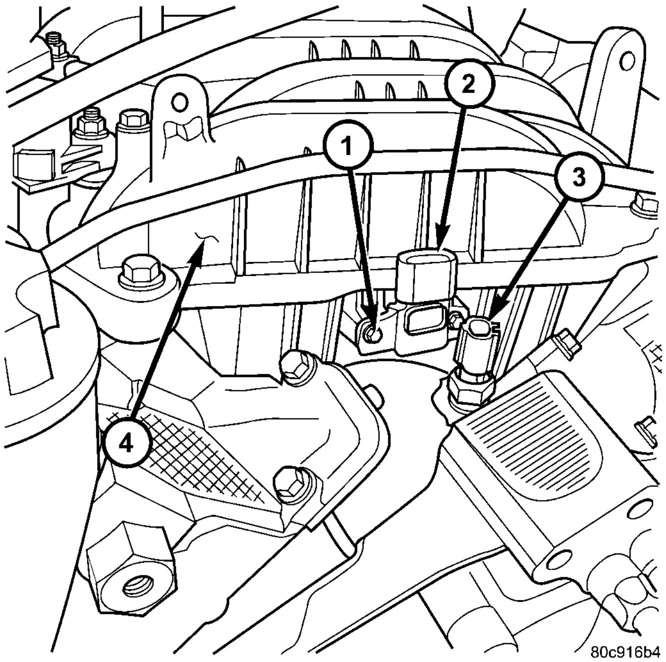


Fig. 18 MAP SENSOR / ECT SENSOR - 3.7L

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

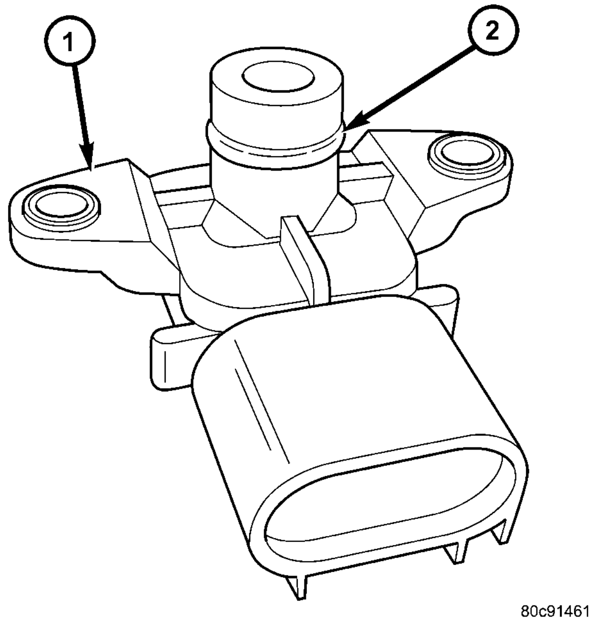


Fig. 19 MAP SENSOR O-RING

1 - MAP SENSOR
2 - O-RING

INSTALLATION

2.4L

The Manifold Absolute Pressure (MAP) sensor is mounted into the rear of the intake manifold. An o-ring is used to seal the sensor to the intake manifold (Fig. 19).

(1) Clean MAP sensor mounting hole at intake manifold.

(2) Check MAP sensor o-ring seal for cuts or tears.

(3) Position sensor into manifold.

(4) Install MAP sensor mounting screws. Tighten screw to 3 N·m (25 in. lbs.) torque.

(5) Connect electrical connector.

3.7L

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold (Fig. 18). An o-ring is used to seal the sensor to the intake manifold (Fig. 19).

(1) Clean MAP sensor mounting hole at intake manifold.

(2) Check MAP sensor o-ring seal for cuts or tears.

(3) Position sensor into manifold.

(4) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.

(5) Connect electrical connector.

OXYGEN SENSOR

DESCRIPTION

The Oxygen Sensors (O2S) are attached to, and protrude into the vehicle exhaust system. Depending on the engine or emission package, the vehicle may use a total of either 2 or 4 sensors.

2.4L Engine: Two sensors are used: upstream (referred to as 1/1) and downstream (referred to as 1/2). With this emission package, the upstream sensor (1/1) is located just before the main catalytic convertor. The downstream sensor (1/2) is located just after the main catalytic convertor.

3.7L V-6 Engine: On this emissions package, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2). With this emission package, the right upstream sensor (2/1) is located in the right exhaust downpipe just before the mini-catalytic convertor. The left upstream sensor (1/1) is located in the left exhaust downpipe just before the mini-catalytic convertor. The right downstream sensor (2/2) is located in the right exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor. The left downstream sensor (1/2) is located in the left exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor.

OXYGEN SENSOR (Continued)

OPERATION

An O2 sensor is a galvanic battery that provides the PCM with a voltage signal (0-1 volt) inversely proportional to the amount of oxygen in the exhaust. In other words, if the oxygen content is low, the voltage output is high; if the oxygen content is high the output voltage is low. The PCM uses this information to adjust injector pulse-width to achieve the 14.7–to–1 air/fuel ratio necessary for proper engine operation and to control emissions.

The O2 sensor must have a source of oxygen from outside of the exhaust stream for comparison. Current O2 sensors receive their fresh oxygen (outside air) supply through the O2 sensor case housing.

Four wires (circuits) are used on each O2 sensor: a 12–volt feed circuit for the sensor heating element; a ground circuit for the heater element; a low-noise sensor return circuit to the PCM, and an input circuit from the sensor back to the PCM to detect sensor operation.

Oxygen Sensor Heater Relay - 3.7L Engine: On the 3.7L engine, 4 heated oxygen sensors are used. A separate oxygen sensor relay is used to supply voltage to the sensors heating elements for only the 1/2 and 2/2 downstream sensors. Voltage for the other 2 sensor heating elements is supplied directly from the Powertrain Control Module (PCM) through a Pulse Width Module (PWM) method.

Pulse Width Module (PWM): Voltage to the O2 sensor heating elements is supplied directly from the Powertrain Control Module (PCM) through two separate Pulse Width Module (PWM) low side drivers. PWM is used on both the upstream and downstream O2 sensors on the 2.4L engine, and only on the 2 upstream sensors (1/1 and 2/1) on the 3.7L engine. The main objective for a PWM driver is to avoid overheating of the O2 sensor heater element. With exhaust temperatures increasing with time and engine speed, it's not required to have a full-voltage duty-cycle on the O2 heater elements.

To avoid the large simultaneous current surge needed to operate all 4 sensors, power is delayed to the 2 downstream heater elements by the PCM for approximately 2 seconds.

Oxygen Sensor Heater Elements:

The O2 sensor uses a Positive Thermal Co-efficient (PTC) heater element. As temperature increases, resistance increases. At ambient temperatures around 70°F, the resistance of the heating element is approximately 4.5 ohms. As the sensor's temperature increases, resistance in the heater element increases. This allows the heater to maintain the optimum operating temperature of approximately 930°-1100°F (500°-600° C). Although the sensors operate the same, there are physical differences, due to the environment that they operate in, that keep them from being interchangeable.

Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

In Closed Loop operation, the PCM monitors certain O2 sensor input(s) along with other inputs, and adjusts the injector pulse width accordingly. During Open Loop operation, the PCM ignores the O2 sensor input. The PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

Upstream Sensor - 2.4L Engine: The upstream sensor (1/1) provides an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensor. The PCM will change the air/fuel ratio until the upstream sensor inputs a voltage that the PCM has determined will make the downstream sensor output (oxygen content) correct.

The upstream oxygen sensor also provides an input to determine catalytic convertor efficiency.

Downstream Sensor - 2.4L Engine: The downstream oxygen sensor (1/2) is also used to determine the correct air-fuel ratio. As the oxygen content changes at the downstream sensor, the PCM calculates how much air-fuel ratio change is required. The PCM then looks at the upstream oxygen sensor voltage and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensor also provides an input to determine catalytic convertor efficiency.

Upstream Sensors - 3.7L Engine: Two upstream sensors are used (1/1 and 2/1). The 1/1 sensor is the first sensor to receive exhaust gases from the #1 cylinder. They provide an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensors. The PCM will change the air/fuel ratio until the upstream sensors input a voltage that the PCM has determined will make the downstream sensors output (oxygen content) correct.

The upstream oxygen sensors also provide an input to determine mini-catalyst efficiency. Main catalytic convertor efficiency is not calculated with this package.

Downstream Sensors - 3.7L Engine: Two downstream sensors are used (1/2 and 2/2). The downstream sensors are used to determine the correct air-fuel ratio. As the oxygen content changes at the downstream sensor, the PCM calculates how much air-fuel ratio change is required. The PCM then looks

OXYGEN SENSOR (Continued)

at the upstream oxygen sensor voltage, and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensors also provide an input to determine mini-catalyst efficiency. Main catalytic convertor efficiency is not calculated with this package.

Engines equipped with either a downstream sensor(s), or a post-catalytic sensor, will monitor catalytic convertor efficiency. If efficiency is below emission standards, the Malfunction Indicator Lamp (MIL) will be illuminated and a Diagnostic Trouble Code (DTC) will be set. Refer to Monitored Systems in Emission Control Systems for additional information.

REMOVAL

CAUTION: Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

Refer to (Fig. 20), (Fig. 21) or (Fig. 22) for O2S (oxygen sensor) location.

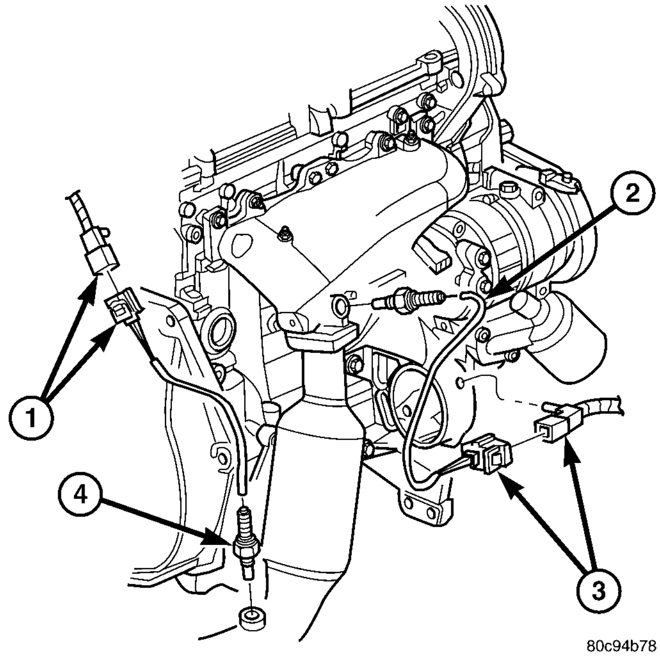


Fig. 20 OXYGEN SENSORS - 2.4L

1 - ELECTRICAL CONNECTORS
2 - UPSTREAM SENSOR (1/1)
3 - ELECTRICAL CONNECTORS
4 - DOWNSTREAM SENSOR (1/2)

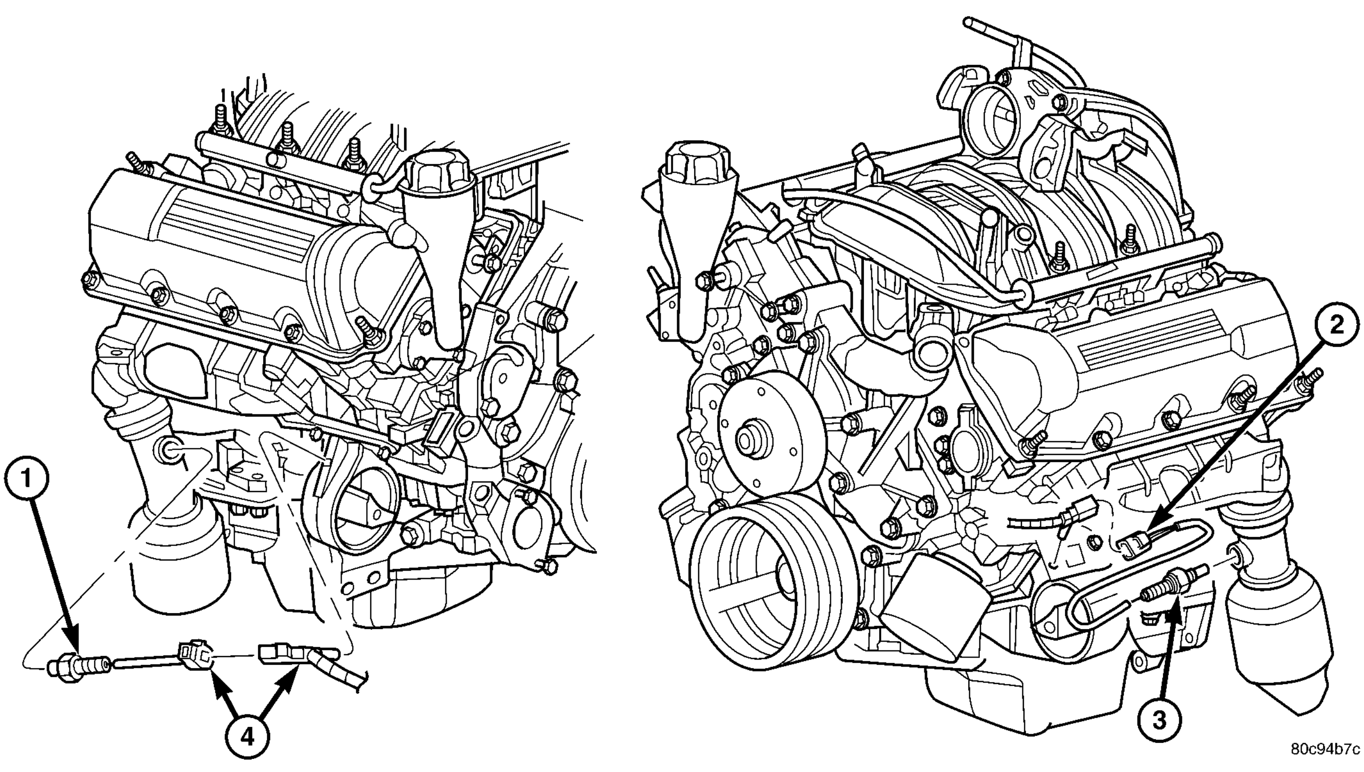


Fig. 21 OXYGEN SENSORS - UPSTREAM - 3.7L

1 - RIGHT UPSTREAM SENSOR (2/1)
2 - ELECTRICAL CONNECTORS
3 - LEFT UPSTREAM SENSOR (1/1)
4 - ELECTRICAL CONNECTORS

OXYGEN SENSOR (Continued)

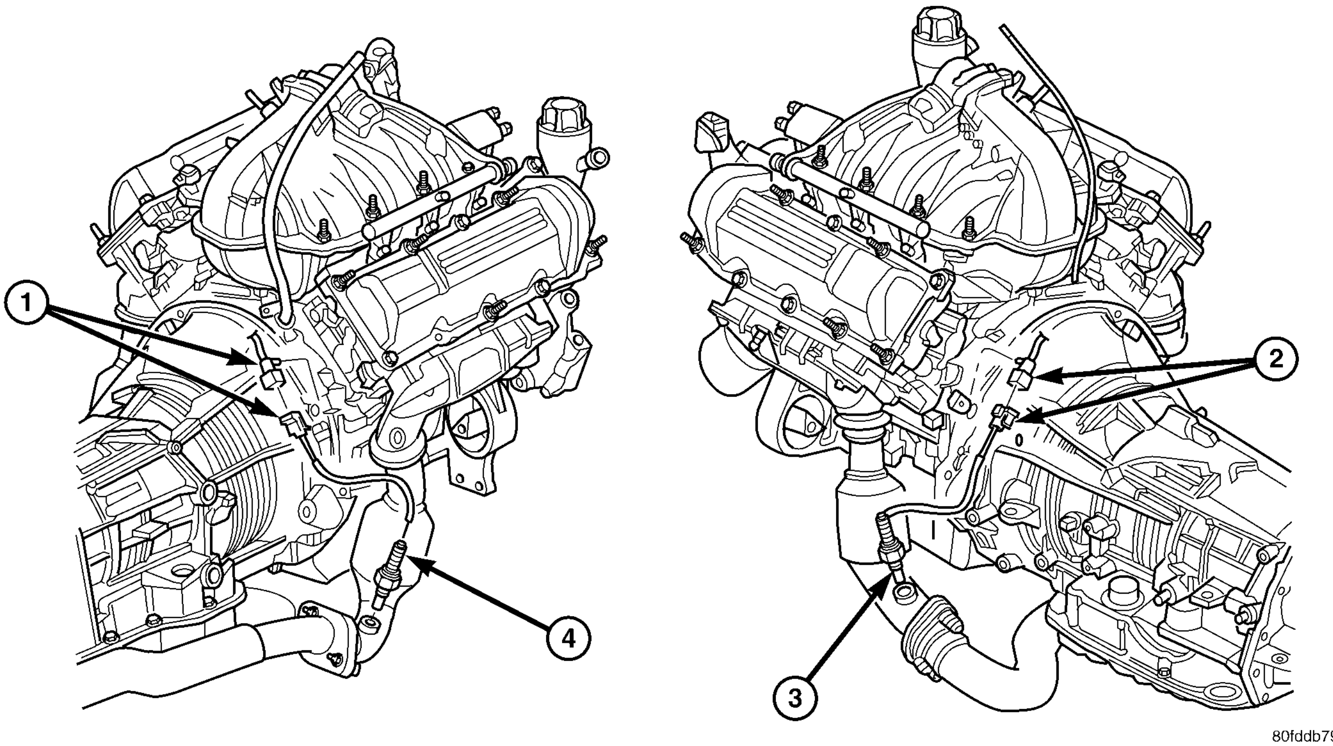


Fig. 22 OXYGEN SENSORS - DOWNSTREAM - 3.7L

1 - ELECTRICAL CONNECTORS
2 - ELECTRICAL CONNECTORS
3 - LEFT DOWNSTREAM SENSOR (1/2)
4 - RIGHT DOWNSTREAM SENSOR (2/2)

WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

(1) Raise and support vehicle.
(2) Disconnect wire connector from O2S sensor.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

(3) Remove O2S sensor with an oxygen sensor removal and installation tool.
(4) Clean threads in exhaust pipe using appropriate tap.

INSTALLATION

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

(1) Install O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.
(2) Connect O2S sensor wire connector.
(3) Lower vehicle.

THROTTLE BODY

DESCRIPTION

The throttle body is located on the intake manifold. Fuel does not enter the intake manifold through the throttle body. Fuel is sprayed into the manifold by the fuel injectors.

OPERATION

Filtered air from the air cleaner enters the intake manifold through the throttle body. The throttle body contains an air control passage controlled by an Idle Air Control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

Certain sensors are attached to the throttle body. The accelerator pedal cable, speed control cable and transmission control cable (when equipped) are connected to the throttle body linkage arm.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

THROTTLE BODY (Continued)

REMOVAL

2.4L

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

(1) Remove air cleaner tube at throttle body.

(2) Disconnect throttle body electrical connectors at IAC motor and TPS.

(3) Remove all control cables from throttle body (lever) arm. Refer to the Accelerator Pedal and Throttle Cable section for removal/installation procedures.

(4) Disconnect necessary vacuum lines at throttle body.

(5) Remove 3 throttle body mounting bolts (Fig. 23).

(6) Remove throttle body from intake manifold.

(7) Check condition of old throttle body-to-intake manifold o-ring.

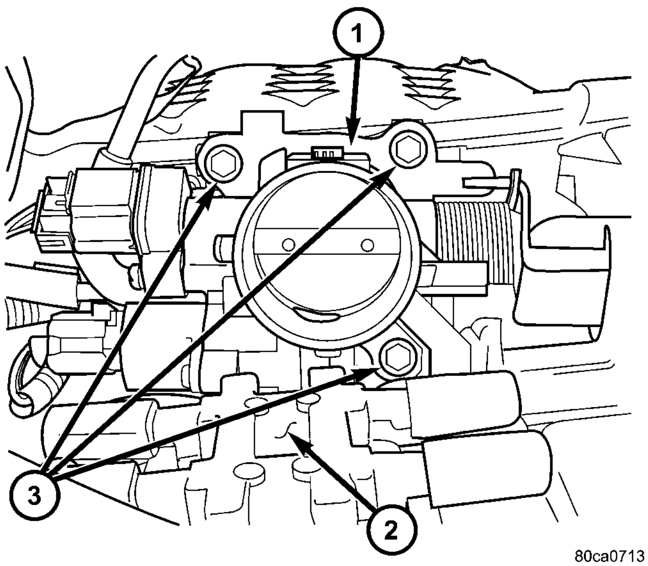


Fig. 23 THROTTLE BODY MOUNTING BOLTS - 2.4L

1 - THROTTLE BODY
2 - IGNITION COIL
3 - MOUNTING BOLTS (3)

3.7L

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

(1) Remove air cleaner tube at throttle body.

(2) Disconnect throttle body electrical connectors at IAC motor and TPS.

(3) Remove all control cables from throttle body (lever) arm. Refer to the Accelerator Pedal and Throttle Cable section for removal/installation procedures.

(4) Disconnect necessary vacuum lines at throttle body.

(5) Remove 3 throttle body mounting bolts (Fig. 24).

(6) Remove throttle body from intake manifold.

(7) Check condition of old throttle body-to-intake manifold o-ring (Fig. 25).

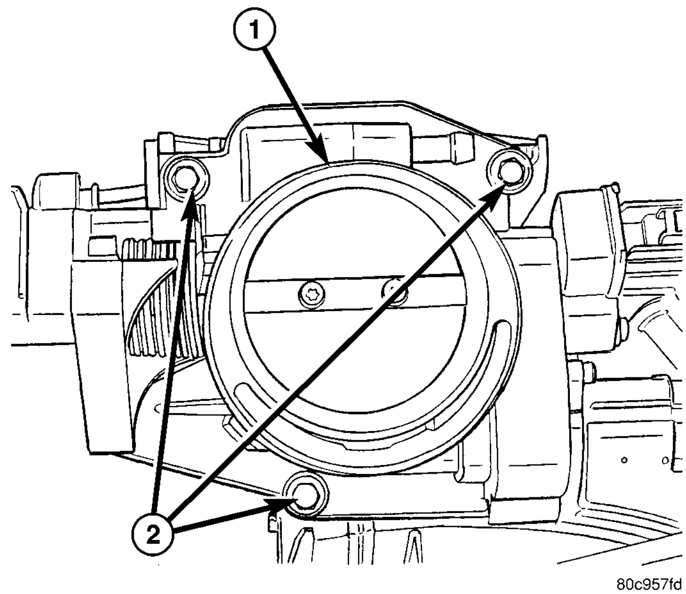


Fig. 24 THROTTLE BODY MOUNTING BOLTS - 3.7L

1 - THROTTLE BODY
2 - MOUNTING BOLTS (3)

INSTALLATION

2.4L

(1) Check condition of throttle body-to-intake manifold o-ring. Replace as necessary.

(2) Clean mating surfaces of throttle body and intake manifold.

(3) Install throttle body-to-intake manifold o-ring.

(4) Install throttle body to intake manifold.

(5) Install 3 mounting bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.

(6) Install control cables.

(7) Install electrical connectors.

(8) Install necessary vacuum lines.

(9) Install air cleaner duct at throttle body.

3.7L

(1) Check condition of throttle body-to-intake manifold o-ring. Replace as necessary.

THROTTLE BODY (Continued)

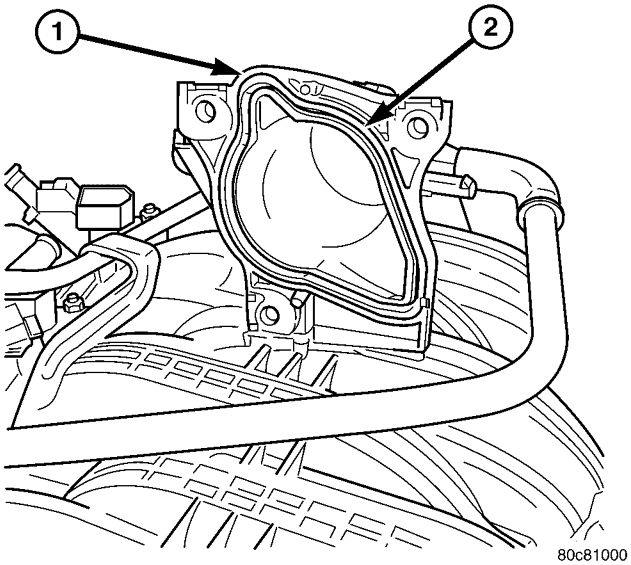


Fig. 25 THROTTLE BODY O-RING - 3.7L

1 - INTAKE MANIFOLD
2 - THROTTLE BODY O-RING

(2) Clean mating surfaces of throttle body and intake manifold.

(3) Install throttle body-to-intake manifold o-ring.

(4) Install throttle body to intake manifold.

(5) Install 3 mounting bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.

(6) Install control cables.

(7) Install electrical connectors.

(8) Install necessary vacuum lines.

(9) Install air cleaner duct at throttle body.

THROTTLE CONTROL CABLE

REMOVAL

2.4L

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing accelerator pedal or throttle cable.

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of pedal arm (Fig. 26). Plastic cable retainer snaps into top of pedal arm.

(2) Remove cable core wire at pedal arm.

(3) From inside vehicle, remove metal clip holding cable to dashpanel (Fig. 26).

(4) Remove air box at throttle body.

(5) Unsnap cable from dashpanel routing clip.

(6) Remove cable housing from dash panel and pull into engine compartment.

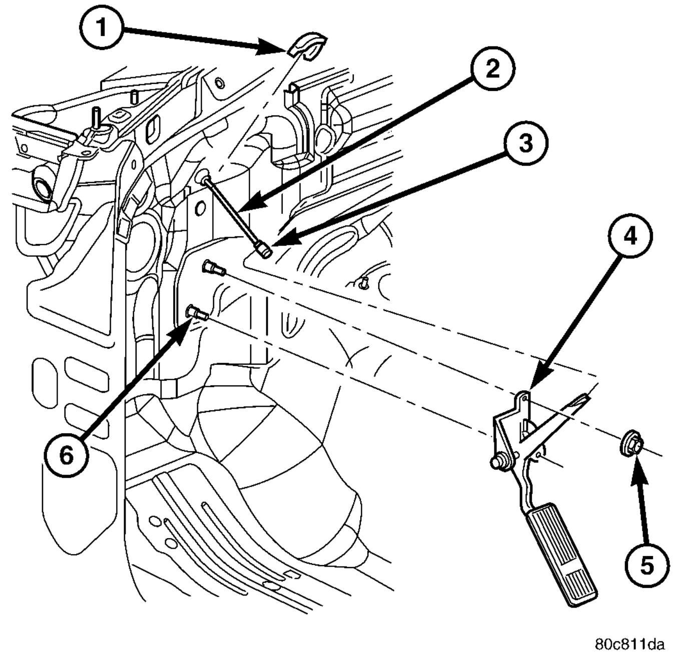


Fig. 26 ACCELERATOR PEDAL/BRACKET ASSEMBLY

1 - METAL THROTTLE CABLE CLIP
2 - THROTTLE CABLE
3 - PLASTIC CABLE RETAINER
4 - PEDAL/BRACKET ASSEMBLY
5 - PEDAL MOUNTING NUTS (2)
6 - PEDAL MOUNTING STUDS (2)

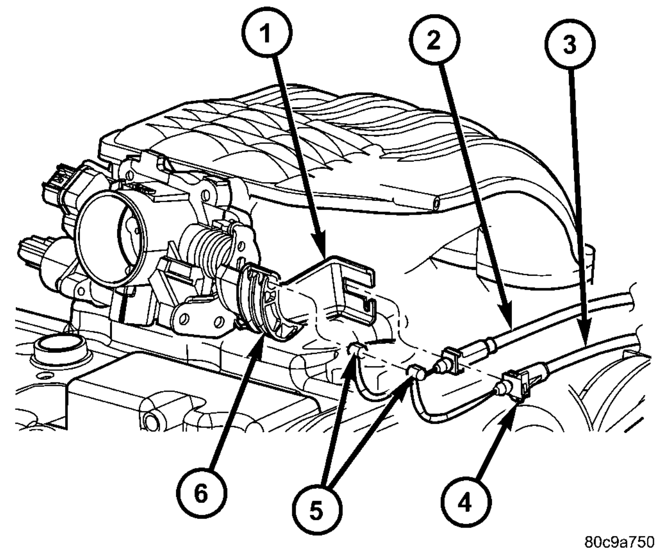


Fig. 27 THROTTLE CABLE, PIN, RELEASE TAB-2.4L

1 - MOUNTING BRACKET
2 - SPEED CONTROL CABLE
3 - THROTTLE CABLE
4 - RELEASE TAB
5 - CABLE PINS
6 - BELLCRANK

THROTTLE CONTROL CABLE (Continued)

(7) Hold throttle in wide open position. While held in this position, slide throttle cable pin (Fig. 27) from throttle body bellcrank.

(8) Using a pick or small screwdriver, press release tab (Fig. 27) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.**To remove throttle cable from throttle body bracket, slide cable towards front of vehicle.

(9) Remove throttle cable from vehicle.

3.7L

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing accelerator pedal or throttle cable.

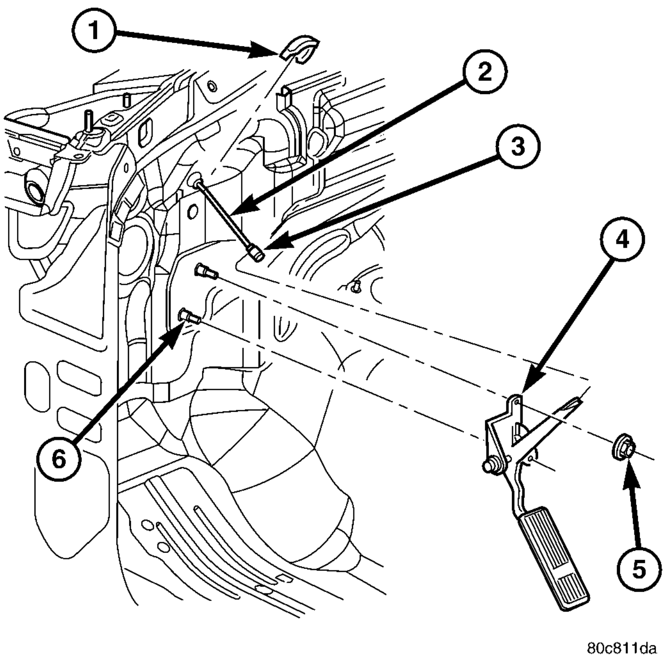


Fig. 28 ACCELERATOR PEDAL/BRACKET ASSEMBLY

1 - METAL THROTTLE CABLE CLIP
2 - THROTTLE CABLE
3 - PLASTIC CABLE RETAINER
4 - PEDAL/BRACKET ASSEMBLY
5 - PEDAL MOUNTING NUTS (2)
6 - PEDAL MOUNTING STUDS (2)

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of pedal arm (Fig. 28). Plastic cable retainer snaps into top of pedal arm.

(2) Remove cable core wire at pedal arm.

(3) From inside vehicle, remove metal clip holding cable to dashpanel (Fig. 28).

(4) Remove air box at throttle body.

(5) Unsnap cable from dashpanel routing clip.

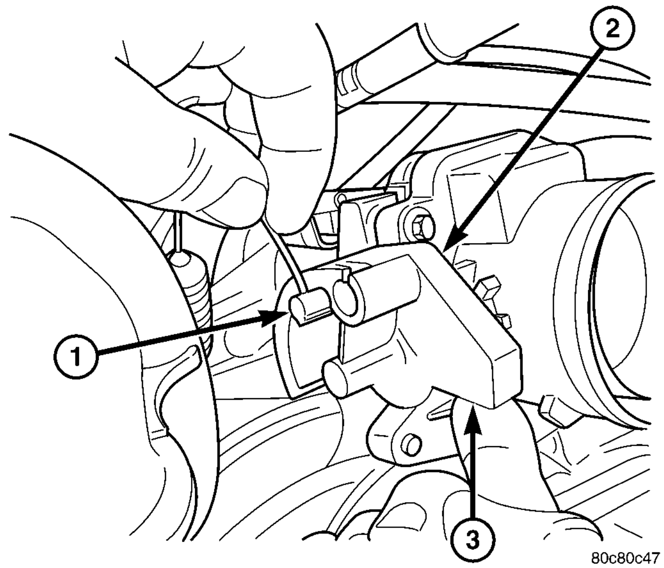


Fig. 29 THROTTLE CABLE PIN-3.7L

1 - THROTTLE CABLE PIN
2 - THROTTLE BODY BELLCRANK
3 - PUSH UP HERE

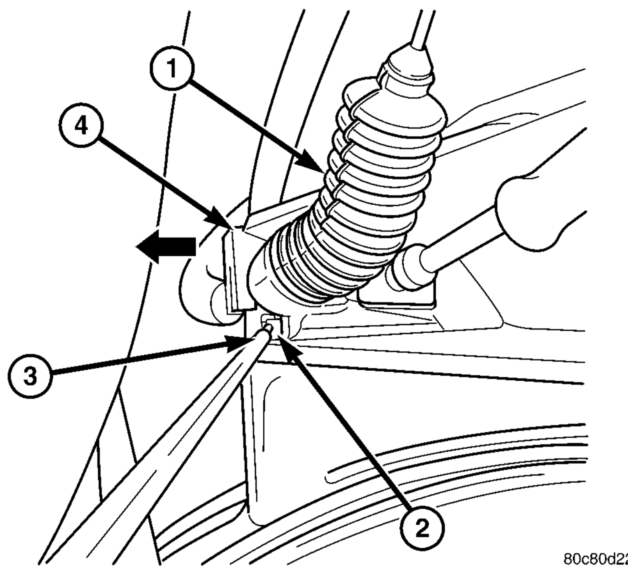


Fig. 30 THROTTLE CABLE RELEASE TAB-3.7L

1 - THROTTLE CABLE
2 - RELEASE TAB
3 - PICK OR SCREWDRIVER
4 - PLASTIC CABLE MOUNT

(6) Remove cable housing from dash panel and pull into engine compartment.

(7) Hold throttle in wide open position. While held in this position, slide throttle cable pin (Fig. 29) from throttle body bellcrank.

(8) Using a pick or small screwdriver, press release tab (Fig. 30) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much,**

THROTTLE CONTROL CABLE (Continued)

it will be broken. Slide plastic mount (Fig. 30) towards right side of vehicle to remove throttle cable from throttle body bracket.

(9) Remove throttle cable from vehicle.

INSTALLATION

(1) Slide accelerator cable plastic mount into throttle body mounting bracket. Continue sliding until release tab (Fig. 30) is aligned to hole in mounting bracket.

(2) Hold throttle in wide open position. While held in this position, slide throttle cable pin (Fig. 29) into throttle body bellcrank.

(3) Push cable housing into rubber grommet and through opening in dash panel.

(4) From inside vehicle, install metal clip holding cable to dashpanel (Fig. 28).

(5) From inside vehicle, slide throttle cable core wire into opening (slot) in top of pedal arm.

(6) Push plastic cable retainer (clip) into pedal arm opening until it snaps in place.

(7) Install air box to throttle body.

(8) Before starting engine, operate accelerator pedal to check for any binding.

THROTTLE POSITION SENSOR

DESCRIPTION

The 3–wire Throttle Position Sensor (TPS) is mounted on the throttle body and is connected to the throttle blade shaft.

OPERATION

The 3–wire TPS provides the Powertrain Control Module (PCM) with an input signal (voltage) that represents the throttle blade position of the throttle body. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from .26 volts at minimum throttle opening (idle), to 4.49 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.

The PCM needs to identify the actions and position of the throttle blade at all times. This information is needed to assist in performing the following calculations:

- Ignition timing advance
- Fuel injection pulse-width
- Idle (learned value or minimum TPS)
- Off-idle (0.06 volt)
- Wide Open Throttle (WOT) open loop (2.608 volts above learned idle voltage)
- Deceleration fuel lean out
- Fuel cutoff during cranking at WOT (2.608 volts above learned idle voltage)
- A/C WOT cutoff (certain automatic transmissions only)

REMOVAL

2.4L

The Throttle Position Sensor (TPS) is mounted to the throttle body (Fig. 31).

(1) Disconnect TPS electrical connector.

(2) Remove 2 TPS mounting screws.

(3) Remove TPS.

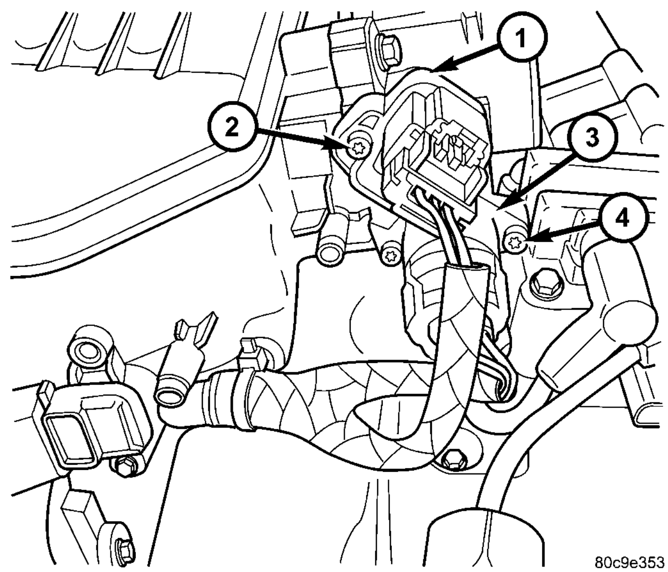


Fig. 31 TPS/IAC MOTOR - 2.4L

1 - THROTTLE POSITION SENSOR (TPS)
2 - MOUNTING SCREWS
3 - IDLE AIR CONTROL MOTOR (IAC)
4 - MOUNTING SCREWS

THROTTLE POSITION SENSOR (Continued)

3.7L

The Throttle Position Sensor (TPS) is mounted to the throttle body (Fig. 32), or (Fig. 33).

(1) Disconnect TPS electrical connector.

(2) Remove 2 TPS mounting screws.

(3) Remove TPS.

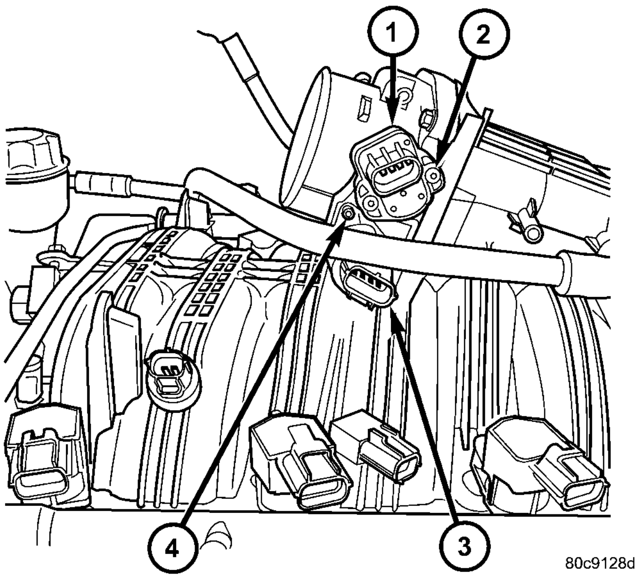


Fig. 32 TPS/IAC MOTOR - 3.7L

1 - THROTTLE POSITION SENSOR (TPS)
2 - MOUNTING SCREWS
3 - IDLE AIR CONTROL MOTOR (IAC)
4 - MOUNTING SCREWS

INSTALLATION

2.4L

The Throttle Position Sensor (TPS) is mounted to the rear of the throttle body.

The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 33). The TPS must be installed so that it can be rotated a few degrees. (If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs). The TPS will be under slight tension when rotated.

(1) Install TPS and retaining screws.

(2) Tighten screws to 7 N·m (60 in. lbs.) torque.

(3) Connect TPS electrical connector to TPS.

(4) Manually operate throttle (by hand) to check for any TPS binding before starting engine.

(5) Install air cleaner tube to throttle body.

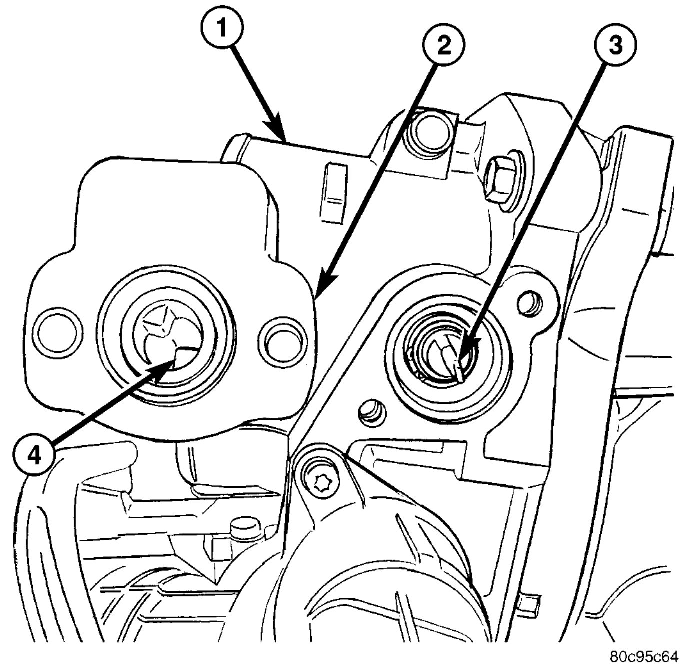


Fig. 33 TPS INSTALLATION - 3.7

1 - THROTTLE BODY
2 - TPS
3 - THROTTLE BODY SHAFT
4 - SOCKET LOCATING TANGS

3.7L

The Throttle Position Sensor (TPS) is mounted to the throttle body (Fig. 32).

The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 33). The TPS must be installed so that it can be rotated a few degrees. (If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs). The TPS will be under slight tension when rotated.

(1) Install TPS and retaining screws.

(2) Tighten screws to 7 N·m (60 in. lbs.) torque.

(3) Connect TPS electrical connector to TPS.

(4) Manually operate throttle (by hand) to check for any TPS binding before starting engine.

(5) Install air cleaner tube to throttle body.

STEERING

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STEERING

DESCRIPTION

Power steering systems consist of:
- Steering column & Intermediate Shaft
- Rack and pinion steering gear
- Belt driven hydraulic steering pump
- Pump pressure, supply and return hoses
- Oil Cooler

OPERATION

The steering column intermediate shaft attaches the steering column to the gear pinion. The rotation of the pinion moves the gear rack from side-to-side. This lateral action of the rack pushes and pulls the tie rods to change the direction of the front wheels.

Power assist is provided by an engine mounted hydraulic pump. The pump supplies hydraulic fluid to the steering gear. All vehicles are equipped with an oil cooler.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER STEERING SYSTEM

There is some noise in all power steering systems. One of the most common is a hissing sound evident at a standstill/parking, or when the steering is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

STEERING NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Steering intermediate shaft to dash panel seal. 2. Noisy valve in power steering gear.	1. Check and repair seal at dash panel. 2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose. 2. Loose or damaged suspension components. 3. Internal gear noise. 4. Loose or damaged intermediate shaft or column.	1. Tighten bolts to specification. 2. Inspect and repair suspension. 3. Replace steering gear. 4. Inspect and repair or replace.
MOAN	Pressure hose in contact with other components.	Reposition hose.

STEERING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
WHINE OR GROWL	1. Low fluid level. 2. Pressure hose in contact with other components. 3. Internal pump noise.	1. Fill to proper level. 2. Reposition hose. 3. Replace pump.
SUCKING AIR SOUND	1. Loose return line clamp. 2. O-ring missing or damaged on hose fitting. 3. Low fluid level. 4. Air leak between pump and reservoir. 5. Reservoir cap not installed correctly.	1. Replace clamp. 2. Replace o-ring. 3. Fill to proper level. 4. Repair as necessary. 5. Install reservoir cap correctly.
SCRUBBING OR KNOCKING	1. Wrong tire size. 2. Wrong gear. 3. Tire Pressure	1. Verify tire size. 2. Verify gear. 3. Adjust Tire Pressure

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level. 2. Tire pressure. 3. Steering components (ball joints/tie rod ends). 4. Loose belt. 5. Low pump pressure. 6. Column Intermediate shaft binding. 7. Steering gear worn.	1. Fill to proper level. 2. Adjust tire pressure. 3 Inspect and repair as necessary. 4. Adjust or replace. 5. Pressure test and replace if necessary. 6. Replace Intermediate Shaft. 7. Replace gear.

STEERING (Continued)

INSUFFICIENT ASST. OR POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Low pump pressure.	4. Pressure test and repair as necessary.
	5. Internal gear leak.	5. Replace gear.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate suspension compnents.
	4. High friction in steering gear.	4. Replace gear.

LOOSE STEERING AND VEHICLE LEAD

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components.	1. Inspect and repair as necessary.
	2. Worn or loose wheel bearings.	2. Inspect and replace bearings.
	3. Steering gear mounting.	3. Tighten / replace gear mounting bolts/ isolators to specification.
	4. Gear out of adjustment.	4. Replace gear.
	5. Worn or loose steering intermediate shaft.	5. Inspect and replace as necessary.
VEHICLE PULLS, DRIFTS OR LEADS TO ONE SIDE.	1. Tire Pressure.	1. Adjust tire pressure.
	2. Radial tire lead.	2. Rotate tires.
	3. Brakes dragging.	3. Repair as necessary.
	4. Wheel alignment.	4. Align front end.

STEERING (Continued)

DIAGNOSIS AND TESTING - POWER STEERING FLOW AND PRESSURE

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Power Steering Analyzer Tool kit 6815 and (Fig. 1) Adapter Kit 6893.

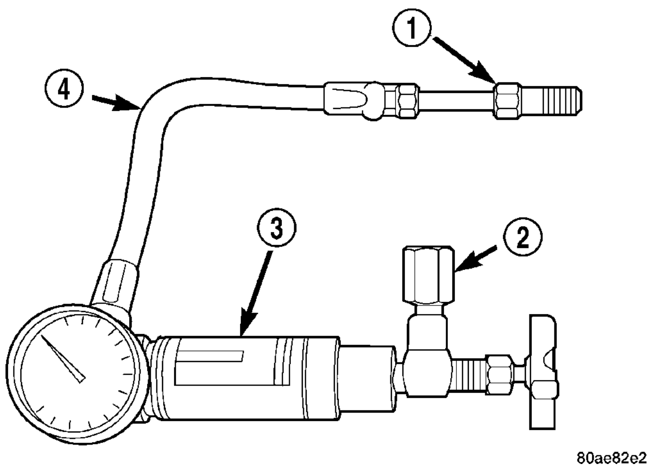

Fig. 1 Analyzer With Tube and Adapter

1 - TUBE
2 - ADAPTER FITTINGS
3 - ANALYZER
4 - GAUGE HOSE

FLOW AND PRESSURE TEST

(1) Check the power steering belt to ensure it is in good condition and adjusted properly.

(2) Connect pressure gauge hose from the Power Steering Analyzer to Tube 6844.

(3) Connect Adapter 6826 to Power Steering Analyzer test valve end.

(4) Disconnect the high pressure hose from the power steering pump.

(5) Connect the tube to the pump hose fitting.

(6) Connect the power steering hose from the steering gear to the adapter.

(7) Open the test valve completely.

(8) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge and to get air out of the fluid. Then shut off engine.

(9) Check fluid level, add fluid as necessary. Start engine again and let idle.

(10) Check for air bubbles, Evacuate if necessary

(11) Gauge should read below 862 kPa (125 psi), if above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi).

(12) Increase the engine speed to 1500 RPM and read the flow meter. If the flow rate (GPM) is below specification, (refer to pump specification chart for GPM) the pump should be replaced.

CAUTION: The following test procedure involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than three seconds as the pump could be damaged.

(13) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

- Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
- Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.

(14) Open the test valve and turn the steering wheel to the extreme left and right positions three times against the stops. Record the highest pressure reading at each position. Compare readings to the pump specifications chart. If pressures readings are not within 50 psi of each other, the gear is leaking internally and must be replaced.

CAUTION: Do not force the pump to operate against the stops for more than 2 to 3 seconds at a time because, pump damage will result.

PUMP SPECIFICATION

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM) AT 1500 RPM
3.7L, 2.4L & 2.5L	10342 kPa (1450 psi)	2.4 - 2.8

COLUMN

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COLUMN

DESCRIPTION

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

The standard non-tilt and tilt steering column has been designed to be serviced as an assembly. The column is connected to the steering gear with a one piece shaft. The upper half has a support bearing mounted to a bracket. The bracket mounts to the frame rail with two nuts. The shaft is serviceable. The key cylinder, switches, clock spring, trim shrouds and steering wheel are serviced separately.

OPERATION - SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

To service the steering wheel, switches or airbag, refer to Electrical - Restraints and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

REMOVAL

(1) Position front wheels **straight ahead.**
(2) Remove and isolate the negative ground cable from the battery.
(3) Remove the airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

NOTE: If equipped with cruise control, disconnect clock spring harness from the cruise switch harness on the steering wheel.

COLUMN (Continued)

(4) Remove the steering wheel with an appropriate puller (Fig. 1) (Refer to 19 - STEERING/COLUMN/ STEERING WHEEL - REMOVAL).

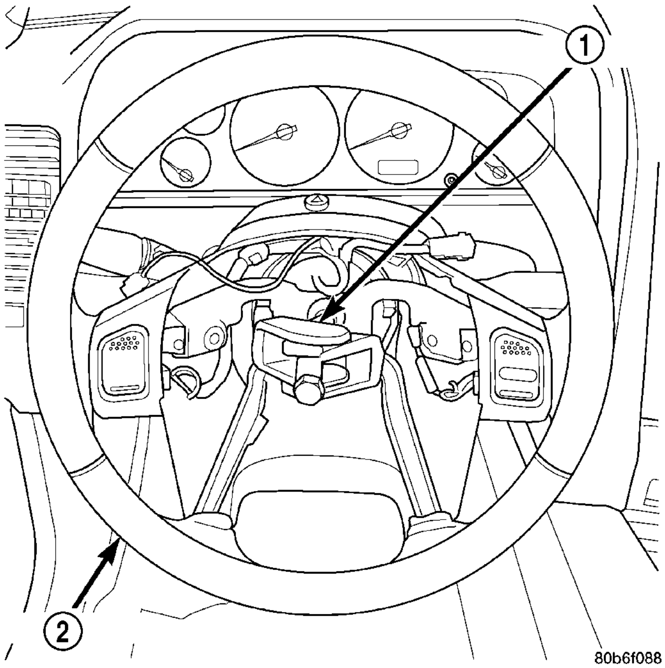


Fig. 1 Steering Wheel Puller

1 - PULLER C-3894-A
2 - STEERING WHEEL

(5) Remove knee blocker cover and knee blocker, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL). (Fig. 2)

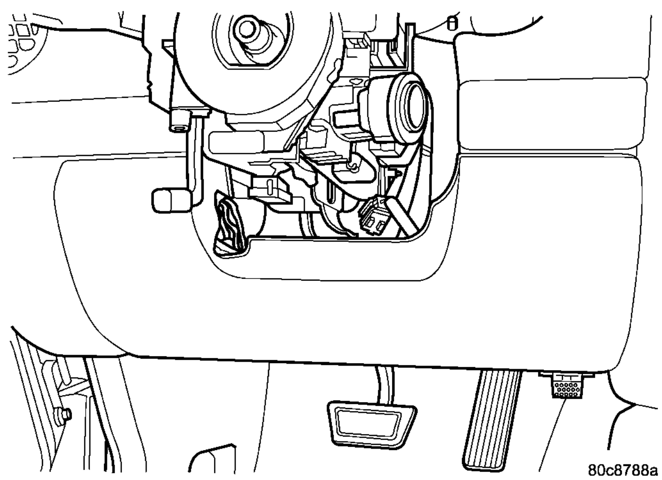


Fig. 2 KNEE BLOCKER

(6) Remove screws from the lower column shroud (Fig. 3) and remove both the upper and lower shrouds.

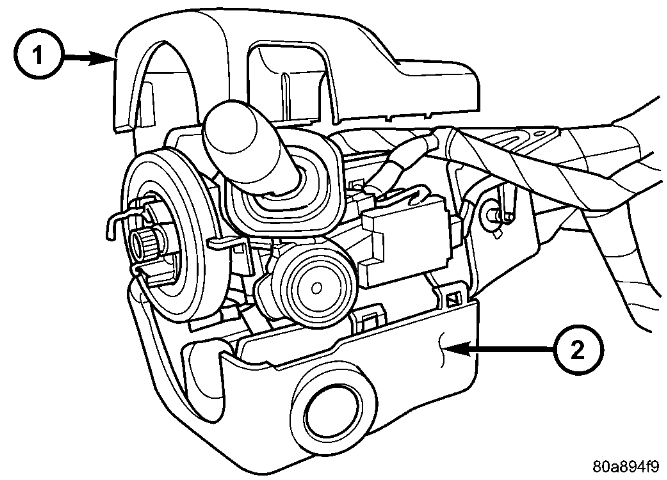


Fig. 3 SHROUD REMOVAL/INSTALL

1 - Upper Shroud
2 - Lower Shroud

(7) Turn ignition key to the on position.

(8) If vehicle is equipped with automatic transmission, disconnect shifter interlock cable from the column.

(9) Remove the steering coupler bolt and column mounting nuts and bolts (Fig. 4) then lower column off the mounting studs.

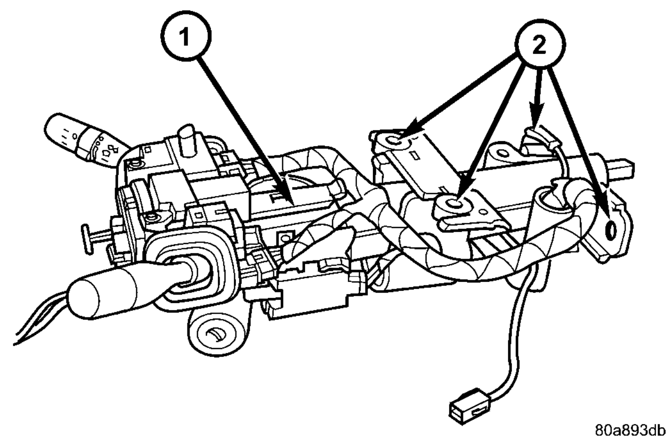


Fig. 4 STEERING COLUMN MOUNTING

1 - Steering Column
2 - Mounting Holes

COLUMN (Continued)

(10) Disconnect and remove the wiring harness from the column (Fig. 5).

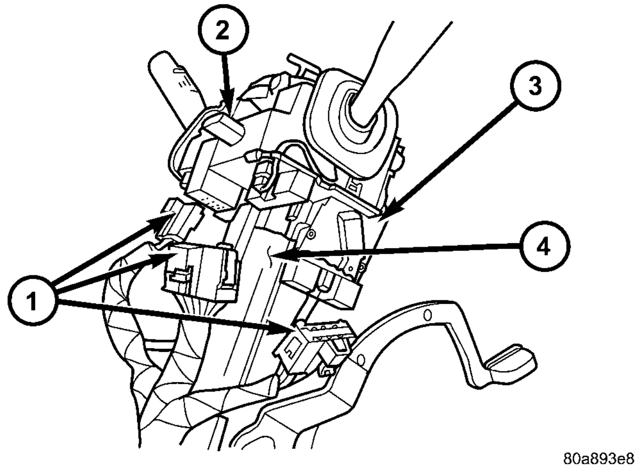


Fig. 5 WIRING HARNESS COLUMN

1 - Column Wiring Harness
2 - Multi-function Switch
3 - Ignition Switch
4 - Steering Column

(11) Slide the shifter interlock cable from the tie straps.

(12) Remove column.

(13) Transfer the necessary parts if needed.

(14) Remove clock spring (Fig. 6), switches, (SKIM if equipped) (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

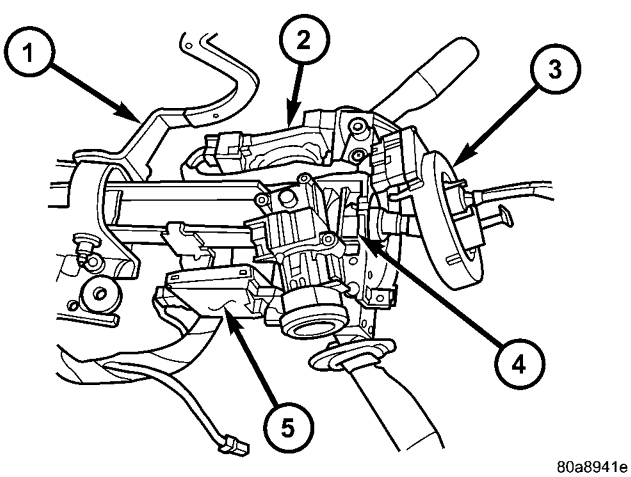


Fig. 6 CLOCK SPRING

1 - Tilt Lever
2 - Ignition Switch
3 - Clockspring
4 - Steering Column
5 - SKIM

INSTALLATION

(1) Align and install column into the steering coupler.

(2) Install column harness and connect harness to switches.

(3) Reroute the shifter interlock cable through the tie straps.

(4) Install the column onto the mounting studs.

(5) Install the two mounting nuts and the two mounting bolts all finger tight.

CAUTION: Lower nuts must be installed and tightened first then the upper nuts in order to prevent damage to the capsules.

(6) Tighten the lower mounting nuts to 17 N·m (150 in. lbs.).

(7) Tighten the upper mounting nuts to 17 N·m (150 in. lbs.).

(8) Install the steering column coupler bolt and tighten to 49 N·m (36 ft. lbs.).

(9) Reconnect the shifter interlock cable.

(10) Center the clock spring (if necessary) and install it on the column, (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

(11) Snap together the column shrouds and install the mounting screws.

(12) Install the knee blocker and the knee blocker cover, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION).

(13)

NOTE: Do not reuse the old steering wheel bolt (a new bolt must be used)

NOTE: Be certain that the steering wheel mounting bolt is tightened to the proper torque specification to ensure proper clockspring operation.Install the steering wheel and tighten bolt to 54 N·m (40 ft. lbs.) (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).

NOTE: If equipped with cruise control, connect clock spring harness to cruise switch harness on the steering wheel.

(14) Install the airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

(15) Install the negative battery terminal.

COLUMN (Continued)

SPECIFICATIONS

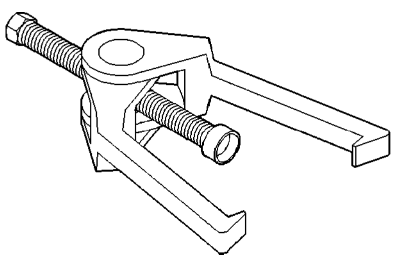
TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Tilt Steering Column Steering Wheel Bolt	54	40	—
Tilt Steering Column Mounting Bolts	17	—	150
Tilt Steering Column Coupler Bolt	49	36	—
Non-Tilt Steering Column Steering Wheel Bolt	54	40	—
Non-Tilt Steering Column Mounting Bolts	17	—	150
Non-Tilt Steering Column Coupler Bolt	49	36	—
Intermediate Shaft Lower Support Bearing Nuts	14	—	125
Ignition Switch Screws	2	—	17

SPECIAL TOOLS

STEERING COLUMN



Puller C-3894-A

IGNITION SWITCH

DESCRIPTION

The electrical ignition switch is located on the steering column. It is used as the main on/off switching device for most electrical components. The mechanical key cylinder is used to engage/disengage the electrical ignition switch.

DIAGNOSIS AND TESTING - IGNITION SWITCH

ELECTRICAL DIAGNOSIS

For ignition switch electrical schematics, Refer to the appropriate section for the component.

MECHANICAL DIAGNOSIS (KEY DIFFICULT TO ROTATE)

Vehicles equipped with an automatic transmission and a floor mounted shifter: a cable is used to connect the interlock device in the steering column assembly, to the transmission floor shift lever. This interlock system is used to lock the transmission shifter in the PARK position when the key cylinder is rotated to any position. If the ignition key is difficult to rotate to or from any position, it may not be the fault of the key cylinder or the steering column components. The brake transmission shift interlock cable may be out of adjustment. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 30RH/GEAR SHIFT CABLE - ADJUSTMENTS). The interlock system within the steering column is not serviceable. If repair is necessary, the steering column assembly must be replaced. (Refer to 19 - STEERING/COLUMN - REMOVAL).

IGNITION SWITCH (Continued)

Vehicles equipped with a manual transmission and a floor mounted shifter: on certain models, a button is located on the steering column behind the ignition key cylinder. The button must be manually depressed to allow rotation of the ignition key cylinder to any position. If it is difficult to rotate the key to any position, the lever mechanism may be defective. This mechanism is not serviceable. If repair is necessary, the steering column assembly must be replaced.(Refer to 19 - STEERING/COLUMN - REMOVAL).

REMOVAL

IGNITION SWITCH REMOVAL

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

(1) Remove lower steering column cover screws and remove cover.

(2) Remove lock cylinder.(Refer to 19 - STEERING/COLUMN/KEY/LOCK CYLINDER - REMOVAL).

(3) Remove the multi-function switch.

(4) Disconnect the electrical connector at the rear of the ignition switch.

(5) Remove the ignition switch mounting screw (Fig. 7). Use tamper proof torx bit to remove the screw.

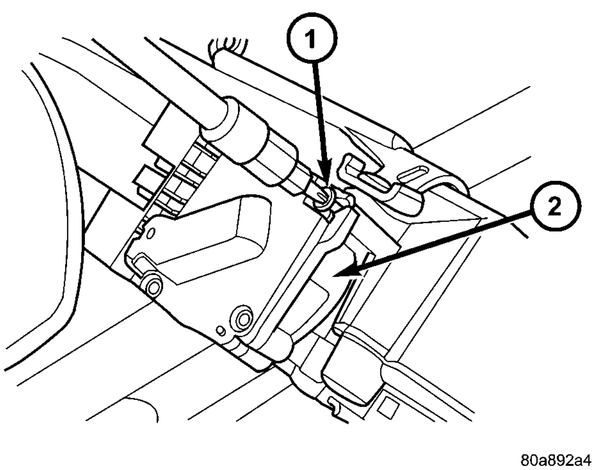


Fig. 7 IGNITION SWITCH MOUNTING SCREW

1 - Tamper Proof Torx Screw
2 - Ignition Switch

(6) Pull the ignition switch straight out to remove from the locking tabs (Fig. 8)

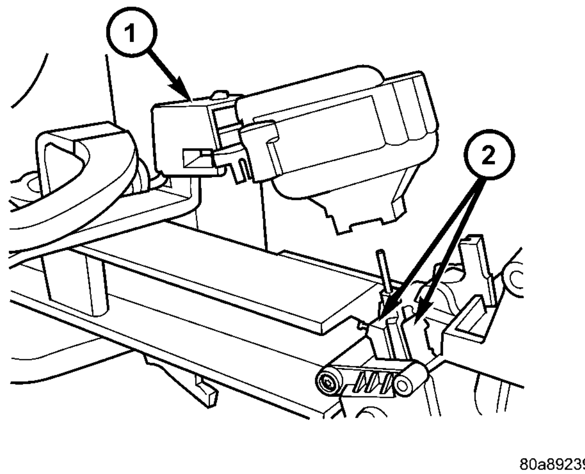


Fig. 8 IGNITION SWITCH TABS

1 - Ignition Switch
2 - Locking Tabs

INSTALLATION

IGNITION SWITCH INSTALLATION

The ignition key must be in the key cylinder for cylinder installation. The key cylinder must be aligned with the ignition switch for installation.

(1) Before installing ignition switch, rotate the slot in the switch to the ON position (Fig. 9).

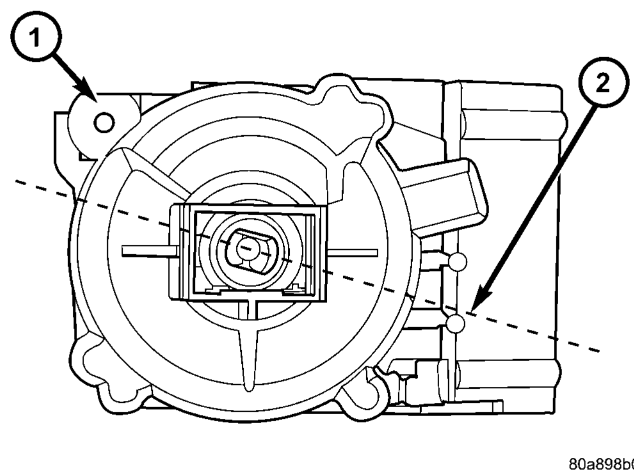


Fig. 9 IGNITION SWITCH ON POSITION

1 - Ignition Switch
2 - Rotate to On Position

IGNITION SWITCH (Continued)

(2) Connect the electrical connector to rear of ignition switch. Make sure that locking tab is fully seated into wiring connector.

(3) Position the switch to the column and install tamper proof screw. Tighten screw to 2 N·m (17 in. lbs.).

(4) Install the lock cylinder (Refer to 19 - STEERING/COLUMN/KEY/LOCK CYLINDER - INSTALLATION).

(5) Test the operation of the lock cylinder for smooth rotating.

(6) Install the multi-function switch.

(7) Install steering column lower cover.

KEY-IN IGNITION SWITCH

DESCRIPTION

The key-in ignition switch is integral to the ignition switch, which is mounted on the left side of the steering column, opposite the ignition cylinder. It closes a path to ground for the instrument cluster chime warning circuitry when the ignition key is inserted in the ignition lock cylinder and the driver door jamb switch is closed (driver door is open). The key-in ignition switch opens the ground path when the key is removed from the ignition cylinder.

The key-in ignition switch cannot be repaired and, if faulty or damaged, the entire ignition switch must be replaced. (Refer to 19 - STEERING/COLUMN/IGNITION SWITCH - REMOVAL).

DIAGNOSIS AND TESTING - KEY-IN IGNITION SWITCH

For circuit descriptions and diagrams, Refer to the appropriate sections on the individual components.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the steering column shrouds. Unplug the key-in ignition switch wire harness connector from the ignition switch.

(2) Check for continuity between the key-in switch sense circuit and the left front door jamb switch sense circuit terminals of the key-in ignition switch. There should be continuity with the key in the ignition cylinder, and no continuity with the key removed from the ignition cylinder. If OK, go to Step 3. If not OK, replace the faulty ignition switch assembly.

(3) Check for continuity between the left front door jamb switch sense circuit cavity of the key-in ignition switch wire harness connector and a good ground. There should be continuity with the driver door open, and no continuity with the driver door closed. If OK, see the diagnosis for Instrument Cluster in this group. If not OK, repair the circuit to the driver door jamb switch as required.

KEY CYLINDER

REMOVAL

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

(1) If equipped with an automatic transmission, place shifter in PARK position.

(2) Remove the lower shroud cover.

(3) Remove the remote keyless entry (R.K.E.) module.

(4) Remove the halo ring around the cylinder.

(5) Rotate key to ON position.

(6) A release tang is located on bottom of key cylinder (Fig. 10).

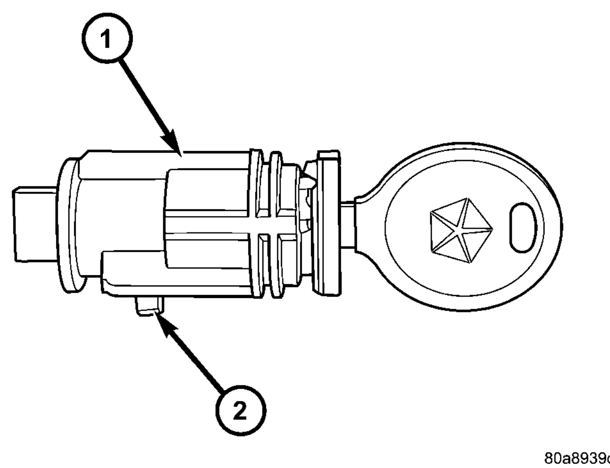


Fig. 10 KEY CYLINDER RELEASE TANG

1 - KEY CYLINDER
2 - RELEASE TANG

KEY CYLINDER (Continued)

(7) Position a small screwdriver or pin punch into tang access hole on bottom of steering column (Fig. 11).

(8) Push the pin punch up while pulling key cylinder from steering column.

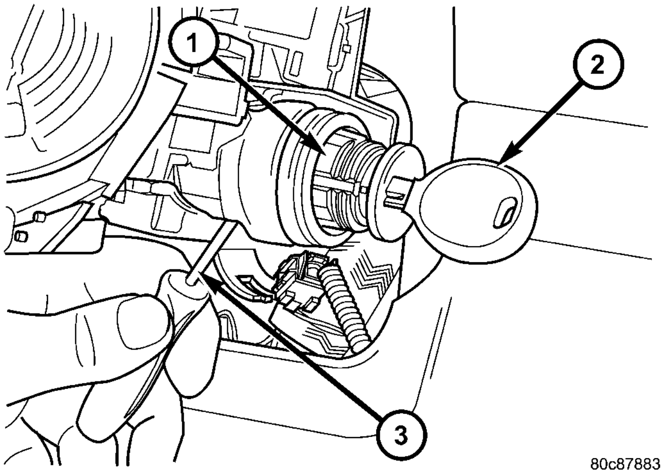


Fig. 11 KEY CYLINDER RELEASE

1 - KEY CYLINDER
2 - KEY
3 - PIN PUNCH

INSTALLATION

The ignition key must be in the key cylinder for cylinder installation.

(1) Install the key cylinder into the housing using care to align the end of the key cylinder with the ignition switch.

(2) Push the key cylinder in until it clicks.

(3) Rotate the key to the insert position.

(4) install the halo ring around the key cylinder housing.

(5) Install the R.K.E. module.

(6) Install the lower shroud cover.

INTERMEDIATE SHAFT

REMOVAL

(1) Disconnect the negative battery cable.

(2) Remove knee blocker cover and knee blocker, (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL).

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(3) Lock the steering wheel with the tires in the straight ahead position.

(4) Remove the lower column pinch bolt (Fig. 12).

(5) Lower the steering coupler shaft from the column.

(6) Remove the intermediate shaft seal by pushing in the four tangs securing it to the panel (Fig. 12).

(7) Remove the center support bearing bracket from the mount on the shock tower.

(8) Remove the lower coupler pinch bolt at the steering gear (Fig. 12).

(9) Remove the coupler at the steering gear (Fig. 12).

(10) Remove the intermediate shaft from the vehicle (Fig. 12).

(11) Remove the center support bracket from the steering shaft (if replacing the intermediate shaft).

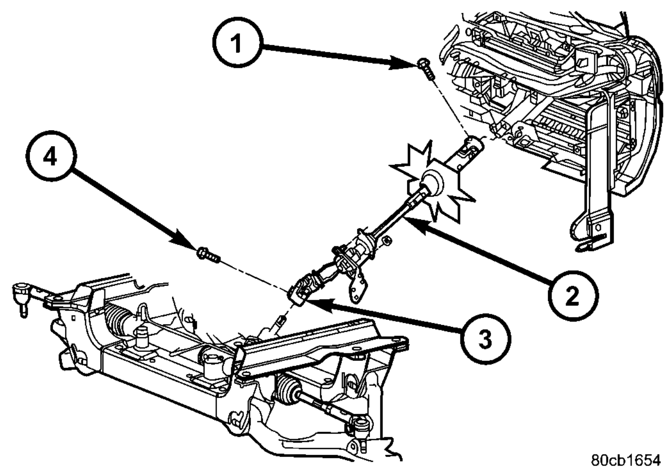


Fig. 12 STEERING COUPLER

1 - PINCH BOLT
2 - STEERING SHAFT
3 - STEERING COUPLER
4 - PINCH BOLT

INSTALLATION

(1) Install the center support bearing bracket to the steering shaft (if removed) Tighten to 14 N·m (125 in.lbs.).

(2) Install the intermediate shaft to the vehicle (Fig. 12).

(3) Install the coupler at the steering gear (Fig. 12).

(4) Install the lower coupler pinch bolt at the steering gear and tighten the bolt to 49 N·m (36 ft. lbs.) (Fig. 12).

(5) Install the center support bearing bracket to the mounting holes on the shock tower.

(6) Install the intermediate shaft seal by pushing it in securing the four tangs to the panel (Fig. 12).

(7) Install the steering coupler shaft to the column.

(8) Install the lower column pinch bolt and tighten the bolt to 49 N·m (36 ft. lbs.) (Fig. 12).

(9) Unlock the steering wheel.

INTERMEDIATE SHAFT (Continued)

(10) Install the knee blocker cover and knee blocker (Refer to 23 - BODY/INSTRUMENT PANEL/ KNEE BLOCKER - INSTALLATION).

(11) Reconnect the negative battery cable.

STEERING WHEEL

REMOVAL

(1) Disable and remove the drivers side airbag.(Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(2) Partially remove the steering wheel bolt and leave the bolt in the column.

(3) Install puller C-3894–A or equivalent using the top of the bolt to push on. (Fig. 13)

NOTE: Ensure the puller jaws are seated in the pockets (Fig. 14) of the steering wheel armature.

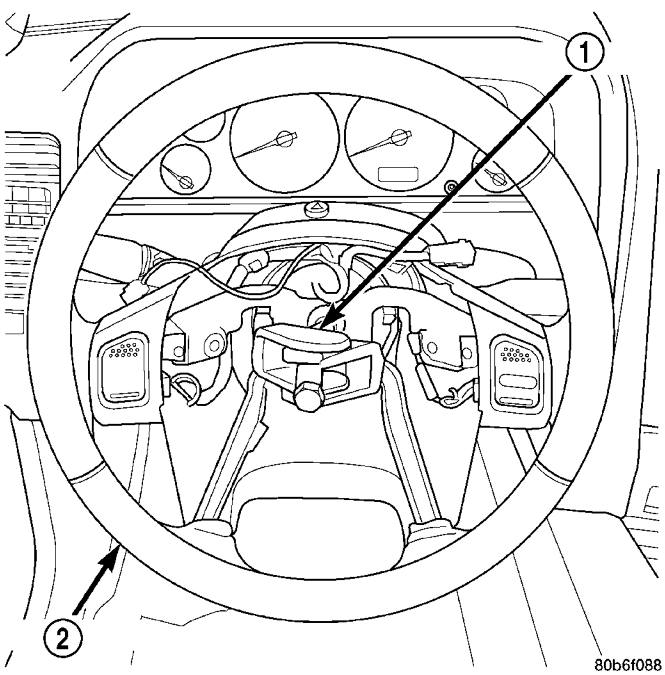


Fig. 13 STEERING WHEEL PULLER

1 - PULLER C-3894-A
2 - STEERING WHEEL

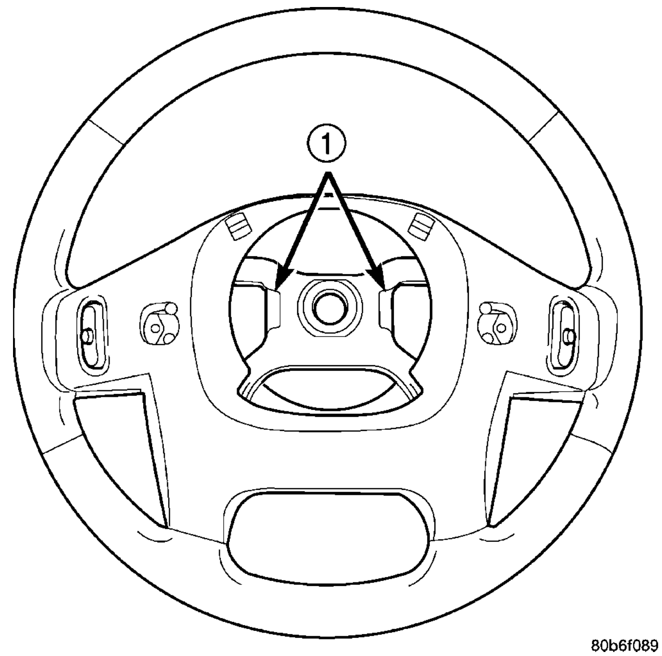


Fig. 14 Steering Wheel Pockets

(4) Remove the steering wheel.

INSTALLATION

NOTE: Do not reuse the old steering wheel bolt (a new bolt must be used)

(1) Install steering wheel to the column

NOTE: Be certain that the steering wheel mounting bolt is tightened to the proper torque specification to ensure proper clockspring operation.

(2) Install the new steering wheel bolt. Tighten the bolt to 54 N·m (40 ft. lbs.).

(3) Install the drivers side air bag. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

GEAR

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GEAR

DESCRIPTION

A rack and pinion steering gear (Fig. 1) is made up of two main components, the pinon shaft and the rack. The gear cannot be adjusted or internally serviced. If a malfunction or a fluid leak occurs, the gear must be replaced as an assembly.

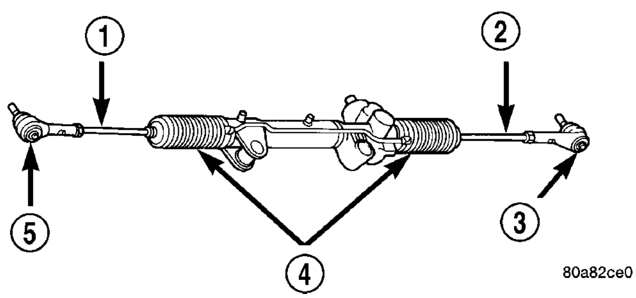


Fig. 1 Rack & Pinion Steering Gear

1 - TIE ROD - INNER
2 - TIE ROD - INNER
3 - TIE ROD END - OUTER LH
4 - BOOTS
5 - TIE ROD END - OUTER RH

OPERATION

The steering column intermediate shaft is attached to the gear pinion. The rotation of the pinion moves the gear rack from side-to-side. This lateral action of the rack pushes and pulls the tie rods, which are connected to the steering knuckles to change the direction of the front wheels.

REMOVAL

REMOVAL - 4WD

(1) Siphon the power steering fluid from the power steering reservoir.

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(2) Lock the steering wheel to prevent spinning of the clockspring.

(3) Raise and support the vehicle.

(4) Remove the skid plate from under the front end to gain access to the gear (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - REMOVAL).

(5) Remove the front tire and wheel assemblies.

NOTE: Mark the alignment adjusting cams for easier installation.

(6) Remove the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL).

(7) Remove the front axle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - REMOVAL).

(8) Remove the tie rod end nuts.

(9) Separate tie rod ends from the knuckles with Puller C-3894-A.

GEAR (Continued)

(10) Remove the intermediate shaft lower coupler bolt and slide the coupler off the gear (Fig. 2).

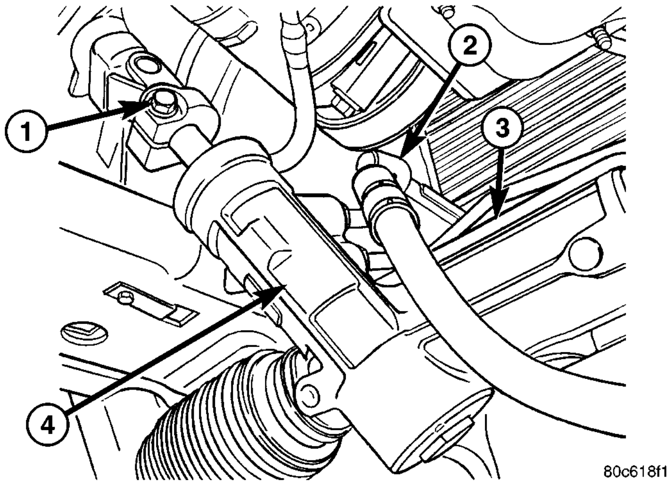


Fig. 2 COUPLER BOLT

1 - LOWER COUPLER & PINCH BOLT
2 - HIGH PRESSURE HOSE
3 - RETURN HOSE
4 - RACK & PINION

(11) Remove power steering pressure hose bracket (Fig. 3).

(12) Remove the power steering lines from the gear (Fig. 2).

(13) Remove the mounting bolts from the gear to the front cradle (Fig. 3).

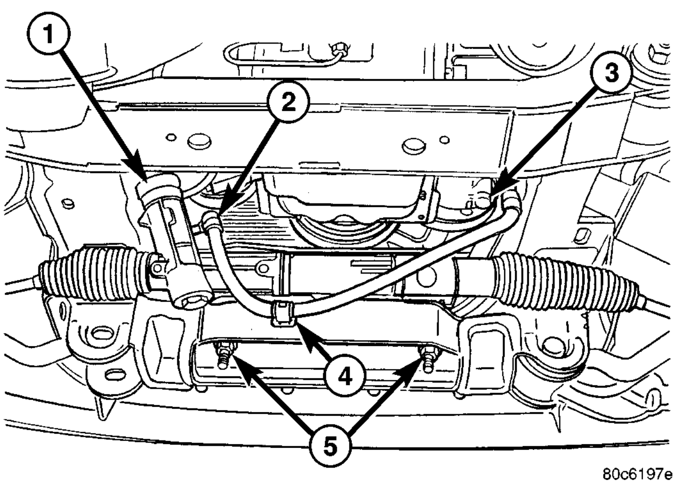


Fig. 3 RACK & PINION

1 - RACK & PINION
2 - HIGH PRESSURE HOSE
3 - POWER STEERING PUMP
4 - HIGH PRESSURE HOSE BRACKET
5 - RACK & PINION MOUNTING BOLTS

(14) Remove the steering gear from the vehicle.

REMOVAL - 2WD

(1) Siphon the power steering fluid from the power steering reservoir.

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(2) Lock the steering wheel to prevent spinning of the clockspring.

(3) Raise and support the vehicle.

(4) Remove the skid plate from under the front end to gain access to the gear(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - REMOVAL).

(5) Remove the tire and wheel assembly.

NOTE: Mark the alignment adjusting cams and tie rod end jam nuts on the steering gear for easier installation.

(6) Remove the tie rod end nuts.

(7) Separate tie rod ends from the knuckles with Puller C-3894-A.

(8) Remove the lower intermediate shaft coupler bolt and slide the coupler off the gear (Fig. 2).

(9) Remove power steering pressure hose bracket (Fig. 3).

(10) Remove the power steering lines from the gear (Fig. 2).

(11) Remove the mounting bolts from the gear to the front cradle (Fig. 3).

(12) Remove the steering gear from the vehicle.

REMOVAL - 2.5L DIESEL

(1) Siphon the power steering fluid from the power steering reservoir.

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(2) Lock the steering wheel to prevent spinning of the clockspring.

(3) Raise and support the vehicle.

(4) Remove the skid plate from under the front end to gain access to the gear (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - REMOVAL)

(5) Remove the tire and wheel assembly.

GEAR (Continued)

NOTE: Mark the alignment adjusting cams for easier installation.

(6) Remove the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL).

(7) Remove the front axle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - REMOVAL).

(8) Remove the tie rod end nuts.

(9) Separate tie rod ends from the knuckles with Puller C-3894-A.

(10) Remove the lower coupler bolt and slide the coupler off the gear (Fig. 4).

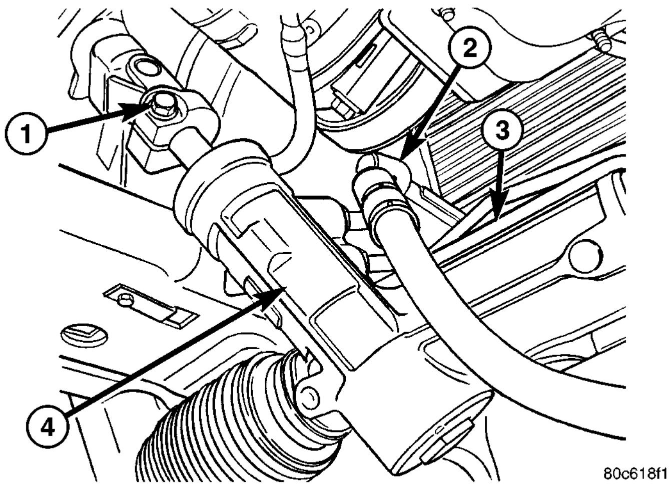


Fig. 4 COUPLER BOLT

1 - LOWER COUPLER & PINCH BOLT
2 - HIGH PRESSURE HOSE
3 - RETURN HOSE
4 - RACK & PINION

(11) Remove power steering pressure hose bracket (Fig. 5).

(12) Remove the power steering lines from the gear (Fig. 4).

(13) Remove the mounting bolts from the gear to the front cradle (Fig. 5).

(14) Remove the steering gear from the vehicle.

REMOVAL - RHD - 4X2 & 4X4

(1) Siphon the power steering fluid from the power steering reservoir.

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

(2) Lock the steering wheel to prevent spinning of the clockspring.

(3) Raise and support the vehicle.

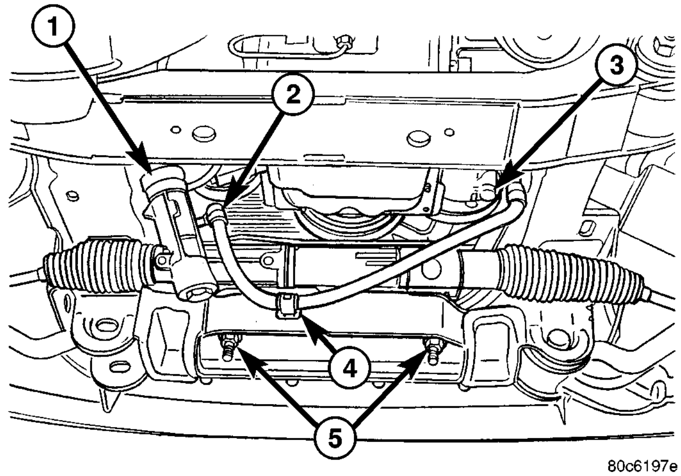


Fig. 5 RACK & PINION

1 - RACK & PINION
2 - HIGH PRESSURE HOSE
3 - POWER STEERING PUMP
4 - HIGH PRESSURE HOSE BRACKET
5 - RACK & PINION MOUNTING BOLTS

(4) Remove the skid plate from under the front end to gain access to the gear(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - REMOVAL).

(5) Remove the tire and wheel assembly.

NOTE: Mark the alignment adjusting cams and tie rod end jam nuts on the steering gear for easier installation.

(6) Remove the tie rod end nuts.

(7) Separate tie rod ends from the knuckles with Puller C-3894-A.

(8) Remove the lower intermediate shaft coupler bolt and slide the coupler off the gear (Fig. 2).

(9) Remove power steering pressure hose bracket (Fig. 3).

(10) Remove the power steering lines from the gear (Fig. 2).

(11) Remove the mounting bolts from the gear to the front cradle (Fig. 3).

(12) Remove the steering gear from the vehicle.

INSTALLATION

INSTALLATION - 4WD

(1) Transfer the tie rod ends to the new steering gear (if needed).

(2) Install the steering gear to the vehicle.

(3) Install the gear mounting bolts to the front cradle. (Fig. 3). Tighten the gear mounting bolts to 162 N·m (120 ft.lbs.)

(4) Install the power steering lines to the gear (Fig. 2).

(5) Install the power steering pressure hose bracket (Fig. 3).

GEAR (Continued)

(6) Install the lower coupler bolt and slide the coupler on to the gear (Fig. 2).

(7) Install the tie rod end to the knuckle and tighten the nuts.

(8) Install the front axle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - INSTALLATION).

(9) Install the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION).

(10) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(11) Install the skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - INSTALLATION).

(12) Lower the vehicle.

(13) Unlock the steering wheel.

(14) Fill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(15) Reset the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

INSTALLATION - 2WD

(1) Transfer the outer tie rod ends to the new steering gear (if needed).

(2) Install the steering gear to the vehicle.

(3) Install the gear mounting bolts to the front cradle. (Fig. 3). Tighten the gear mounting bolts to 162 N·m (120 ft.lbs.)

(4) Install the power steering lines to the gear (Fig. 2).

(5) Install the power steering pressure hose bracket (Fig. 3).

(6) Install the lower coupler bolt and slide the coupler on to the gear (Fig. 2).

(7) Install the tie rod end to the knuckle and tighten the nuts.

(8) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Install the skid plate(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - INSTALLATION).

(10) Lower the vehicle.

(11) Unlock the steering wheel.

(12) Fill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(13) Reset the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

INSTALLATION - 2.5L DIESEL

(1) Transfer the tie rod ends to the new steering gear (if needed).

(2) Install the steering gear to the vehicle.

(3) Install the gear mounting bolts to the front cradle. (Fig. 5). Tighten the gear mounting bolts to 162 N·m (120 ft.lbs.)

(4) Install the power steering lines to the gear (Fig. 4).

(5) Install the power steering pressure hose bracket (Fig. 5).

(6) Install the lower coupler bolt and slide the coupler on to the gear (Fig. 4).

(7) Install the tie rod end to the knuckle and tighten the nuts.

(8) Install the front axle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/FRONT AXLE - INSTALLATION).

(9) Install the lower control arms. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION).

(10) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(11) Install the skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - INSTALLATION).

(12) Lower the vehicle.

(13) Unlock the steering wheel.

(14) Fill the power steering fluid.

(15) Align the front end.

INSTALLATION - RHD - 4X2 & 4X4

(1) Transfer the outer tie rod ends to the new steering gear (if needed).

(2) Install the steering gear to the vehicle.

(3) Install the gear mounting bolts to the front cradle. (Fig. 3). Tighten the gear mounting bolts to 162 N·m (120 ft.lbs.)

(4) Install the power steering lines to the gear (Fig. 2).

(5) Install the power steering pressure hose bracket (Fig. 3).

(6) Install the lower coupler bolt and slide the coupler on to the gear (Fig. 2).

(7) Install the tie rod end to the knuckle and tighten the nuts.

(8) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(9) Install the skid plate(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT SKID PLATE - INSTALLATION).

(10) Lower the vehicle.

(11) Unlock the steering wheel.

(12) Fill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(13) Reset the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

GEAR (Continued)

SPECIFICATIONS

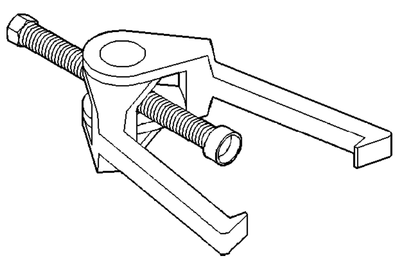
TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Rack and Pinion Steering Gear Gear to Frame Bolts	162	120	—
Rack and Pinion Steering Gear Intermediate Shaft Bolt	49	36	—
Tie Rod End Knuckle Nut	108	80	—
Tie Rod End Jam Nut	75	55	—
Power Steering Line Pressure Line	35	25	—
Power Steering Line Return Line	35	25	—

SPECIAL TOOLS

OUTER TIE ROD END REMOVAL TOOL



Puller C-3894-A

LINKAGE

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LINKAGE

STANDARD PROCEDURE - STEERING LINKAGE

The tie rod end and ball stud seals should be inspected during all oil changes. If a seal is damaged, replace the tie rod.

CAUTION: If any steering components are replaced or serviced an alignment must be performed, to ensure the vehicle meets all alignment specifications.

TIE ROD END

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the tire and wheel assembly.

NOTE: Mark the tie rod end jam nuts on the steering gear for easier installation.

(3) Loosen the tie rod end jam nut (Fig. 1).

(4) Remove the tie rod end nut (Fig. 1).

(5) Seperate the tie rod end from the knuckle using tool C3894A.

NOTE: Count the number of turns when removing.

(6) Remove the tie rod end from the rack (Fig. 1).

INSTALLATION

(1) Install the tie rod end to the rack to the exact number of turns that it was removed (Fig. 1).

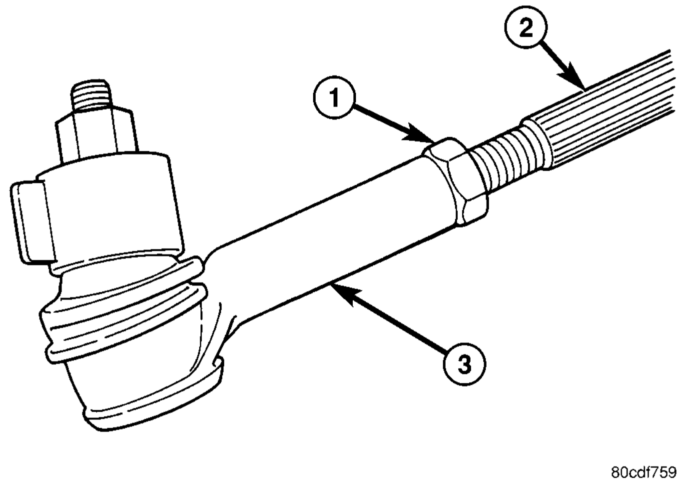

Fig. 1 TIE ROD END

1 - JAM NUT
2 - TIE ROD - INNER
3 - TIE ROD END - OUTER

(2) Install the tie rod end to the knuckle. Tighten the nut to 108 N·m (80 ft.lbs).

(3) Tighten the jam nut to 76 N·m (55 ft.lbs). (Fig. 1).

(4) Install the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

(5) Reset the toe and center the steering wheel (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

PUMP

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PUMP

DESCRIPTION

DESCRIPTION

Hydraulic pressure for the power steering system is provided by a belt driven power steering pump (Fig. 1). The pump shaft has a bolt-on drive pulley that is belt driven by the crankshaft pulley. The reservoir is seperate from the pump body. The power steering pump is connected to the steering gear by the pressure and return hoses

DESCRIPTION

Hydraulic pressure for the power steering system is provided by a belt driven power steering pump (Fig. 2). The pump shaft has a pressed-on high strength plastic drive pulley that is belt driven by the crankshaft pulley. The integral reservoir used on the 3.7L only is attached to the pump body with spring clips (Fig. 2). The 2.4L uses a remote fluid reservoir (Fig. 3). The power steering pump is connected to the steering gear by the pressure and return hoses.

OPERATION

The power steering pump is a constant flow rate and displacement, vane-type pump. The pump internal parts operate submerged in fluid. The flow control orifice is part of the high pressure line fitting. The pressure relief valve inside the flow control valve limits the pump pressure.

PUMP (Continued)

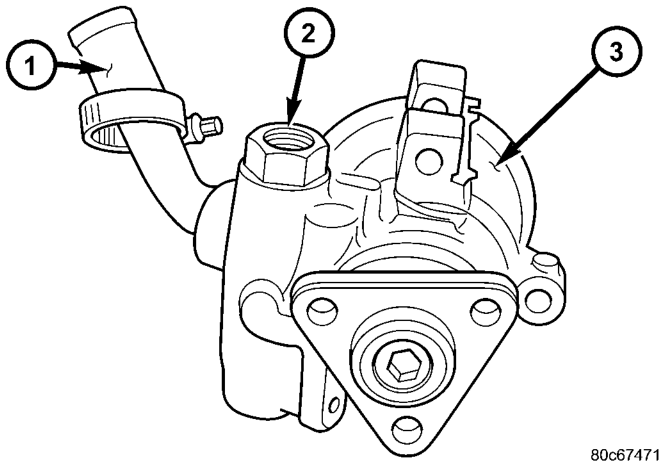


Fig. 1 POWER STEERING PUMP

1 - RETURN TUBE
2 - HIGH PRESSURE HOSE FITTING
3 - POWER STEERING PUMP BODY

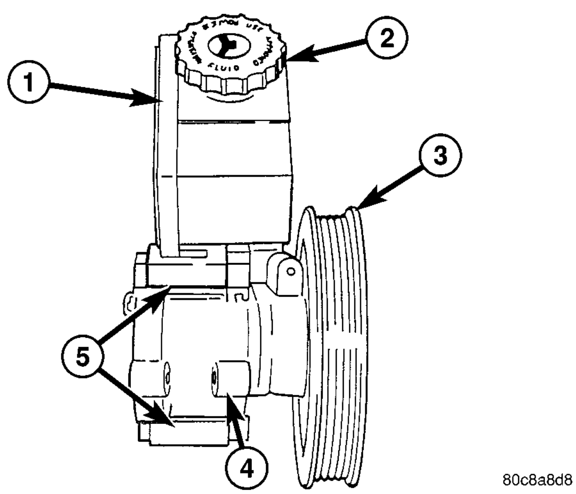


Fig. 2 POWER STEERING PUMP ASSEMBLY

1 - RESERVOIR
2 - CAP
3 - PULLEY
4 - PUMP BODY
5 - RESERVOIR RETAINING CLIPS

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

STANDARD PROCEDURE - POWER STEERING PUMP - INITIAL OPERATION

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

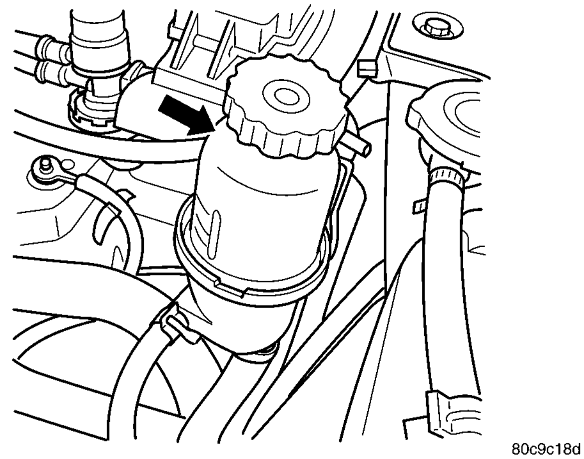


Fig. 3 FLUID RESERVOIR - 2.4L

CAUTION: Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal ambient temperature.

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two minutes.
(2) Raise the front wheels off the ground.
(3) Slowly turn the steering wheel right and left, lightly contacting the wheel stops at least 20 times.
(4) Check the fluid level add if necessary.
(5) Lower the vehicle, start the engine and turn the steering wheel slowly from lock to lock.
(6) Stop the engine and check the fluid level and refill as required.

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

(7) If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.
(8) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

REMOVAL

REMOVAL

(1) Siphon out as much power steering fluid as possible.
(2) Remove the engine cooling fan.
(3) Remove the fan shroud
(4) Remove the serpentine drive belt.
(5) Remove the three bolts securing the pulley to the pump. (Fig. 4)
(6) Remove the power steering hoses. (Fig. 4)

PUMP (Continued)

(7) Remove the three bolts securing the pump to the bracket. (Fig. 4)

(8) Remove the pump from the vehicle.

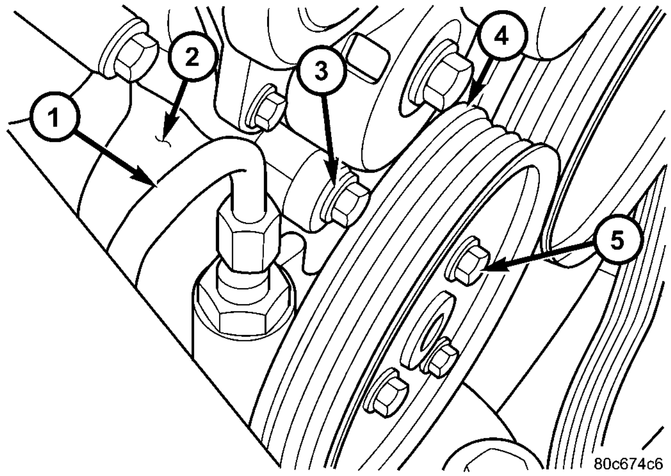


Fig. 4 POWER STEERING PUMP - 2.5 DIESEL

1 - HIGH PRESSURE HOSE
2 - POWER STEERING PUMP
3 - POWER STEERING PUMP MOUNTING BOLT
4 - POWER STEERING PUMP PULLEY
5 - POWER STEERING PUMP PULLEY MOUNTING BOLTS

REMOVAL - 3.7L

(1) Siphon out as much power steering fluid as possible.

(2) Remove the radiator cross member (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - REMOVAL).

(3) Remove the engine cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(4) Remove the fan shroud

(5) Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(6) Remove the power steering high pressure hose at the pump.

(7) Remove the return hose at the pump.

(8) Remove the three bolts securing the pump to the bracket thru the holes in the pulley. (Fig. 5)

(9) Remove the pump from the vehicle.

REMOVAL - 2.4L

CAUTION: On vehicles equipped with the 2.4L, Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

(1) Siphon out as much power steering fluid as possible.

(2) Remove the serpentine drive belt.

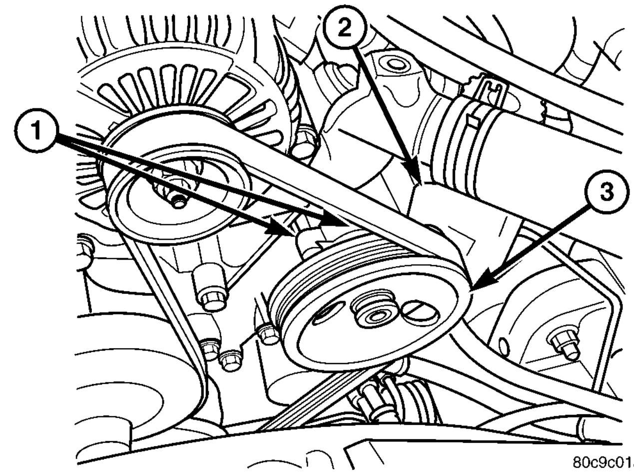


Fig. 5 POWER STEERING PUMP - 3.7L

1 - MOUNTING BOLTS
2 - RESERVOIR
3 - STEEL PULLEY

(3) Remove the power steering high pressure hose at the pump using care not to remove the flow control valve.

(4) Remove the return hose at the pump.

(5) Remove the two nuts securing the wire loom behind the pump bracket.

(6) Remove the three bolts securing the pump to the bracket thru the holes in the pulley. (Fig. 6)

(7) Remove the pump from the vehicle.

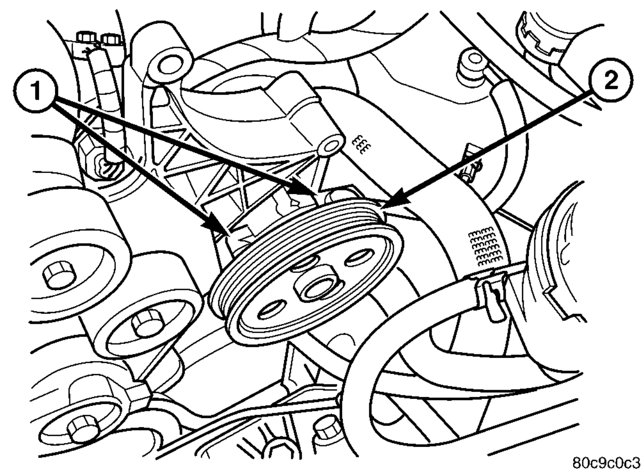


Fig. 6 POWER STEERING PUMP - 2.4L

1 - MOUNTING BOLTS
2 - PULLEY

INSTALLATION

INSTALLATION

(1) Install the pump to the vehicle.

(2) Install the three bolts securing the pump to the bracket. (Fig. 4)

PUMP (Continued)

(3) Install the power steering hoses. (Fig. 4)

(4) Install the three bolts securing the pulley to the pump. (Fig. 4)

(5) Install the serpentine belt.

(6) Install the fan shroud

(7) Install the engine cooling fan.

(8) Refill the power steering fluid and check for leaks.

INSTALLATION - 3.7L

(1) Install the pump to the vehicle.

(2) Install the three bolts securing the pump to the engine. (Fig. 5) Tighten the bolts to 47 N·m (35 ft.lbs.).

(3) Install the power steering hoses.

(4) Install the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(5) Install the fan shroud

(6) Install the engine cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(7) Install the radiator crossmember (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - INSTALLATION).

(8) Refill the power steering fluid and check for leaks (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 2.4L

(1) Install the pump to the vehicle.

(2) Install the three bolts securing the pump to the engine. (Fig. 6) Tighten the bolts to 47 N·m (35 ft.lbs.).

(3) Install the two nuts securing the wire loom to the pump bracket.

(4) Install the power steering pressure and supply hoses.

(5) Install the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(6) Refill the power steering fluid and check for leaks (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

SPECIFICATIONS

TORQUE CHART

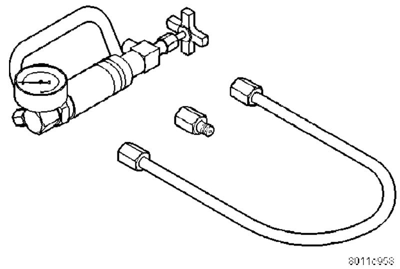
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Power Steering Pump Bracket to Pump	28	21	—
Power Steering Pump Bracket to Engine	47	35	—
Power Steering Pump Flow Control Valve	75	55	—
Power Steering Pump Pressure Line	28	21	—
Power Steering Pump Pressure Line Bracket	12	9	105

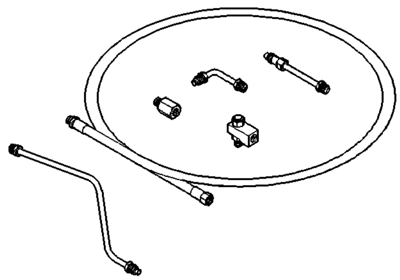
PUMP (Continued)

SPECIAL TOOLS

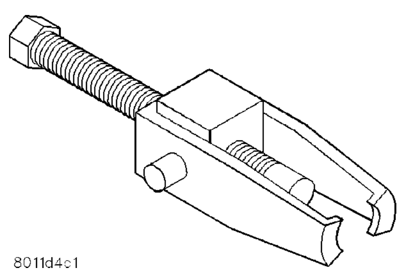
POWER STEERING PUMP



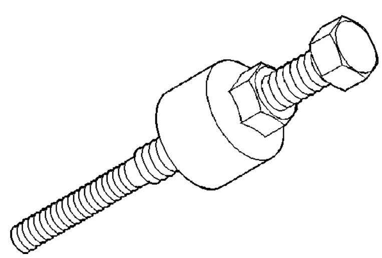
Analyzer Set, Power Steering Flow/Pressure 6815



Adapters, Power Steering Flow/Pressure Tester 6893



Puller C-4333



Installer, Power Steering Pulley C-4063B

FLUID COOLER

DESCRIPTION

The power steering fluid cooler is located at the front of the vehicle. It is mounted to the radiator lower support just forward of the air-conditioning condenser and just rearward of the front fascia. The cooler is positioned so it is in the air flow through the front fascia of the vehicle (Fig. 7)

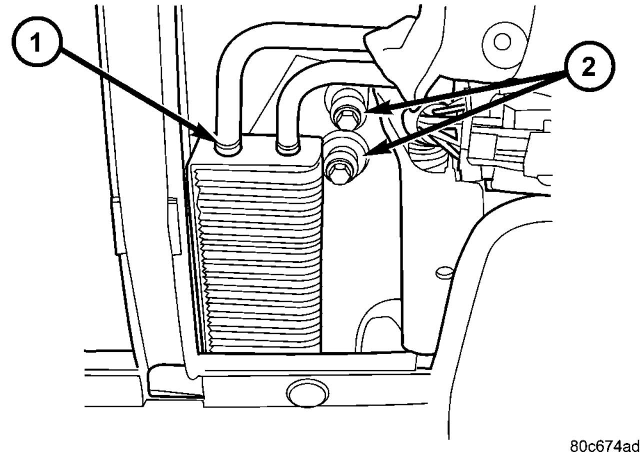


Fig. 7 FLUID COOLER

1 - FLUID COOLER
2 - MOUNTING BOLTS

OPERATION

The purpose of the power steering fluid cooler is to keep the temperature of the power steering system fluid from rising to a level that would affect the performance of the power steering system.

The cooler used on this vehicle is referred to as a fluid-to-air type cooler. This means that the air flow across the fin/tubes of the cooler is used to extract the heat from the cooler which it has absorbed from the power steering fluid flowing through it. The cooler is placed in series with the power steering fluid return line, between the steering gear and the power steering fluid reservoir. This lowers the temperature of the power steering fluid prior to it entering the power steering fluid reservoir where it is resupplied to the power steering pump.

REMOVAL

(1) Remove the return line at the gear.
(2) Remove the return line at the reservoir.
(3) Remove the grille (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).
(4) Remove the two cooler mounting bolts. (Fig. 7)
(5) Remove the cooler from the vehicle.

INSTALLATION

(1) Install the cooler to the vehicle.
(2) Install the two cooler mounting bolts. (Fig. 7).
(3) Install the grille (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).
(4) Install the return line at the reservoir.
(5) Install the return line at the gear.
(6) Refill the power steering fluid and check for leaks (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

HOSES

REMOVAL

REMOVAL

(1) Siphon the power steering fluid from the reservoir.
(2) Remove the upper core support.
(3) Remove the clutch fan.
(4) Remove the fan shroud.
(5) Remove the serpentine belt.
(6) Remove the return hose from the pump.
(7) Remove the return hose at the cooler.
(8) Remove the return hose mounting bracket bolts from the front cradle. (Fig. 8)
(9) Remove the return hose from the vehicle.

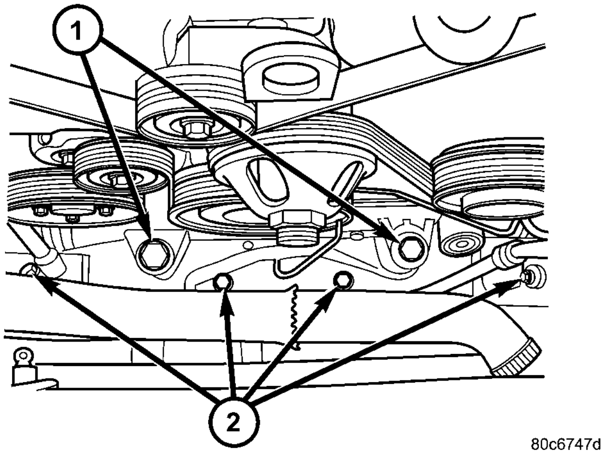


Fig. 8 RETURN HOSE BRACKETS

1 - RACK & PINION MOUNTING BOLTS
2 - RETURN HOSE MOUNTING BRACKETS

REMOVAL - PRESSURE HOSE

(1) Siphon the power steering fluid from the reservoir.
(2) Remove the radiator crossmember (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - REMOVAL).
(3) Remove the fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
(4) Remove the fan shroud.
(5) Remove the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(6) Remove the pressure hose at the pump.
(7) Disconnect the pressure switch electrical connector from the pressure hose.
(8) Remove the pressure hose from the gear.
(9) Remove the pressure hose mounting bracket bolts from behind the headlamp assembly. (Fig. 9)
(10) Remove the pressure hose from the vehicle and transfer power steering pressure switch if necessary.

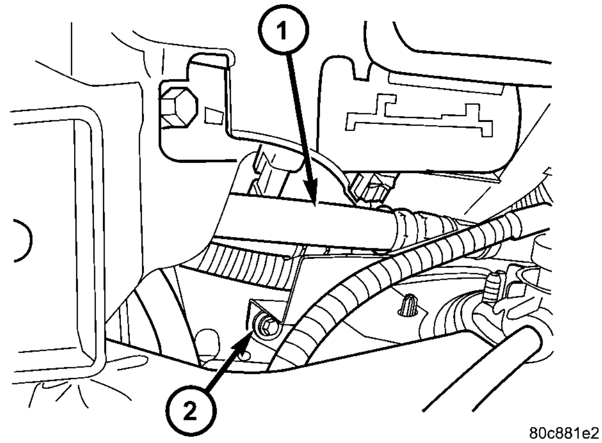


Fig. 9 MOUNTING BRACKET

1 - HIGH PRESSURE POWER STEERING HOSE
2 - MOUNTING BRACKET

REMOVAL - RETURN HOSE (GEAR TO THE COOLER)

(1) Siphon the power steering fluid from the reservoir.
(2) Remove the radiator crossmember (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - REMOVAL).
(3) Remove the fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
(4) Remove the fan shroud.
(5) Remove the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(6) Remove the return hose from the gear.
(7) Remove the return hose at the cooler.
(8) Remove the return hose mounting bracket bolts from the front cradle. (Fig. 10)
(9) Remove the return hose from the vehicle.

REMOVAL - RETURN HOSE (RESERVOIR TO THE COOLER)

(1) Siphon the power steering fluid from the reservoir.
(2) Remove the return hose from the pump reservoir.
(3) Remove the return hose at the cooler.
(4) Remove the return hose from the vehicle.

INSTALLATION

INSTALLATION

(1) Install the return hose to the vehicle.

HOSES (Continued)

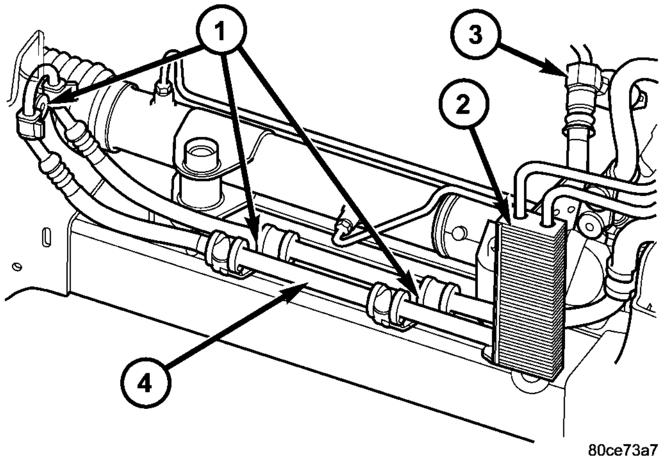


Fig. 10 RETURN HOSE TO COOLER

1 - MOUNTING BRACKETS
2 - FLUID COOLER
3 - PRESSURE SWITCH
4 - RETURN HOSE

(2) Install the return hose mounting bracket bolts to the front cradle.
(3) Install the retrun hose at the cooler.
(4) Install the return hose at the pump. (Fig. 11)
(5) Install the serpentine belt.
(6) Install the fan shroud.
(7) Install the clutch fan.
(8) Install the upper core support.
(9) Refill the power steering fluid.

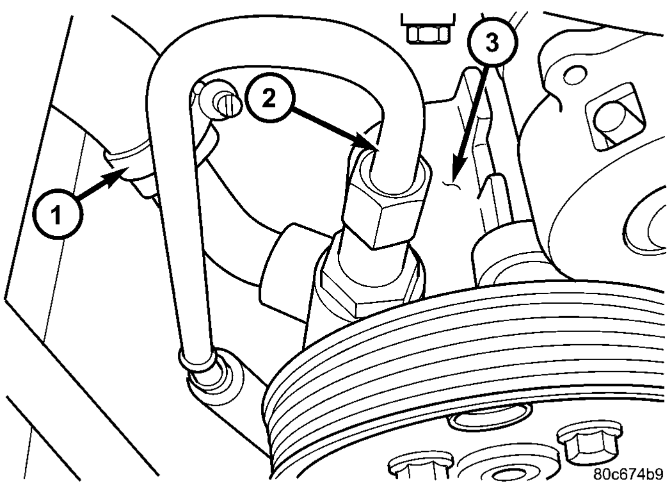


Fig. 11 RETURN & PRESSURE HOSE

1 - RETURN HOSE
2 - HIGH PRESSURE HOSE
3 - POWER STEERING PUMP

INSTALLATION - PRESSURE HOSE

(1) Install the pressure hose to the vehicle. (Fig. 12)
(2) Install the pressure hose mounting bracket bolts behind the headlamp assembly. Tighten to to 12 N·m (9 ft.lbs.).
(3) Install the pressure hose to the gear. Tighten the hose to28 N·m (21 ft.lbs.).
(4) Install the pressure switch electrical connector.
(5) Install the pressure hose at the pump. Tighten the hose to28 N·m (21 ft.lbs.).
(6) Install the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(7) Install the fan shroud.
(8) Install the fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
(9) Install the radiator crossmember (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - INSTALLATION).
(10) Refill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

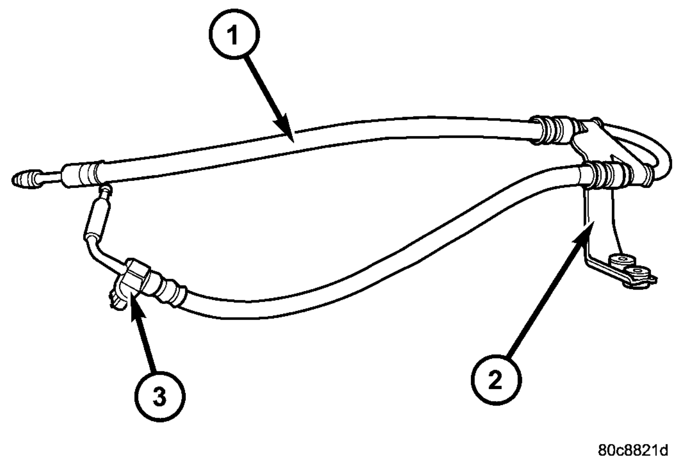


Fig. 12 HIGH PRESSURE HOSE ASSEMBLY

1 - HIGH PRESSURE POWER STEERING HOSE
2 - MOUNTING BRACKET
3 - POWER STEERING PRESURE SWITCH

INSTALLATION - RETURN HOSE (GEAR TO THE COOLER)

(1) Install the return hose to the vehicle. (Fig. 10)
(2) Install the return hose mounting bracket bolts to the front cradle.
(3) Install the return hose at the cooler.
(4) Install the return hose at the gear 28 N·m (21 ft.lbs.).
(5) Install the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(6) Install the fan shroud.
(7) Install the fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

HOSES (Continued)

(8) Install the radiator crossmember (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - INSTALLATION).

(9) Refill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - RETURN HOSE (RESERVOIR TO THE COOLER)

(1) Install the return hose to the vehicle.

(2) Install the return hose to the pump reservoir.

(3) Install the return hose at the cooler.

(4) Refill the power steering fluid (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

POWER STEERING PRESSURE SWITCH

DESCRIPTION

A pressure sensing switch is used in the power steering system. It is mounted on the high-pressure steering hose. This switch will be used with both 2.4L and 3.7L engines.

OPERATION

The switch is used on both the 2.4L 4–cylinder and 3.7L V-6 engines.

The power steering pressure switch provides an input to the Powertrain Control Module (PCM). This input is provided during periods of high steering pump load and low engine rpm; such as during parking maneuvers. The PCM increases the idle speed through the Idle Air Control (IAC) motor. This is done to prevent the engine from stalling under the increased load.

When steering pump pressure exceeds 3275 kPa ± 690 kPa (475 psi ± 100 psi), the Normally Closed (NC) switch will open and the PCM will increase the engine idle speed. This will prevent the engine from stalling.

When pump pressure drops to approximately 1379 kPa (200 psi), the switch circuit will re-close and engine idle speed will return to its previous setting.

REMOVAL

The power steering pressure switch is installed in the power steering high-pressure hose (Fig. 13).

(1) Remove the high pressure power steering hose(Refer to 19 - STEERING/PUMP/HOSES - REMOVAL).

(2) Disconnect electrical connector from power steering pressure switch.

(3) Place a small container or shop towel beneath switch to collect any excess fluid.

(4) Remove switch. Use back-up wrench on power steering line to prevent line bending.

INSTALLATION

(1) Install power steering switch into power steering line. (Fig. 13)

(2) Tighten to 9.6 N·m (85 in. lbs.) torque.

(3) Install the high pressure power steering hose (Refer to 19 - STEERING/PUMP/HOSES - INSTALLATION).

(4) Connect electrical connector to switch.

(5) Check power steering fluid and add as necessary (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(6) Start engine and again check power steering fluid. Add fluid if necessary.

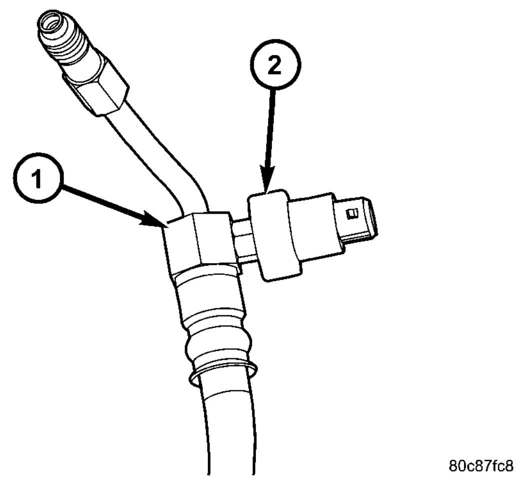


Fig. 13 POWER STEERING PRESSURE SWITCH

1 - HIGH PRESSURE POWER STEERING HOSE
2 - POWER STEERING PRESSURE SWITCH

PULLEY

REMOVAL

REMOVAL - DIESEL

(1) Remove the engine cooling fan.

(2) Remove the fan shroud.

(3) Remove the serpentine drive belt.

(4) Remove the three bolts securing the pulley to the pump (Fig. 4).

REMOVAL

CAUTION: On vehicles equipped with the 2.4L, Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

PULLEY (Continued)

(1) Remove pump assembly. (Refer to 19 - STEERING/PUMP - REMOVAL).

(2) Remove pulley from pump with Puller C-4333 or equivalent puller (Fig. 14).

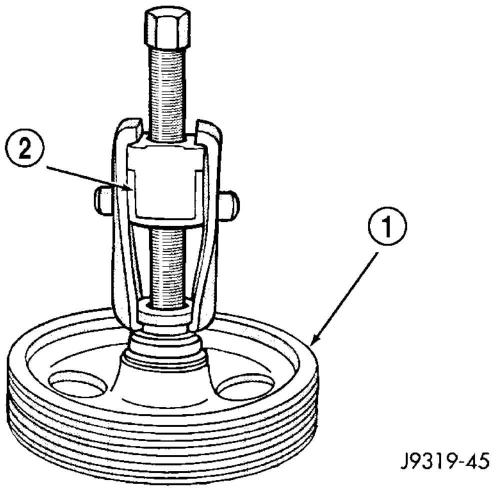


Fig. 14 Pulley Removal

1 - POWER STEERING PUMP DRIVE PULLEY
2 - SPECIAL TOOL C-4333

INSTALLATION

INSTALLATION - DIESEL

(1) Install the pulley to the pump shaft.
(2) Install the serpentine belt.
(3) Install the fan shroud.
(4) Install the engine cooling fan.

INSTALLATION

NOTE: The pulley is marked front for installation.

(1) Replace pulley if bent, cracked, or loose.

(2) Install pulley on pump with Installer C-4063-B or equivalent installer (Fig. 15). The pulley must be flush with the end of the shaft. Ensure the tool and pulley are aligned with the pump shaft.

(3) Install pump assembly. (Refer to 19 - STEERING/PUMP - INSTALLATION)

(4) With Serpentine Belt, run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**

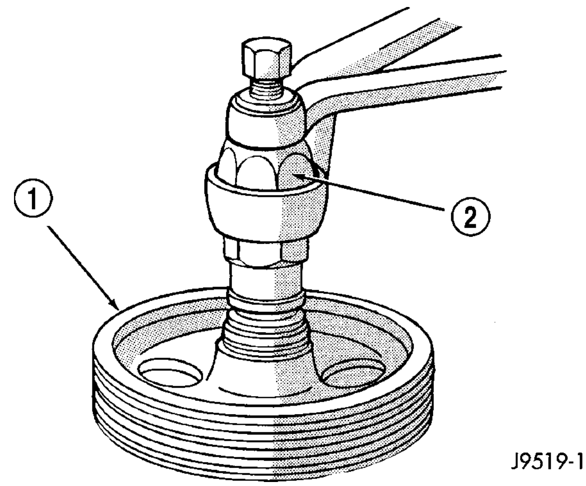


Fig. 15 Pulley Installation

1 - POWER STEERING PUMP DRIVE PULLEY
2 - SPECIAL TOOL C-4063–B

RESERVOIR

REMOVAL

REMOVAL - DIESEL

(1) Siphon out as much power steering fluid as possible.
(2) Remove the power steering hoses.
(3) Remove the bolt securing the reservoir to the mounting bracket. (Fig. 16)
(4) Remove the reservoir.

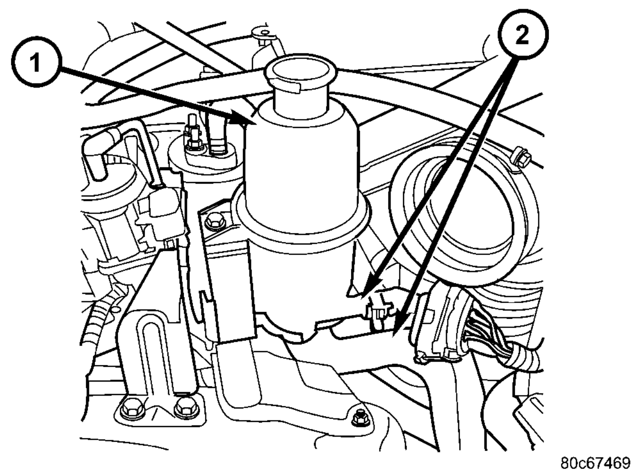


Fig. 16 RESERVOIR

1 - FLUID RESERVOIR
2 - RETURN HOSES

RESERVOIR (Continued)

REMOVAL - 3.7L

(1) Remove the power steering pump. (Refer to 19 - STEERING/PUMP - REMOVAL).

(2) Secure the pump in a holding fixture.

(3) Remove the retaining clips by prying the lock tab upwards and tap the retaining clips off the pump body. (Fig. 17)

(4) Remove the reservoir from the pump body.

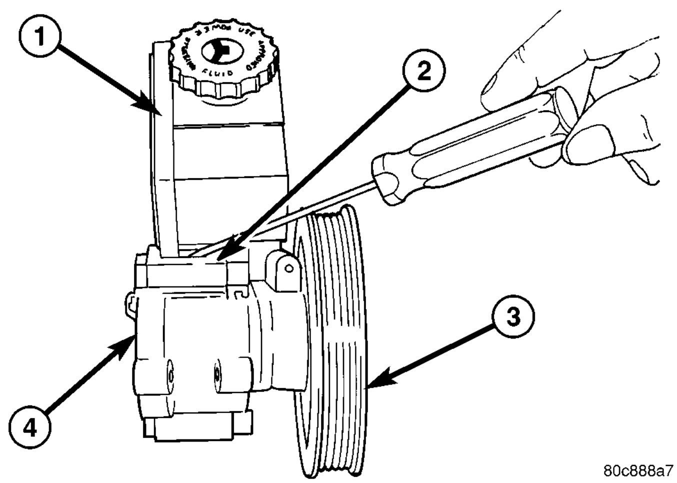


Fig. 17 FLUID RESERVOIR

1 - FLUID RESERVOIR
2 - RETAINING CLIP
3 - PULLEY
4 - PUMP BODY

REMOVAL - 2.4L

(1) Siphon out as much power steering fluid as possible.

(2) Remove the power steering hoses.

(3) Remove the bolt securing the reservoir to the mounting bracket. (Fig. 18)

(4) Remove the reservoir.

INSTALLATION

INSTALLATION - DIESEL

(1) Install the reservoir to the mounting bracket.

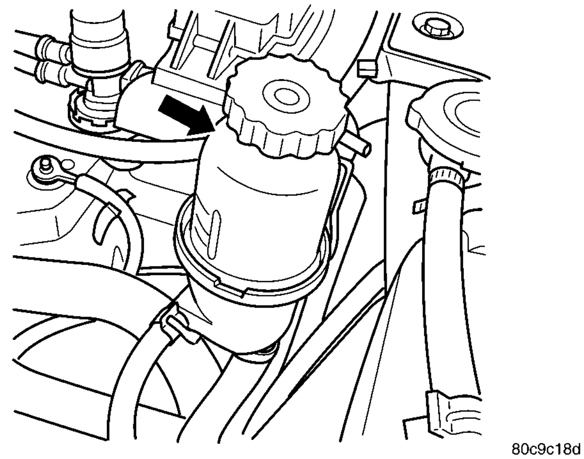


Fig. 18 FLUID RESERVOIR - 2.4L

(2) Install and tighten the bolt to 12 N·m (9 ft. lbs.).

(3) Install the hoses.

(4) Refill the power steering fluid and check for leaks. (Fig. 16)

INSTALLATION - 3.7L

(1) Install the reservoir to the pump body.

(2) Install the retaining clips to the pump and reservoir.

(3) Install the pump to the engine. (Refer to 19 - STEERING/PUMP - INSTALLATION).

(4) Refill the power steering fluid and check for leaks (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 2.4L

(1) Install the reservoir to the mounting bracket.

(2) Install and tighten the bolt to

(3) Install the hoses.

(4) Refill the power steering fluid and check for leaks (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE). (Fig. 18)

TRANSMISSION AND TRANSFER CASE

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MANUAL - NV1500

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MANUAL - NV1500

DESCRIPTION

The NV1500 is a medium-duty, 5-speed, constant mesh, fully synchronized manual transmission. The Transmission is available in vehicles equipped with a 2.4L engine.

The transmission gear case consists of two aluminum gear housings and a detachable clutch housing.

The mainshaft is supported by two sealed ball bearings, and the countershaft is supported by two tapered roller bearings. The transmission gears all rotate on caged type needle bearings. A roller bearing is used between the input and output shaft.

The Transmission has a single shaft shift mechanism with three shift forks all mounted on the shaft. The shaft is supported in the front and rear housings by bushings. Internal shift components consist of the forks, shaft, shift lever socket, and detent components.

The drain plug in on the bottom of the transmission and fill plug is on the side.

Identification bar code tags (Fig. 1) are located on each side of the transmission, below the shift tower. The tag located on the right side has the part number and the tag located on the left side has the build sequence and date information.

OPERATION

The driver selects a particular gear by moving the shift lever to the desired gear position. This movement moves the internal transmission shift components to begin the shift sequence. As the shift lever moves the selected shift rail, the shift fork attached to that rail begins to move. The fork is positioned in a groove in the outer circumference of the synchronizer sleeve. As the shift fork moves the synchronizer sleeve, the synchronizer begins to speed-up or slow down the selected gear (depending on whether we are up-shifting or down-shifting). The synchronizer does this by having the synchronizer hub splined to the mainshaft, or the countershaft in some cases, and moving the blocker ring into contact with the gear's friction cone. As the blocker ring and friction cone come together, the gear speed is brought up or down to the speed of the synchronizer. As the two speeds match, the splines on the inside of the synchronizer sleeve become aligned with the teeth on the blocker ring and the friction cone and eventually will slide over the teeth, locking the gear to the mainshaft, or countershaft, through the synchronizer.

MANUAL - NV1500 (Continued)

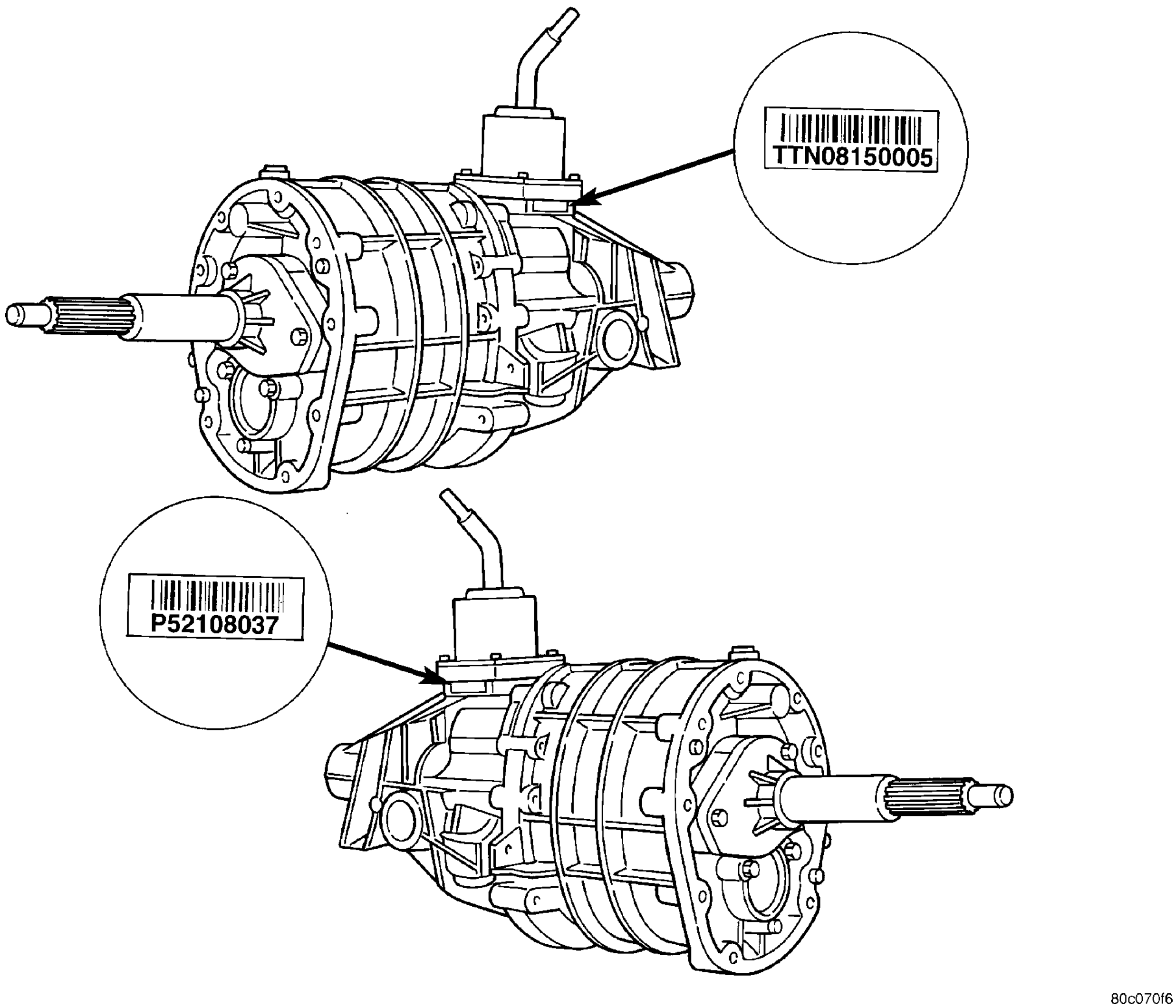


Fig. 1 NV1500 IDENTIFICATION

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing the disc to slip, grab, and/or chatter.

A correct lubricant level check can only be made when the vehicle is level. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an underfill or overfill condition. Always check the lubricant level after any addition of fluid to avoid an incorrect lubricant level condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper, or contaminated lubricants. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. If a leak goes undetected for an extended period, the first indications of component damage are usually hard shifting and noise.

Component damage, incorrect clutch adjustment, or a damaged clutch pressure plate or disc are additional probable causes of increased shift effort. Incor-

MANUAL - NV1500 (Continued)

rect adjustment or a worn/damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear–in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper, or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL

(1) Shift transmission into netural.

(2) Raise and support the vehicle.

(3) Remove skid plate if equipped.

(4) Remove wiring connectors from the transmission.

(5) Remove propeller shaft/shafts.

(6) Remove transfer case shift cable, vent hose and transfer case, if equipped.

(7) Remove slave cylinder from clutch housing.

(8) Remove starter.

(9) Support engine with jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(10) Support transmission with a trans jack.

(11) Remove crossover pipe from manifold extensions.

(12) Remove exhaust hanger from the transmission crossmember.

(13) Remove transmission dust shield.

(14) Remove transmission mount and crossmember.

(15) Lower trans jack enought to remove shift tower bolts (Fig. 2).

(16) Lower transmission jack and remove transmission from under vehicle.

(17) Pull transmission jack rearward (Fig. 3) until input shaft clears clutch.

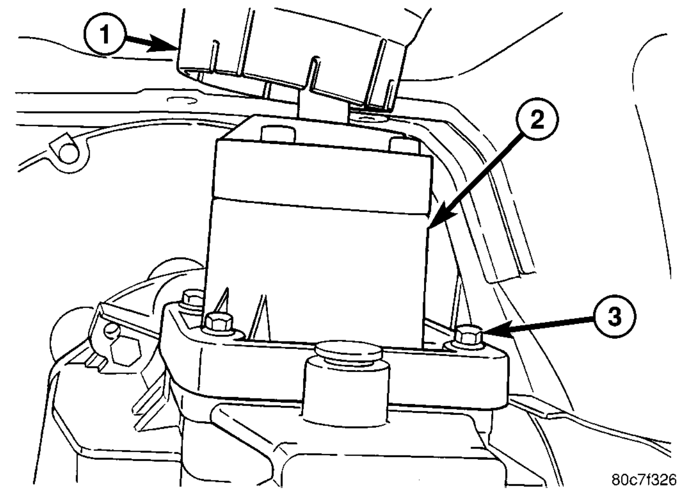


Fig. 2 SHIFT TOWER

1 - SHIFT TOWER BOOT
2 - SHIFT TOWER
3 - SHIFT TOWER BOLT (4)

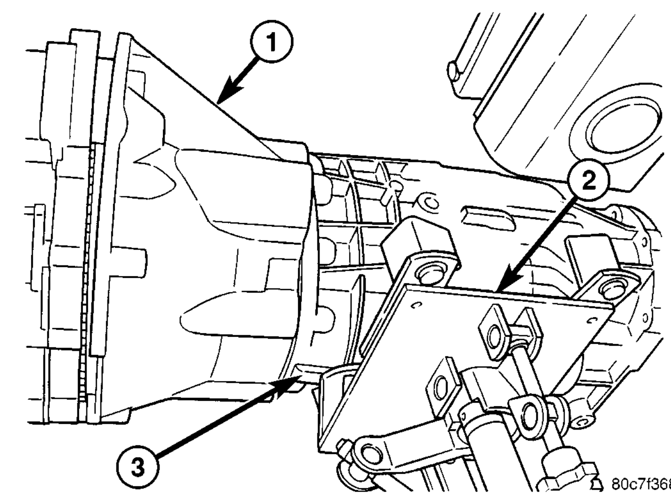


Fig. 3 TRANSMISSION ASSEMBLY

1 - CLUTCH HOUSING
2 - TRANSMISSION JACK
3 - TRANSMISSION

MANUAL - NV1500 (Continued)

(18) Remove clutch release bearing, release fork and retainer clip (Fig. 4).

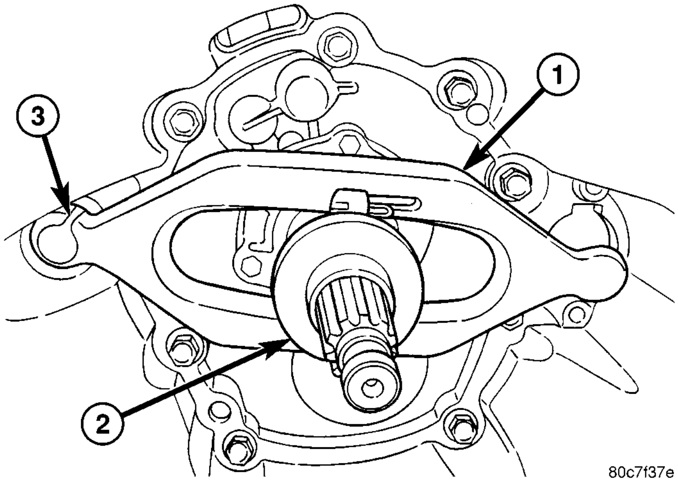


Fig. 4 CLUTCH RELEASE BEARING

1 - FORK
2 - BEARING
3 - CLIP

(19) Remove clutch housing from transmission.

DISASSEMBLY

FRONT HOUSING

(1) Shift transmission into Neutral.

(2) Remove drain plug and drain lubricant into a container.

(3) Remove backup light switch (Fig. 5).

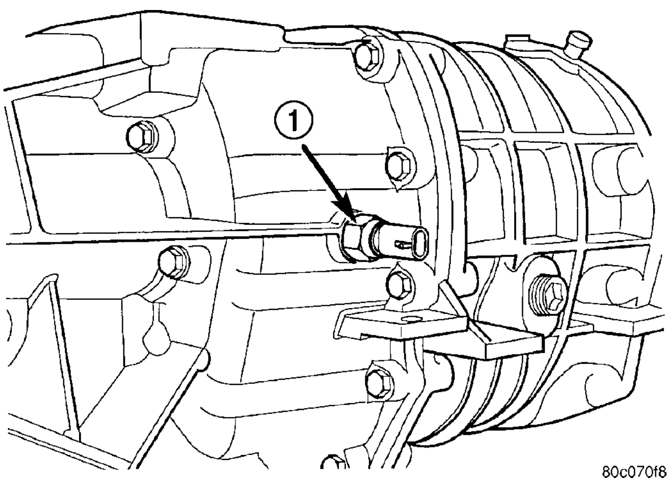


Fig. 5 BACKUP LIGHT SWITCH

1 - BACKUP LAMP SWITCH

(4) Remove shift tower bolts and remove tower and lever assembly (Fig. 6).

(5) Remove shift shaft lock bolt (Fig. 7). Bolt secures the shift shaft bushing and lever.

(6) Remove shift shaft detent plug with Remover 8117A (Fig. 8).

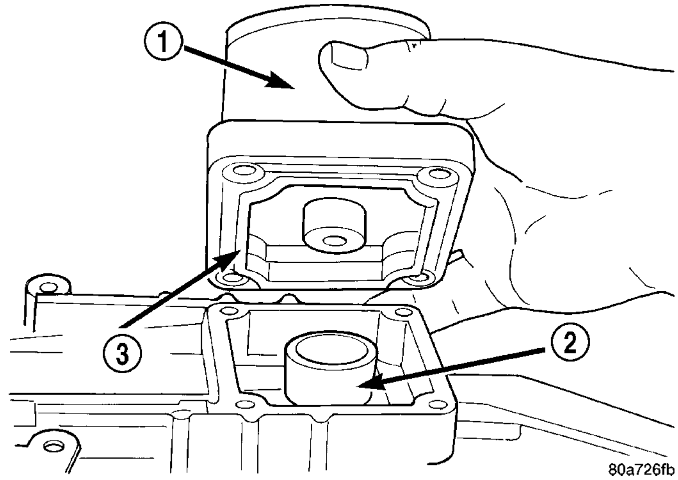


Fig. 6 SHIFT TOWER

1 - SHIFT TOWER AND LEVER ASSEMBLY
2 - SHIFT SOCKET
3 - SEAL

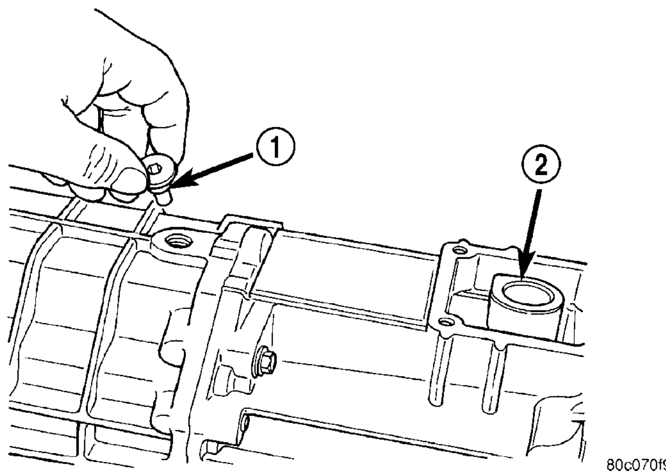


Fig. 7 SHIFT SHAFT BUSHING LOCK BOLT

1 - SHIFT SHAFT LOCK BOLT
2 - SHAFT SOCKET

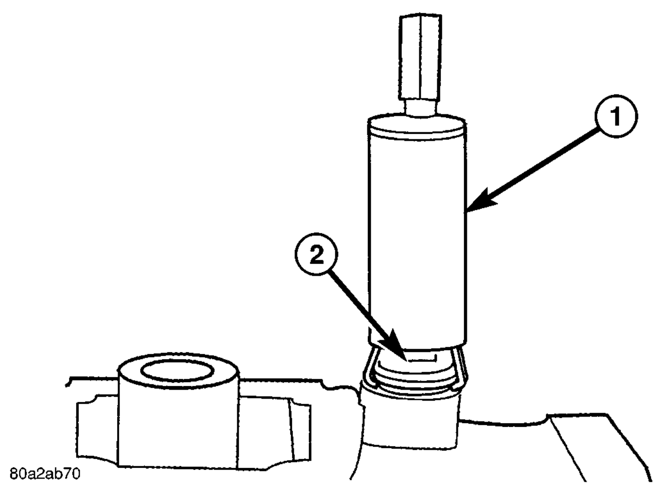


Fig. 8 DETENT PULLER

1 - REMOVER
2 - DETENT PLUG

MANUAL - NV1500 (Continued)

(7) Remove shift shaft detent plunger and spring with a pencil magnet.

(8) Remove input shaft bearing retainer bolts (Fig. 9).

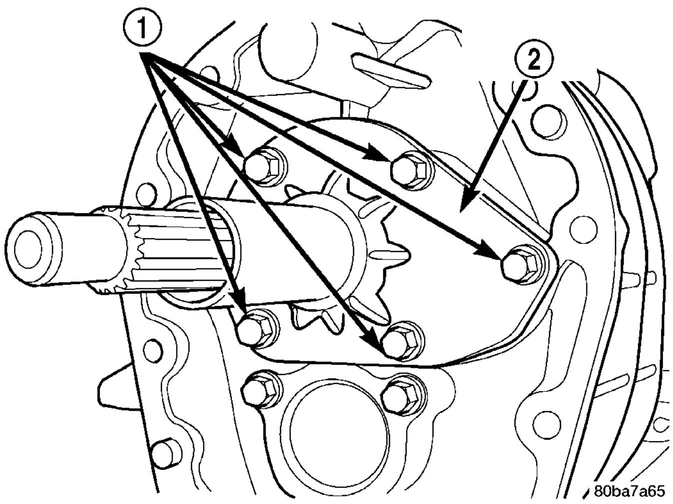


Fig. 9 BEARING RETAINER BOLTS

1 - BOLTS (5)
2 - BEARING RETAINER

(9) Remove bearing retainer from input shaft with a pry tool (Fig. 10).

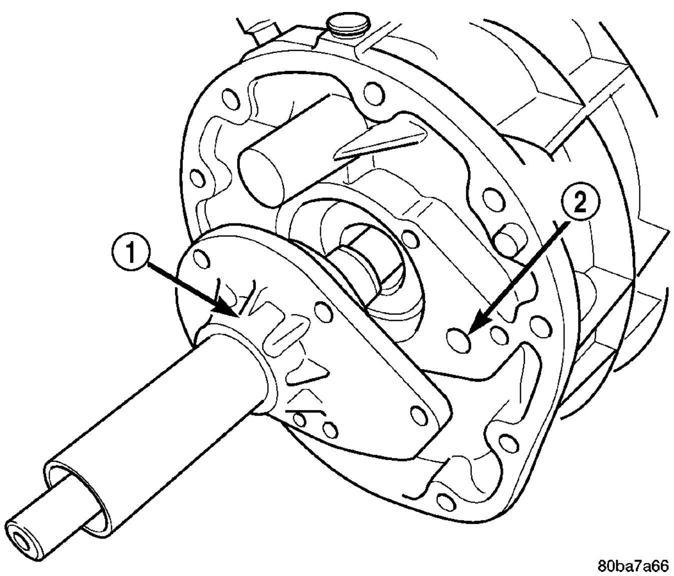


Fig. 10 INPUT SHAFT BEARING RETAINER

1 - BEARING RETAINER
2 - OIL FEED

(10) Remove snap ring securing input shaft in front bearing (Fig. 11).

(11) Remove front housing bolts (Fig. 12). Leave one bolt in place until geartrain is ready to be removed from case. Three bolts at the rear of housing are for the output shaft bearing retainer.

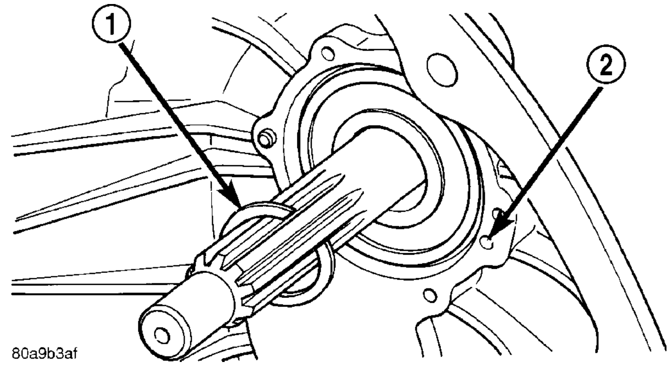


Fig. 11 INPUT SHAFT SNAP RING

1 - INPUT SHAFT SNAP RING
2 - OIL FEED

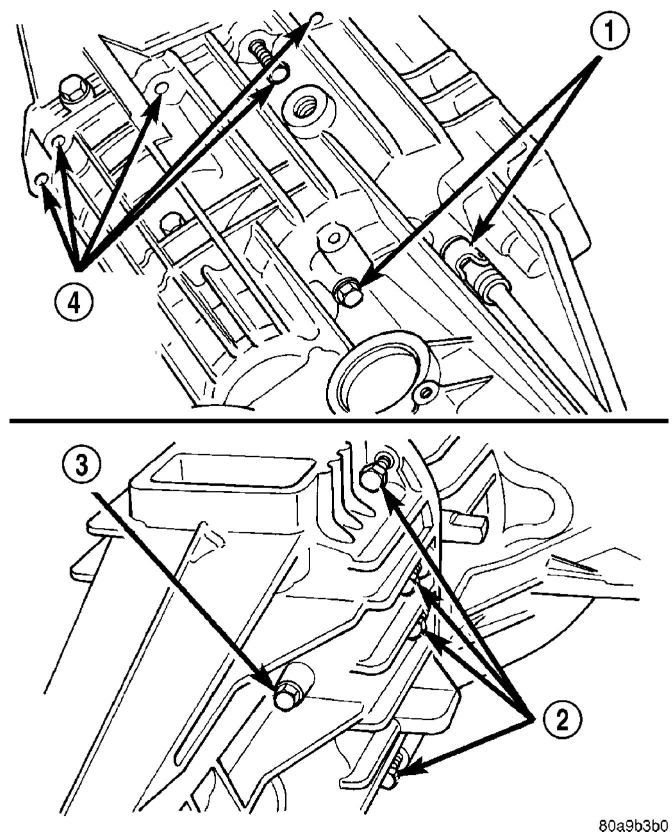


Fig. 12 HOUSING AND BEARING RETAINER BOL

1 - RETAINER BOLTS
2 - HOUSING BOLTS
3 - RETAINER BOLT
4 - HOUSING BOLT LOCATIONS

MANUAL - NV1500 (Continued)

(12) Tap front housing off alignment dowels with a plastic mallet and separate the housing.

(13) Remove input shaft bearing (Fig. 13).

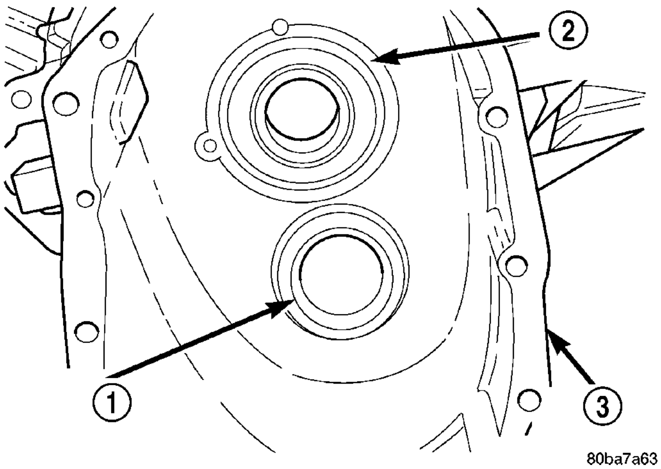


Fig. 13 INPUT SHAFT/COUNTERSHAFT BEARING

1 - COUNTERSHAFT FRONT BEARING RACE
2 - INPUT SHAFT BEARING
3 - FRONT HOUSING

(14) Note position of input shaft, shift shaft, forks, and geartrain components in housing (Fig. 14).

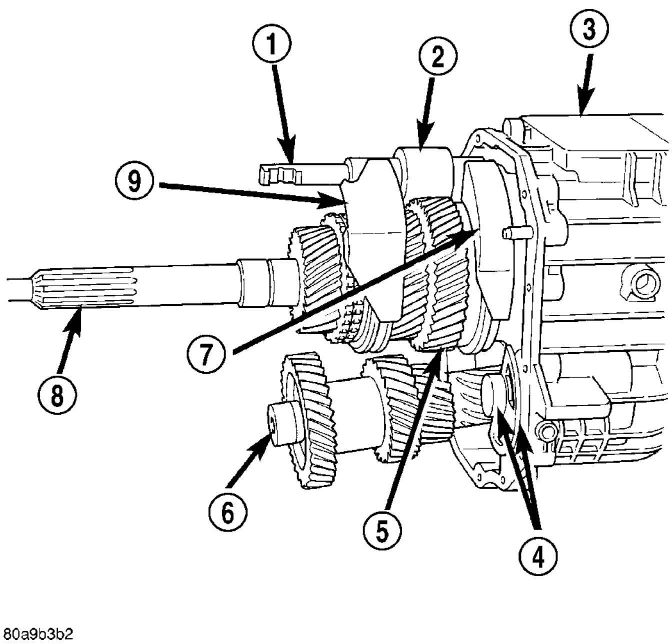


Fig. 14 GEARTRAIN AND SHIFT COMPONENT

1 - SHIFT SHAFT
2 - BUSHING
3 - REAR HOUSING
4 - REVERSE IDLER AND SUPPORT
5 - OUTPUT SHAFT AND GEARS
6 - COUNTERSHAFT
7 - 1-2 FORK
8 - INPUT SHAFT
9 - 3-4 FORK

SHIFT SHAFT, SHIFT FORKS AND REVERSE IDLER

(1) Drive out roll pin that secures shift bushing and lever to shift shaft with a hammer and punch (Fig. 15).

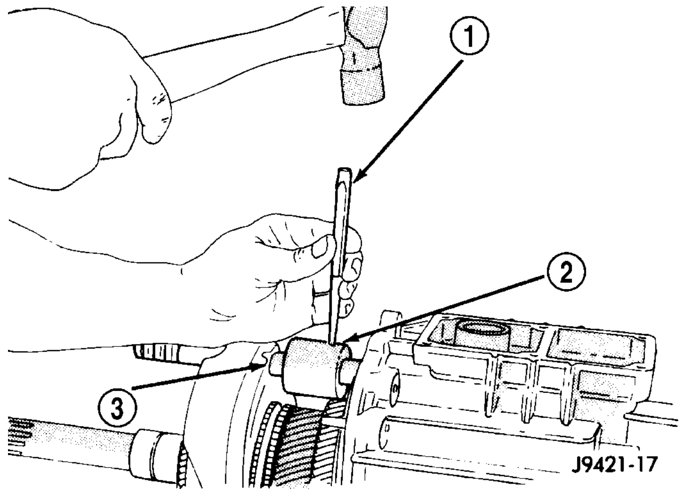


Fig. 15 SHIFT SHAFT LEVER & BUSHING ROLL PIN

1 - PIN PUNCH
2 - BUSHING AND LEVER
3 - SHIFT SHAFT

(2) Position shift socket off to the side so roll pin removal does not interfere with gears.

(3) Drive out shift socket roll pin with a hammer and punch.

NOTE: Use proper size punch to prevent damage to the shift shaft.

(4) Pull shift shaft straight out of rear housing and shift forks (Fig. 16).

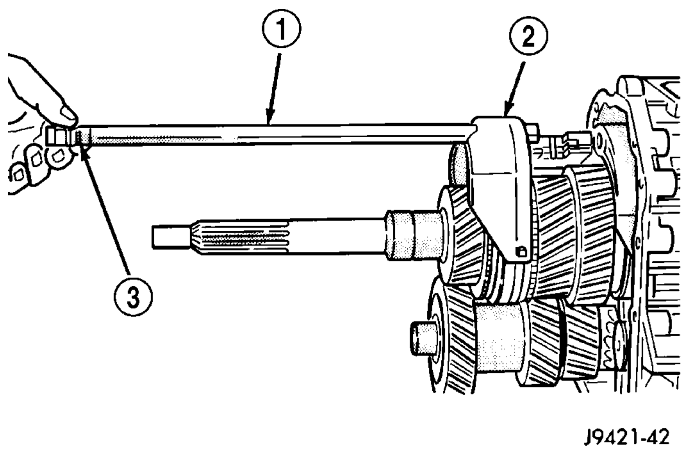


Fig. 16 SHIFT SHAFT

1 - SHIFT SHAFT
2 - 3-4 FORK
3 - SHAFT DETENT NOTCHES

MANUAL - NV1500 (Continued)

(5) Remove shift socket from rear housing (Fig. 17).

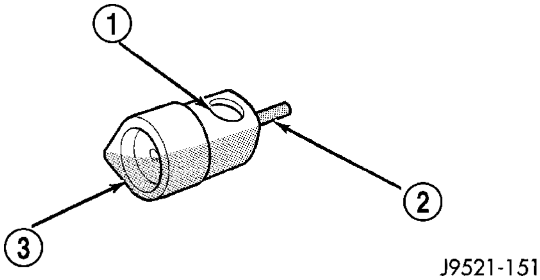


Fig. 17 SHIFT SOCKET AND ROLL PIN

1 - SHAFT BORE
2 - ROLL PIN
3 - SHIFT SOCKET

(6) Remove lever and bushing (Fig. 18).

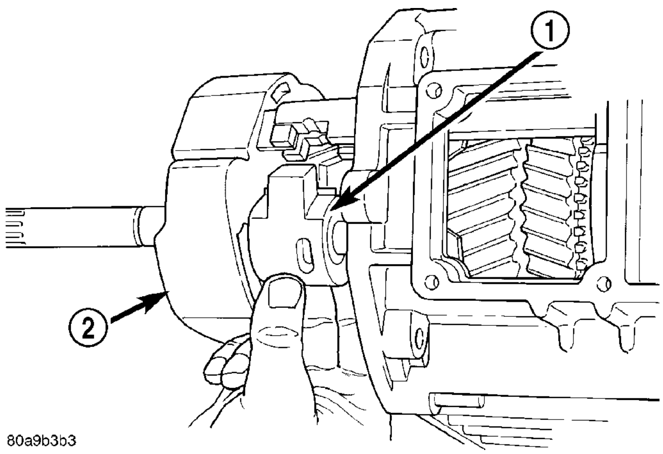


Fig. 18 SHIFT SHAFT LEVER AND BUSHING

1 - SHAFT LEVER AND BUSHING
2 - 3-4 FORK

(7) Rotate 3-4 fork around synchro sleeve until fork clears shift arms on 1-2 and fifth-reverse forks, then remove 3-4 fork (Fig. 19).

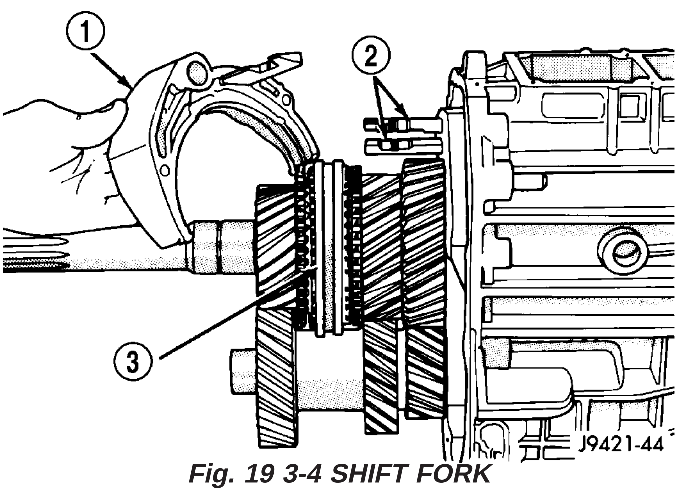


Fig. 19 3-4 SHIFT FORK

1 - 3-4 FORK
2 - 1-2 AND 5TH-REVERSE FORK ARMS
3 - 3-4 SYNCHRO SLEEVE

(8) Remove front reverse idler shaft support bolt and loosen rear bolt (Fig. 20).

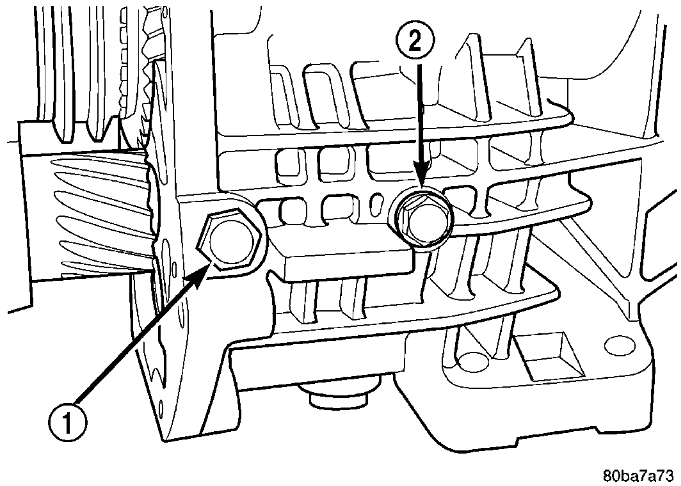


Fig. 20 REVERSE IDLER SHAFT/SUPPORT BOLT

1 - SUPPORT BOLT
2 - SHAFT BOLT

(9) Remove reverse idler shaft support by sliding it straight out of housing.

(10) Remove rear reverse idler shaft bolt.

(11) Remove reverse idler shaft, idler gear, bearing and thrust washer (Fig. 21).

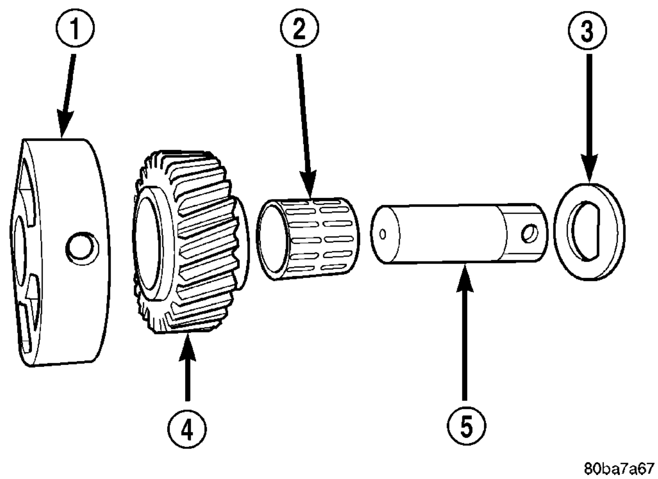


Fig. 21 REVERSE IDLER ASSEMBLY

1 - SUPPORT
2 - BEARING
3 - WASHER
4 - GEAR
5 - SHAFT

MANUAL - NV1500 (Continued)

GEARTRAIN

(1) Remove output shaft bearing retainer bolts. Bolts are rear of shift tower opening on 2WD (Fig. 22). Bolts are inside the rear housing on 4WD (Fig. 23).

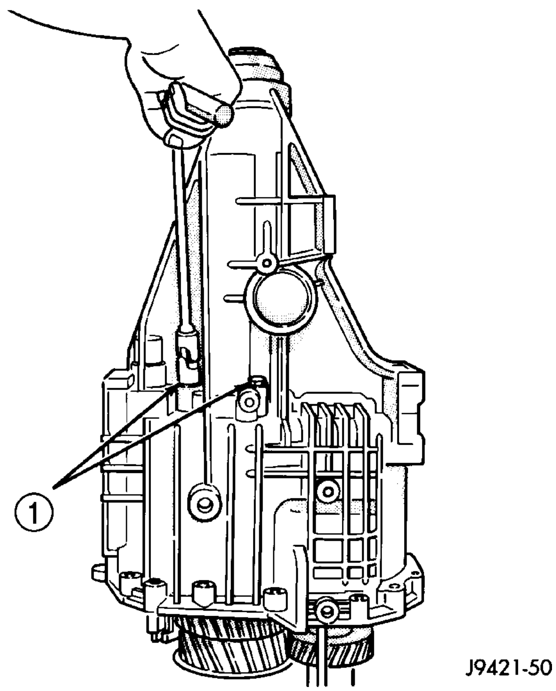


Fig. 22 BEARING RETAINER BOLTS 2WD

1 - OUTPUT SHAFT BEARING RETAINER BOLTS (THIRD BOLT AT OPPOSITE SIDE OF CASE)

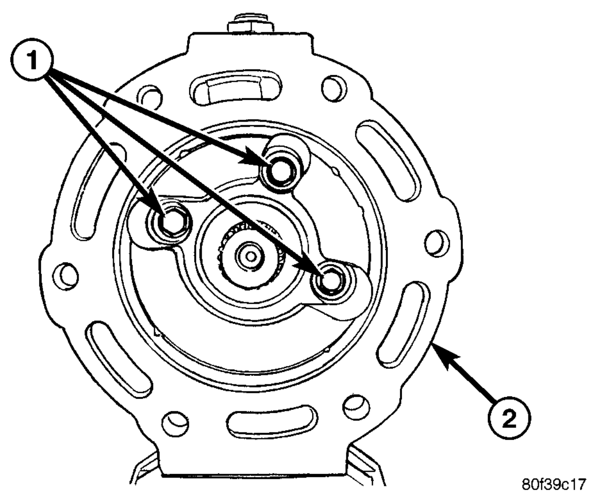


Fig. 23 BEARING RETAINER BOLTS 4WD

1 - BEARING RETAINER BOLT
2 - REAR HOUSING

(2) Hold geartrain while lifting rear housing off (Fig. 24) and (Fig. 25).

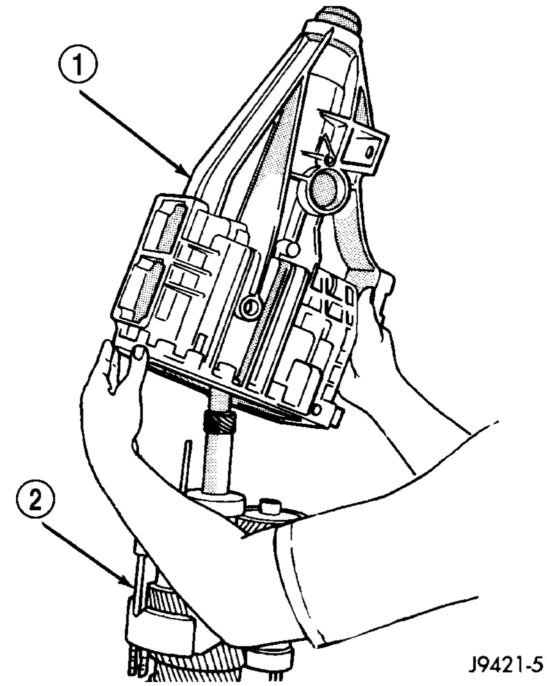


Fig. 24 REAR HOUSING 2WD

1 - REAR HOUSING
2 - SHIFT FORKS AND GEARTRAIN

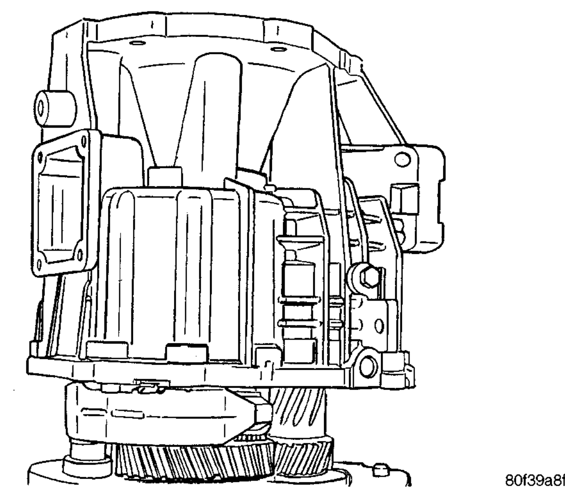


Fig. 25 REAR HOUSING 4WD

GEARTRAIN

(1) Remove 1-2 and fifth-reverse forks from synchro sleeves.
(2) Separate countershaft from mainshaft.
(3) Separate input shaft from output shaft.

COUNTERSHAFT

(1) Remove countershaft front and rear bearing with Puller 8356.

MANUAL - NV1500 (Continued)

(2) Remove rear bearing race (in rear housing) with Bearing Race Remover L-4454. Install new race with Driver C-4656 and Driver Handle C-4171.

(3) Remove bearing shim cap from front housing (below input shaft bearing retainer). Remove shim. Drive race through and out of housing with Driver C-4656 and Driver Handle C-4171. Install new race into housing from outside. **Do not drive all the way into position. Tightening the shim cap will install the race to the proper position.** Install shim and shim cap and torque cap bolts to 28.5 N·m (21 ft. lbs.).

OUTPUT SHAFT

NOTE: Synchronizer hubs and sleeves are different. Remove synchronizer unit as an assembly to avoid intermixing parts. Mark each synchro hub and sleeve for assembly reference.

(1) Remove snap ring that secures 3-4 synchro hub on output shaft.

(2) Remove 3-4 synchro assembly, third gear synchro ring and third gear with a shop press and Splitter 1130. Position splitter between second and third gears.

(3) Remove third gear needle bearing (Fig. 26).

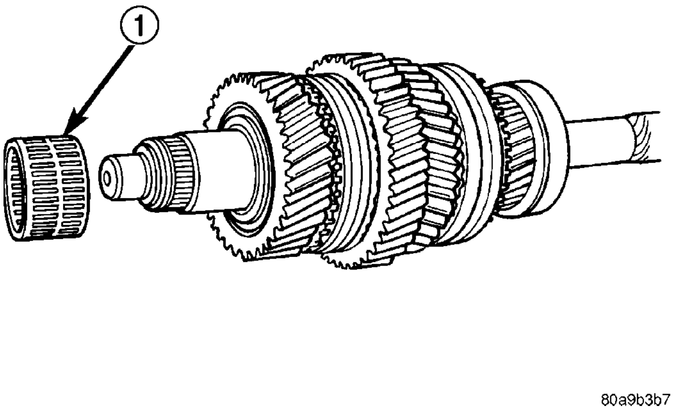


Fig. 26 THIRD GEAR NEEDLE BEARING

1 - THIRD GEAR NEEDLE BEARING

(4) Remove retaining ring that secures two-piece thrust washer on shaft.

(5) Remove two-piece thrust washer (Fig. 27). Note position of washer locating lugs in shaft notches for installation reference.

(6) Remove second gear and needle bearing (Fig. 28).

(7) Remove 2nd-3rd gear thrust washer locating pin.

(8) Remove second gear synchro ring and synchro cone.

(9) Remove 1-2 synchro hub snap ring.

(10) Remove 1-2 synchro hub and sleeve and first gear from output shaft with shop press and Splitter 1130 (Fig. 29). Position splitter between first and reverse gears.

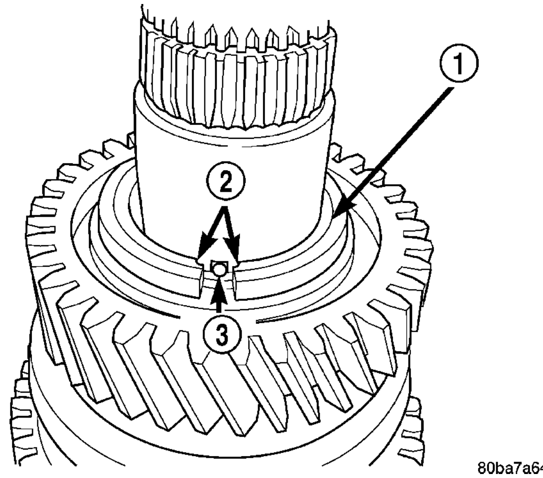


Fig. 27 TWO-PIECE THRUST WASH

1 - WASHER (2 HALVES)
2 - PIN RELIEF
3 - PIN

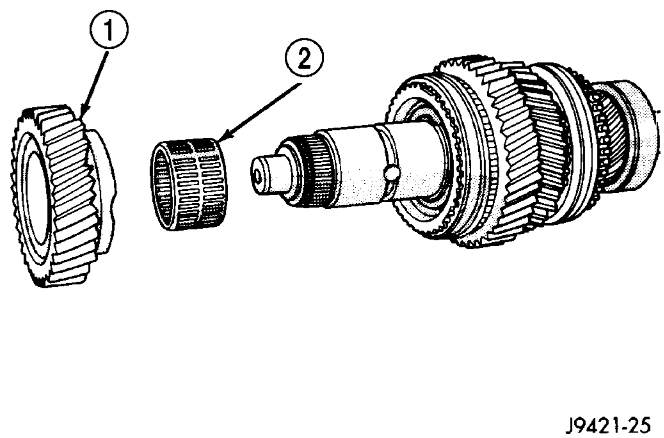


Fig. 28 SECOND GEAR AND NEEDLE BEARING

1 - SECOND GEAR
2 - SECOND GEAR NEEDLE BEARING

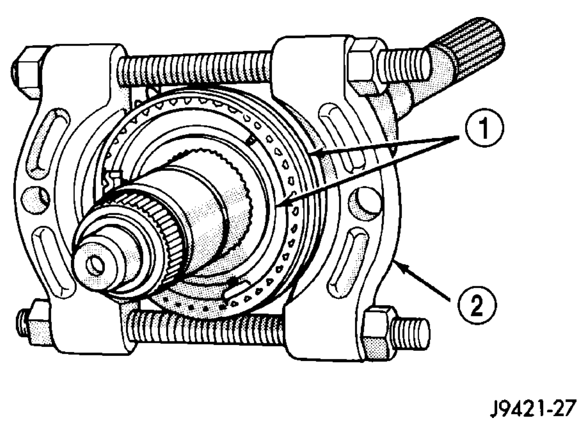


Fig. 29 1-2 SYNCHRO HUB AND SLEEVE

1 - 1-2 SYNCHRO HUB AND SLEEVE
2 - BEARING SPLITTER

MANUAL - NV1500 (Continued)

(11) Remove first gear needle bearing (Fig. 30).

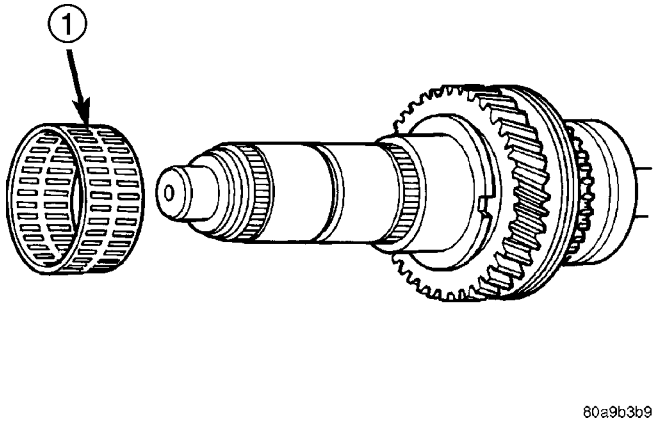


Fig. 30 FIRST GEAR NEEDLE BEARING

1 - FIRST GEAR NEEDLE BEARING

(12) Remove output shaft bearing snap ring (Fig. 31).

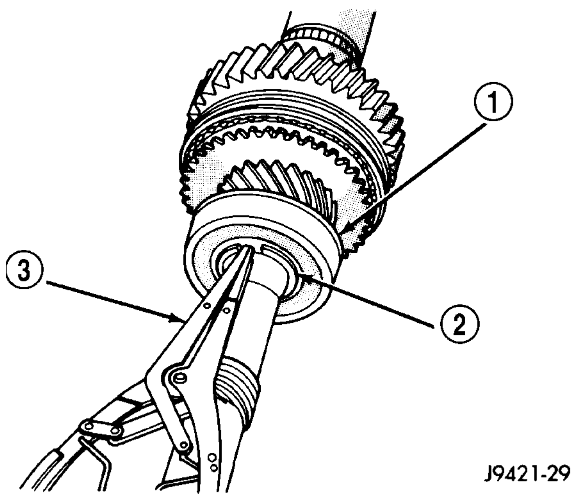


Fig. 31 OUTPUT SHAFT BEARING SNAP RING

1 - OUTPUT SHAFT BEARING
2 - BEARING SNAP RING
3 - SNAP RING PLIERS

(13) Remove output shaft bearing from shaft with shop press and Splitter 1130. Position splitter between bearing and fifth gear.

(14) Remove fifth gear (Fig. 32).

(15) Remove fifth gear needle bearing. Spread bearing apart just enough to clear shoulder on output shaft (Fig. 33).

(16) Remove fifth-reverse synchro hub snap ring (Fig. 34).

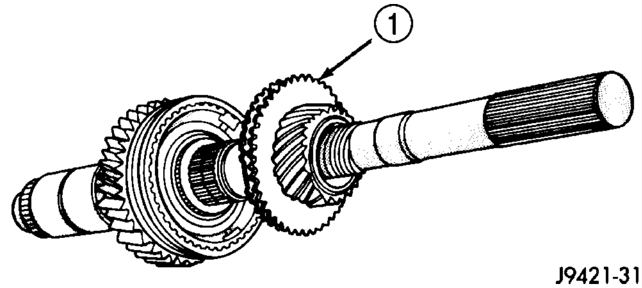


Fig. 32 FIFTH GEAR

1 - FIFTH GEAR AND SYNCHRO RING

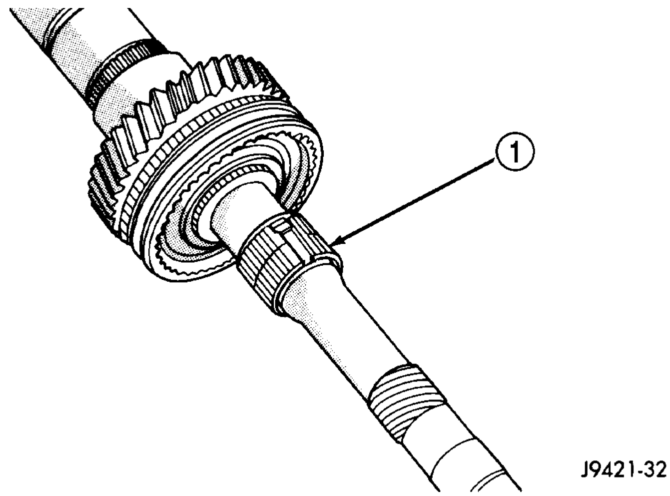


Fig. 33 FIFTH GEAR NEEDLE BEARING

1 - FIFTH GEAR NEEDLE BEARING

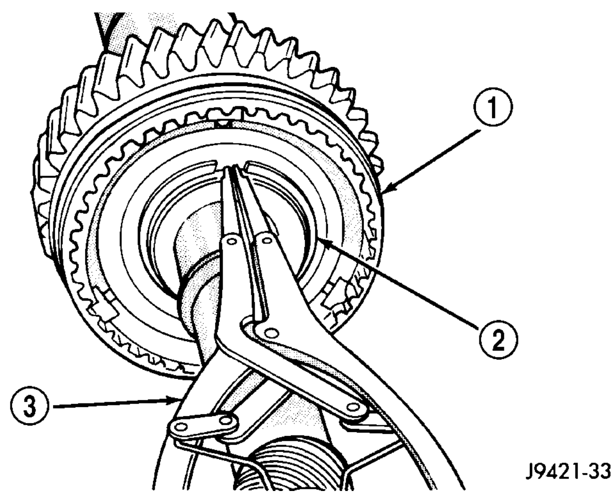


Fig. 34 FIFTH REVERSE SYNCHRO HUB SNAP RING

1 - FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
2 - SYNCHRO HUB SNAP RING
3 - SNAP RING PLIERS

MANUAL - NV1500 (Continued)

(17) Remove fifth-reverse synchro hub and sleeve with shop press (Fig. 35).

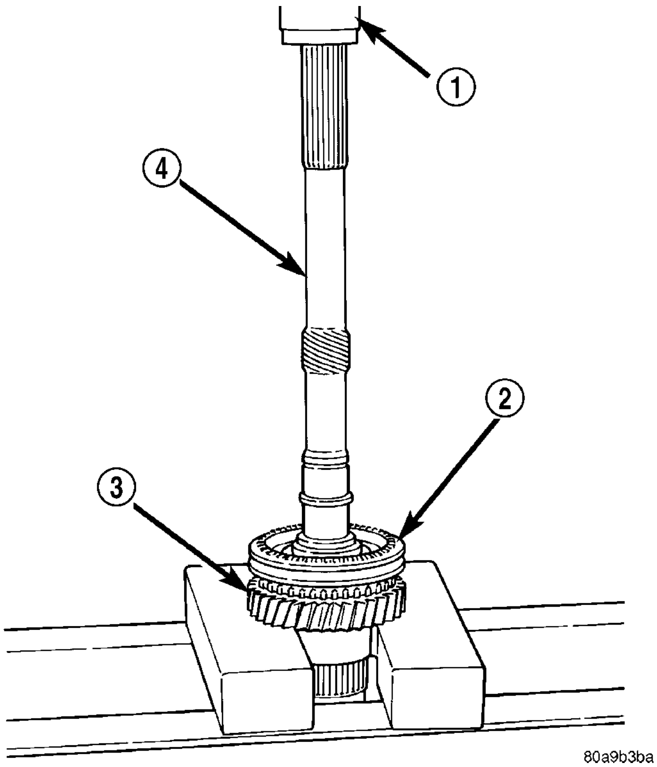


Fig. 35 FIFTH-REVERSE SYNCHRO HUB AND SLEEVE

1 - PRESS
2 - FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
3 - REVERSE GEAR
4 - OUTPUT SHAFT

(18) Remove reverse gear and needle bearing (Fig. 36).

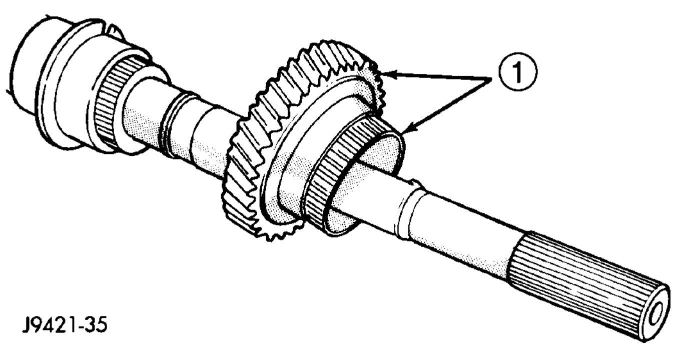


Fig. 36 REVERSE GEAR AND NEEDLE BEARING

1 - REVERSE GEAR AND NEEDLE BEARING

CLEANING

Clean the gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean the shaft bearings with a mild solvent such as Mopar® degreasing solvent, Gunk, or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry, or wipe them dry with clean shop towels.

INSPECTION

NOTE: Minor nicks on the surface can be smoothed off with 320/420 grit emery cloth and final polished with oil coated crocus cloth.

SHIFT LEVER ASSEMBLY

The shift lever assembly is not serviceable. Replace the lever and shift tower as an assembly if the tower, lever, lever ball or internal components are worn or damaged.

SHIFT SHAFT AND FORKS

Inspect the shift fork interlock arms and synchro sleeve contact surfaces (Fig. 37). Replace any fork exhibiting wear or damage in these areas. Do not attempt to salvage shift forks.

Check condition of the shift shaft detent plunger and spring. The plunger should be smooth and free of nicks or scores. Replace the plunger and spring if in doubt about condition. Check condition of detent plunger bushings. Replace if damaged.

Inspect the shift shaft, shift shaft bushing and bearing. The shaft lever and the lever bushing that fits over the lever. Replace the shaft if bent, cracked or severely scored. Replace the shift shaft bushing or bearing if damaged.

Replace the shaft lever and bushing if either part is deformed or worn. Do not attempt to salvage these parts as shift fork binding will occur. Replace the roll pin that secures the lever to the shaft.

FRONT/REAR HOUSINGS AND BEARING RETAINERS

Clean the gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean the shaft bearings with a mild solvent such as Mopar degreasing solvent, Gunk or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

Inspect the housings carefully for cracks, stripped threads, scored mating surfaces, damaged bearing bores or worn dowel pin holes.

MANUAL - NV1500 (Continued)

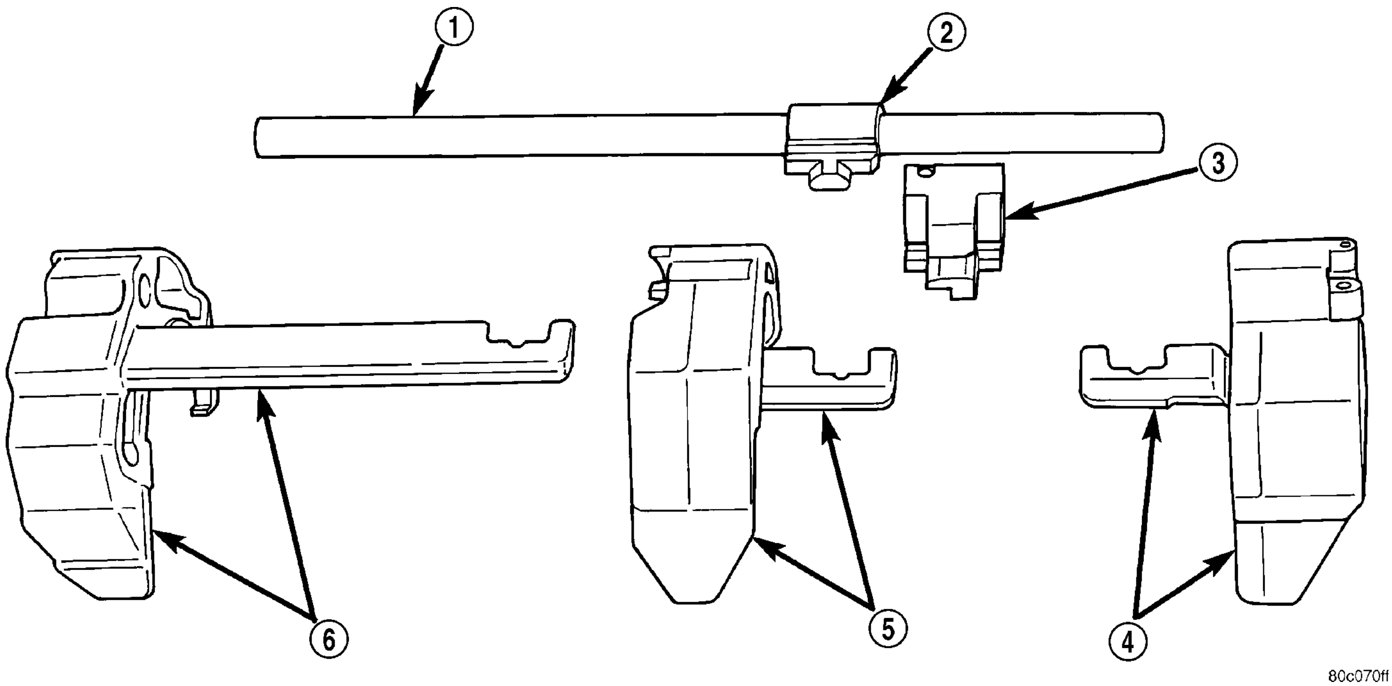


Fig. 37 SHIFT FORKS AND SHAFT

1 - SHIFT SHAFT
2 - SHAFT LEVER
3 - SHAFT LEVER BUSHING
4 - 3-4 SHIFT FORK
5 - 1-2 SHIFT FORK
6 - FIFTH-REVERSE SHIFT FORK

NOTE: The front housing contains the countershaft front bearing race. The rear housing contains the countershaft rear bearing race. If a countershaft bearing failure results, the bearing races must be replaced also.

Inspect input shaft bearing retainer. Be sure the release bearing slide surface of the retainer is in good condition. Replace the retainer seal if necessary.

Inspect output shaft bearing retainer. Be sure the U-shaped retainer is flat and free of distortion. Replace the retainer if the threads are damaged or if the retainer is bent or cracked.

COUNTERSHAFT BEARINGS AND RACES

The countershaft bearings are standard tapered roller bearings with matching races. The races are pressed into the front and rear housings. Inspect countershaft bearings and races for abnormal wear or damage.

REVERSE IDLER COMPONENTS

Inspect idler gear, bearing, shaft, thrust washer and support for excessive wear or failure (Fig. 38). Replace bearing if any of the needle bearing rollers are worn, chipped, cracked, flat-spotted or brinnelled. Also replace the bearing if the plastic bearing cage is damaged or distorted.

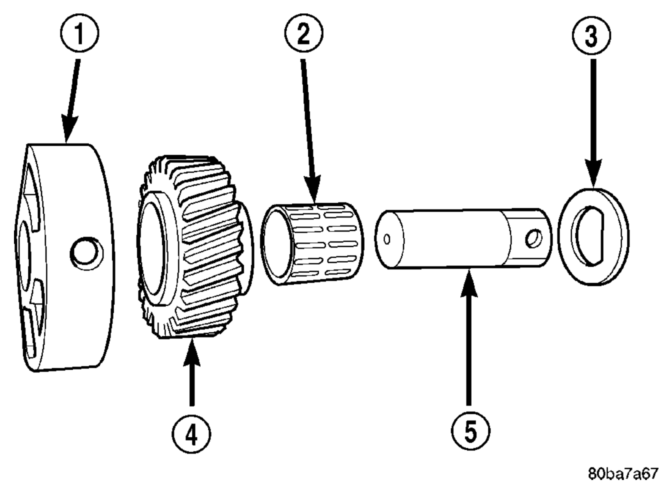


Fig. 38 REVERSE IDLER ASSEMBLY

1 - SUPPORT
2 - BEARING
3 - WASHER
4 - GEAR
5 - SHAFT

Replace thrust washer, if cracked, chipped or worn. Replace idler gear if the teeth are chipped, cracked or worn thin. Replace shaft if worn, scored or the bolt threads are damaged beyond repair. Replace support segment if cracked or chipped and replace the idler attaching bolts if the threads are damaged.

MANUAL - NV1500 (Continued)

Shift Socket

Inspect shift socket for wear or damage. Replace socket if the roll pin or shift shaft bores are damaged. Replace socket if the ball seat is worn, or cracked. Do not reuse the original shift socket roll pin. The socket roll pin is approximately is approximately 33 mm (1-1/4 in.) long.

Output Shaft And Geartrain

Inspect all gears for worn, cracked, chipped or broken teeth. Check condition of the bearing bore in each gear. The bores should be smooth and free of surface damage. Discoloration of the gear bores is a normal occurrence and is not a reason for replacement. Replace gears only when tooth damage has occurred or if the bores are brinnelled or severely scored.

Inspect shaft splines and bearings surfaces. Replace the shaft if the splines are damaged or bearing surfaces are deeply scored, worn or brinnelled.

ASSEMBLY

SYNCHRONIZER

NOTE: The easiest method of assembling each synchro is to install the springs, struts and detent balls one at a time.

(1) Slide the sleeve part way onto the hub. Leave enough room to install the spring in the hub and the strut in the hub groove.

(2) Install first spring in the hub and then install a strut over the spring. Verify spring is seated in the spring bore in the strut.

(3) Slide the sleeve onto the hub just far enough to hold the first strut and spring in place.

(4) Place detent ball in the top of the strut. Then work the sleeve over the ball to hold it in place. Use a small flat blade screwdriver to press the ball into place while moving the sleeve over it.

(5) Repeat procedure for the remaining springs, struts and balls. Tape or rubber band each strut and ball temporarily as they are installed.

(6) Verify the three springs, struts and detent balls are all in place (Fig. 39).

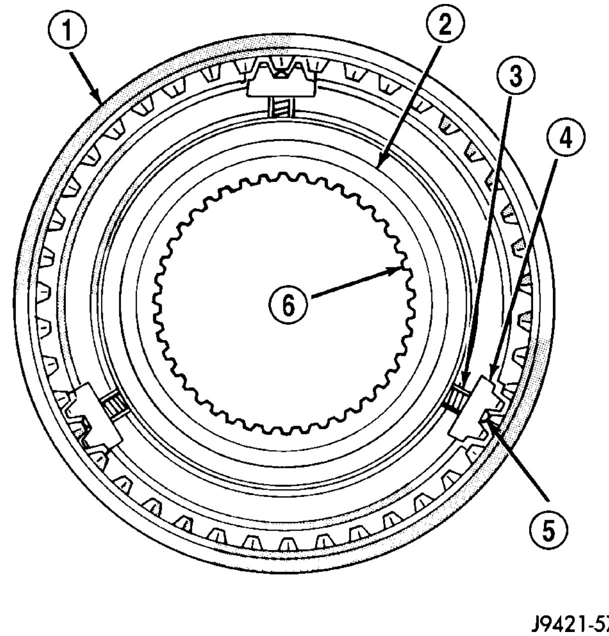


Fig. 39 ASSEMBLED SYNCHRO COMPONENTS

1 - SLEEVE
2 - HUB SHOULDER
3 - SPRING (3)
4 - STRUT (3)
5 - DETENT BALL (3)
6 - HUB

OUTPUT SHAFT

NOTE: Lubricate shaft, gears and bearings with recommended lubricant and immerse each synchro ring in lubricant before installation. Petroleum jelly can be used to hold parts in place.

(1) Install reverse gear needle bearing on shaft (Fig. 40). Slide bearing up against shoulder on output shaft.

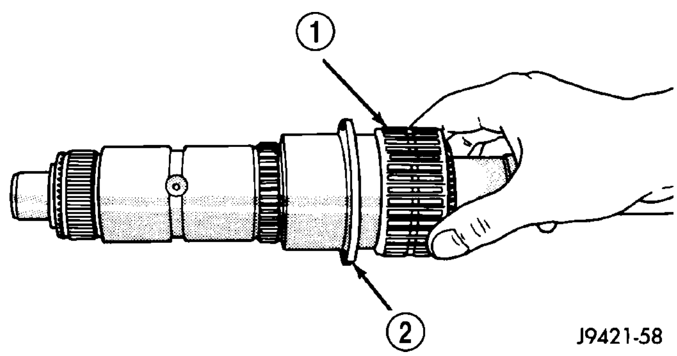


Fig. 40 REVERSE GEAR BEARING

1 - REVERSE GEAR BEARING
2 - SHOULDER

MANUAL - NV1500 (Continued)

(2) Install reverse gear over needle bearing (Fig. 41).

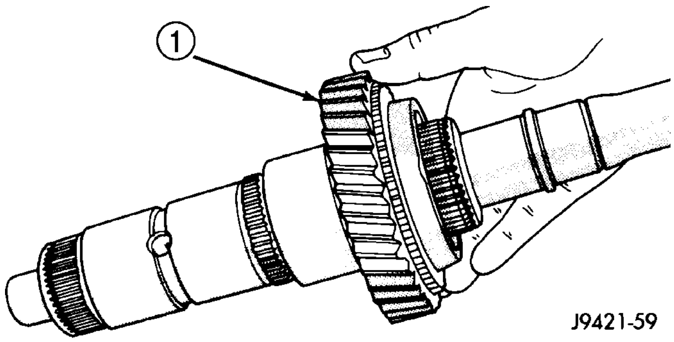


Fig. 41 REVERSE GEAR

1 - REVERSE GEAR

(3) Install solid brass synchro ring on reverse gear (Fig. 42).

NOTE: This synchro ring is different than all the rest. The angle on the friction face is 9° versus the 6.5° of all the other synchro rings.

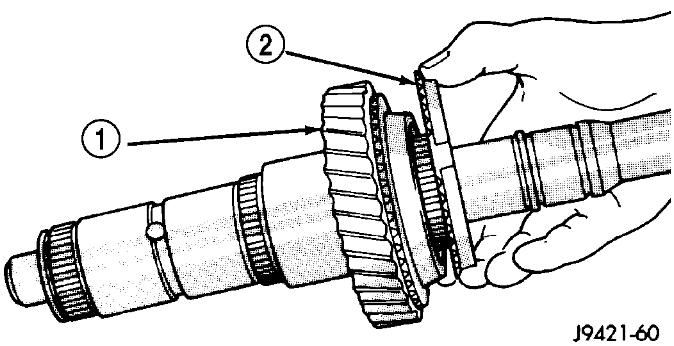


Fig. 42 REVERSE GEAR SYNCHRO RING

1 - REVERSE GEAR
2 - SYNCHRO RING (SOLID BRASS)

(4) Start fifth-reverse synchro assembly on output shaft splines by hand. Then seat synchro onto shaft with shop press and Cup 6310-1 (Fig. 43).

CAUTION: Fifth-reverse synchro hub and sleeve can be installed backwards. One side of the sleeve has double grooves and offset teeth. This side must be installed away from reverse gear (towards 5th).

NOTE: The synchro hub is a press fit design. There may be instances where the press is not necessary. As long as there is a snug fit between the hub and the shaft, the hub does not need to be replaced.

(5) Install **new** fifth-reverse hub snap ring (Fig. 44) and verify snap ring is seated in the shaft groove.

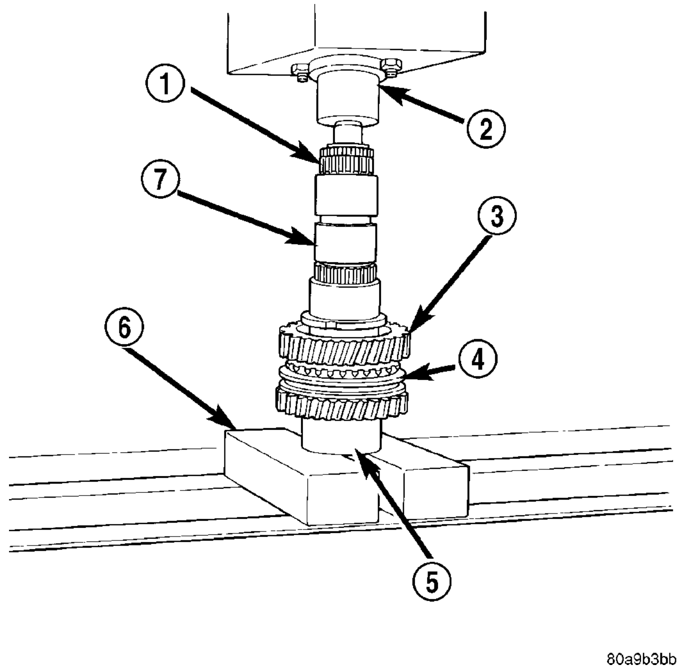


Fig. 43 FIFTH-REVERSE SYNCHRO ASSEMBLY

1 - SPACER
2 - PRESS RAM
3 - REVERSE GEAR
4 - FIFTH-REVERSE SYNCHRO ASSEMBLY
5 - CUP
6 - PRESS BLOCKS
7 - OUTPUT SHAFT

NOTE: Install thickest snap ring that will fit in shaft groove.

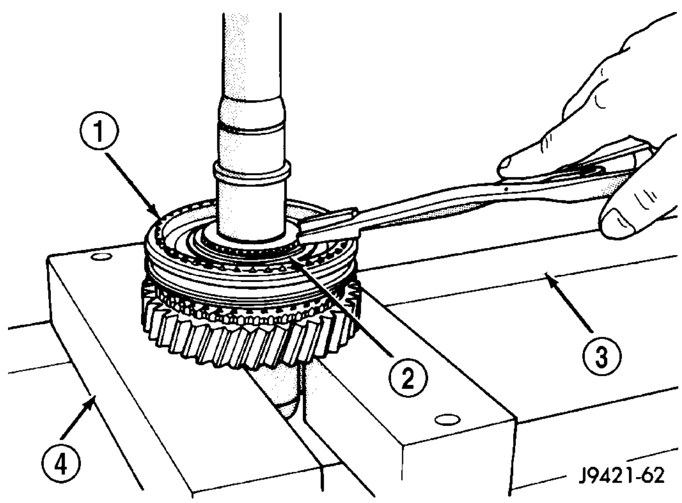


Fig. 44 FIFTH-REVERSE SYNCHRO HUB SNAP RING

1 - FIFTH-REVERSE SYNCHRO ASSEMBLY
2 - SNAP RING
3 - PRESS BED
4 - PRESS BLOCKS

MANUAL - NV1500 (Continued)

(6) Install fifth gear synchro ring in synchro hub and sleeve (Fig. 45).

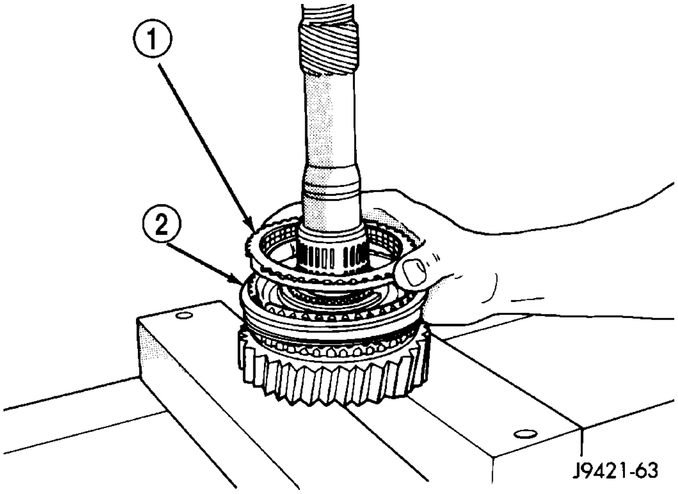


Fig. 45 FIFTH GEAR SYNCHRO RING

1 - FIFTH-SPEED SYNCHRO RING
2 - FIFTH-REVERSE SYNCHRO ASSEMBLY

(7) Install fifth gear bearing, spreading bearing only enough to clear shoulder on output shaft (Fig. 46). Verify bearing is seated.

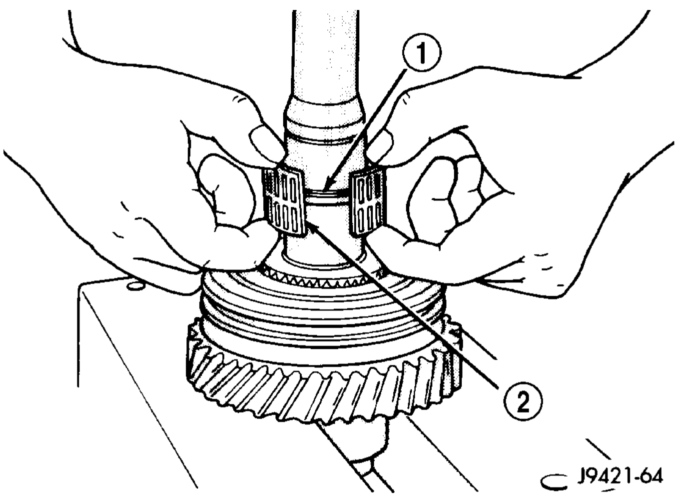


Fig. 46 FIFTH GEAR BEARING

1 - SHAFT SHOULDER
2 - FIFTH GEAR BEARING

(8) Install fifth gear on shaft and onto bearing (Fig. 47).

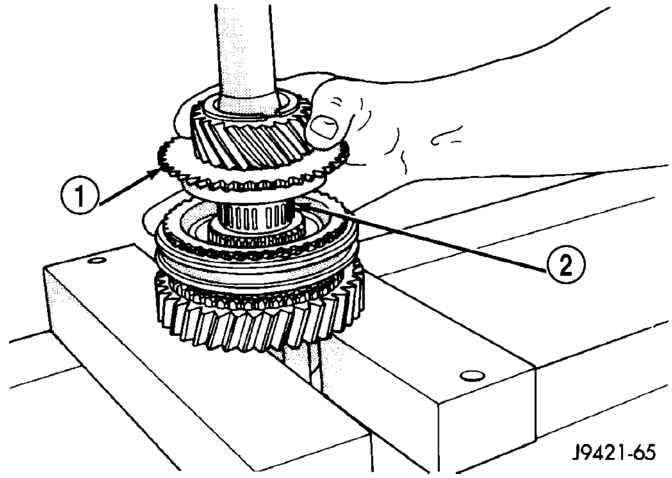


Fig. 47 FIFTH GEAR

1 - FIFTH GEAR
2 - BEARING

(9) Install output shaft bearing.

(10) Install output shaft bearing snap ring, spread snap ring only enough to install it (Fig. 48). Verify snap ring is seated in shaft groove.

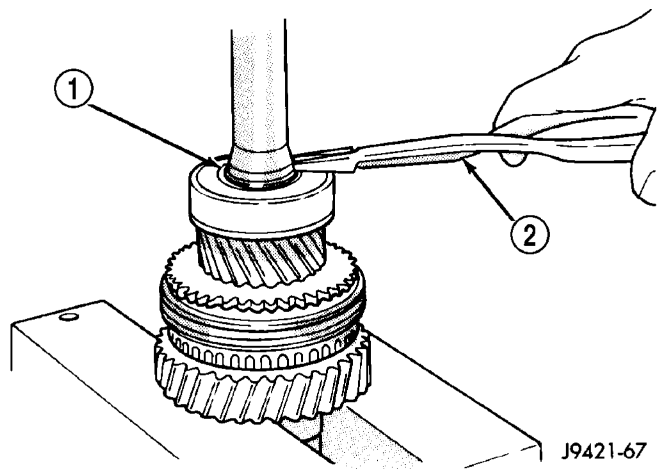


Fig. 48 OUTPUT SHAFT BEARING

1 - BEARING SNAP RING
2 - HEAVY DUTY SNAP RING PLIERS

MANUAL - NV1500 (Continued)

(11) Invert output shaft and set the shaft in Cup 6310-1 so that fifth gear is seated on the tool (Fig. 49).

(12) Install first gear bearing on output shaft (Fig. 49). Verify bearing is seated on shaft shoulder and is properly joined.

(13) Install synchro cone onto first gear. Verify synchro cone locating tabs are properly located to the recesses in first gear.

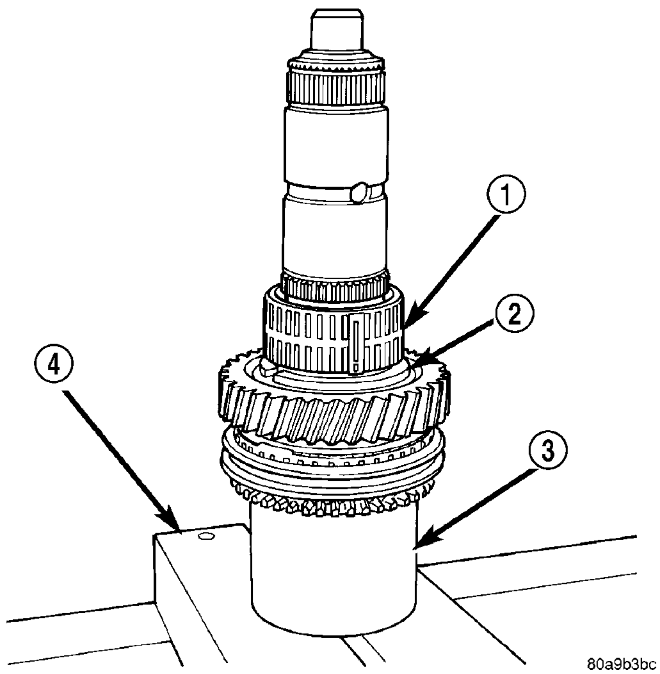


Fig. 49 FIRST GEAR BEARING

1 - FIRST GEAR BEARING
2 - SHAFT SHOULDER
3 - CUP
4 - PRESS BLOCKS

(14) Install first gear on shaft and over bearing with bearing synchro cone facing up (Fig. 50).

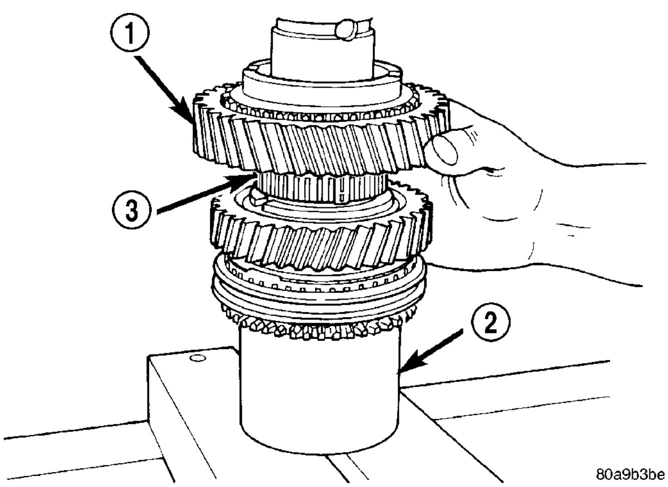


Fig. 50 FIRST GEAR

1 - FIRST GEAR
2 - CUP
3 - BEARING

(15) Install first gear synchro ring (Fig. 51).

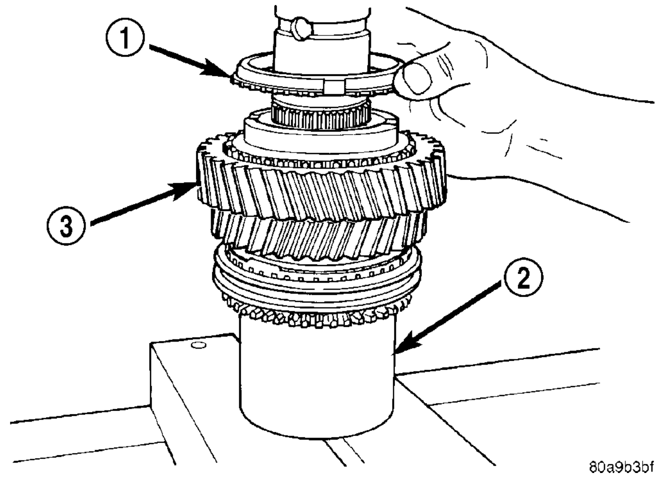


Fig. 51 FIRST GEAR SYNCHRO RING

1 - FIRST GEAR SYNCHRO RING
2 - CUP
3 - FIRST GEAR

(16) Start 1-2 synchro assembly on shaft by hand (Fig. 52). Be sure synchro sleeve is properly positioned.

CAUTION: The 1-2 synchro hub and sleeve can be installed backwards. One side of the sleeve has a groove and offset teeth. This side must be installed towards 1st gear (away from 2nd gear).

NOTE: The synchro hub is a press fit design. There may be instances where the press is not necessary. As long as there is a snug fit between the hub and the shaft, the hub does not need to be replaced.

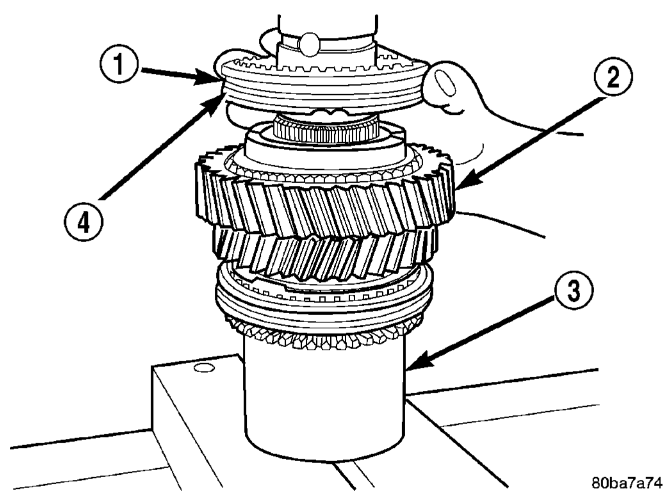


Fig. 52 START 1-2 SYNCHRO ON SHAFT

1 - 1-2 SYNCHRO ASSEMBLY
2 - FIRST GEAR
3 - CUP
4 - SINGLE GROOVE SIDE OF SYNCHRO SLEEVE

MANUAL - NV1500 (Continued)

(17) Press 1-2 synchro onto output shaft with suitable size pipe and shop press (Fig. 53).

CAUTION: Align synchro ring and sleeve as hub is being pressed onto the shaft. The synchro ring can be cracked if it becomes misaligned.

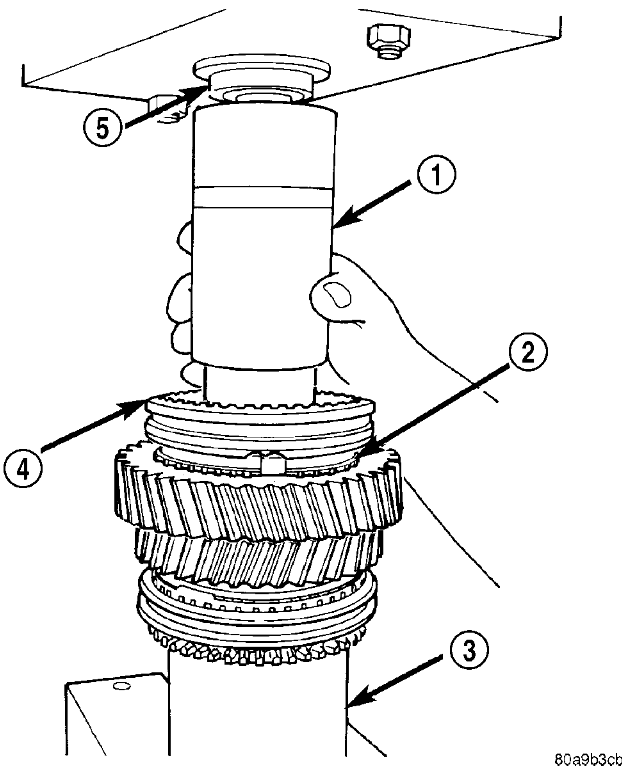


Fig. 53 PRESS 1-2 SYNCHRO ASSEMBLY

1 - SUITABLE SIZE PIPE TOOL
2 - SYNCHRO RING
3 - CUP
4 - 1-2 SYNCHRO ASSEMBLY
5 - PRESS RAM

(18) Install **new** 1-2 synchro hub snap ring (Fig. 54) with the thickest snap ring that will fit in shaft groove. Verify snap ring is seated in shaft groove.

(19) Install second gear synchro ring in 1-2 synchro hub and sleeve (Fig. 55). Verify synchro ring is seated in sleeve.

(20) Install synchro cone into synchro ring.

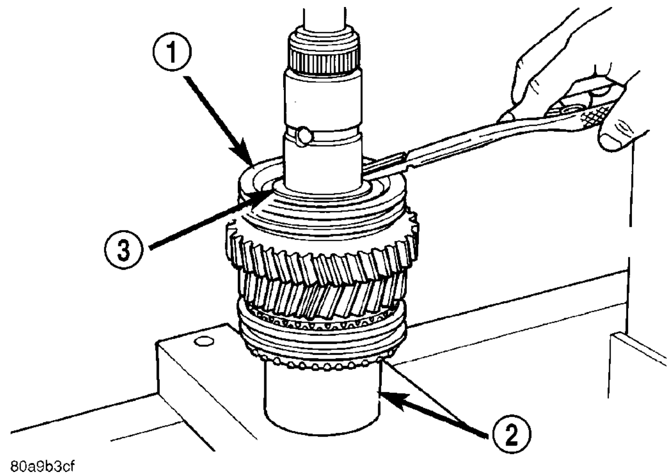


Fig. 54 1-2 SYNCHRO HUB SNAP RING

1 - 1-2 SYNCHRO
2 - CUP
3 - SYNCHRO SNAP RING

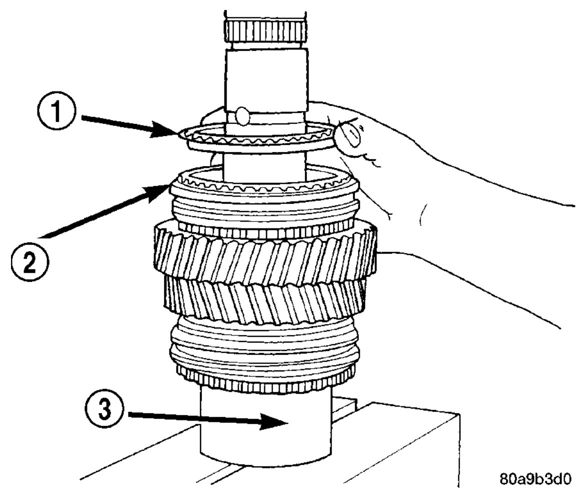


Fig. 55 SECOND GEAR SYNCHRO RING

1 - SECOND GEAR SYNCHRO RING
2 - 1-2 SYNCHRO
3 - CUP

MANUAL - NV1500 (Continued)

(21) Install second gear needle bearing on shaft (Fig. 56).

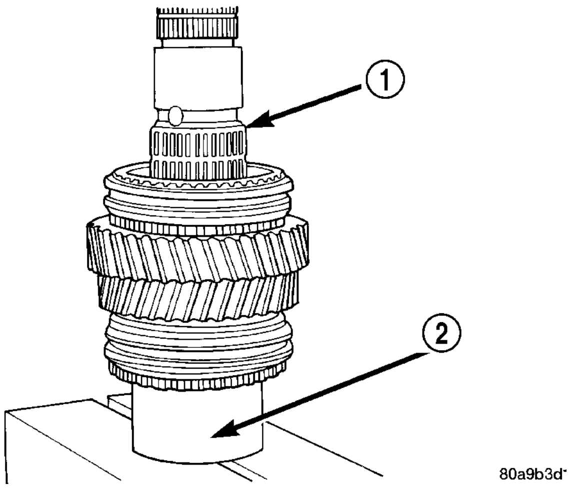


Fig. 56 SECOND GEAR BEARING

1 - SECOND GEAR BEARING
2 - CUP

(22) Install second gear onto shaft and bearing (Fig. 57). Verify second gear is seated on synchro components.

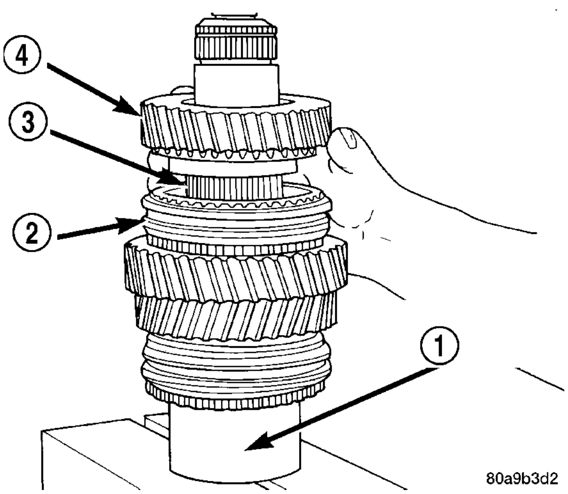


Fig. 57 SECOND GEAR

1 - CUP
2 - 1-2 SYNCHRO ASSEMBLY
3 - BEARING
4 - SECOND GEAR

(23) Install thrust washer pin to shaft and install two-piece thrust washer (Fig. 58). Verify washer halves are seated in shaft groove and pin reliefs are positioned at washer locating pin.

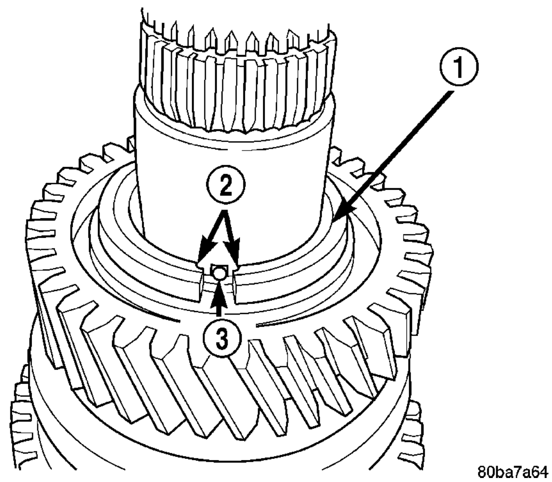


Fig. 58 TWO-PIECE THRUST WASH

1 - WASHER (2 HALVES)
2 - PIN RELIEF
3 - PIN

(24) Seat retaining ring around two-piece thrust washer.

(25) Install third gear needle bearing on shaft (Fig. 59).

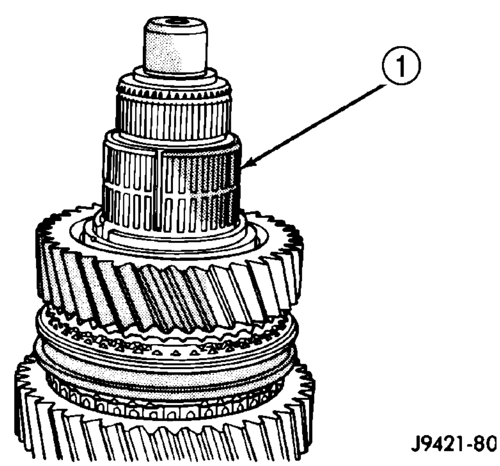


Fig. 59 THIRD GEAR BEARING

1 - THIRD GEAR BEARING

MANUAL - NV1500 (Continued)

(26) Install third gear on shaft and bearing (Fig. 60).

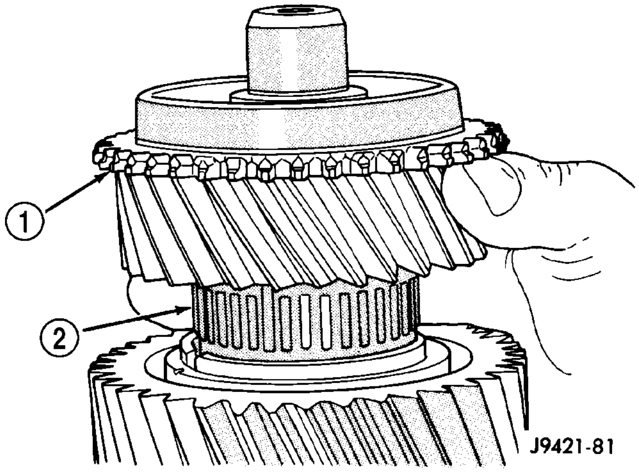


Fig. 60 THIRD GEAR

1 - THIRD GEAR
2 - BEARING

(27) Install third speed synchro ring on third gear (Fig. 61).

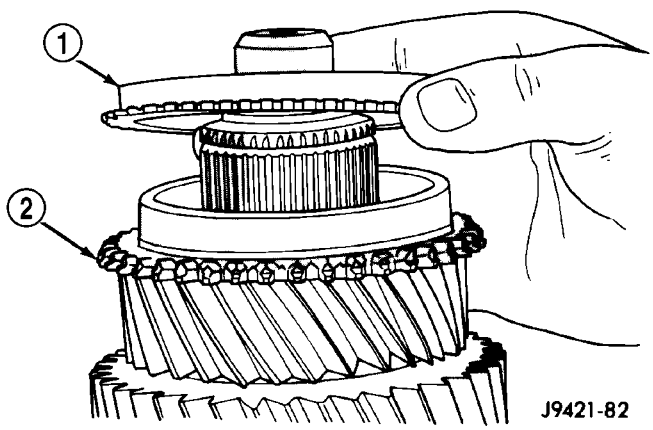


Fig. 61 THIRD SPEED SYNCHRO RING

1 - THIRD SPEED SYNCHRO RING
2 - THIRD GEAR

(28) Start 3-4 synchro hub on output shaft splines by hand (Fig. 62).

CAUTION: The 3-4 synchro hub and sleeve can be installed backwards. One side of the sleeve has two grooves and offset teeth. This side must be installed towards 3rd gear (away from 4th gear).

NOTE: The synchro hub is a press fit design. There may be instances where the press is not necessary. As long as there is a snug fit between the hub and the shaft, the hub does not need to be replaced.

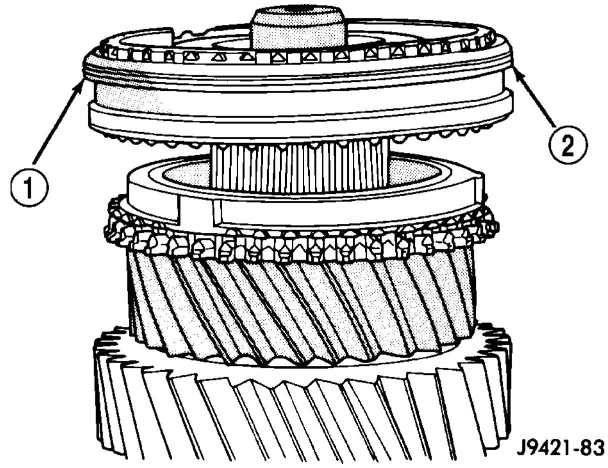


Fig. 62 START 3-4 SYNCHRO HUB ON OUTPUT SHAFT

1 - GROOVED SIDE OF SLEEVE (TO FRONT)
2 - 3-4 SYNCHRO ASSEMBLY

(29) Press 3-4 synchro assembly onto output shaft with shop press and suitable size pipe tool (Fig. 63). Press tool must be as close to the hub center as possible but not contacting the shaft splines.

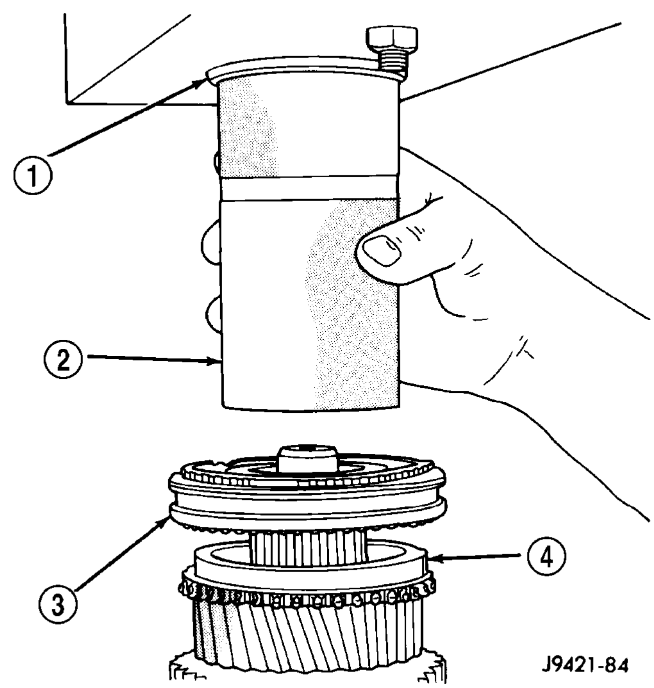


Fig. 63 3-4 SYNCHRO ASSEMBLY ON SHAFT

1 - PRESS RAM
2 - PIPE TOOL
3 - 3-4 SYNCHRO
4 - THIRD SPEED SYNCHRO RING

MANUAL - NV1500 (Continued)

(30) Install 3-4 synchro hub **new** snap ring (Fig. 64) with thickest snap ring that will fit in shaft groove. Verify snap ring is seated in groove.

(31) Verify position of synchro sleeves before proceeding (Fig. 65).

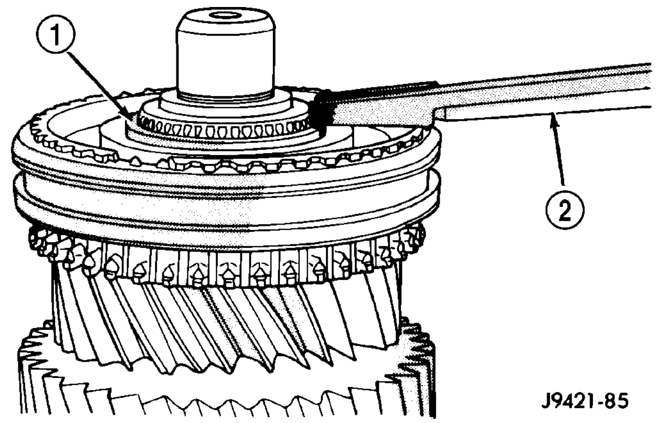


Fig. 64 3-4 SYNCHRO HUB SNAP RING

1 - 3-4 SYNCHRO HUB SNAP RING
2 - HEAVY DUTY SNAP RING PLIERS

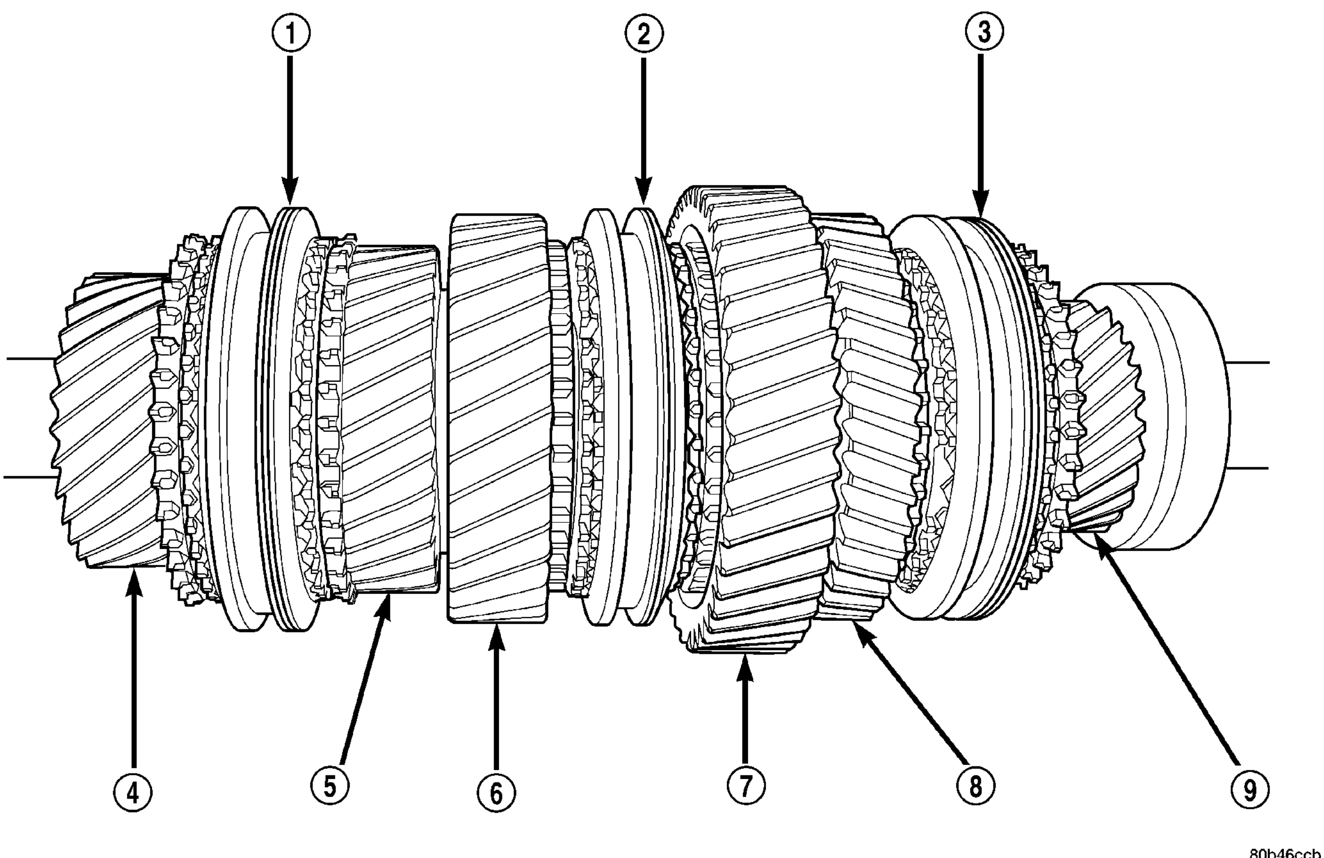


Fig. 65 SYNCHRO SLEEVE POSITION

1 - 2 GROOVES
2 - 1 GROOVE
3 - 2 GROOVES
4 - FOURTH GEAR
5 - THIRD GEAR
6 - SECOND GEAR
7 - FIRST GEAR
8 - REVERSE GEAR
9 - FIFTH GEAR

MANUAL - NV1500 (Continued)

GEARTRAIN

(1) Install input shaft into Support Stand 8355 (Fig. 66).

(2) Install pilot bearing in input shaft (Fig. 66).

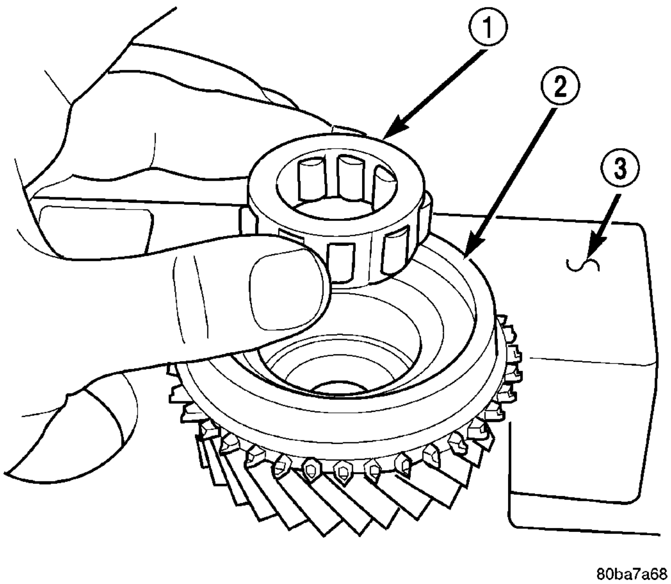


Fig. 66 INPUT SHAFT AND PILOT BEARING

1 - PILOT BEARING
2 - INPUT SHAFT
3 - STAND

(3) Install fourth gear synchro ring on input shaft (Fig. 67).

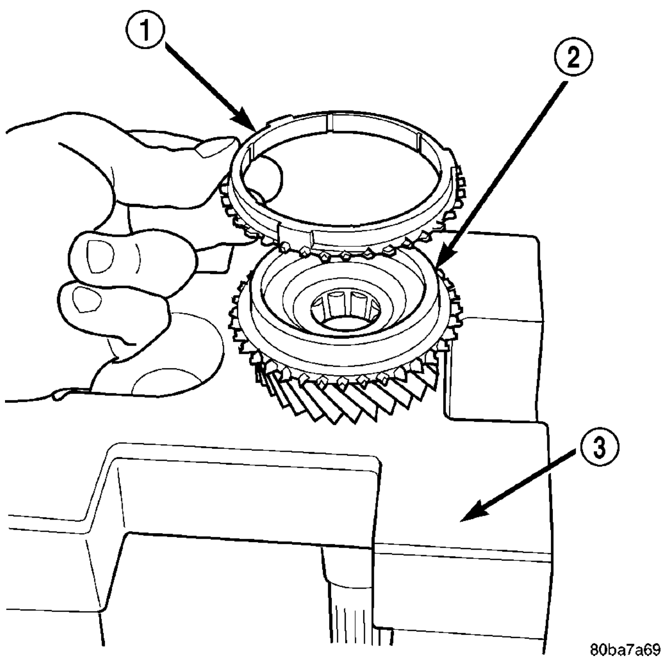


Fig. 67 FOURTH GEAR SYNCHRO RING ON INPUT SHAFT

1 - FOURTH GEAR SYNCHRO RING
2 - INPUT SHAFT
3 - STAND

(4) Install assembled output shaft and geartrain in input shaft (Fig. 68). Rotate output shaft until the 3-4 synchro ring seats in synchro hub and sleeve.

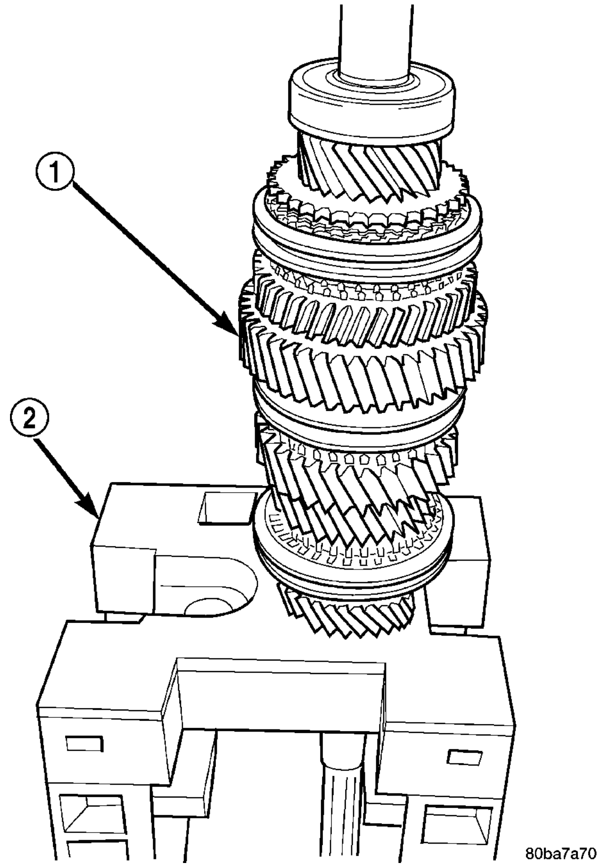


Fig. 68 MAINSHAFT ON SUPPORT STAND

1 - MAIN SHAFT
2 - SUPPORT STAND

MANUAL - NV1500 (Continued)

(5) Slide countershaft into fixture slot. Verify countershaft and output shaft gears are fully meshed with the mainshaft gears (Fig. 69).

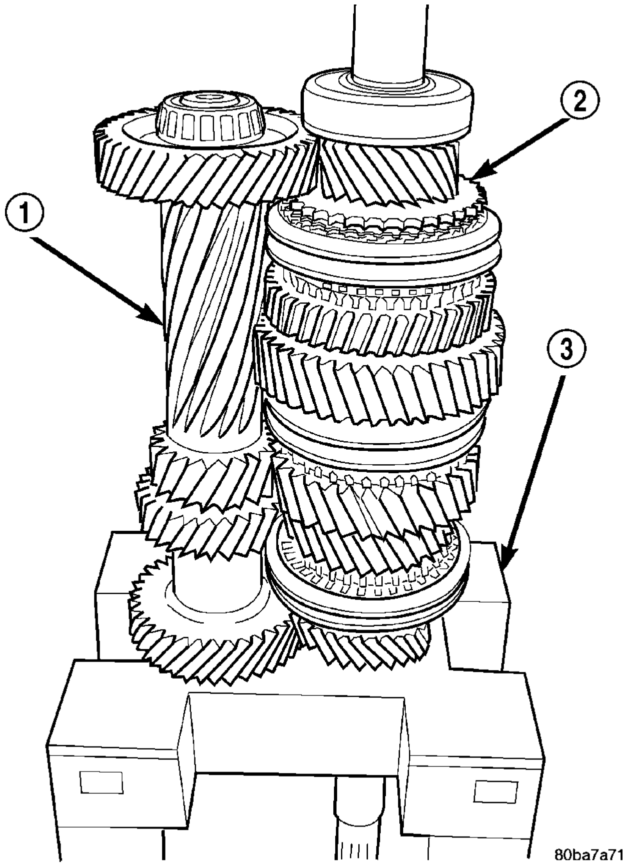


Fig. 69 COUNTERSHAFT ON SUPPORT STAND

1 - COUNTER SHAFT
2 - MAIN SHAFT
3 - SUPPORT STAND

(6) Thread one Pilot Stud 8120 in center or passenger side hole of output shaft bearing retainer. Then position retainer on fifth gear.

(7) Assemble 1-2 and fifth reverse-shift forks (Fig. 70). Arm of fifth-reverse fork goes through slot in 1-2 fork.

(8) Install assembled shift forks in synchro sleeves (Fig. 71). Verify forks are seated in sleeves.

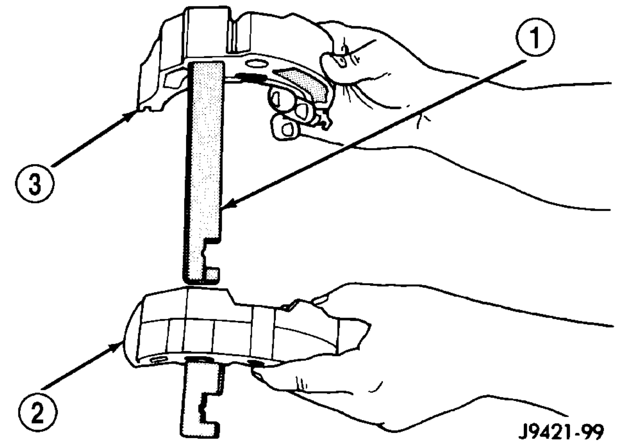


Fig. 70 1-2 AND FIFTH-REVERSE SHIFT FORKS

1 - FIFTH-REVERSE FORK ARM
2 - 1-2 FORK
3 - FIFTH-REVERSE FORK

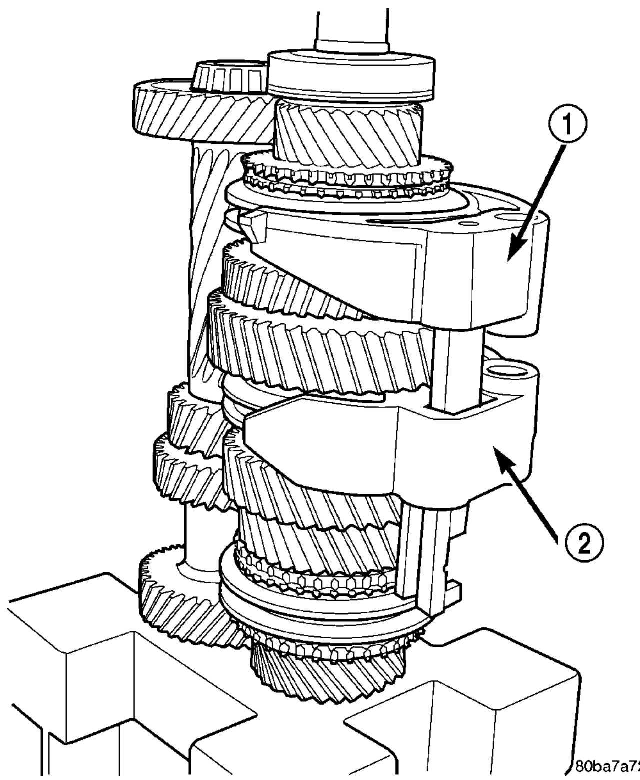


Fig. 71 SHIFT FORKS AND SYNCHROS

1 - FIFTH REVERSE SHIFT FORK
2 - 1-2 SHIFT FORK

MANUAL - NV1500 (Continued)

REAR HOUSING

(1) Lubricate countershaft rear bearing race.

(2) Install rear housing onto geartrain (Fig. 72) and (Fig. 73). Verify bearing retainer pilot stud is in correct bolt hole and countershaft and output shaft bearings are aligned in housing and on countershaft.

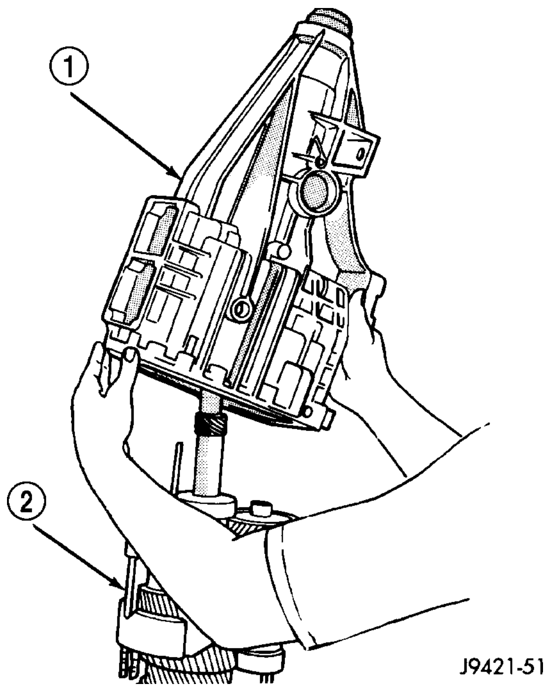


Fig. 72 REAR HOUSING 2WD

1 - REAR HOUSING
2 - SHIFT FORKS AND GEARTRAIN

(3) Seat rear housing on output shaft rear bearing and countershaft. Tap housing into place with plastic or rawhide hammer.

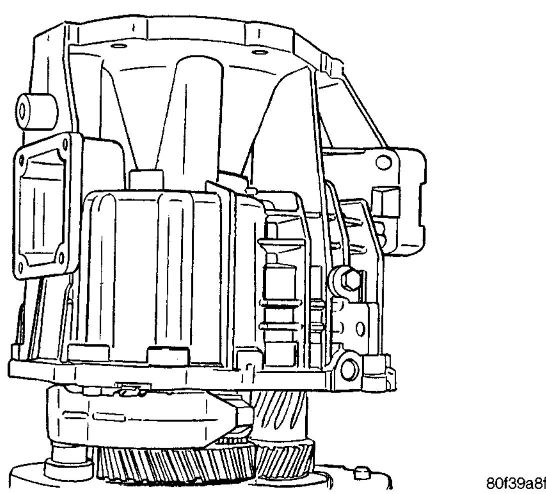


Fig. 73 REAR HOUSING 4WD

(4) Apply Mopar® Gasket Maker or equivalent to bolt threads, bolt shanks and under bolt heads (Fig. 74).

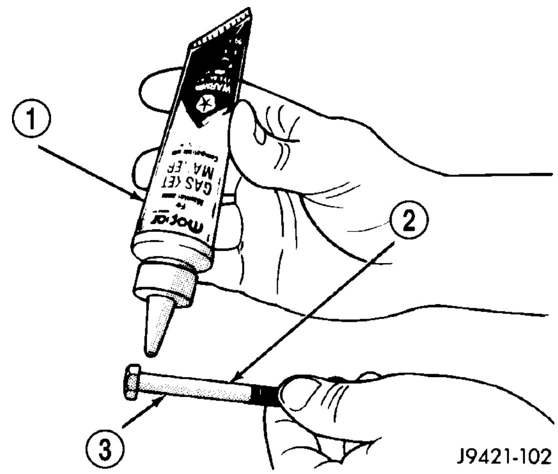


Fig. 74 RETAINER AND HOUSING BOLTS

1 - MOPAR GASKET MAKER
2 - RETAINER AND HOUSING BOLTS
3 - APPLY SEALER TO UNDERSIDE OF BOLT HEAD, SHANK AND THREADS

(5) Start first two bolts in retainer. It may be necessary to move retainer rearward (with pilot stud) in order to start bolts.

(6) Remove Pilot Stud 8120 and install last retainer bolt.

(7) Tighten all three retainer bolts to 22 N·m (16 ft. lbs.) (Fig. 75) and (Fig. 76).

NOTE: All bolts except the reverse idler shaft bolts have o-rings to seal the bolts to the transmission case. Inspect the o-rings to ensure that they are in good condition.

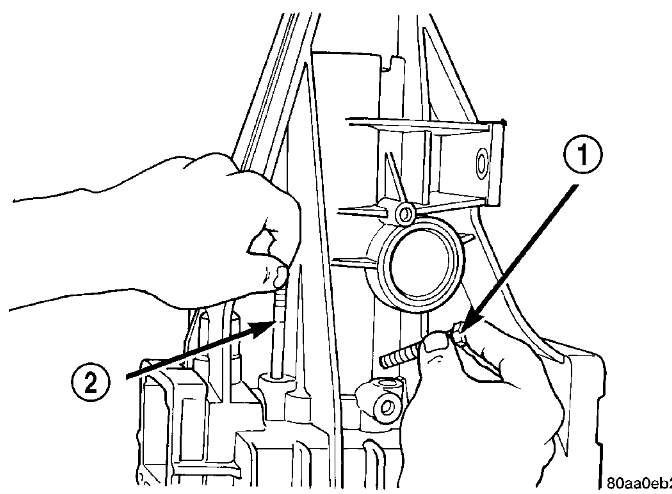


Fig. 75 PILOT STUD AND RETAINER BOLTS 2WD

1 - BEARING RETAINER BOLT
2 - PILOT SUD

MANUAL - NV1500 (Continued)

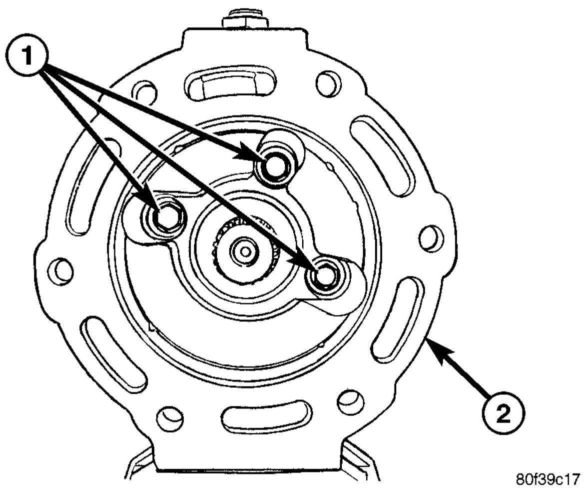


Fig. 76 BEARING RETAINER BOLTS 4WD

1 - BEARING RETAINER BOLT
2 - REAR HOUSING

REVERSE IDLER

(1) Remove geartrain and housing assembly from support stand with aid of helper.

(2) Assemble shaft, gear and washer (without bearing or support) and install into housing (Fig. 77).

NOTE: The small shoulder on the reverse idler gear goes toward the front of the transmission.

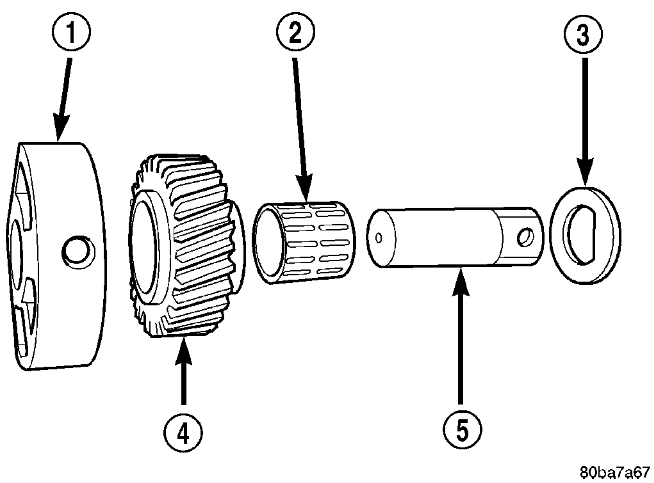


Fig. 77 REVERSE IDLER ASSEMBLY

1 - SUPPORT
2 - BEARING
3 - WASHER
4 - GEAR
5 - SHAFT

(3) Apply Mopar® Gasket Maker or equivalent sealer to underside of idler shaft and support bolt heads, bolt shanks and bolt threads (Fig. 74).

(4) Align hole in housing with threaded hole in shaft and start shaft rear bolt a few threads.

(5) Install bearing into position.

(6) Install segment (Fig. 77), align housing hole with segment threaded hole, and start support bolt a few threads.

(7) Tighten large idler shaft bolt to 43 N·m (31.7 ft. lbs.). Tighten small idler shaft bolt to 22 N·m (16.2 ft. lbs.).

CAUTION: Verify idler shaft and support segment are properly seated and firmly in place while tightening the shaft bolts. The segment, housing or shaft threads can be damaged if the idler shaft is allowed to shift out of position.

SHIFT SHAFT, SHAFT LEVER AND BUSHING AND SHIFT SOCKET

(1) Verify all synchro sleeves are in Neutral position (centered on hub).

CAUTION: Synchros must all be in Neutral position to prevent damage to the housings, shift forks and gears during installation of the two housings.

(2) Install 3-4 shift fork in synchro sleeve (Fig. 78). Verify groove in fork arm is aligned with grooves in 1-2 and fifth-reverse fork arms.

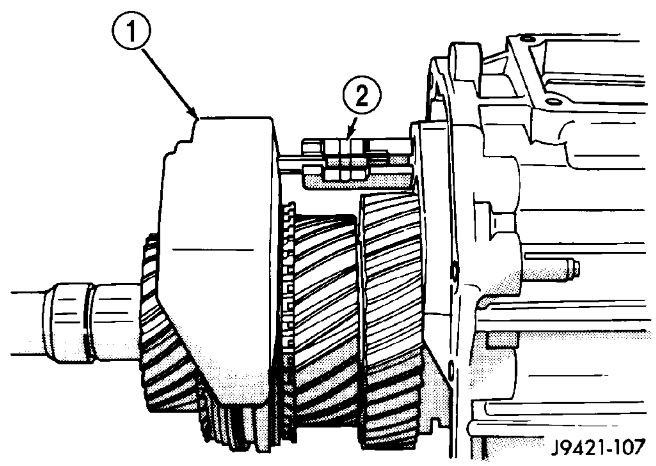


Fig. 78 3-4 SHIFT FORK

1 - 3-4 FORK
2 - ALIGN GROOVES IN FORK ARMS

MANUAL - NV1500 (Continued)

(3) Slide shift shaft through the shift forks (Fig. 79).

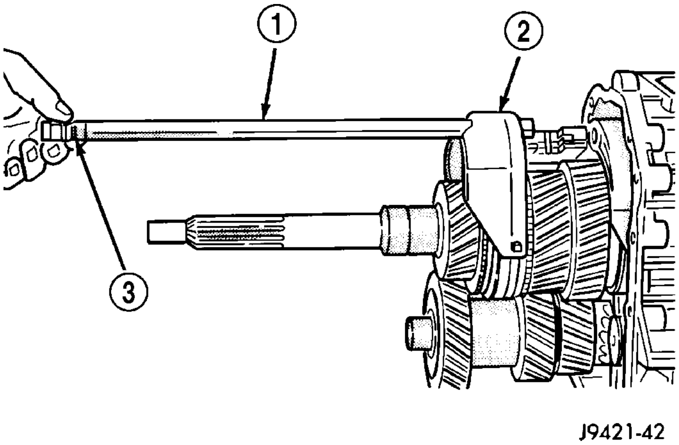


Fig. 79 SHIFT SHAFT

1 - SHIFT SHAFT
2 - 3-4 FORK
3 - SHAFT DETENT NOTCHES

(4) Assemble shift shaft shift lever and bushing (Fig. 80). Slot in bushing must face up and roll pin hole for lever to align with hole in shaft.

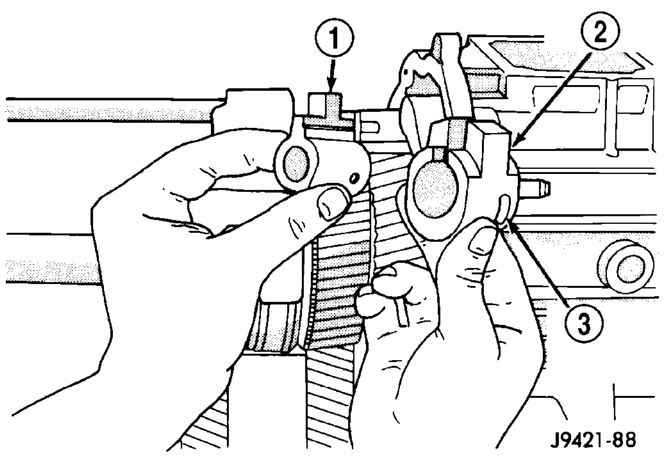


Fig. 80 SHIFT SHAFT LEVER AND BUSHING

1 - SHAFT LEVER
2 - LEVER BUSHING
3 - BUSHING LOCK PIN SLOT

(5) Install assembled lever and bushing on shift shaft (Fig. 81).

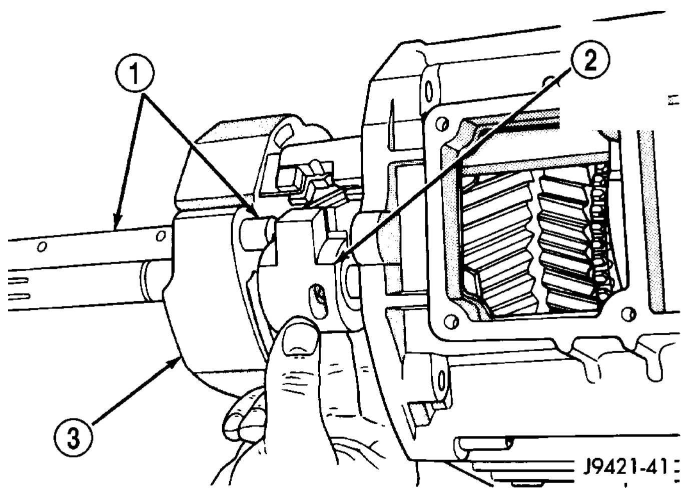


Fig. 81 SHIFT SHAFT LEVER AND BUSHING

1 - SHIFT SHAFT
2 - SHAFT LEVER AND BUSHING
3 - 3-4 FORK

(6) Slide shift shaft through 1-2 and fifth-reverse fork and into shift lever opening in rear housing (Fig. 82).

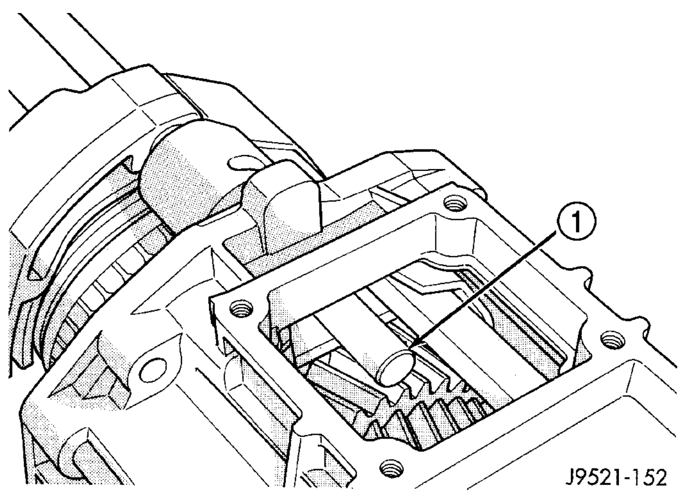


Fig. 82 LEVER OPENING IN HOUSING

1 - SHIFT SHAFT

MANUAL - NV1500 (Continued)

(7) Align shift socket with shaft and slide shaft through socket and into shift shaft bearing in rear housing (Fig. 83).

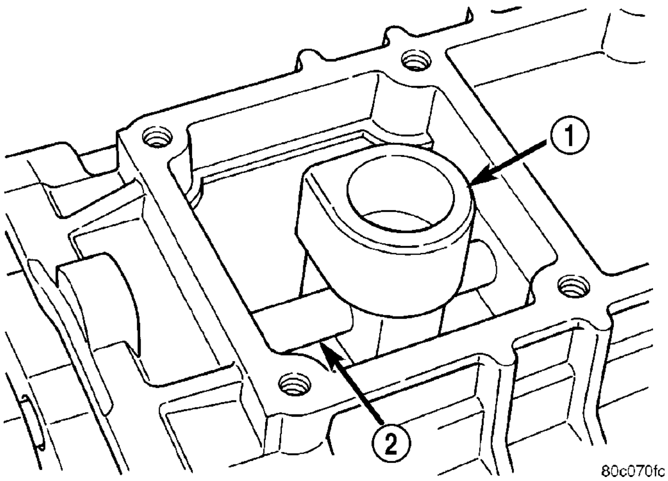


Fig. 83 SHIFT SOCKET AND SHAFT

1 - SHIFT SOCKET
2 - SHIFT SHAFT

(8) Rotate shift shaft so detent notches in shaft are facing the TOP of the transmission housing.

CAUTION: Positioning of the shift shaft detent notch is important. Both of the shaft roll pins can be installed even when the shaft is 180° off. If this occurs, transmission will have to be disassembled to correct shaft alignment.

(9) Select correct new roll pin for shift shaft lever (Fig. 84). Shaft lever roll pin is approximately 22 mm (7/8 in.) long. Shift socket roll pin is approximately 33 mm (1-1/4 in.) long.

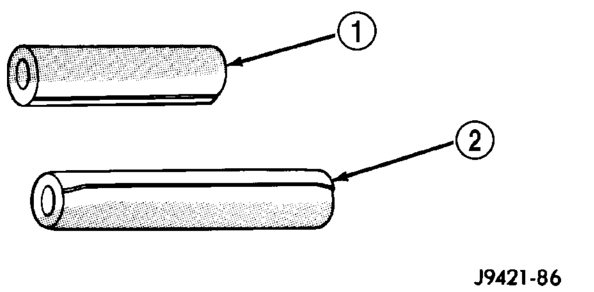


Fig. 84 SHAFT LEVER AND SOCKET ROLL PINS

1 - SHAFT LEVER ROLL PIN
2 - SHIFT SOCKET ROLL PIN

(10) Align roll pin holes in shift shaft, lever and bushing, then start roll pin into shaft lever by hand (Fig. 85).

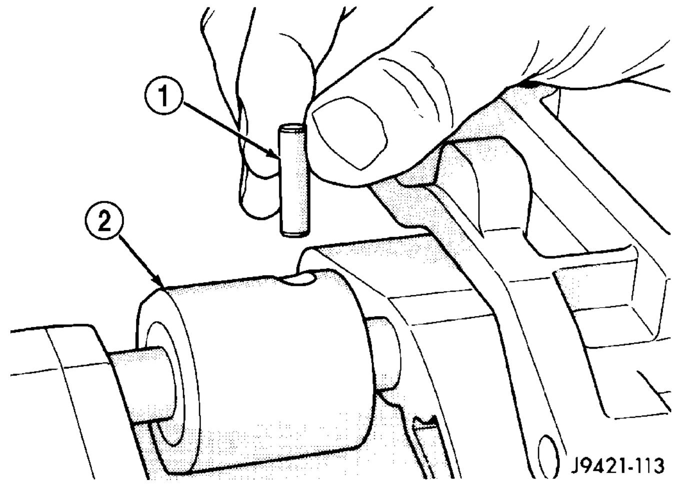


Fig. 85 STARTING ROLL PIN IN SHIFT SHAFT LEVER

1 - SHAFT LEVER ROLL PIN
2 - LEVER AND BUSHING

(11) Seat shaft lever roll pin with pin punch (Fig. 86).

CAUTION: Shaft lever roll pin must be flush with the surface of the lever. The lever bushing will bind on the roll pin if the pin is not seated flush.

(12) Verify lock pin slot in lever bushing is positioned as shown (Fig. 86).

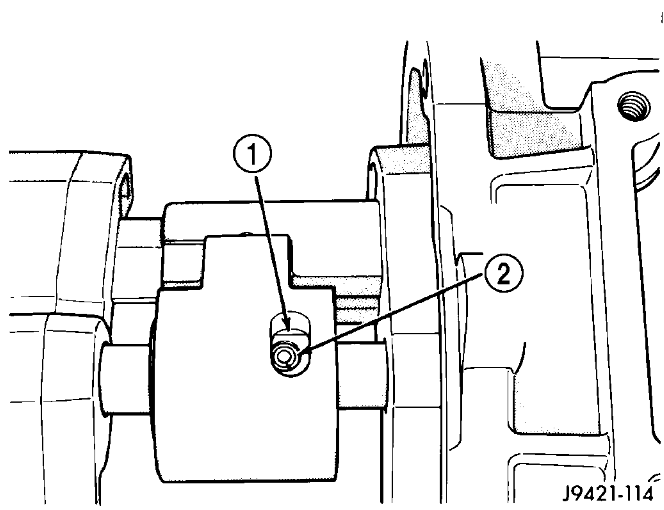


Fig. 86 SEATING SHIFT SHAFT LEVER ROLL PIN

1 - BUSHING LOCK PIN SLOT
2 - SEAT ROLL PIN FLUSH WITH LEVER

MANUAL - NV1500 (Continued)

(13) Align roll pin holes in shift socket and shift shaft. Then start roll pin into shift shaft by hand (Fig. 87).

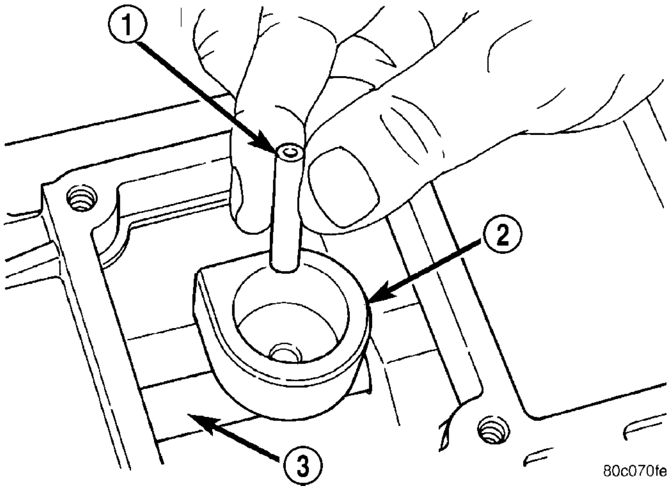


Fig. 87 STARTING ROLL PIN IN SHIFT SOCKET

1 - ROLL PIN
2 - SHIFT SOCKET
3 - SHIFT SHAFT

(14) Seat roll pin in shift socket with pin punch. Roll pin must be installed flush with socket (Fig. 88).

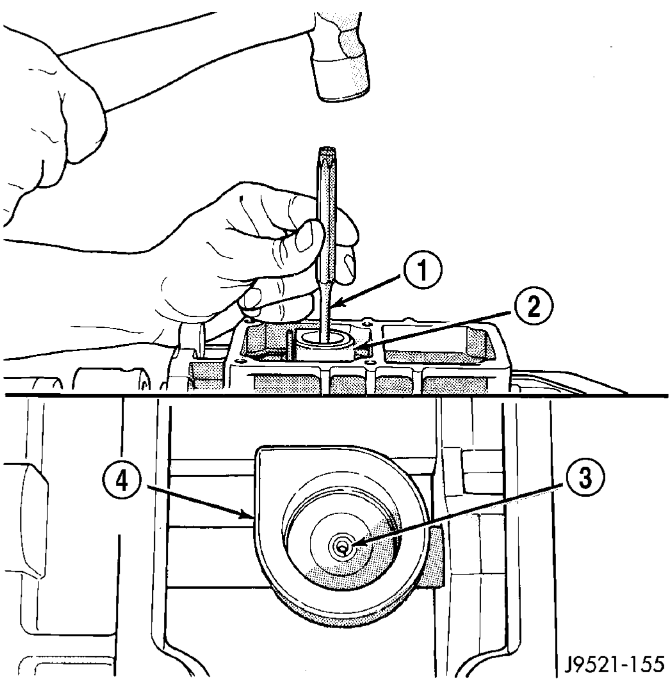


Fig. 88 SEATING SHIFT SOCKET ROLL PIN

1 - PIN PUNCH
2 - SHIFT SOCKET
3 - SEAT ROLL PIN FLUSH
4 - SHIFT SOCKET

(15) Verify notches in shift fork arms are aligned.

FRONT HOUSING AND INPUT SHAFT BEARING RETAINER

(1) If previously removed, install input shaft bearing in front housing bore (Fig. 89). Install snap ring and use plastic mallet to seat bearing. Bearing goes in from front side of housing only.

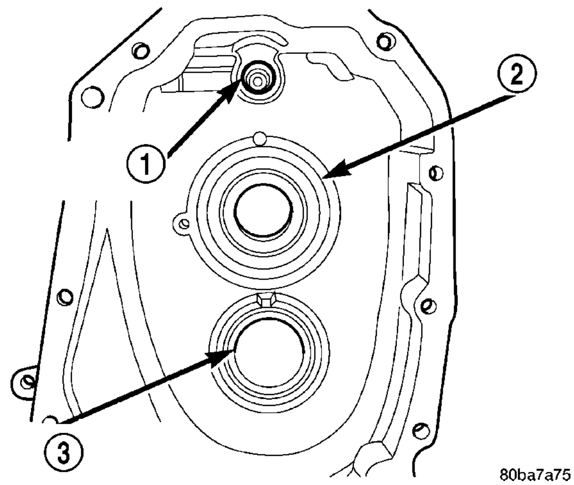


Fig. 89 INPUT SHAFT AND COUNTERSHAFT BEARING

1 - SHIFT SHAFT BUSHING
2 - INPUT SHAFT BEARING
3 - COUNTERSHAFT FRONT BEARING RACE

(2) Apply small amount of petroleum jelly to shift shaft bushing in front housing (Fig. 90).

(3) Apply 1/8 in. wide bead of Mopar® Gasket Maker or equivalent to mating surfaces of front and rear housings (Fig. 90).

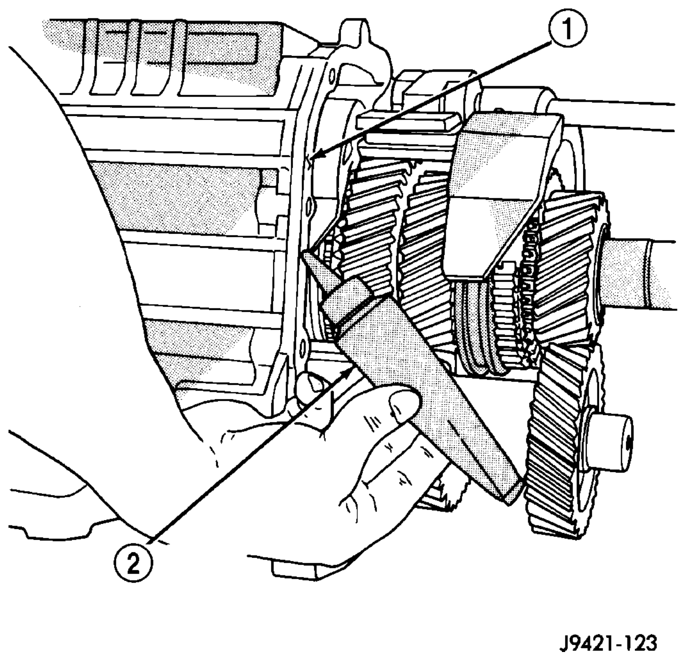


Fig. 90 SEALER TO FRONT/REAR HOUSING

1 - HOUSING FLANGE SURFACE
2 - MOPAR GASKET MAKER (OR LOCTITE 518)

MANUAL - NV1500 (Continued)

(4) Have helper hold rear housing and geartrain in upright position. Then install front housing on rear housing and geartrain.

(5) Work front housing downward onto geartrain until seated on rear housing.

CAUTION: If the front housing will not seat on the rear housing, the shift components are not in Neutral, or one or more components are misaligned. Do not force the front housing into place.

(6) Place transmission in horizontal position.

(7) Apply Mopar® Gasket Maker or equivalent to housing attaching bolts. Apply sealer material sealer to underside of bolt heads and to bolt shanks and threads (Fig. 91).

(8) Install and start housing attaching bolts by hand (Fig. 91). Then tighten bolts to 34 N·m (25 ft. lbs.).

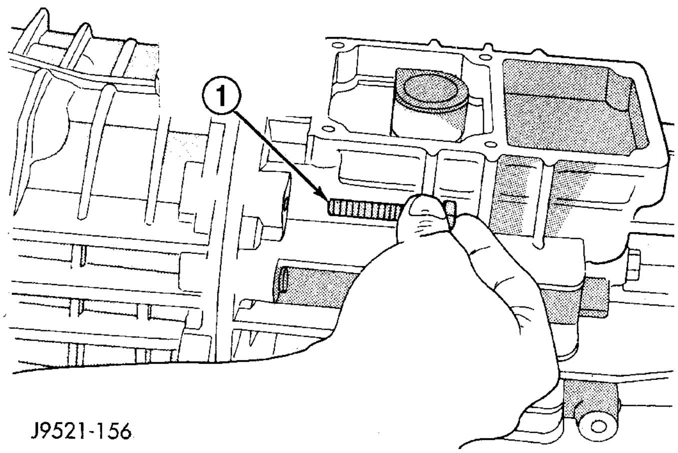


Fig. 91 HOUSING ATTACHING BOLTS

1 - HOUSING ATTACHING BOLTS (APPLY SEALER BEFOREHAND)

(9) Install shift shaft bushing lock bolt (Fig. 92). Apply Mopar® Gasket Maker or equivalent to bolt threads, shank and underside of bolt head before installation.

CAUTION: If the lock bolt cannot be fully installed, do not try to force it into place. Either the shift shaft is not in Neutral, or the shaft bushing (or lever) is misaligned.

(10) Remove countershaft bearing shim cap and shim. Attach a dial indicator and move countershaft front and back to measure shaft end play. The required countershaft preload 0.001-0.003 inches. Add this amount to the measured amount of countershaft end-play. This gives the amount of shims necessary to correctly preload the front and rear countershaft bearings.

(11) Install the selected shims and the shim cap. Tighten shim cap bolts to 29 N·m (21.4 ft. lbs.). Verify the shim selection by rotating the input shaft by

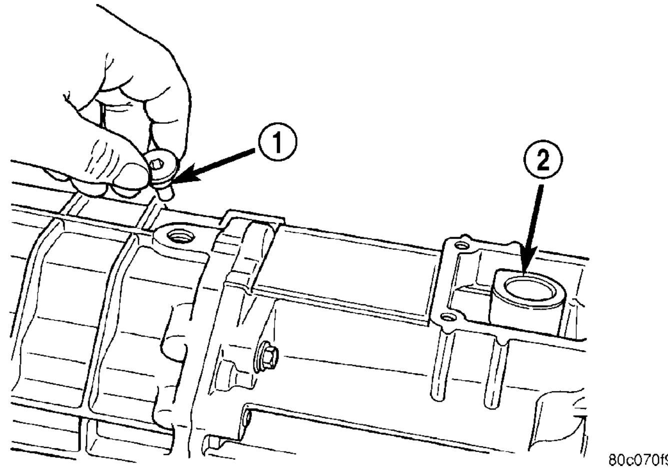


Fig. 92 SHIFT SHAFT BUSHING LOCK BOLT

1 - SHIFT SHAFT LOCK BOLT
2 - SHAFT SOCKET

hand with the transmission in neutral. The proper torque required to rotate the input shaft and the countershaft is approximately 5-7 in.lbs.. The input shaft should therefore be easily rotated by hand. If the input shaft cannot be rotated by hand or is not smooth through several rotations, re-check the countershaft preload.

(12) Lubricate then install shift shaft detent plunger in housing bore. **Verify plunger is fully seated in detent notch in shift shaft.**

NOTE: Lubricate plunger with Valvoline Dura blend® Semi-Synthetic or Synthetic grease or equivalent.

(13) Install detent plug in end of Installer 8123. Position plug on detent spring and compress spring until detent plug pilots in detent plunger bore. Drive detent plug into transmission case until plug seats.

(14) Install backup light switch (Fig. 93).

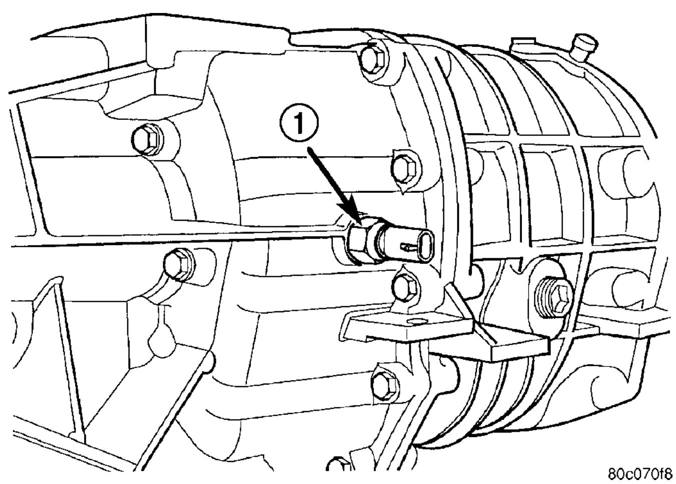


Fig. 93 BACKUP LIGHT SWITCH

1 - BACKUP LAMP SWITCH

MANUAL - NV1500 (Continued)

(15) Install input shaft snap ring (Fig. 94).

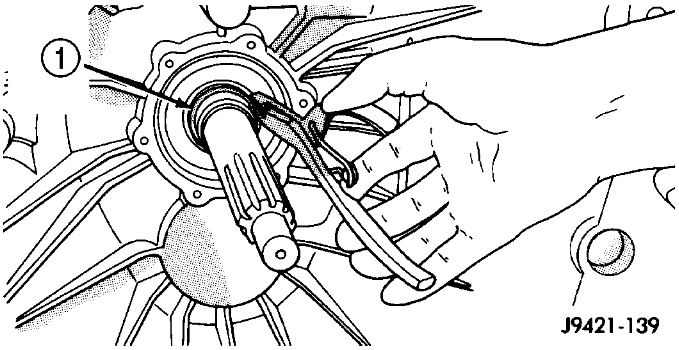


Fig. 94 INPUT SHAFT SNAP RING

1 - INPUT SHAFT SNAP RING

(16) Install **new** oil seal in front bearing retainer with Installer 6448 (Fig. 95).

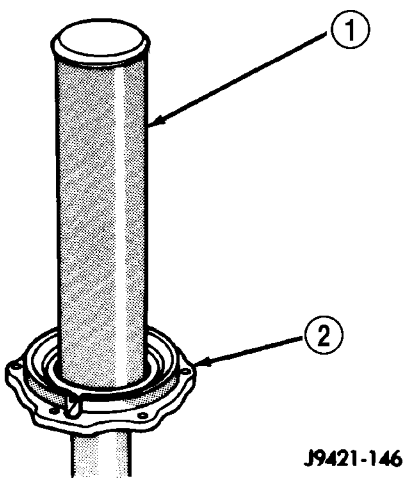


Fig. 95 BEARING RETAINER OIL SEAL

1 - INSTALLER
2 - FRONT BEARING RETAINER

(17) Apply bead of Mopar® Silicone Sealer or equivalent to flange surface of front bearing retainer.

(18) Align and install front bearing retainer over input shaft and onto housing mounting surface (Fig. 96). Although retainer is one-way fit on housing, be sure bolt holes are aligned before seating retainer.

NOTE: Be sure that no sealer gets into the oil feed hole in the transmission case or bearing retainer.

(19) Install and tighten bearing retainer bolts to 29 N·m (21.4 ft. lbs.) (Fig. 97).

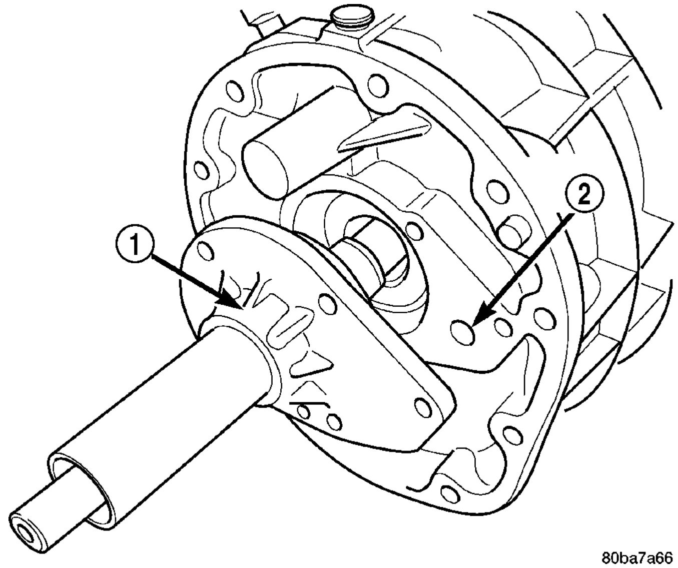


Fig. 96 INPUT SHAFT BEARING RETAINER

1 - BEARING RETAINER
2 - OIL FEED

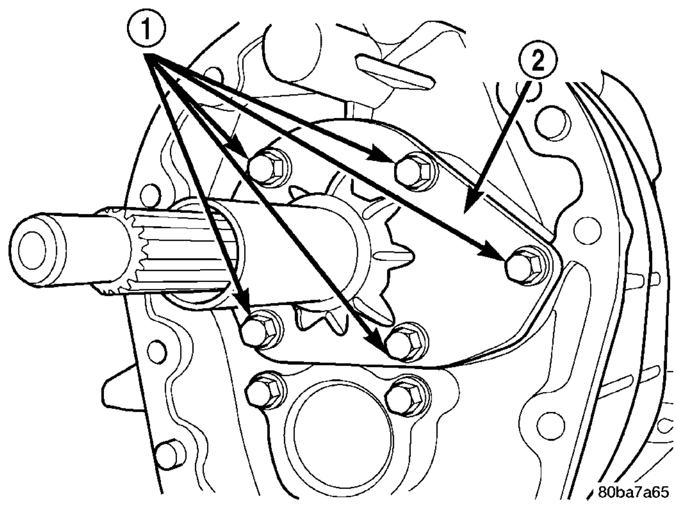


Fig. 97 INPUT SHAFT BEARING RETAINER BOLTS

1 - BOLTS (5)
2 - BEARING RETAINER

MANUAL - NV1500 (Continued)

SHIFT TOWER AND LEVER

(1) Apply petroleum jelly to ball end of shift lever and interior of shift socket.

(2) Shift the transmission into third gear.

(3) Align and install shift tower and lever assembly (Fig. 98). Verify shift ball is seated in socket and offset in the tower is toward the passenger side of the vehicle before installing tower bolts.

(4) Install shift tower bolts (Fig. 99) and tighten bolts to 8.5 N·m (75.2 in. lbs.).

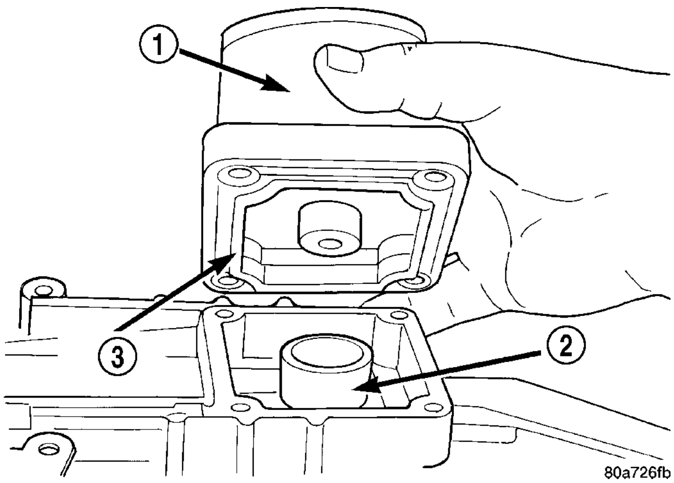


Fig. 98 SHIFT TOWER

1 - SHIFT TOWER AND LEVER ASSEMBLY
2 - SHIFT SOCKET
3 - SEAL

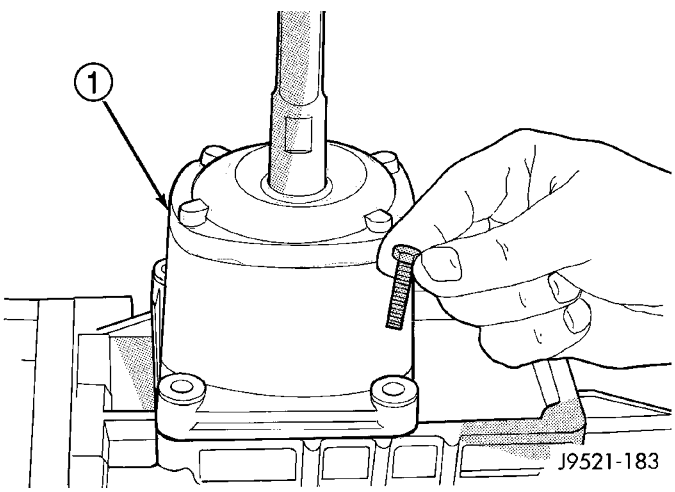


Fig. 99 SHIFT TOWER BOLT

1 - SHIFT TOWER AND LEVER ASSEMBLY

(5) Fill transmission to bottom edge of fill plug hole with Mopar® Transmission.

(6) Install and tighten fill plug to 34 N·m (25 ft. lbs.).

(7) Check transmission vent. Be sure vent is open and not restricted.

INSTALLATION

(1) Install clutch housing on transmission and tighten housing bolts to 46 N·m (34 ft. lbs.).

(2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease.

(3) Install release bearing, fork and retainer clip.

(4) Position and secure transmission on transmission jack.

(5) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar high temp grease.

(6) Raise transmission and align transmission input shaft and clutch disc splines. Then slide transmission into place.

(7) Install clutch housing-to-engine bolts and tighten to 58 N·m (43 ft.lbs.).

NOTE: Be sure the housing is properly seated on engine block before tightening bolts.

(8) Install shift tower and bolts. Tighten bolts to 7-10 N·m (5-7 ft.lbs.).

(9) Install rear crossmember and tighten crossmember bolts to 41 N·m (31 ft. lbs.).

(10) Install transmission mount bolts and to 54 N·m (40 ft. lbs.).

(11) Install exhaust bracket to crossmember.

(12) Install crossover pipe to manifold extensions.

(13) Remove support stands from engine and transmission.

(14) Install transfer case, shift cable and vent hose if equipped.

(15) Install wire connectors to transmission/transfer case.

(16) Install propeller shaft/shafts.

(17) Install slave cylinder in clutch housing.

(18) Install skid plate if equipped.

(19) Fill transmission and transfer case if equipped, with recommended lubricants.

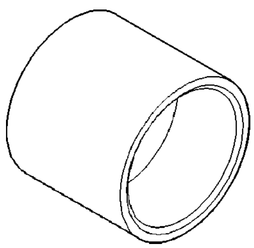
MANUAL - NV1500 (Continued)

SPECIFICATIONS

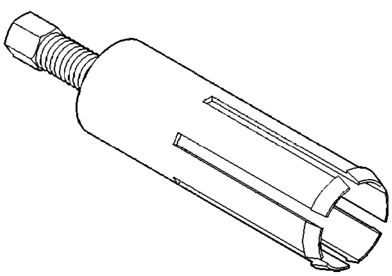
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Back up Lamp Switch	41	30	-
Coutershaft Bearing Shim Cap	41	30	-
Bearing Retainer - Front	41	30	-
Bearing Retainer - Rear	34	25	-
Drain/Fill Plug	34	25	-
Shift Shaft Lock Bolt	27	20	-
Idler Shaft Bolts - M8	27	20	-
Idler Shaft Bolts - M10	52	40	-
Shift Tower Bolts	14	10	120

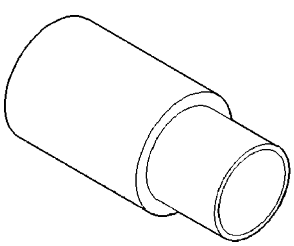
SPECIAL TOOLS



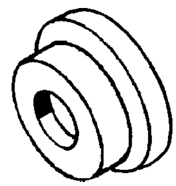
INSTALLER C-3995-A



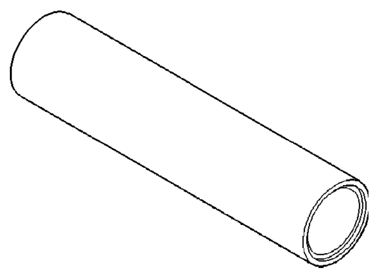
REMOVER 6957



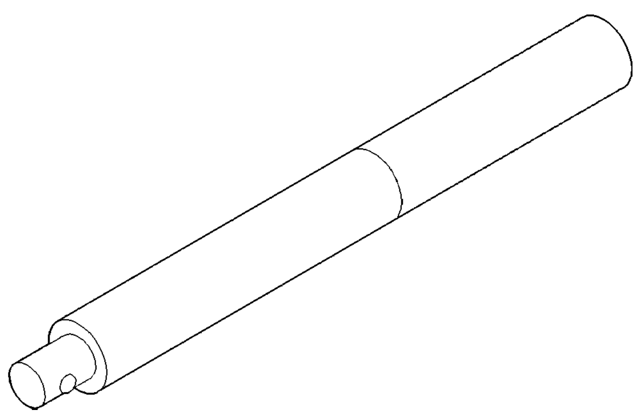
INSTALLER 8160



INSTALLER C-4656

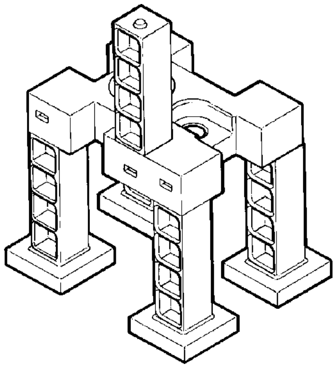


INSTALLER 6448

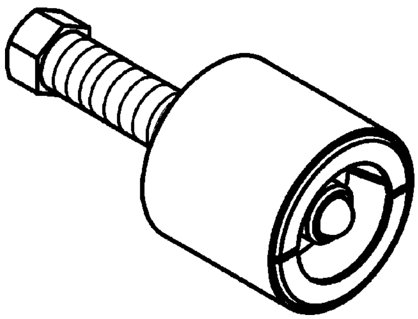


HANDLE C-4171

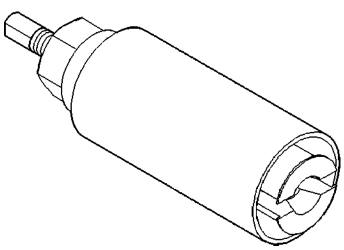
MANUAL - NV1500 (Continued)



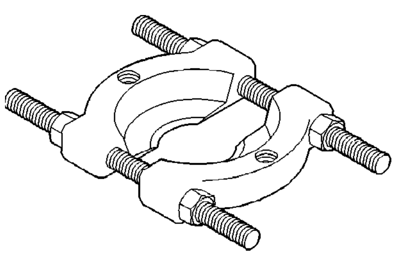
SUPPORT STAND 8355



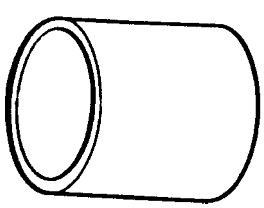
REMOVER 8356



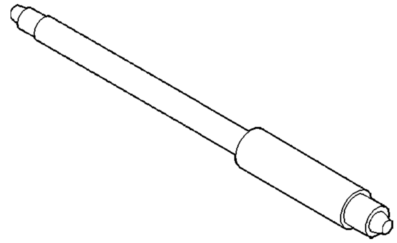
REMOVER L-4454



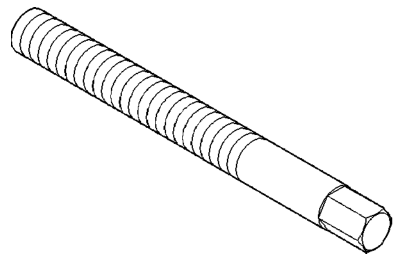
SPLITTER BEARING 1130



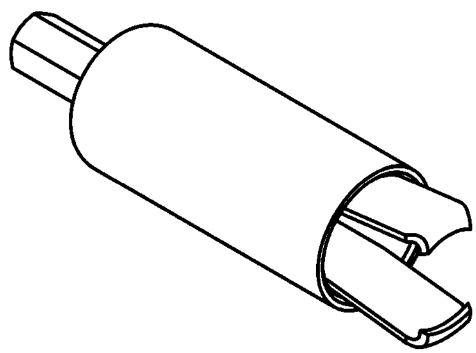
CUP 6310-1



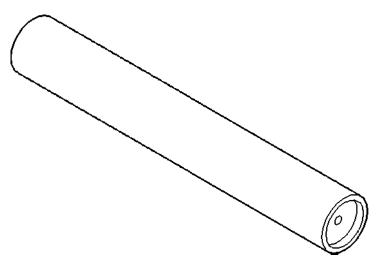
REMOVER/INSTALLER 8119



STUD ALIGNMENT 8120



REMOVER 8117A



INSTALLER 8123

EXTENSION HOUSING SEAL

REMOVAL

(1) Raise raise and support vehicle.

(2) Mark propeller shaft and axle yoke for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Remover C-3985-B (Fig. 100) from transmission housing.

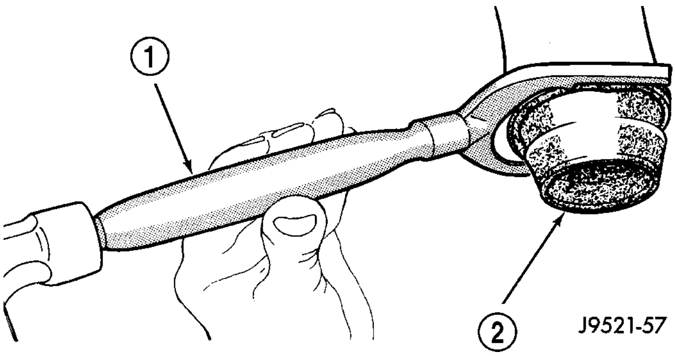


Fig. 100 YOKE SEAL

1 - REMOVER
2 - SEAL

INSTALLATION

(1) Place seal in position on transmission housing.

(2) Drive new seal into transmission housing with Installer C-3972-A and Handle C-4171 (Fig. 101).

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines.

(4) Install propeller shaft with reference marks aligned.

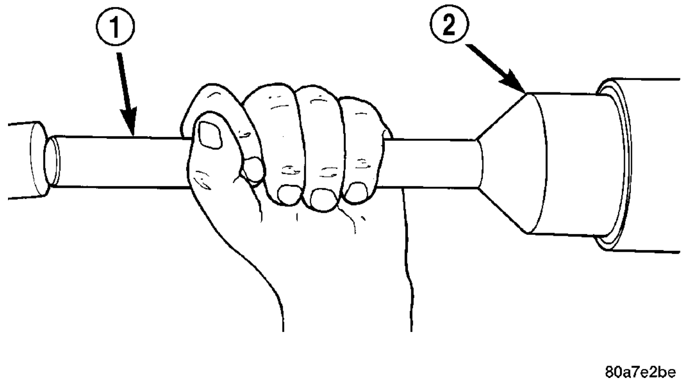


Fig. 101 Yoke Seal Installer

1 - HANDLE
2 - INSTALLER

(5) Remove support and lower vehicle.

(6) Check transmission fluid level.

MANUAL - NV3550

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MANUAL - NV3550

DESCRIPTION

The NV3550 is a medium-duty, 5-speed, constant mesh, fully synchronized manual transmission. The transmission is available in two and four-wheel drive configurations.

The gear case consists of two aluminum housings and a removable clutch housing. The clutch housing is not an integral part of the transmission.

Roller bearings and needle bearings are used in the transmission. The transmission gears all rotate on caged type needle bearings. Roller bearings are used to support the input, output and counter shafts.

The transmission has a single shaft shift mechanism with three shift forks all mounted on the shaft. The shaft is supported in the front and rear housings by bushings and one linear ball bearing. Internal shift components consist of the forks, shaft, shift lever socket and detent components.

The drain plug is located in the bottom of the transmission and fill plug is on the left side.

OPERATION

The driver selects a particular gear by moving the shift lever to the desired gear position. This movement moves the internal transmission shift components to begin the shift sequence. As the shift lever moves the selected shift rail, the shift fork attached to that rail begins to move. The fork is positioned in a groove in the outer circumference of the synchronizer sleeve. As the shift fork moves the synchronizer sleeve, the synchronizer begins to speed-up or slow down the selected gear (depending on whether we are up-shifting or down-shifting). The synchronizer does this by having the synchronizer hub splined to the mainshaft, or the countershaft in some cases, and moving the blocker ring into contact with the gear's friction cone. As the blocker ring and friction cone come together, the gear speed is brought up or down to the speed of the synchronizer. As the two speeds match, the splines on the inside of the synchronizer sleeve become aligned with the teeth on the blocker ring and the friction cone and eventually will slide over the teeth, locking the gear to the mainshaft, or countershaft, through the synchronizer.

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing the disc to slip, grab, and/or chatter.

A correct lubricant level check can only be made when the vehicle is level. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an underfill or overfill condition. Always check the lubricant level after any addition of fluid to avoid an incorrect lubricant level condition.

MANUAL - NV3550 (Continued)

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper, or contaminated lubricants. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. If a leak goes undetected for an extended period, the first indications of component damage are usually hard shifting and noise.

Component damage, incorrect clutch adjustment, or a damaged clutch pressure plate or disc are additional probable causes of increased shift effort. Incorrect adjustment or a worn/damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper, or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear and bearing damage.

REMOVAL

(1) Shift transmission into netural.

(2) Raise and support the vehicle.

(3) Remove skid plate if equipped.

(4) Remove wiring connectors from the transmission.

(5) Remove propeller shaft/shafts.

(6) Remove transfer case shift cable, vent hose from and trasnfer case, if equipped.

(7) Remove slave cylinder from clutch housing.

(8) Support engine with jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(9) Support transmission with a trans jack.

(10) Remove exhaust hanger from the transmission crossmember.

(11) Remove transmission mount and crossmember.

(12) Lower trans jack enought to remove shift tower bolts (Fig. 1).

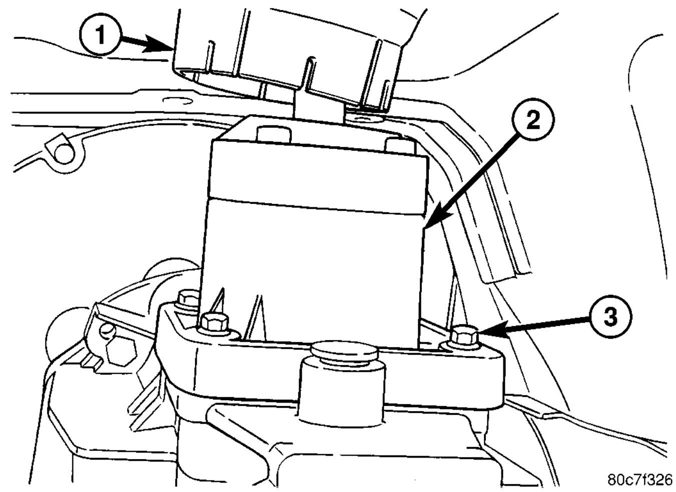


Fig. 1 SHIFT TOWER

1 - SHIFT TOWER BOOT
2 - SHIFT TOWER
3 - SHIFT TOWER BOLT (4)

(13) Remove clutch housing-to-engine bolts.

(14) Pull transmission jack rearward (Fig. 2) until input shaft clears clutch.

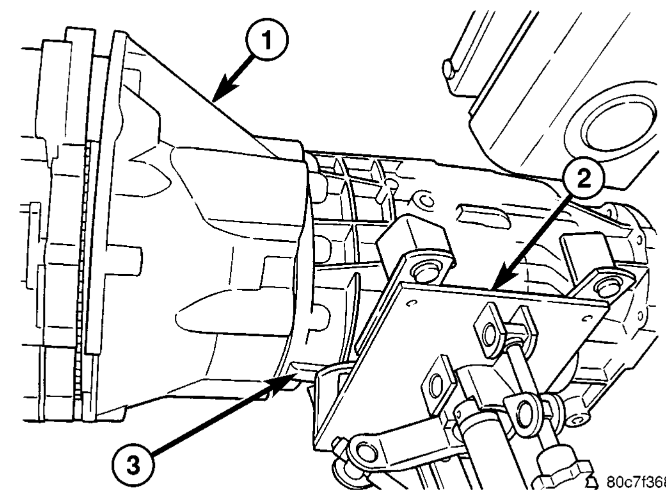


Fig. 2 TRANSMISSION ASSEMBLY

1 - CLUTCH HOUSING
2 - TRANSMISSION JACK
3 - TRANSMISSION

MANUAL - NV3550 (Continued)

(15) Remove clutch release bearing, release fork and retainer clip (Fig. 3).

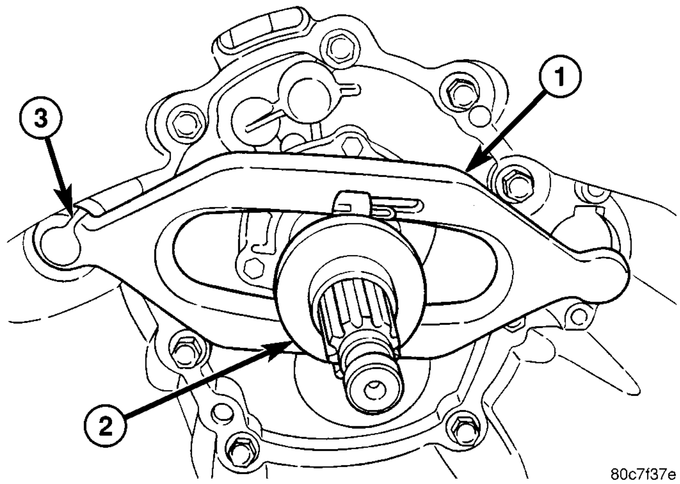


Fig. 3 CLUTCH RELEASE BEARING

1 - FORK
2 - BEARING
3 - CLIP

(16) Remove clutch housing from transmission.

DISASSEMBLY

FRONT HOUSING

(1) Shift transmission into Neutral.
(2) Remove drain plug and drain lubricant.
(3) Inspect drain plug magnet for debris.
(4) Remove backup light switch located on passenger side of rear housing (Fig. 4).

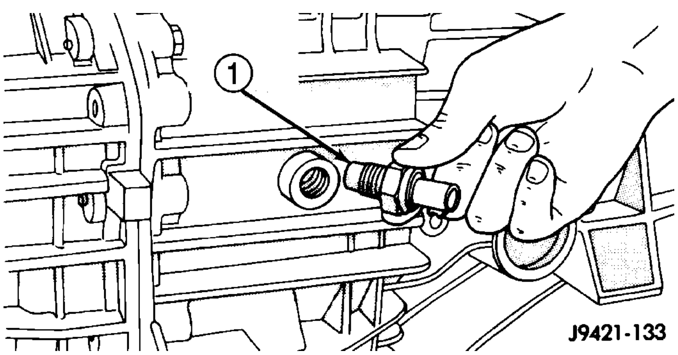


Fig. 4 BACKUP LIGHT SWITCH

1 - BACKUP LIGHT SWITCH

(5) Remove shift tower bolts and remove tower and lever assembly (Fig. 5).

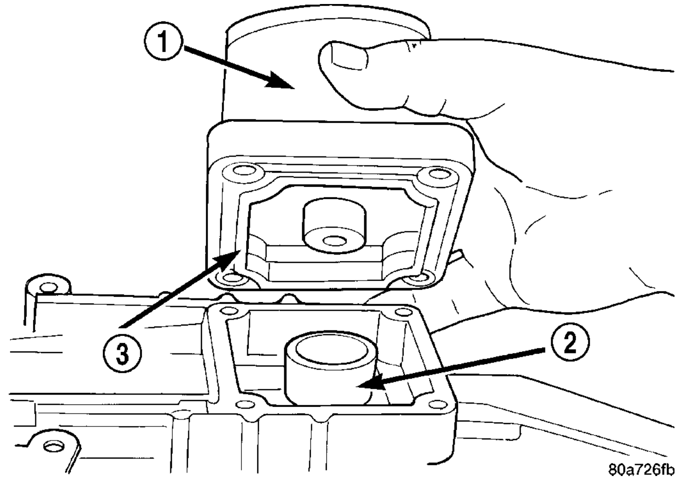


Fig. 5 SHIFT TOWER

1 - SHIFT TOWER
2 - SHIFT SOCKET
3 - SEAL

(6) Remove shift shaft lock bolt (Fig. 6) located just forward of shift tower.

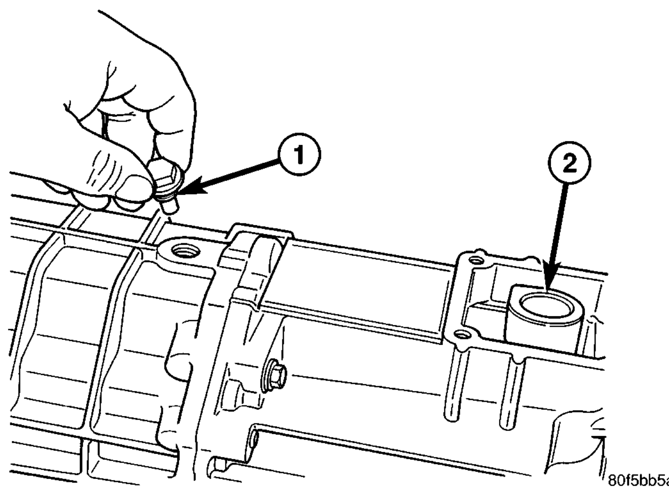


Fig. 6 SHAFT LOCK BOLT

1 - SHIFT SHAFT LOCK BOLT
2 - SHAFT SOCKET

MANUAL - NV3550 (Continued)

(7) Remove shift shaft detent plug with Remover 8117A. Attach the fingers of the remover to the detent plug (Fig. 7). Then push the cup down till it contacts the trans. Tighten the nut (Fig. 8) till it pulls the plug from the trans case.

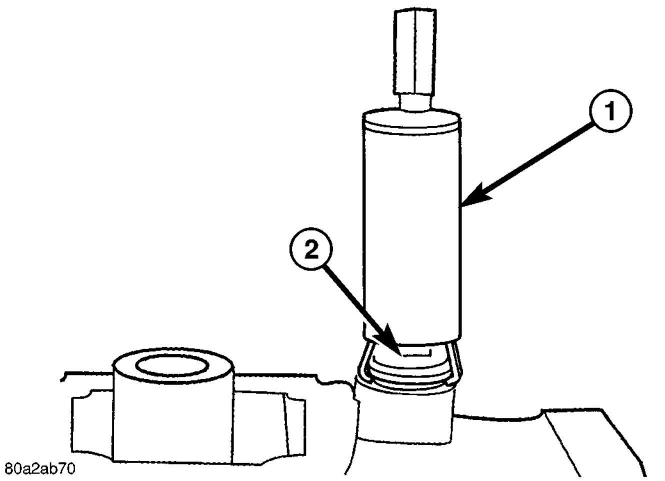


Fig. 7 DETENT PULLER

1 - REMOVER
2 - DETENT PLUG

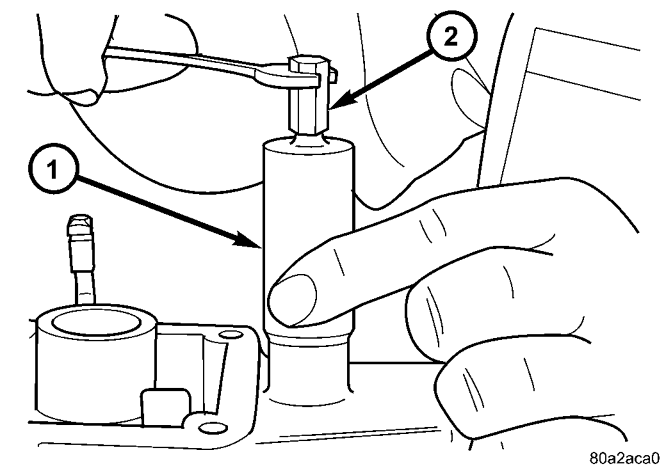


Fig. 8 PULL DETENT PLUG

1 - NUT
2 - REMOVER

(8) Remove shift shaft detent spring and plunger with a pencil magnet.

(9) Remove input shaft bearing retainer bolts.

(10) Loosen input shaft bearing retainer by **carefully** lifting the retainer with a pry tool to break sealer bead (Fig. 9).

(11) Remove bearing retainer from input shaft (Fig. 10).

(12) Remove snap ring that secures input shaft in front bearing (Fig. 11).

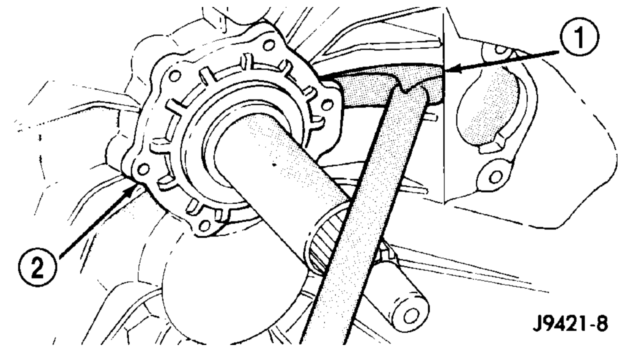


Fig. 9 BEARING RETAINER

1 - PRY TOOL
2 - INPUT SHAFT BEARING RETAINER

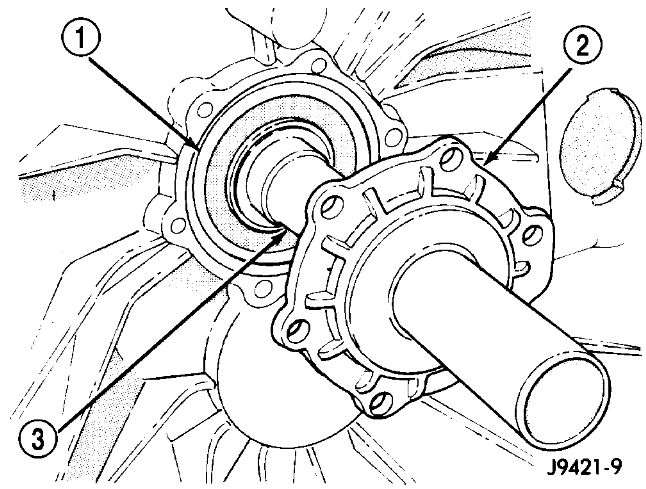


Fig. 10 INPUT SHAFT BEARING RETAINER

1 - SHAFT BEARING
2 - BEARING RETAINER
3 - INPUT SHAFT

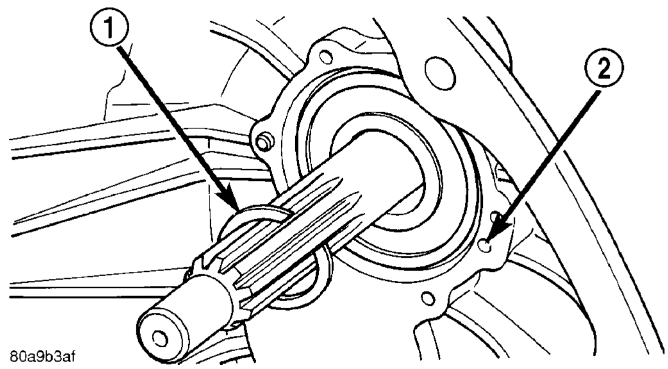


Fig. 11 INPUT SHAFT SNAP RING

1 - INPUT SHAFT SNAP RING
2 - OIL FEED

MANUAL - NV3550 (Continued)

(13) Remove front housing bolts that attach it to the rear housing (Fig. 12). Three bolts at rear of housing are for the output shaft bearing retainer. Leave one of these bolts in place until the geartrain is ready to be removed from case.

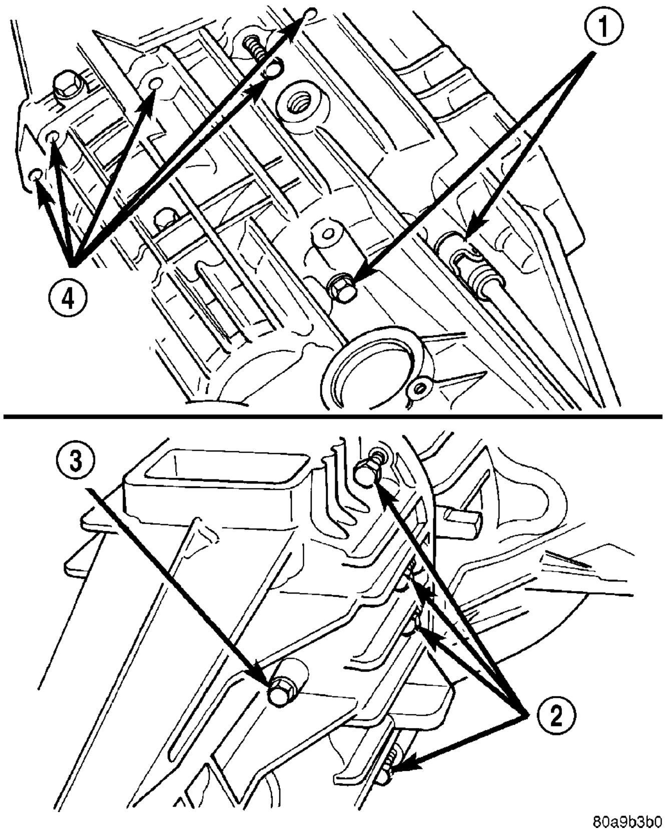


Fig. 12 HOUSING AND BEARING RETAINER BOLTS

1 - RETAINER BOLTS
2 - HOUSING BOLTS
3 - RETAINER BOLT
4 - HOUSING BOLT LOCATIONS

(14) Separate the housings (Fig. 13) by taping the front housing off the alignment dowels with a plastic mallet.

(15) Remove and inspect input shaft bearing and countershaft front bearing race (Fig. 14).

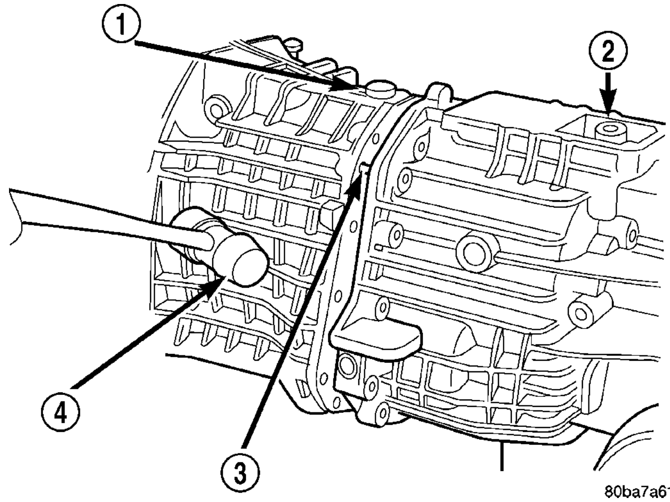


Fig. 13 FRONT HOUSING

1 - FRONT HOUSING
2 - REAR HOUSING
3 - DOWELS (2)
4 - PLASTIC MALLET

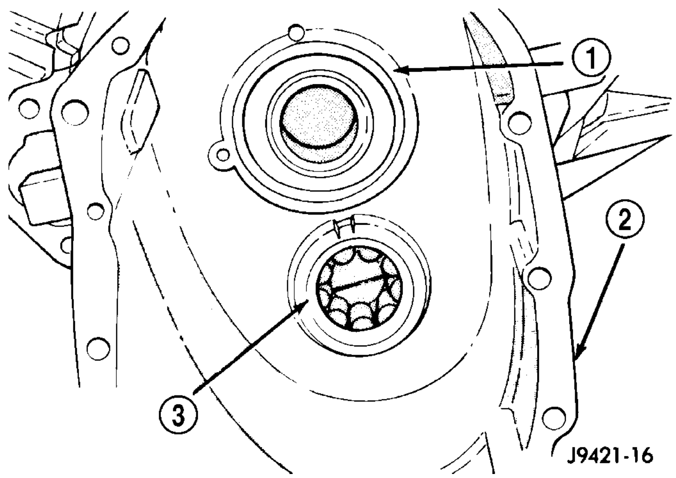


Fig. 14 INPUT SHAFT AND COUNTERSHAFT BEARING RACE

1 - INPUT SHAFT BEARING
2 - FRONT HOUSING
3 - COUNTERSHAFT FRONT BEARING

MANUAL - NV3550 (Continued)

(16) Remove screw from reverse blocker and remove blocker (Fig. 15) from case.

NOTE: The reverse blocker is used on RHD vehicles only.

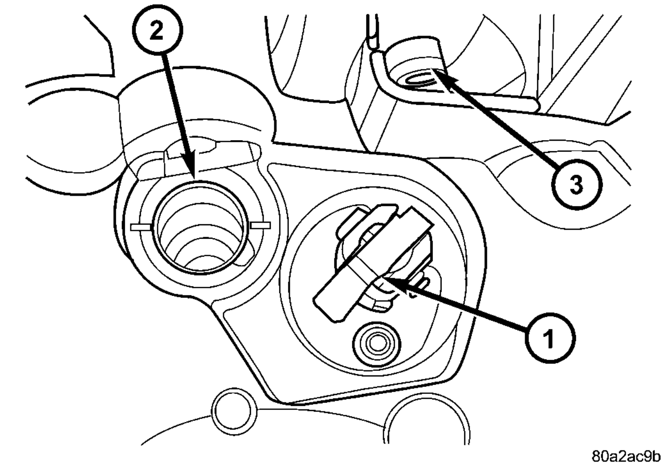


Fig. 15 REVERSE BLOCKER (RHD)

1 - REVERSE BLOCKER
2 - SHIFTER SHAFT BUSHING
3 - VENT

(17) Note position of input shaft, shift shaft, forks and geartrain components in housing (Fig. 16).

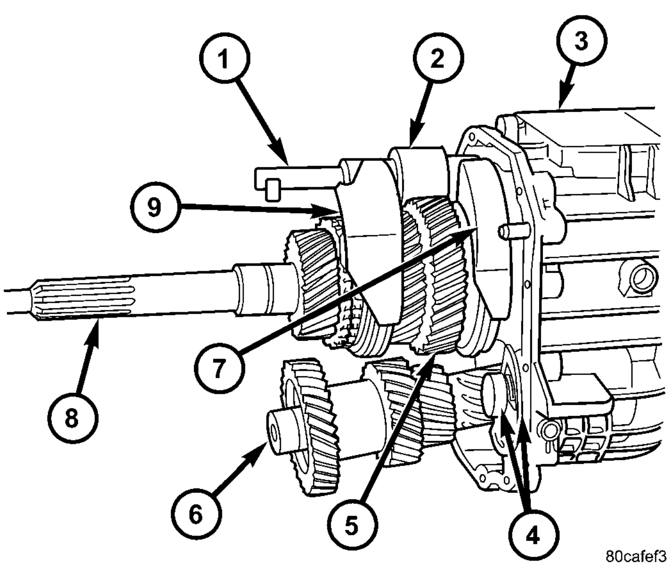


Fig. 16 GEARTRAIN AND SHIFT COMPONENTS

1 - SHIFT SHAFT
2 - BUSHING
3 - REAR HOUSING
4 - REVERSE IDLER AND SUPPORT
5 - OUTPUT SHAFT AND GEARS
6 - COUNTERSHAFT
7 - 1-2 FORK
8 - INPUT SHAFT
9 - 3-4 FORK

SHIFT/FORK SHAFTS AND REVERSE IDLER SEGMENT

(1) To remove the roll pin that secures the shift socket to the shift shaft, position Remover 6858 on the shift shaft. Center the tool over the roll pin and verify tool legs are firmly seated on the shift socket (Fig. 17).

(2) Tilt the socket toward the side of the case, to positions the roll pin at a slight angle. This will prevent the pin from being trapped between the gear teeth.

(3) Tighten the tool to press the roll pin downward and out of the shift socket (Fig. 17).

NOTE: Press roll pin just enough to clear the shift shaft. Be careful not to push the pin into the geartrain.

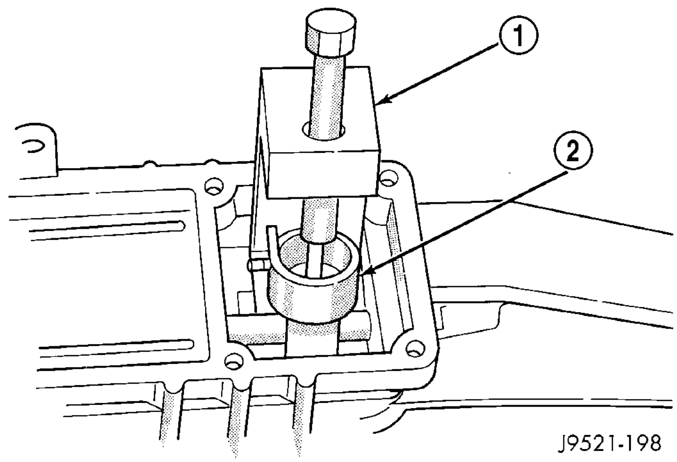


Fig. 17 SHIFT SOCKET ROLL PIN

1 - REMOVER
2 - SHIFT SOCKET

MANUAL - NV3550 (Continued)

(4) Rotate lever and bushing upward and out of the shift forks and catch detent ball and spring (Fig. 18) as they exit the shaft lever.

NOTE: Place shop towel over shaft to contain detent ball and spring.

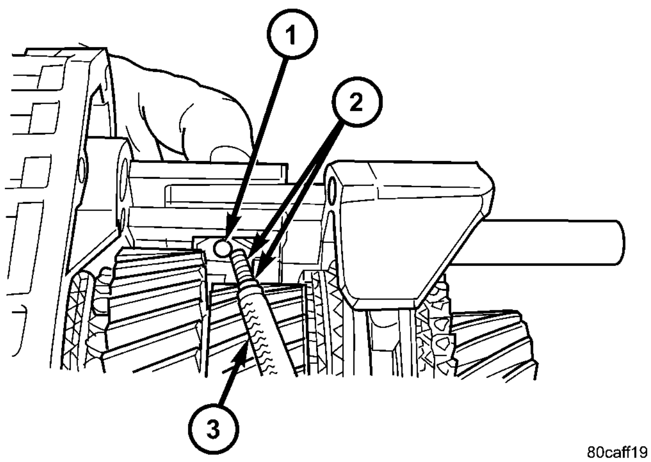


Fig. 18 DETENT SPRING AND BALL

1 - SHAFT LEVER
2 - SPRING AND BALL
3 - MAGNET

(5) Drive out roll pin that secures shift bushing and lever to shift shaft (Fig. 19) with a hammer and punch.

CAUTION: Use proper size punch to avoid bending the shift shaft.

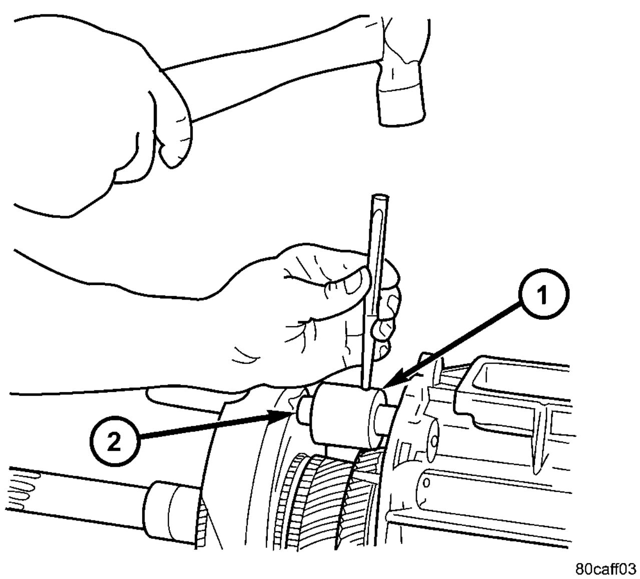


Fig. 19 SHIFT SHAFT LEVER AND BUSHING ROLL PIN

1 - BUSHING AND LEVER
2 - SHIFT SHAFT

(6) Pull shift shaft straight (Fig. 20) out of rear housing.

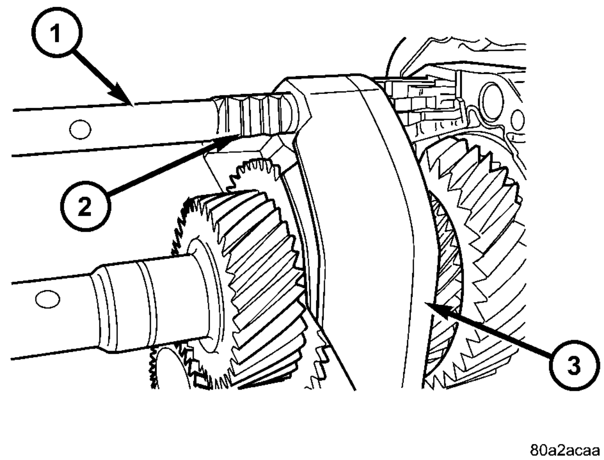


Fig. 20 SHIFT SHAFT

1 - SHIFTER SHAFT
2 - SHIFTER SHAFT DETENT
3 - 3-4 SHIFT FORK

(7) Remove shift socket from rear housing (Fig. 21).

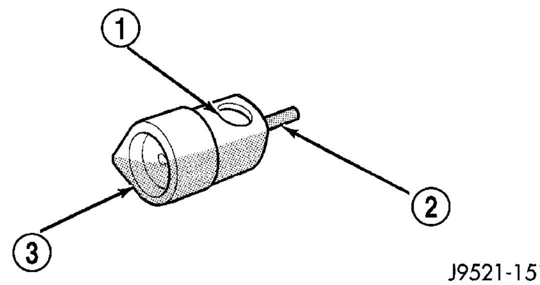


Fig. 21 SHIFT SOCKET AND ROLL PIN

1 - SHAFT BORE
2 - ROLL PIN
3 - SHIFT SOCKET

MANUAL - NV3550 (Continued)

(8) Remove lever and bushing (Fig. 22).

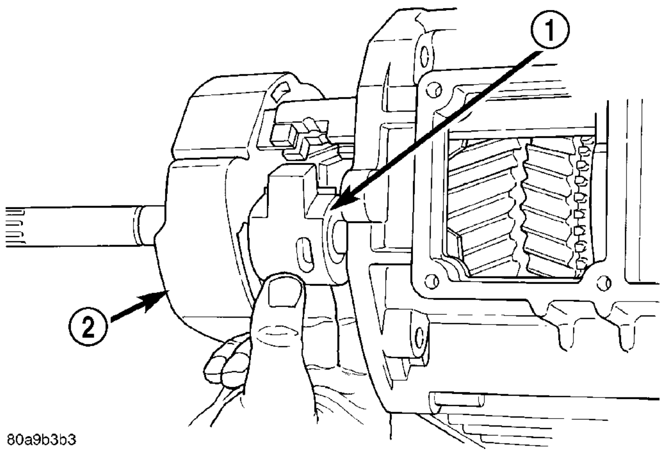


Fig. 22 SHIFT SHAFT LEVER AND BUSHING

1 - SHAFT LEVER AND BUSHING
2 - 3-4 FORK

(9) Rotate 3-4 fork around synchro sleeve until fork clears shift arms on 1-2 and fifth-reverse forks, then remove 3-4 fork (Fig. 23).

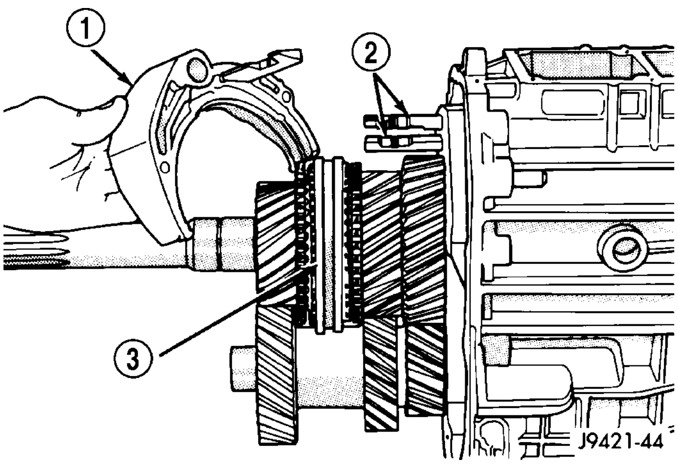


Fig. 23 3-4 SHIFT FORK

1 - 3-4 FORK
2 - 1-2 AND 5TH-REVERSE FORK ARMS
3 - 3-4 SYNCHRO SLEEVE

(10) Remove the reverse idler shaft support bolt and loosen rear reverse idler shaft bolt (Fig. 24).

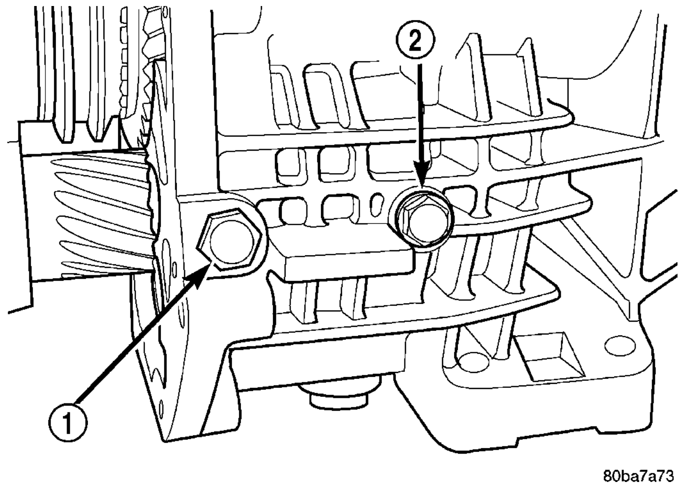


Fig. 24 REVERSE IDLER SHAFT/SUPPORT BOLT

1 - SUPPORT BOLT
2 - SHAFT BOLT

(11) Slide reverse idler shaft support (Fig. 25) straight out of housing.

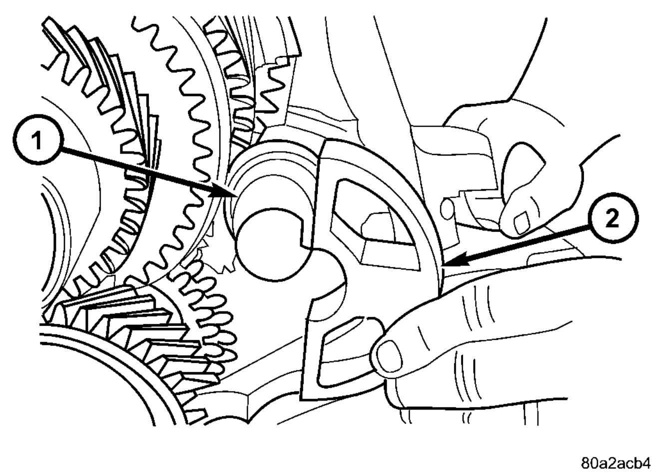


Fig. 25 IDLER SHAFT SUPPORT

1 - IDLER SHAFT
2 - IDLER SHAFT SUPPORT

MANUAL - NV3550 (Continued)

(12) Support geartrain and rear housing on Fixture 6747 as follows:

(a) Adjust height of reverse idler pedestal rod until the reverse idle shaft bottoms in Cup 8115.

(b) Position Adapters 6747-1A and 6747-2A on Fixture 6747.

(c) Slide fixture tool onto input shaft, countershaft and idler gear (Fig. 26).

(d) Stand geartrain and rear housing upright on fixture (Fig. 27). Have helper hold fixture tool in place while housing and geartrain is being rotated into upright position.

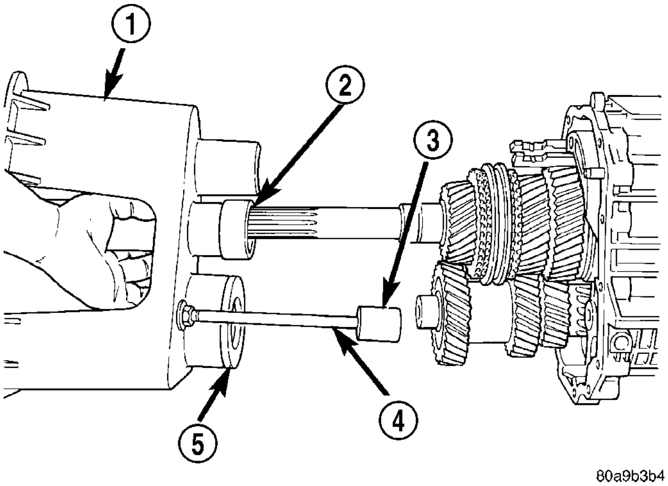


Fig. 26 FIXTURE ASSEMBLY

1 - FIXTURE
2 - ADAPTER
3 - CUP
4 - REVERSE IDLER PEDESTAL
5 - ADAPTER

(13) Remove rear bolt holding reverse idler shaft in housing.

REAR HOUSING - 2WD

(1) Remove three bolts rear of shift tower, that attach output shaft bearing retainer to rear case (Fig. 28).

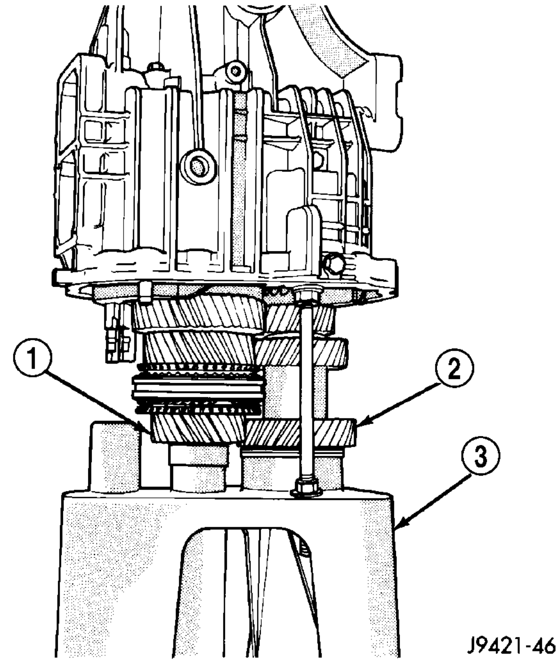


Fig. 27 GEARTRAIN/HOUSING FIXTURE

1 - INPUT SHAFT
2 - COUNTERSHAFT
3 - FIXTURE

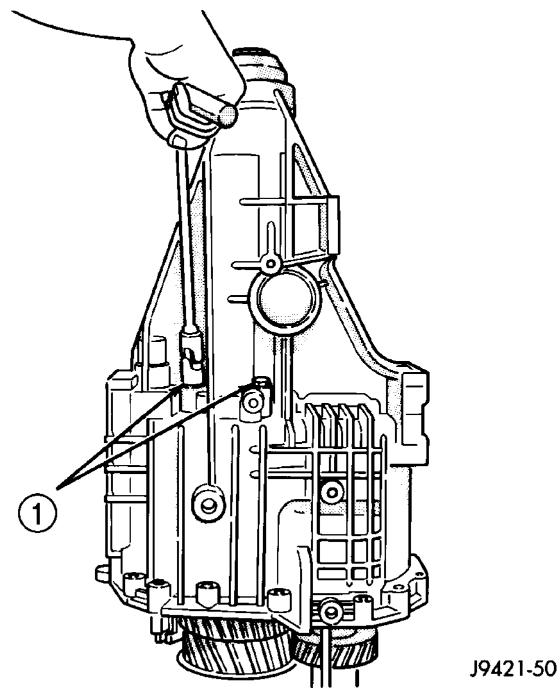


Fig. 28 OUTPUT SHAFT

1 - RETAINER BOLTS

MANUAL - NV3550 (Continued)

(2) Tap rear housing upward and off output shaft bearing (Fig. 29).

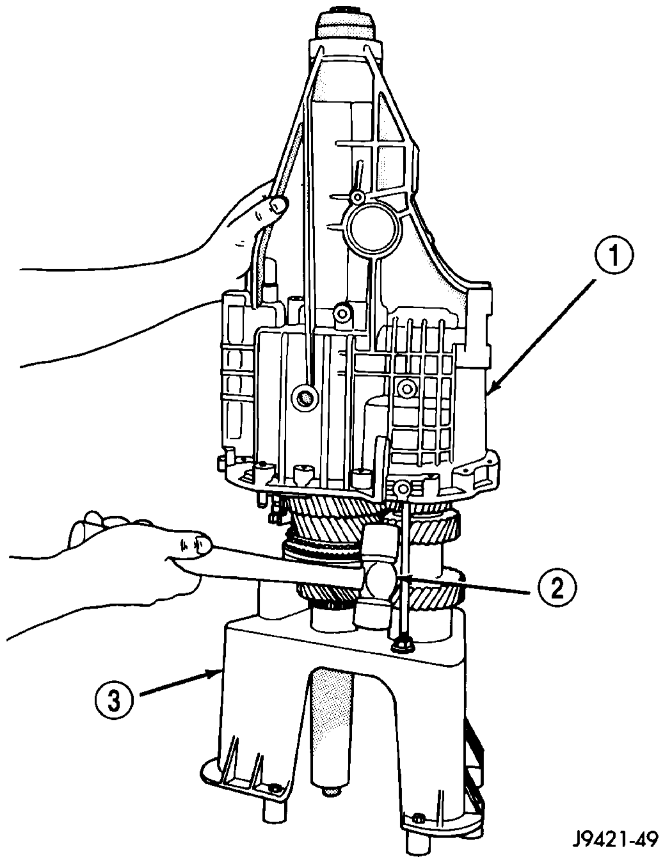


Fig. 29 REAR HOUSING - 2WD

1 - REAR HOUSING
2 - PLASTIC/RAWHIDE MALLET
3 - FIXTURE

(3) Lift rear housing up and off geartrain (Fig. 30).

(4) Remove countershaft rear bearing from countershaft (Fig. 31).

(5) Examine condition of bearing bore and idler shaft notch in rear housing. Replace housing if damaged.

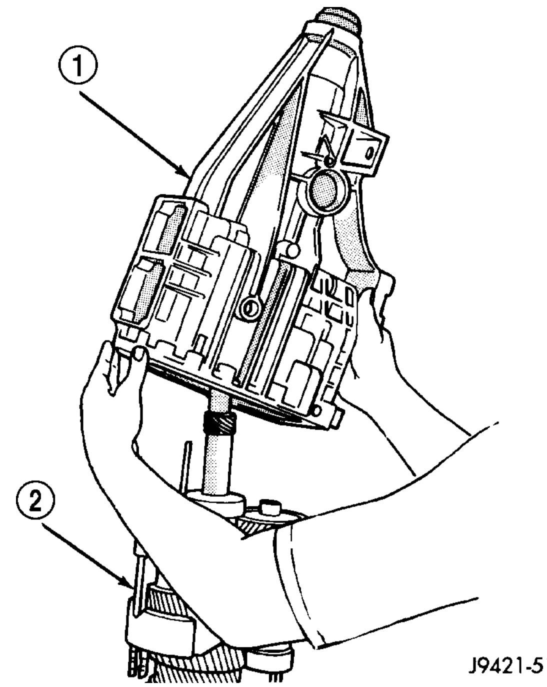


Fig. 30 REAR HOUSING

1 - REAR HOUSING
2 - SHIFT FORKS AND GEARTRAIN

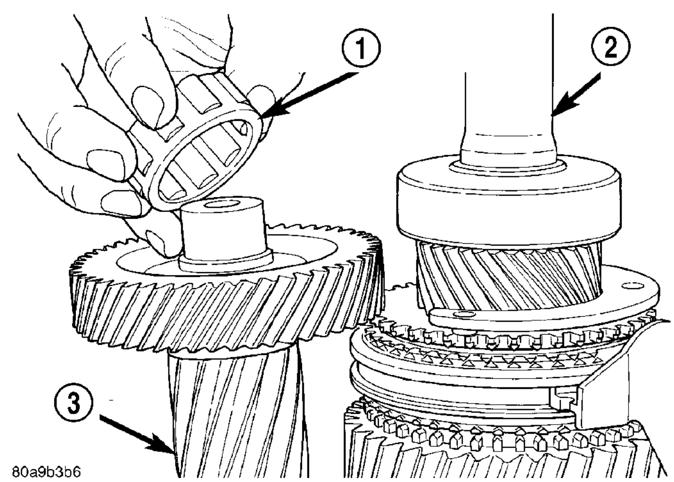


Fig. 31 COUNTERSHAFT REAR BEARING

1 - COUNTERSHAFT REAR BEARING
2 - OUTPUT SHAFT
3 - COUNTER SHAFT

MANUAL - NV3550 (Continued)

REAR ADAPTER HOUSING - 4WD

(1) Locate rear seal dimples (Fig. 32). Insert slide hammer mounted screw into one of the seal dimples and remove seal (Fig. 33).

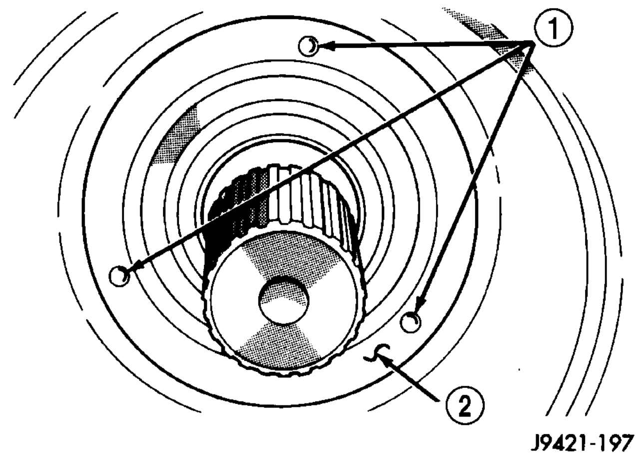


Fig. 32 SEAL DIMPLES - 4WD

1 - DIMPLES
2 - SEAL FACE

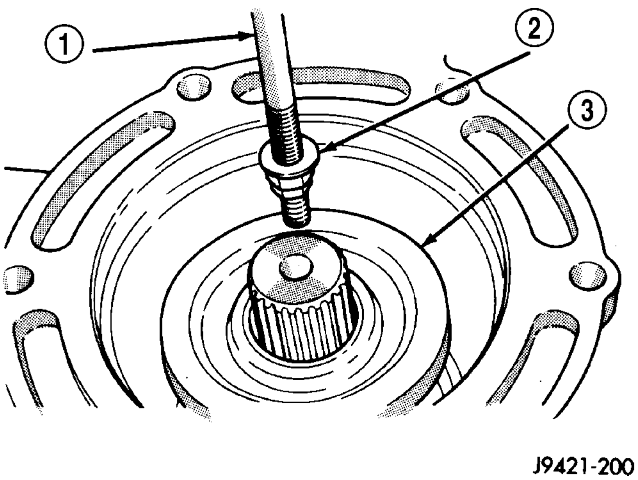


Fig. 33 REAR SEAL - 4WD

1 - SLIDE HAMMER
2 - SCREW
3 - REAR SEAL

(2) Remove rear bearing snap ring from output shaft with snap ring pliers (Fig. 34).

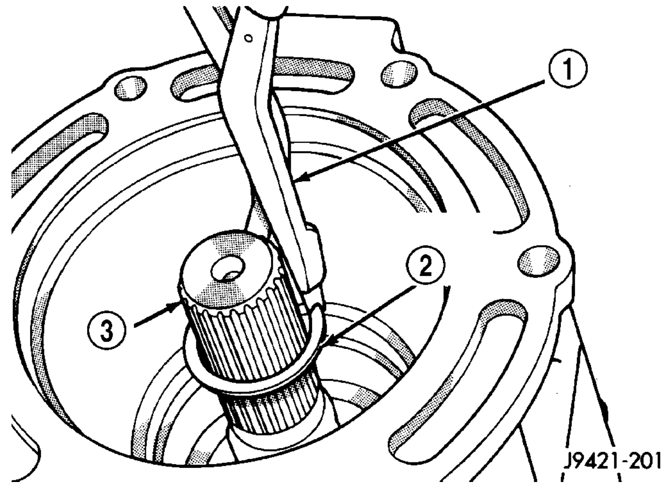


Fig. 34 REAR BEARING SNAP RING - 4WD

1 - HEAVY DUTY SNAP RING PLIERS
2 - REAR BEARING SNAP RING
3 - OUTPUT SHAFT

(3) Lift rear adapter housing upward and off geartrain (Fig. 35).

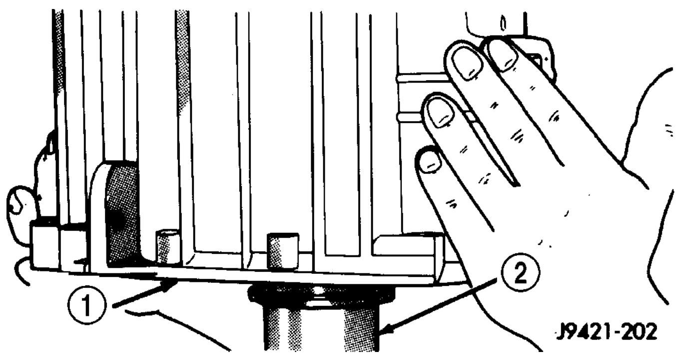


Fig. 35 REAR ADAPTER HOUSING

1 - REAR ADAPTER HOUSING
2 - OUTPUT SHAFT

MANUAL - NV3550 (Continued)

(4) Remove bearing retainer bolts, rear bearing retainer and rear bearing (Fig. 36).

NOTE: If needed push or tap bearing out of the housing with a hammer.

(5) Inspect condition of bearing bore, countershaft rear bearing race and idler shaft notch in rear housing. Replace housing if race, bore or notch are worn or damaged.

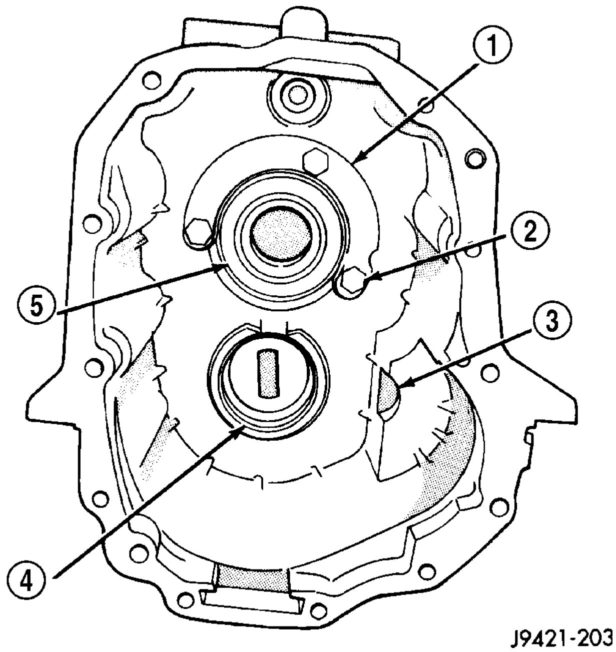


Fig. 36 REAR ADAPTER HOUSING COMPONENTS

1 - BEARING RETAINER
2 - RETAINER BOLTS (3)
3 - IDLER SHAFT NOTCH
4 - COUNTERSHAFT REAR BEARING RACE
5 - REAR BEARING

GEARTRAIN FROM FIXTURE

(1) Remove reverse idler gear assembly from assembly fixture cup.

(2) Remove 1-2 and fifth-reverse forks from synchro sleeves.

(3) Slide countershaft out of fixture tool.

(4) On 2WD remove output shaft bearing retainer from rear surface of fifth gear (retainer will drop onto gear after bolts are removed).

(5) Lift and remove output shaft and gears off input shaft.

(6) Lift and remove input shaft, pilot bearing and fourth gear synchro ring from assembly fixture tool.

OUTPUT SHAFT

NOTE: The synchronizer hubs and sleeves are different and must not be intermixed. Remove each synchronizer unit as an assembly to avoid intermixing parts. Reference mark or tag each synchro hub and sleeve for correct assembly.

(1) Remove snap ring that secures 3-4 synchro hub on output shaft.

(2) Remove 3-4 synchro assembly, third gear synchro ring and third gear with shop press and Bearing Splitter 1130. Position splitter between second and third gears.

(3) Remove third gear needle bearing (Fig. 37).

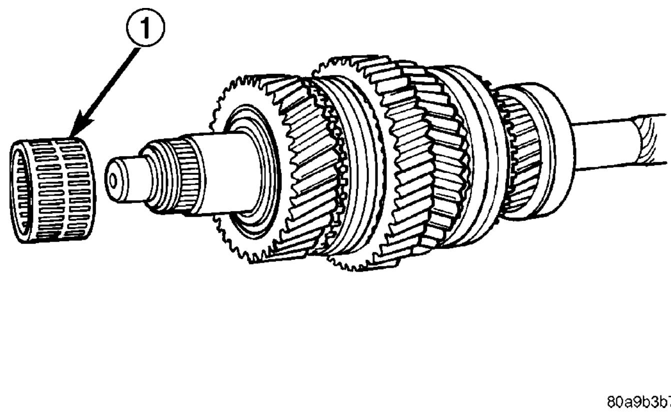


Fig. 37 THIRD GEAR NEEDLE BEARING

1 - THIRD GEAR NEEDLE BEARING

(4) Remove retaining ring that secures two-piece thrust washer on shaft (Fig. 38) with a small pry tool.

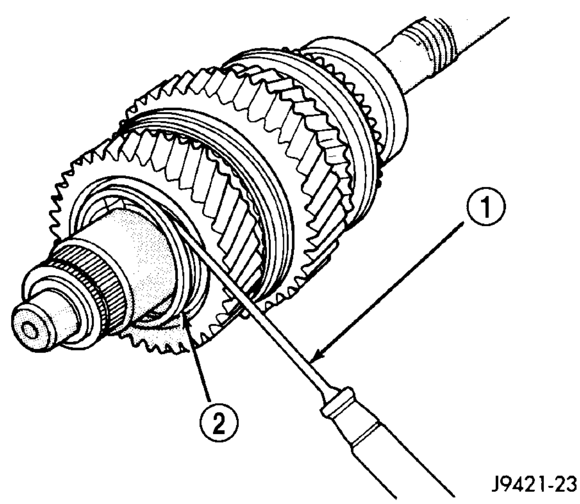


Fig. 38 THRUST WASHER

1 - PRY TOOL
2 - THRUST WASHER RETAINING RING

MANUAL - NV3550 (Continued)

(5) Remove two-piece thrust washer (Fig. 39).

NOTE: Record location of washer locating lugs in shaft notches for installation reference.

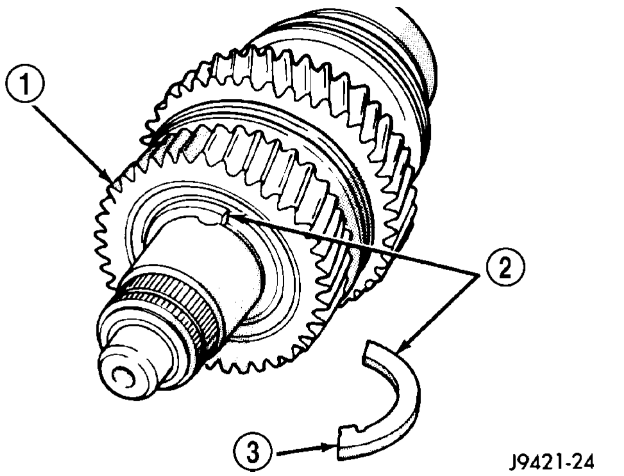


Fig. 39 TWO-PIECE THRUST WASHER

1 - SECOND GEAR
2 - THRUST WASHER (2-PIECE)
3 - WASHER LOCATING LUG

(6) Remove second gear and needle bearing (Fig. 40).

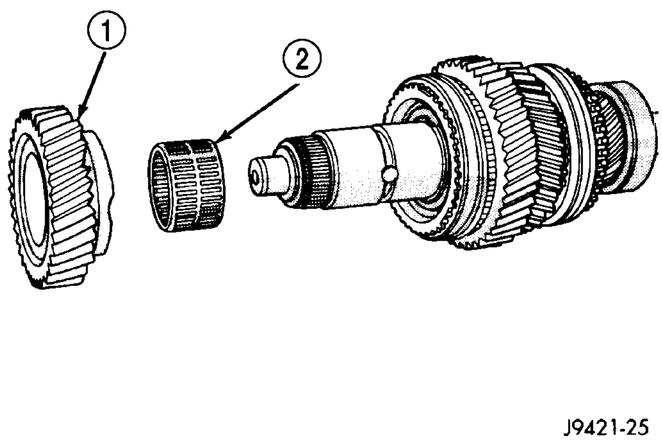


Fig. 40 SECOND GEAR AND NEEDLE BEARING

1 - SECOND GEAR
2 - SECOND GEAR NEEDLE BEARING

(7) Remove second gear synchro ring, synchro friction cone and synchro cone (Fig. 41).

(8) Remove interim ring and 1-2 synchro hub snap ring.

(9) Remove 1-2 synchro hub, sleeve and first gear from output shaft with a press and Bearing Splitter 1130 (Fig. 42). Position splitter between first and reverse gears.

(10) Remove first gear needle bearing (Fig. 43).

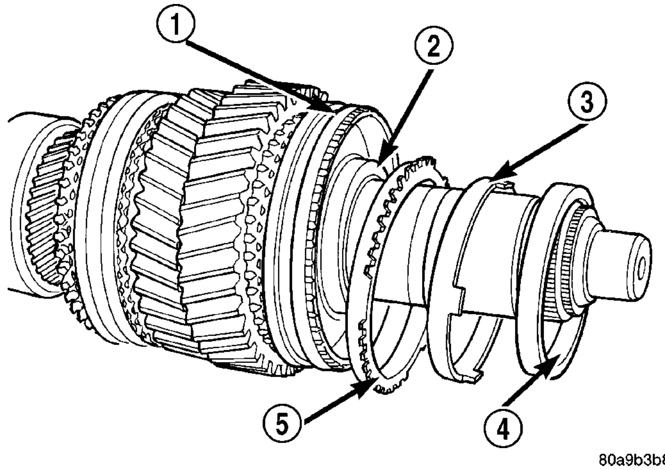


Fig. 41 SECOND GEAR SYNCHRO RING AND CONES

1 - 1-2 SYNCHRO HUB AND SLEEVE
2 - INTERM RING
3 - SYNCHRO FRICTION CONE
4 - SYNCHRO CONE
5 - SYNCHRO RING

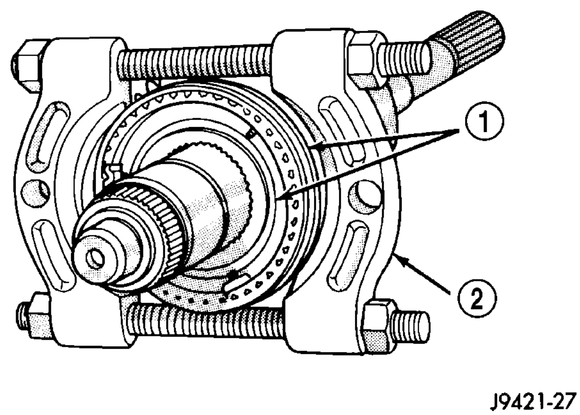


Fig. 42 HUB SLEEVE AND 1-2 SYNCHRO

1 - 1-2 SYNCHRO HUB AND SLEEVE
2 - BEARING SPITTER

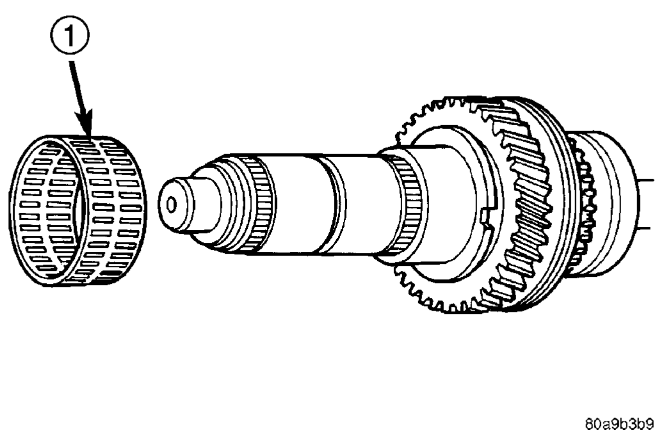


Fig. 43 FIRST GEAR NEEDLE BEARING

1 - FIRST GEAR NEEDLE BEARING

MANUAL - NV3550 (Continued)

(11) Remove output shaft bearing snap ring (Fig. 44).

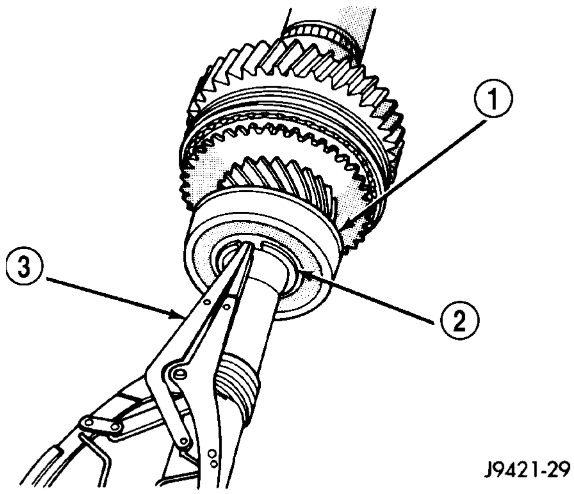


Fig. 44 OUTPUT SHAFT BEARING SNAP RING

1 - OUTPUT SHAFT BEARING
2 - BEARING SNAP RING
3 - SNAP RING PLIERS

(12) Remove output shaft bearing on 2-wheel drive models.

(13) Remove fifth gear (Fig. 45).

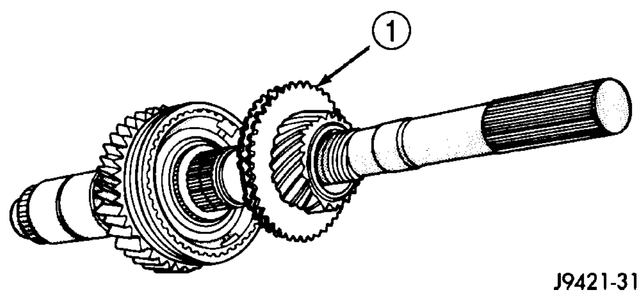


Fig. 45 FIFTH GEAR

1 - FIFTH GEAR AND SYNCHRO RING

(14) Remove fifth gear needle bearing by spreading it apart just enough to clear shoulder on output shaft (Fig. 46).

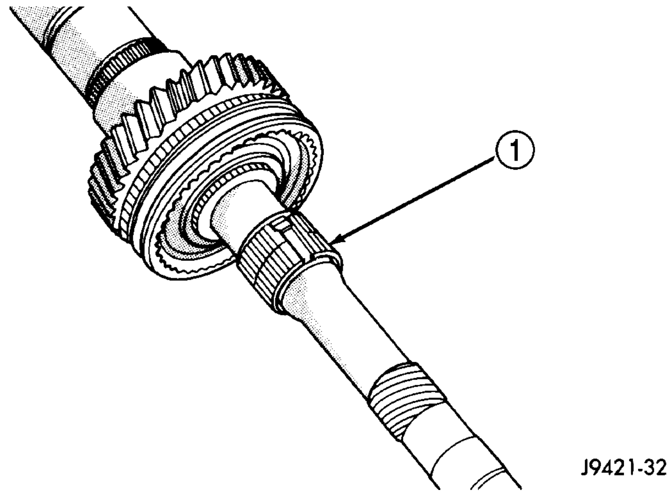


Fig. 46 FIFTH GEAR NEEDLE BEARING

1 - FIFTH GEAR NEEDLE BEARING

(15) Remove fifth-reverse synchro hub snap ring (Fig. 47).

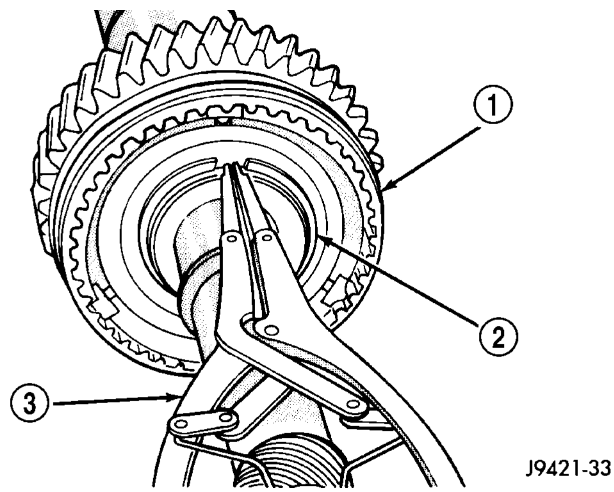


Fig. 47 FIFTH-REVERSE SYNCHRO HUB SNAP RING

1 - FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
2 - SYNCHRO HUB SNAP RING
3 - SNAP RING PLIERS

MANUAL - NV3550 (Continued)

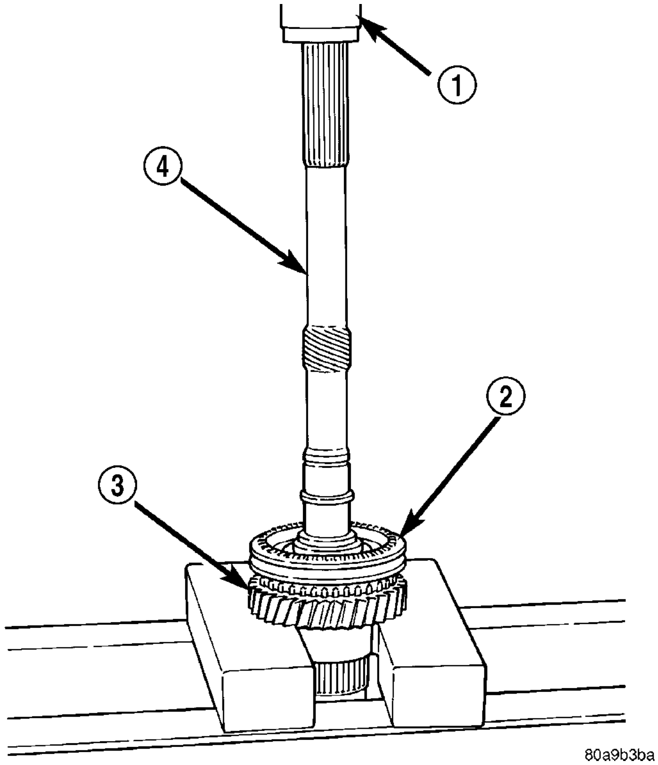


Fig. 48 FIFTH-REVERSE SYNCHRO HUB AND SLEEVE

1 - PRESS
2 - FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
3 - REVERSE GEAR
4 - OUTPUT SHAFT

(16) Remove fifth-reverse synchro hub and sleeve with a press (Fig. 48).

(17) Remove reverse gear and needle bearing (Fig. 49).

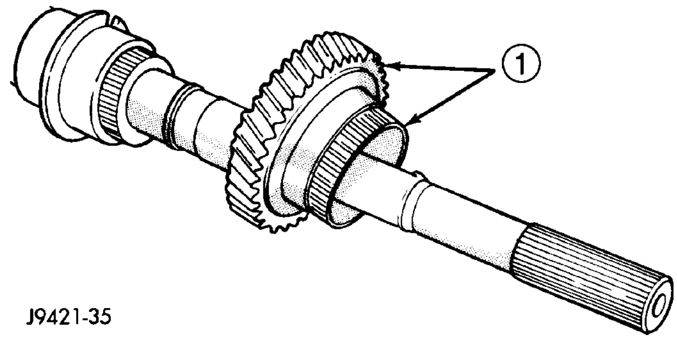


Fig. 49 REVERSE GEAR AND NEEDLE BEARING

1 - REVERSE GEAR AND NEEDLE BEARING

REVERSE IDLER

(1) Remove idler gear snap rings (Fig. 50).

(2) Remove thrust washer, wave washer, thrust plate and idler gear from shaft.

(3) Remove idler gear needle bearing from shaft.

CLEANING

Clean the gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean the shaft bearings with a mild solvent such as Mopar® degreasing solvent, Gunk, or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry, or wipe them dry with clean shop towels.

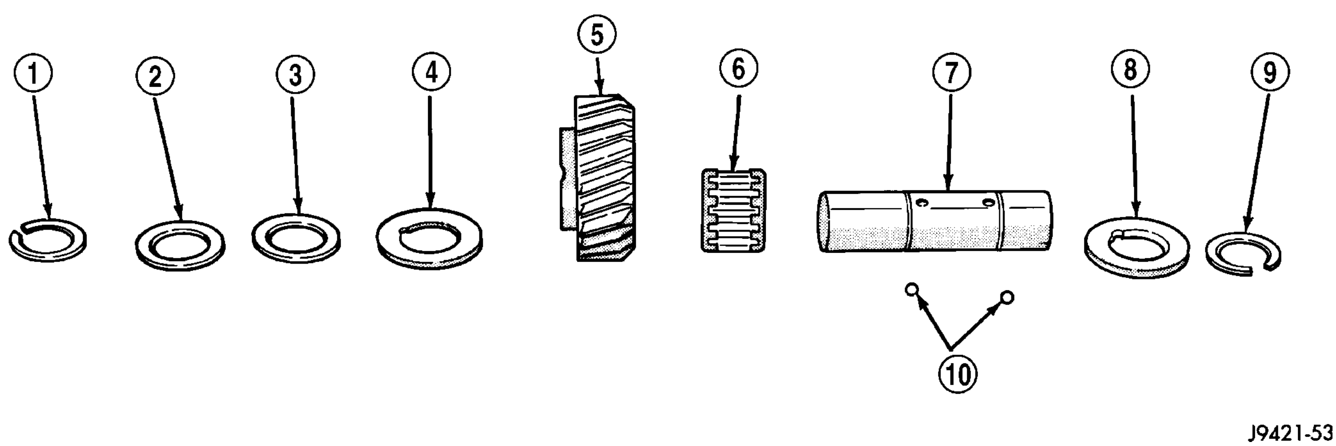


Fig. 50 REVERSE IDLER COMPONENTS

1 - SNAP RING
2 - FLAT WASHER
3 - WAVE WASHER
4 - THRUST WASHER
5 - REVERSE IDLER GEAR
6 - IDLER GEAR BEARING
7 - IDLER SHAFT
8 - THRUST WASHER
9 - SNAP RING
10 - THRUST WASHER LOCKBALLS

MANUAL - NV3550 (Continued)

INSPECTION

NOTE: Minor nicks on surfaces can be smoothed off with 320/420 grit emery cloth and final polished with oil coated crocus cloth.

SHIFT LEVER ASSEMBLY

The shift lever assembly is not serviceable. Replace the lever and shift tower as an assembly if the tower, lever, lever ball, or internal components are worn, or damaged.

SHIFT SHAFT AND FORKS

Inspect the shift fork interlock arms and synchro sleeve contact surfaces (Fig. 51). Replace any fork exhibiting wear or damage in these areas. Do not attempt to salvage shift forks.

Check condition of the shift shaft detent plunger and spring. The plunger should be smooth and free of nicks, or scores. The plunger spring should be straight and not collapsed, or distorted. Replace the plunger and spring if in doubt about condition. Check condition of detent plunger bushings. Replace if damaged.

Inspect the shift shaft, shift shaft bushing and bearing, the shaft lever, and the lever bushing that fits over the lever. Replace the shaft if bent, cracked, or severely scored. Replace the shift shaft bushing or bearing if damaged.

Replace the shaft lever and bushing if either part is deformed, or worn. Do not attempt to salvage these parts as shift fork binding will occur. Replace the roll pin that secures the lever to the shaft.

FRONT/REAR HOUSINGS AND BEARING RETAINERS

Inspect the housings carefully. Look for cracks, stripped threads, scored mating surfaces, damaged bearing bores, or worn dowel pin holes. Minor nicks on mating surfaces can be dressed off with a fine file, or emery cloth.

NOTE: The front housing contains the countershaft front bearing race. The rear housing contains the countershaft rear bearing race. Be advised that these components are NOT serviceable items. The front housing will have to be replaced if the countershaft bearing race is loose, worn, or damaged. The rear housing will have to be replaced if the countershaft rear bearing race is loose, worn, or damaged.

Inspect the input shaft bearing retainer. Be sure the release bearing slide surface of the retainer is in good condition. Replace the retainer seal if necessary.

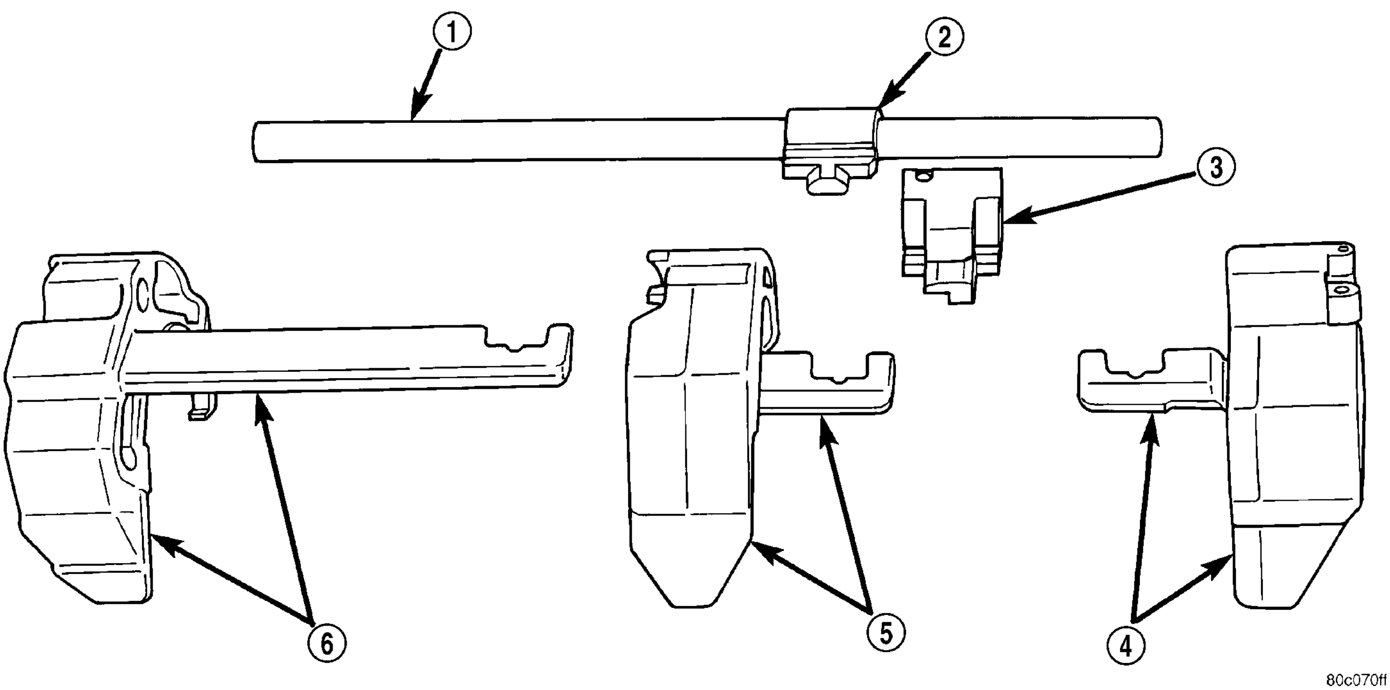


Fig. 51 Shift Forks And Shaft

1 - SHIFT SHAFT
2 - SHAFT LEVER
3 - SHAFT LEVER BUSHING
4 - 3-4 SHIFT FORK
5 - 1-2 SHIFT FORK
6 - FIFTH-REVERSE SHIFT FORK

MANUAL - NV3550 (Continued)

Inspect the output shaft bearing retainer. Be sure the U-shaped retainer is flat and free of distortion. Replace the retainer if the threads are damaged, or if the retainer is bent, or cracked.

COUNTERSHAFT BEARINGS AND RACES

The countershaft bearings and races are machine lapped during manufacture to form matched sets. The bearings and races should not be interchanged.

NOTE: The bearing races are a permanent press fit in the housings and are NOT serviceable. If a bearing race becomes damaged, it will be necessary to replace the front or rear housing as necessary. A new countershaft bearing will be supplied with each new housing for service use.

The countershaft bearings can be installed backwards if care is not exercised. The bearing roller cage is a different diameter on each side. Be sure the bearing is installed so the large diameter side of the cage is facing the countershaft gear (Fig. 52). The small diameter side goes in the bearing race.

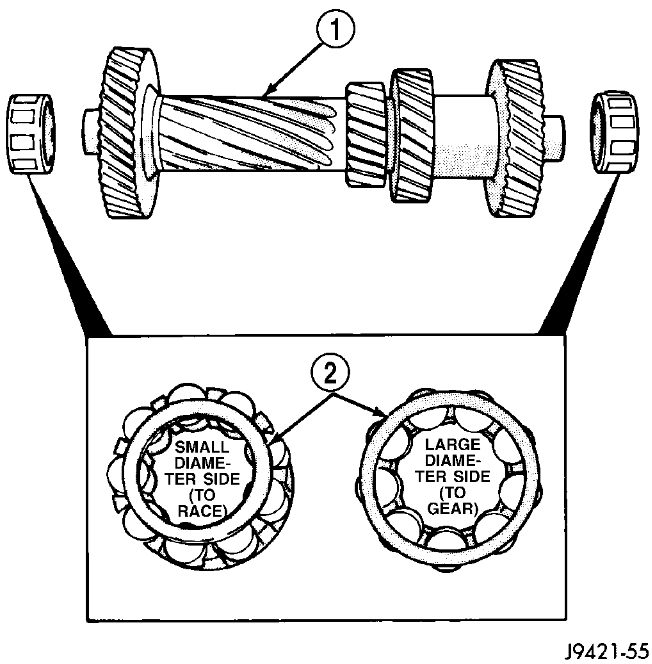


Fig. 52 Countershaft Bearings

1 - COUNTERSHAFT
2 - BEARING CAGE

REVERSE IDLER COMPONENTS

Inspect the idler gear, bearing, shaft, thrust washer, wave washer and thrust plate. Replace the bearing if any of the needle bearing rollers are worn, chipped, cracked, flat-spotted, or brinnelled. Also replace the bearing if the plastic bearing cage is damaged or distorted.

Replace the thrust washer, wave washer, or thrust plate if cracked, chipped, or worn. Replace the idler gear if the teeth are chipped, cracked or worn thin. Replace the shaft if worn, scored, or the bolt threads are damaged beyond repair. Replace the support segment if cracked, or chipped and replace the idler attaching bolts if the threads are damaged.

Shift Socket

Inspect the shift socket for wear or damage. Replace the socket if the roll pin, or shift shaft bores are damaged. Minor nicks in the shift lever ball seat in the socket can be smoothed down with 400 grit emery or wet/dry paper. Replace the socket if the ball seat is worn, or cracked. Do not reuse the original shift socket roll pin. Install a new pin during reassembly. The socket roll pin is approximately is approximately 33 mm (1-1/4 in.) long.

Output Shaft And Geartrain

Inspect all of the gears for worn, cracked, chipped, or broken teeth. Also check condition of the bearing bore in each gear. The bores should be smooth and free of surface damage. Discoloration of the gear bores is a normal occurrence and is not a reason for replacement. Replace gears only when tooth damage has occurred, or if the bores are brinnelled or severely scored.

Inspect the shaft splines and bearings surfaces. Replace the shaft if the splines are damaged or bearing surfaces are deeply scored, worn, or brinnelled.

ASSEMBLY

CAUTION: Transmission shift components must be in the Neutral position during assembly, to prevent damage to synchros and shift components durning housing installation.

NOTE: Use Mopar Gasket Maker or equivalent, for all case joints and Mopar silicone sealer or equivalent, for the input shaft bearing retainer.

SYNCHRONIZER

NOTE: Assemble synchro springs, struts and detent balls one at a time.

(1) Slide the sleeve onto the hub, leaving enough room to install the spring in the hub and strut in the hub groove.

(2) Install the first spring in the hub. Then install a strut over the spring and verify the spring is seated in the spring bore in the strut.

MANUAL - NV3550 (Continued)

(3) Slide the sleeve onto the hub just far enough to hold the first strut and spring in place.

(4) Place the detent ball in the top of the strut. Then carefully work the sleeve over the ball to hold it in place. With a small flat blade screwdriver, press the ball into place while moving the sleeve over it.

(5) Repeat the procedure for the remaining springs, struts and balls. Tape or rubber band each strut and ball to temporarily secure as they are installed.

(6) Verify synchro springs, struts and detent balls are all in place (Fig. 53).

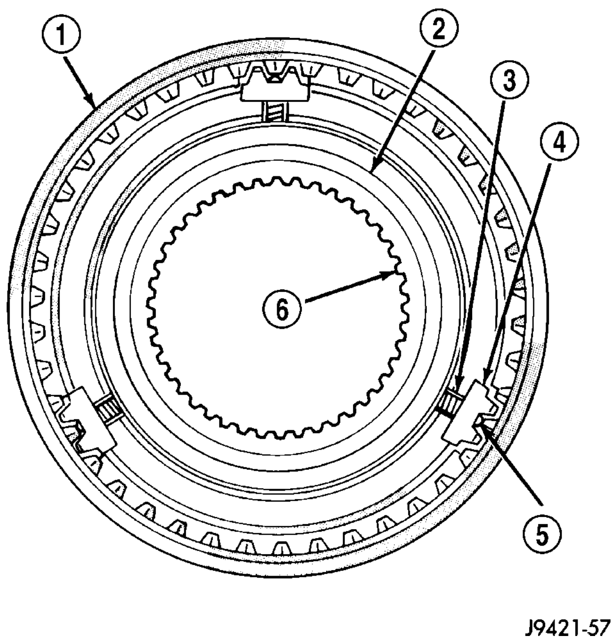


Fig. 53 SYNCHRONIZER COMPONENTS

1 - SLEEVE
2 - HUB SHOULDER
3 - SPRING (3)
4 - STRUT (3)
5 - DETENT BALL (3)
6 - HUB

OUTPUT SHAFT

NOTE: Lubricate shaft, gears, bearings and immerse each synchro ring with recommended lubricant during assembly. Petroleum jelly can be used to hold parts in place.

(1) Install reverse gear needle bearing, against the shoulder of the output shaft (Fig. 54).

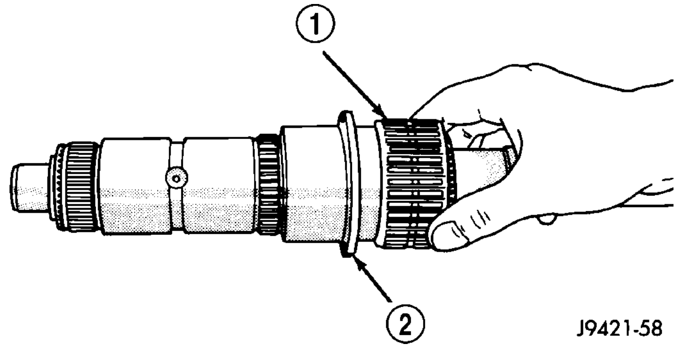


Fig. 54 REVERSE GEAR BEARING

1 - REVERSE GEAR BEARING
2 - SHOULDER

(2) Install reverse gear over needle bearing (Fig. 55).

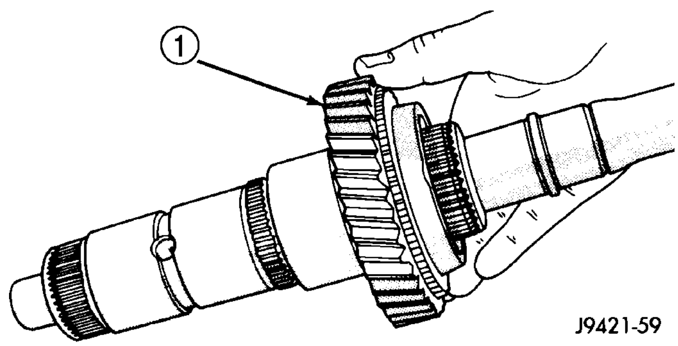


Fig. 55 REVERSE GEAR

1 - REVERSE GEAR

(3) Install brass synchro ring on reverse gear (Fig. 56).

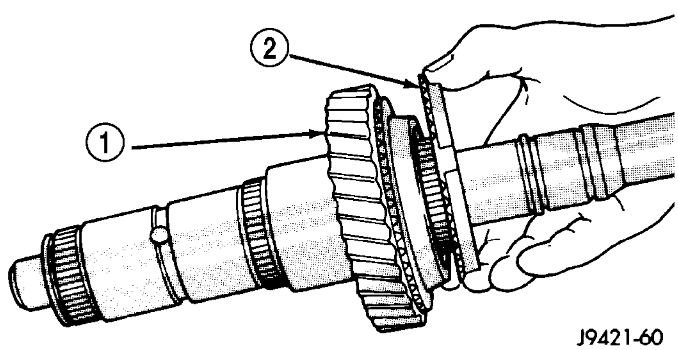


Fig. 56 REVERSE SYNCHRO

1 - REVERSE GEAR
2 - SYNCHRO RING

MANUAL - NV3550 (Continued)

(4) Assemble fifth-reverse synchro hub, sleeve, struts, springs and detent balls, if not previously done.

NOTE: The side of the hub with the shoulder around the hub bore and tapered side of the sleeve, faces the front of the shaft.

(5) Align fifth-reverse synchro assembly on output shaft splines. Seat synchro onto the shaft with Cup 6310-1 and a press (Fig. 57).

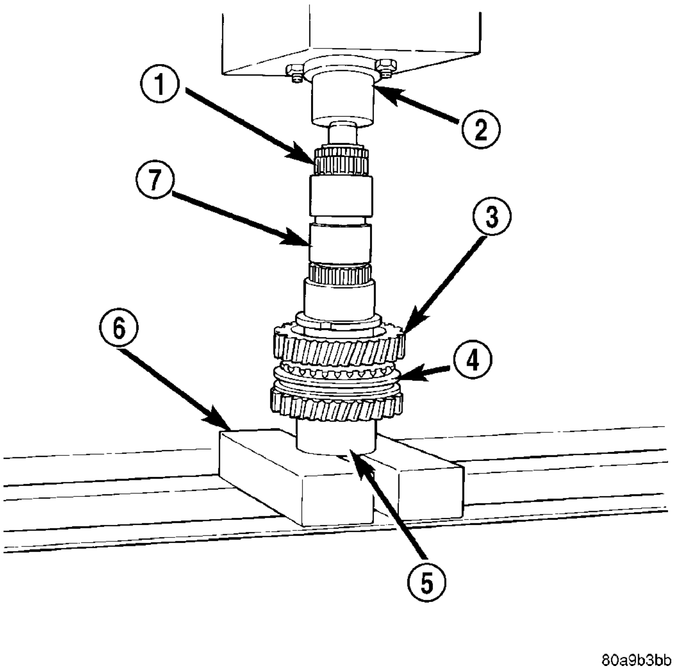


Fig. 57 FIFTH-REVERSE SYNCHRO ASSEMBLY

1 - SPACER
2 - PRESS RAM
3 - REVERSE GEAR
4 - FIFTH-REVERSE SYNCHRO ASSEMBLY
5 - CUP
6 - PRESS BLOCKS
7 - OUTPUT SHAFT

(6) Install **new** fifth-reverse hub snap ring (Fig. 58) and verify the snap ring is seated.

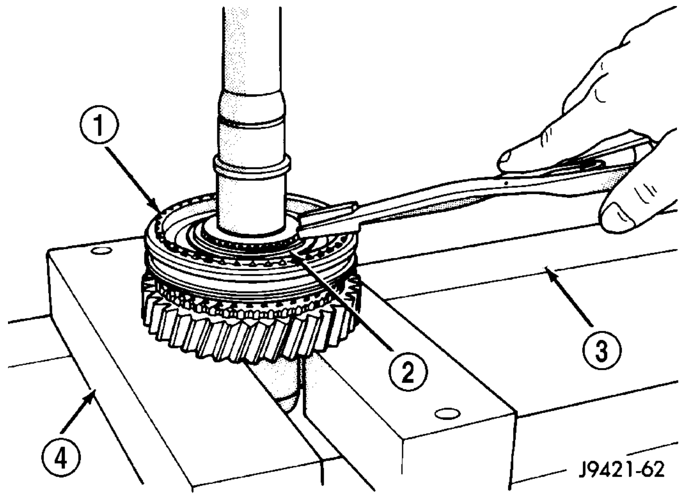


Fig. 58 FIFTH/REVERSE SYNCHRO HUB SNAP RING

1 - FIFTH-REVERSE SYNCHRO ASSEMBLY
2 - SNAP RING
3 - PRESS BED
4 - PRESS BLOCKS

(7) Install fifth gear synchro ring in synchro hub and sleeve (Fig. 59).

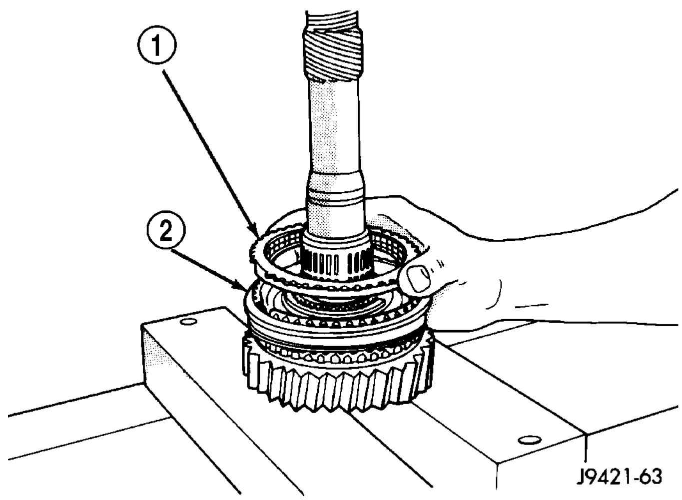


Fig. 59 FIFTH GEAR SYNCHRO RING

1 - FIFTH-SPEED SYNCHRO RING
2 - FIFTH-REVERSE SYNCHRO ASSEMBLY

MANUAL - NV3550 (Continued)

(8) Install fifth gear bearing by spreading bearing, just enough to clear shoulder on the output shaft (Fig. 60). Verify bearing is properly seated.

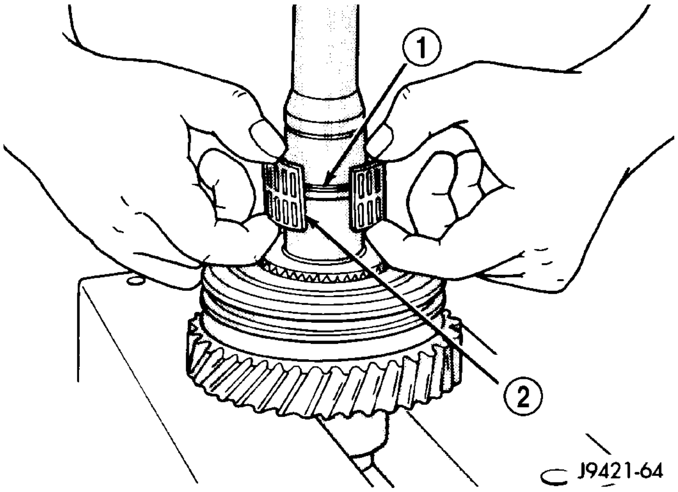


Fig. 60 FIFTH GEAR BEARING

1 - SHAFT SHOULDER
2 - FIFTH GEAR BEARING

(9) Install fifth gear on shaft and onto bearing (Fig. 61).

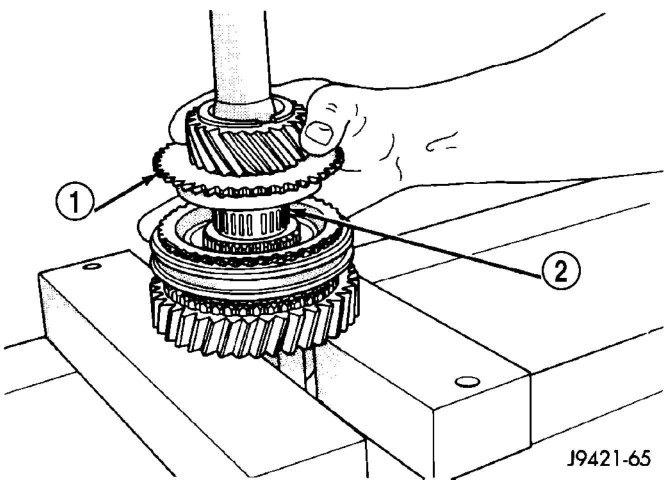


Fig. 61 FIFTH GEAR

1 - FIFTH GEAR
2 - BEARING

(10) Invert output shaft and set shaft in Cup 6310-1 so fifth gear is seated on the tool (Fig. 62).

(11) Install first gear bearing on output shaft (Fig. 62). Verify bearing is seated on shaft shoulder and is properly joined.

(12) Install first gear on shaft and over bearing with bearing synchro cone facing up (Fig. 63).

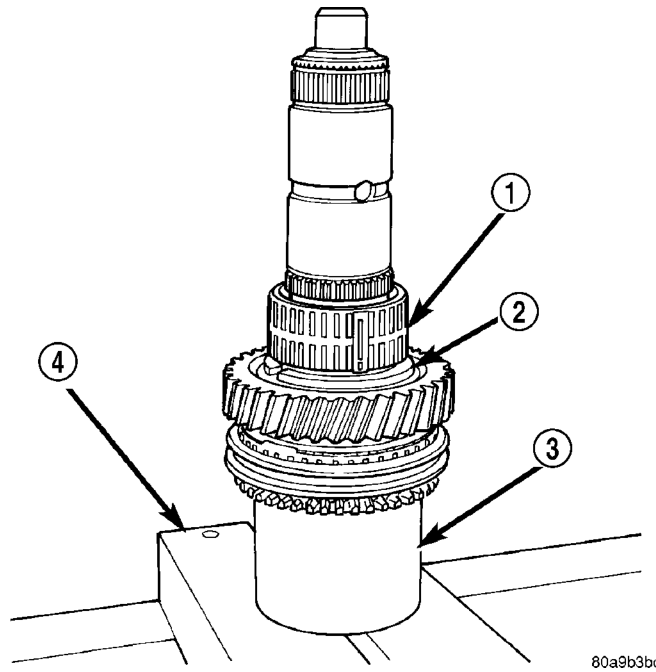


Fig. 62 FIRST GEAR BEARING

1 - FIRST GEAR BEARING
2 - SHAFT SHOULDER
3 - CUP
4 - PRESS BLOCKS

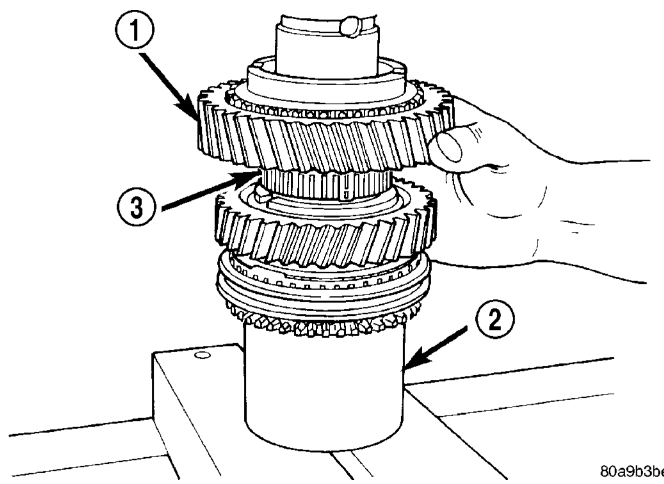


Fig. 63 FIRST GEAR

1 - FIRST GEAR
2 - CUP
3 - BEARING

MANUAL - NV3550 (Continued)

(13) Install first gear synchro ring (Fig. 64).

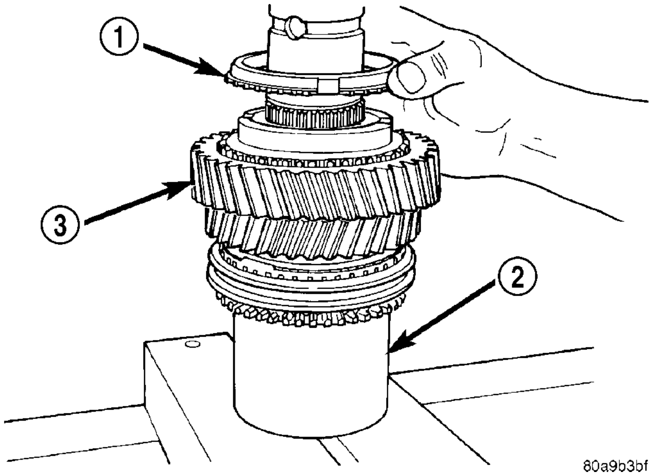


Fig. 64 FIRST GEAR SYNCHRO RING

1 - FIRST GEAR SYNCHRO RING
2 - CUP
3 - FIRST GEAR

(14) Assemble 1-2 synchro hub sleeve, springs, struts and detent balls.

CAUTION: One side of the synchro sleeve is marked First Gear Side. This side of the sleeve must face first gear.

(15) Align 1-2 synchro assembly on the shaft (Fig. 65).

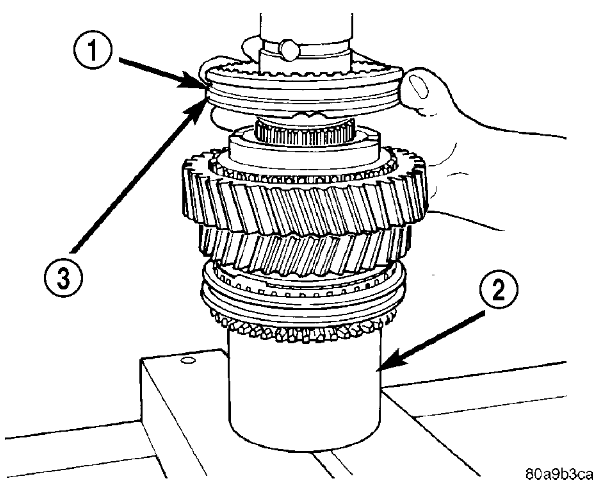


Fig. 65 STARTING 1-2 SYNCHRO

1 - 1-2 SYNCHRO ASSEMBLY
2 - CUP
3 - FIRST GEAR SIDE OF SYNCHRO SLEEVE

(16) Press 1-2 synchro onto output shaft using suitable size pipe tool and shop press (Fig. 66).

CAUTION: Ensure synchro ring and sleeve is aligned as hub is being pressed onto the shaft. The synchro ring can crack if not aligned.

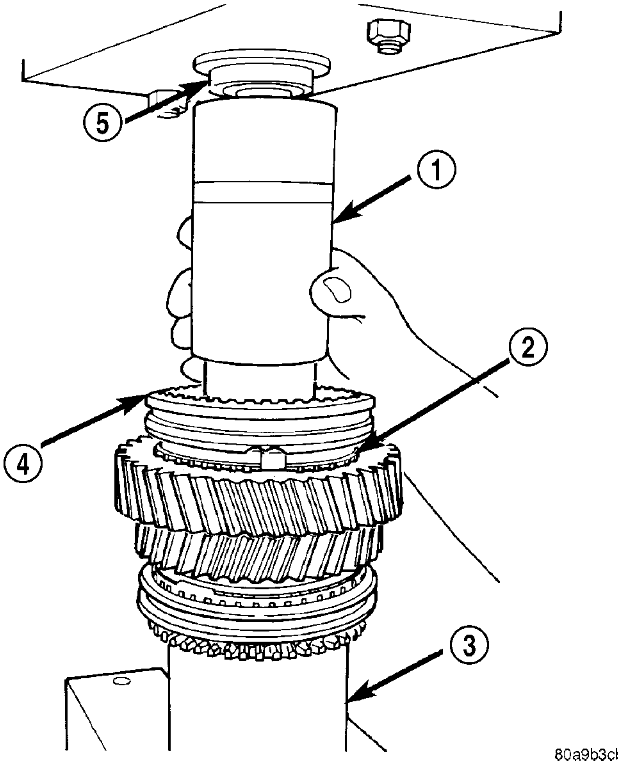


Fig. 66 PRESS 1-2 SYNCHRO

1 - SUITABLE SIZE PIPE
2 - SYNCHRO RING
3 - SPECIAL TOOL
4 - 1-2 SYNCHRO ASSEMBLY
5 - PRESS RAM

(17) Install interm ring.

(18) Install **new** 1-2 synchro hub snap ring (Fig. 67) and verfiy the snap ring is seated.

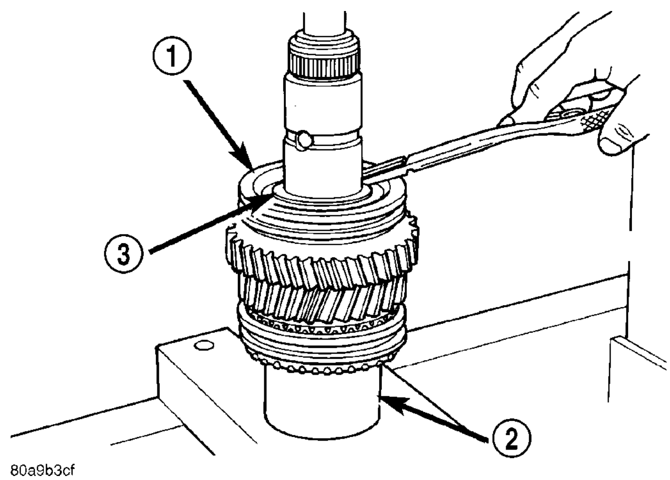


Fig. 67 1-2 SYNCHRO HUB SNAP RING

1 - 1-2 SYNCHRO
2 - CUP
3 - SYNCHRO SNAP RING

MANUAL - NV3550 (Continued)

(19) Install second gear synchro ring in 1-2 synchro hub and sleeve (Fig. 68). Verify synchro ring is properly seated.

(20) Install synchro friction cone and synchro cone in synchro ring.

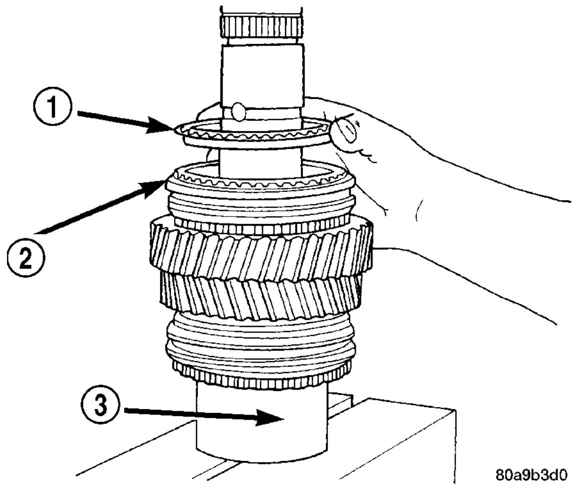


Fig. 68 SECOND GEAR SYNCHRO RING

1 - SECOND GEAR SYNCHRO RING
2 - 1-2 SYNCHRO
3 - CUP

(21) Install second gear needle bearing on shaft (Fig. 69).

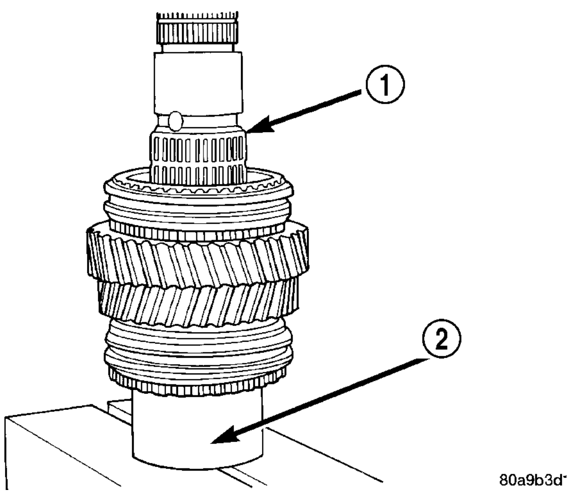


Fig. 69 SECOND GEAR BEARING

1 - SECOND GEAR BEARING
2 - CUP

(22) Install second gear onto shaft and bearing (Fig. 70). Verify second gear is fully seated on synchro components.

(23) Install two-piece thrust washer (Fig. 71). Ensure washer halves are seated in shaft groove and washer lugs are seated in shaft lug bores.

NOTE: Verify i.d. grooves and markings noted during removal are facing the correct direction.

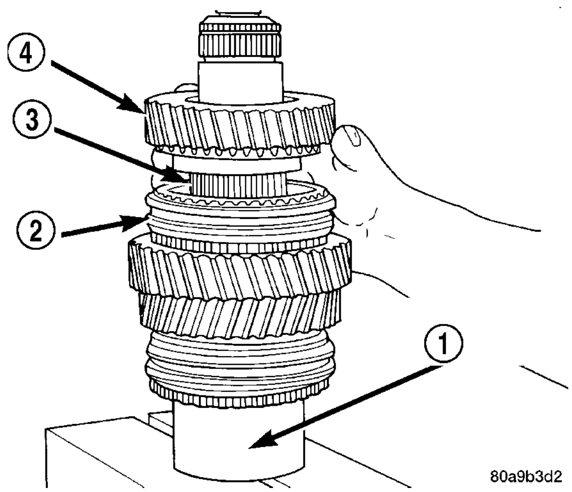


Fig. 70 SECOND GEAR

1 - CUP
2 - 1-2 SYNCHRO ASSEMBLY
3 - BEARING
4 - SECOND GEAR

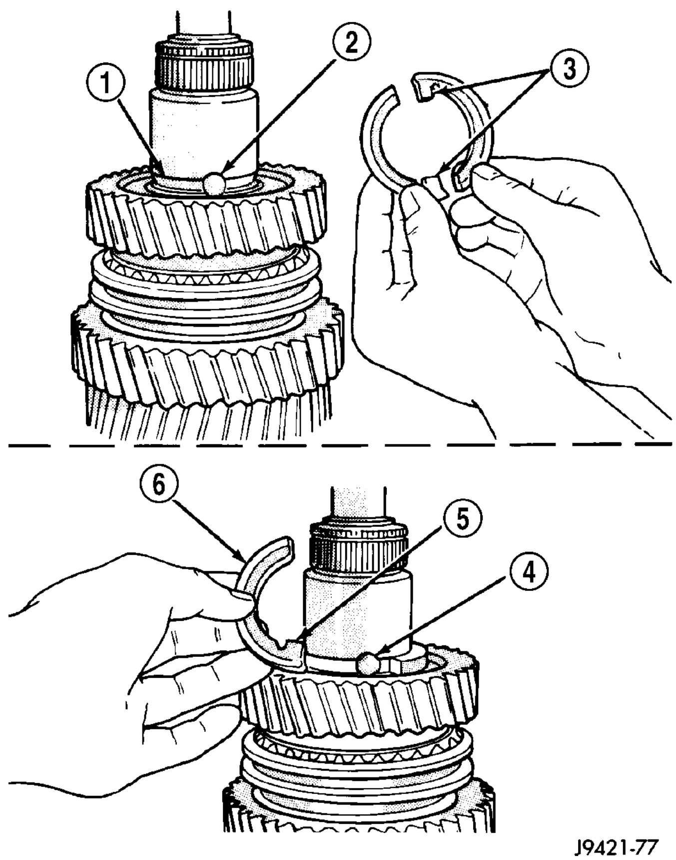


Fig. 71 TWO-PIECE THRUST WASHER

1 - WASHER GROOVE IN SHAFT
2 - LUG BORE
3 - THRUST WASHER LUGS
4 - LUG BORE
5 - LUG
6 - WASHER HALF

MANUAL - NV3550 (Continued)

(24) Start retaining ring around two-piece thrust washer (Fig. 72). Ensure locating dimple is between the thrust washer halves.

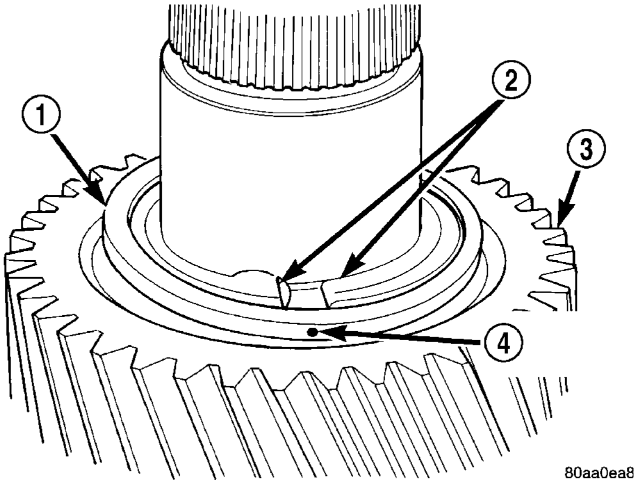


Fig. 72 RETAINING RING

1 - THRUST WASHER RETAINING RING
2 - THRUST WASHER HALVES
3 - SECOND GEAR
4 - LOCATING DIMPLE

(25) Seat thrust washer retaining ring with plastic mallet (Fig. 73).

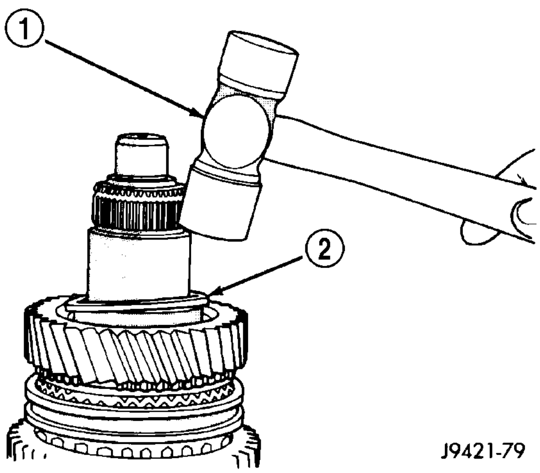


Fig. 73 THRUST RETAINER

1 - PLASTIC MALLET
2 - THRUST WASHER RETAINING RING

(26) Install third gear needle bearing on shaft (Fig. 74).

(27) Install third gear on shaft and bearing (Fig. 75).

(28) Install third speed synchro ring on third gear (Fig. 76).

(29) Assemble 3-4 synchro hub, sleeve, springs, struts and detent balls.

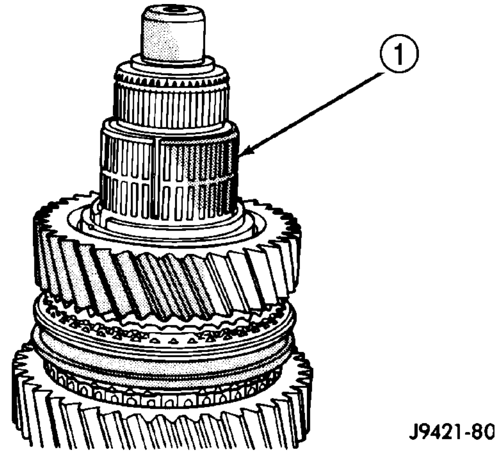


Fig. 74 THIRD GEAR BEARING

1 - THIRD GEAR BEARING

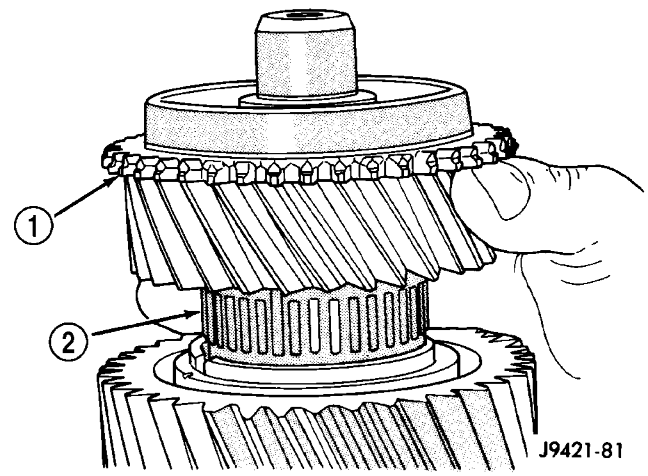


Fig. 75 THIRD GEAR

1 - THIRD GEAR
2 - BEARING

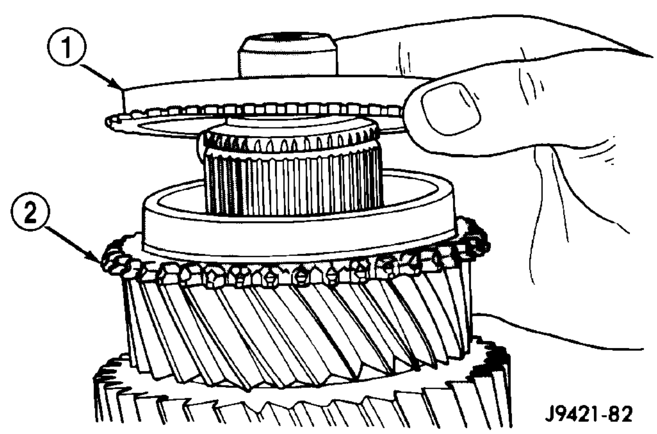


Fig. 76 THIRD SPEED SYNCHRO RING

1 - THIRD SPEED SYNCHRO RING
2 - THIRD GEAR

MANUAL - NV3550 (Continued)

(30) Align 3-4 synchro hub on output shaft splines by hand (Fig. 77).

CAUTION: One side of the sleeve has grooves in it. This side of sleeve must faces the front of the shaft.

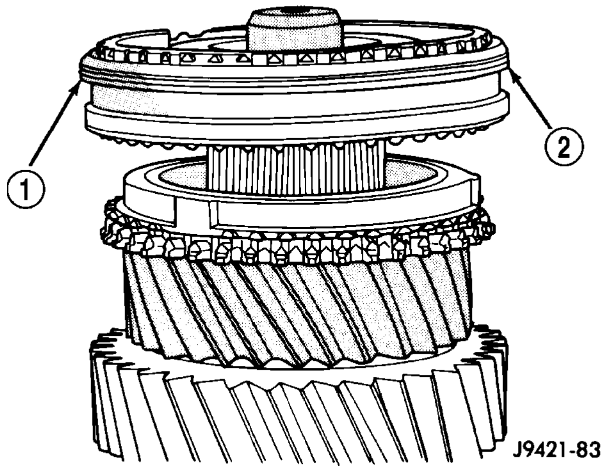


Fig. 77 3-4 SYNCHRO HUB ON OUTPUT SHAFT

1 - GROOVED SIDE OF SLEEVE
2 - 3-4 SYNCHRO ASSEMBLY

(31) Press 3-4 synchro assembly onto output shaft with shop press and suitable size pipe tool (Fig. 78).

NOTE: Place the pipe on hub as close to output shaft as possible without contacting the shaft splines.

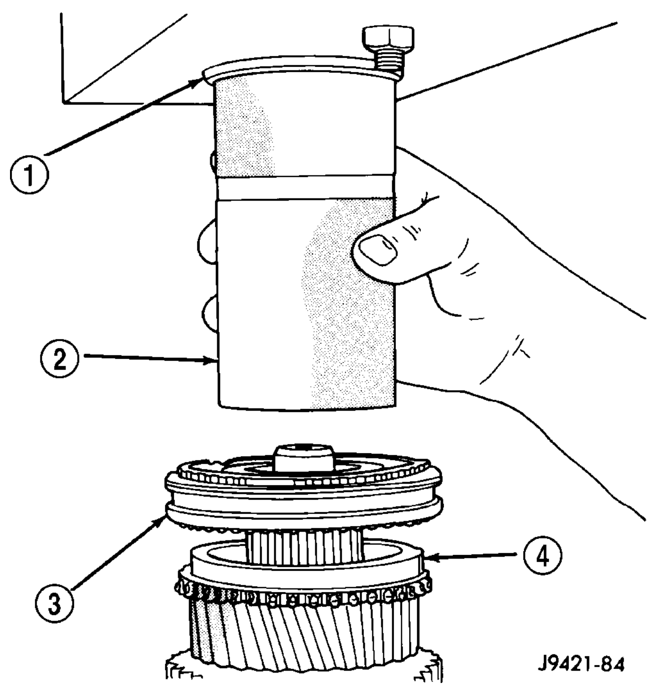


Fig. 78 PRESS 3-4 SYNCHRO ON OUTPUT SHAF

1 - PRESS RAM
2 - PIPE TOOL
3 - 3-4 SYNCHRO
4 - THIRD SPEED SYNCHRO RING

(32) Install **new** 3-4 synchro hub snap ring (Fig. 79) and verify snap ring is seated.

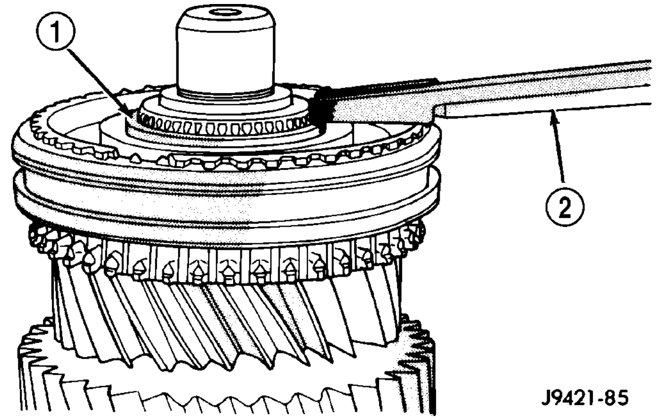


Fig. 79 3-4 SYNCHRO HUB SNAP RING

1 - 3-4 SYNCHRO HUB SNAP RING
2 - HEAVY DUTY SNAP RING PLIERS

(33) Install output shaft bearing.

(34) Install output shaft bearing snap ring, spreading it just enough to install it (Fig. 80). Verify snap ring is seated in shaft groove.

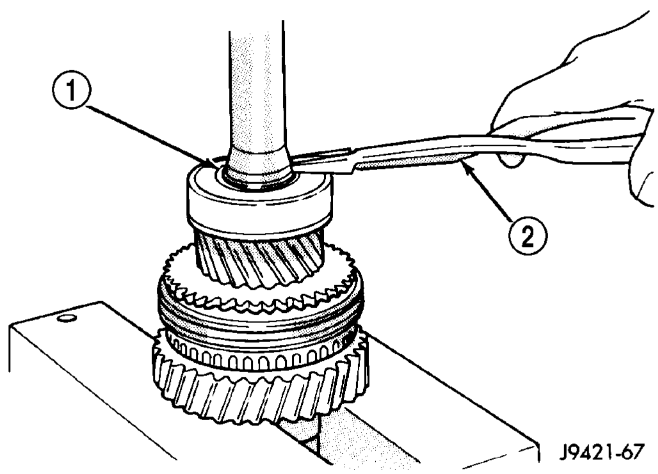


Fig. 80 OUTPUT SHAFT BEARING

1 - BEARING SNAP RING
2 - SNAP RING PLIERS

MANUAL - NV3550 (Continued)

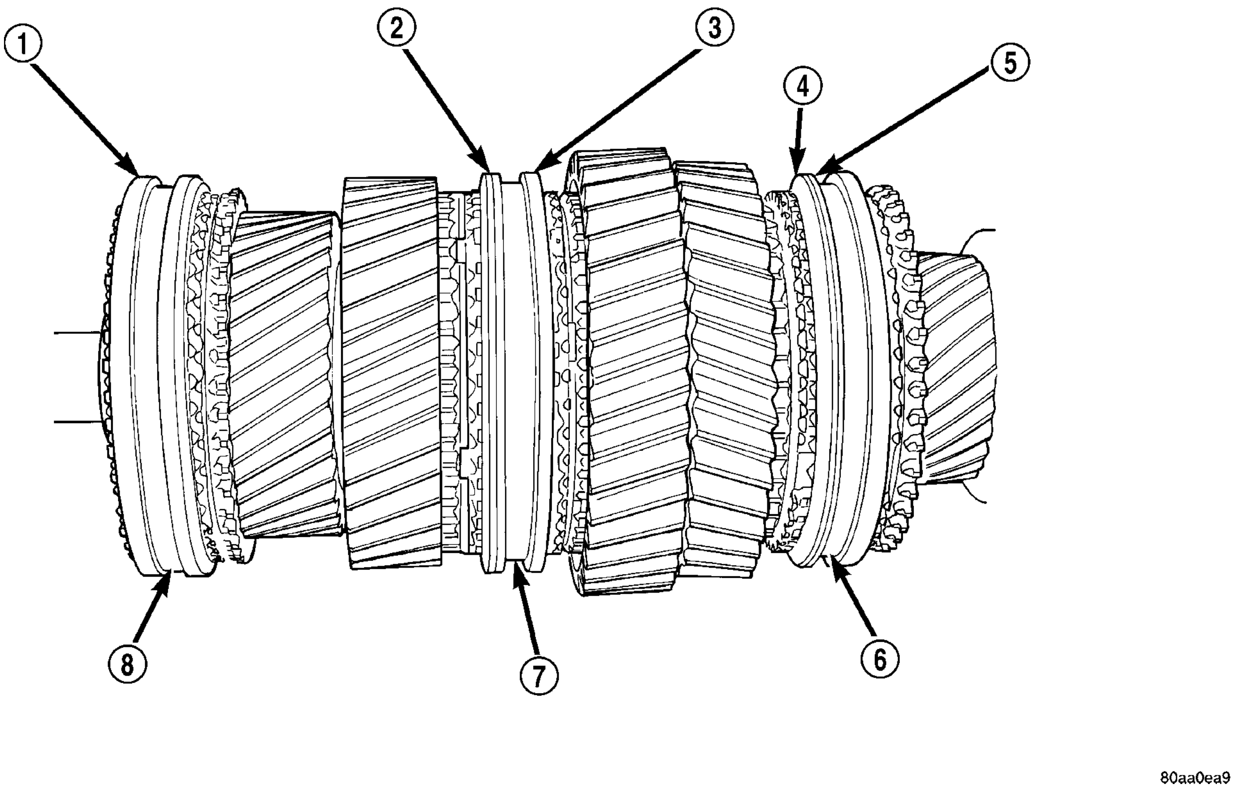


Fig. 81 SYNCHRO SLEEVE LOCATIONS

1 - DOUBLE GROOVE FORWARD
2 - GROOVE FORWARD
3 - FIRST GEAR SIDE MARKING TOWARD FIRST GEAR
4 - TAPER FORWARD
5 - GROOVE FORWARD
6 - 5TH-REV SYNCHRO SLEEVE
7 - 1-2 SYNCHRO SLEEVE
8 - 3-4 SYNCHRO SLEEVE

(35) Verify position of synchro sleeves before proceeding with assembly operations (Fig. 81). Grooved side of 3-4 sleeve should be facing forward. First gear side of 1-2 sleeve should be facing first gear. Tapered side of fifth-reverse sleeve should be facing forward.

REVERSE IDLER ASSEMBLY

(1) Lubricate idler components with gear lube.

(2) Slide idler gear bearing on shaft (Fig. 82). Bearing fits either way on shaft.

(3) Slide gear onto shaft with recess to the rear (Fig. 82).

(4) Place first lock ball in dimple at rear end of idler shaft (Fig. 82). Hold ball in place with petroleum jelly.

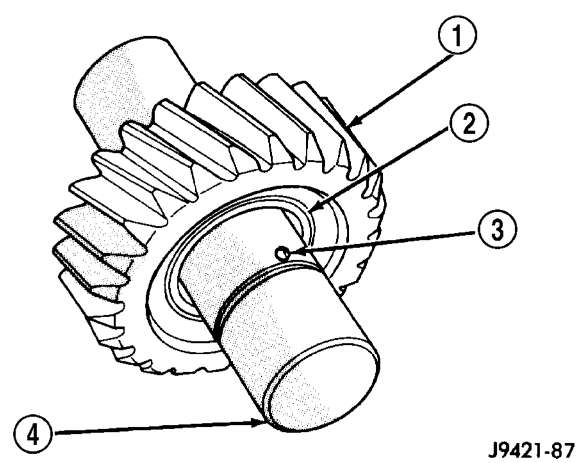


Fig. 82 IDLER GEAR AND BEARING

1 - IDLER GEAR
2 - BEARING
3 - LOCK BALL
4 - REAR OF SHAFT

MANUAL - NV3550 (Continued)

(5) Slide rear thrust washer onto shaft and over lock ball (Fig. 83).

(6) Install snap ring in groove at rear of shaft (Fig. 83).

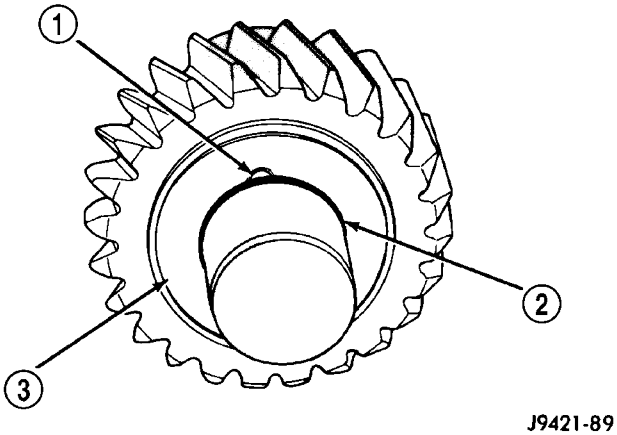


Fig. 83 IDLER GEAR REAR THRUST WASHER

1 - LOCK BALL
2 - SNAP RING GROOVE
3 - THRUST WASHER

(7) Install lock ball in dimple at front of shaft. Hold ball in place with petroleum jelly.

(8) Install front thrust washer on shaft and slide washer up against gear and over lock ball (Fig. 84).

(9) Install wave washer, flat washer and remaining snap ring on idler shaft (Fig. 84). Verify snap ring is seated.

SHIFT SHAFT AND BUSHINGS/BEARINGS

(1) Locate a bolt that will thread into the bushing without great effort.

(2) Thread the bolt into the bushing, allowing the bolt to make its own threads in the bushing.

(3) Attach a slide hammer or suitable puller to the bolt and remove bushing.

(4) Use the short end of Installer 8119 to install the new bushing.

(5) The bushing is correctly installed if the bushing is flush with the transmission case.

(6) To replace the bearing locate a bolt that will thread into the bearing without great effort.

(7) Thread the bolt into the bearing as much as possible.

(8) Attach a slide hammer or suitable puller to the bolt and remove the bearing.

(9) Use the short end of Installer 8119 to install the new bearing.

(10) The bearing is correctly installed if the bearing is flush with the transmission case.

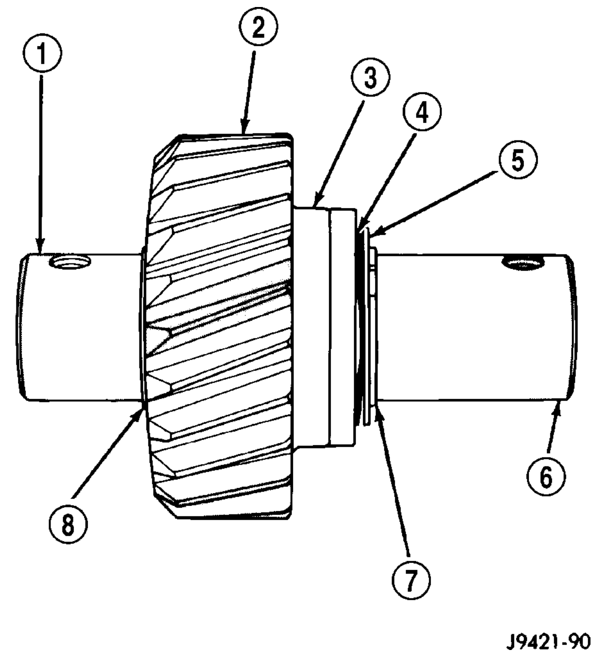


Fig. 84 IDLER GEAR AND SHAFT ASSEMBLY

1 - REAR OF SHAFT
2 - GEAR
3 - THRUST WASHER AND BALL
4 - WAVE WASHER
5 - FLAT WASHER
6 - FRONT OF SHAFT
7 - SNAP RING
8 - SNAP RING

DETENT PLUNGER BUSHING

NOTE: The detent plunger bushings are installed to a specific depth. The space between the two bushings when correctly installed contain an oil feed hole. Do not attempt to install the bushings with anything other than the specified tool or this oil hole may become restricted.

(1) Using the long end of Installer 8119, drive the detent bushings through the outer case and into the shift shaft bore.

(2) Remove the bushings from the shift shaft bore.

(3) Install a new detent plunger bushing on the long end of Installer 8118.

(4) Start the bushing in the detent plunger bore in the case.

(5) Drive the bushing into the bore until the tool contacts the transmission case.

(6) Install a new detent plunger bushing on the short end of Installer 8118.

(7) Start the bushing in the detent plunger bore in the case.

(8) Drive the bushing into the bore until the tool contacts the transmission case.

MANUAL - NV3550 (Continued)

GEARTRAIN ASSEMBLY

(1) Install Adapter 6747-1A on input shaft hub of Fixture 6747 (Fig. 85).

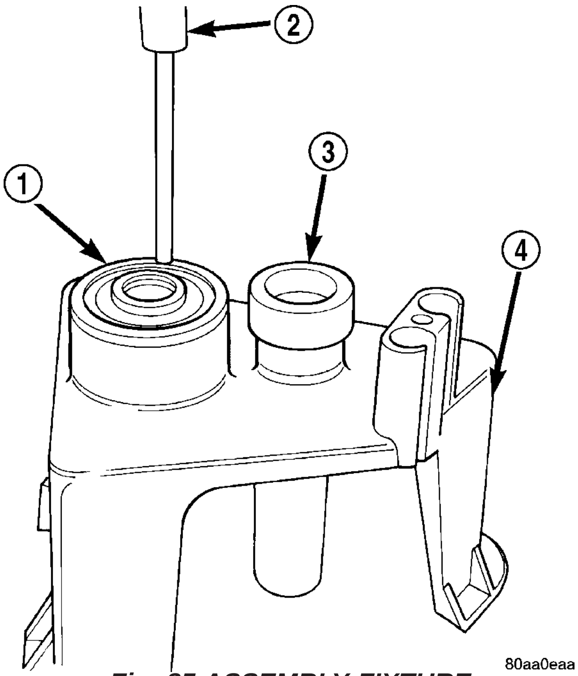


Fig. 85 ASSEMBLY FIXTURE

1 - ADAPTER 6747-2A
2 - CUP 8115
3 - ADAPTER 6747-1A
4 - FIXTURE

(2) Install input shaft in fixture and make sure Adapter 6747-1A is positioned under shaft as shown (Fig. 86).

(3) Install pilot bearing in input shaft (Fig. 86).

NOTE: The side of the pilot bearing with the small diameter goes toward the input shaft.

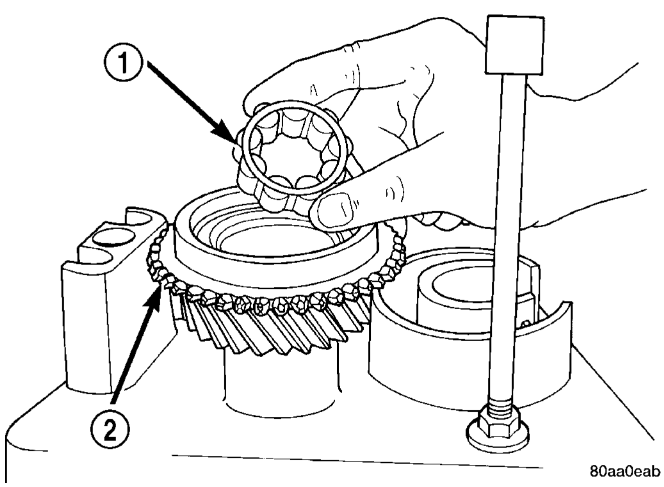


Fig. 86 PILOT BEARING AND INPUT SHAFT

1 - PILOT BEARING
2 - INPUT SHAFT

(4) Install fourth gear synchro ring on input shaft (Fig. 87).

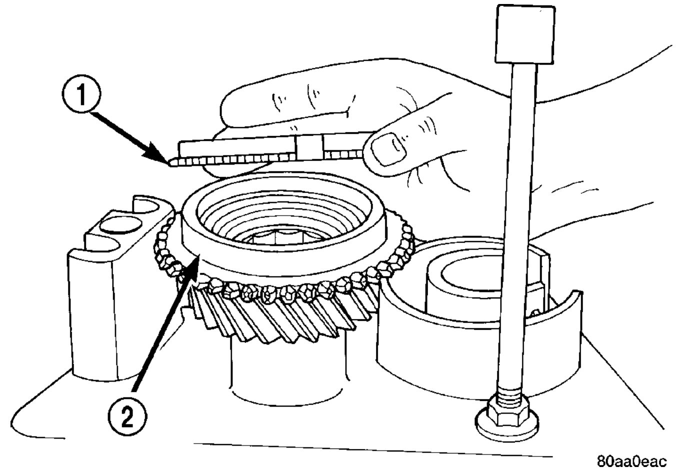


Fig. 87 FOURTH GEAR SYNCHRO

1 - FOURTH GEAR SYNCHRO RING
2 - INPUT SHAFT

(5) Adjust height of idler gear pedestal on assembly fixture (Fig. 88). Start with a basic height of 18.4 cm (7-1/4 in.). Final adjustment can be made after gear is positioned on pedestal.

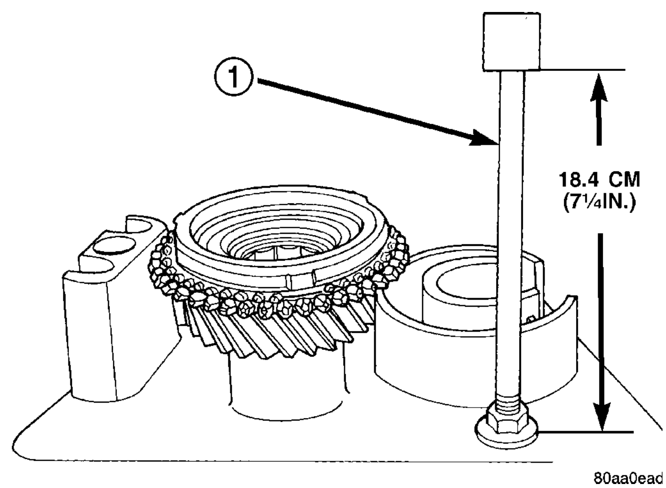


Fig. 88 IDLER PEDESTAL BASIC HEIGHT

1 - REVERSE IDLER PEDESTAL

MANUAL - NV3550 (Continued)

(6) Install assembled output shaft and geartrain in input shaft (Fig. 89). Carefully rotate output shaft until the 3-4 synchro ring seats in synchro hub and sleeve.

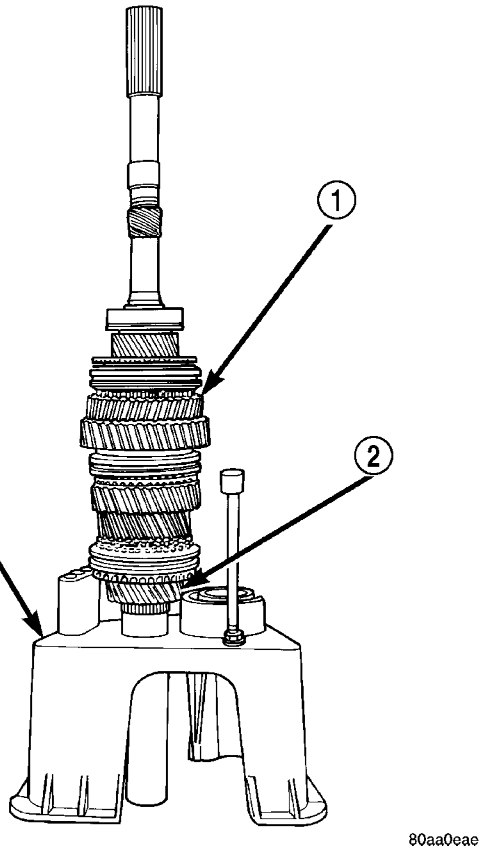


Fig. 89 OUTPUT SHAFT AND GEARTRAIN

1 - OUTPUT SHAFT AND GEARTRAIN
2 - INPUT SHAFT
3 - FIXTURE

(7) Install Adapter 6747-2A on front bearing hub of countershaft. The adapter has a shoulder on one side that goes towards the countershaft.

(8) Slide countershaft (and adapter) into fixture slot. Verify countershaft and output shaft gears are meshed with the mainshaft gears (Fig. 90).

(9) Check alignment of countershaft and output shaft gear teeth. Note gears may not align perfectly. A difference in height of 1.57 to 3.18 mm (1/16 to 1/8 in.) will probably exist. This difference will not interfere with assembly.

(10) Position reverse idler in support cup of assembly fixture (Fig. 91). Ensure idler gear is properly meshed and aligned with shaft gear teeth and bolt holes are facing out and not toward geartrain. Adjust pedestal up or down if necessary and verify that short end of idler shaft is facing up as shown.

(11) On 2-wheel drive transmission, thread one Alignment Pin 8120 in center or passenger side hole

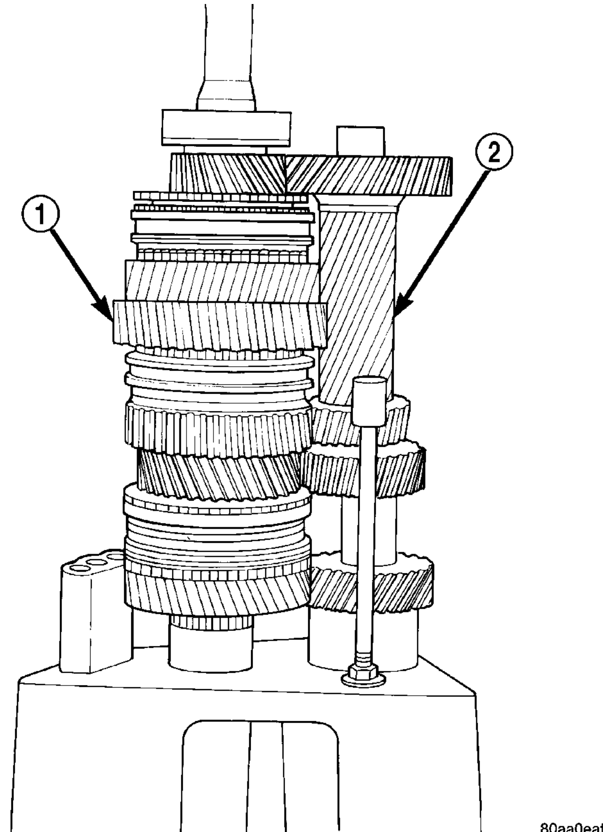


Fig. 90 COUNTERSHAFT ON FIXTURE

1 - OUTPUT SHAFT AND GEARTRAIN
2 - COUNTERSHAFT (SLIDE INTO PLACE ON FIXTURE TOOL)

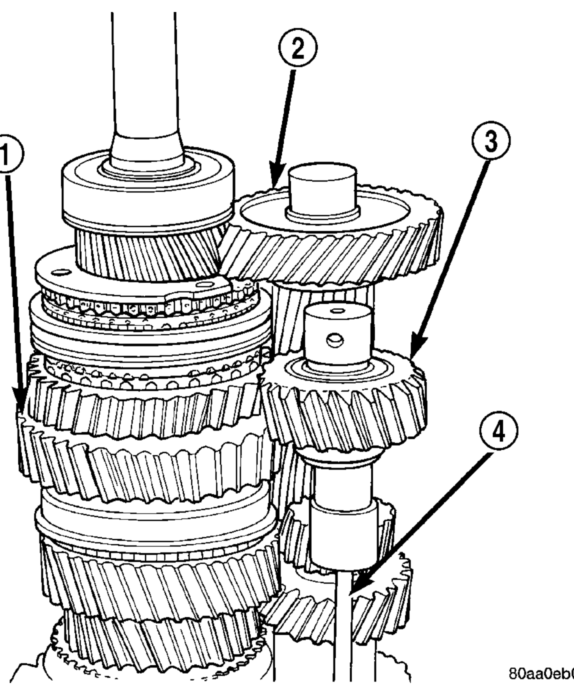


Fig. 91 REVERSE IDLER ASSEMBLY POSITION

1 - OUTPUT SHAFT AND GEARTRAIN
2 - COUNTERSHAFT
3 - REVERSE IDLER ASSEMBLY
4 - TOOL PEDESTAL

MANUAL - NV3550 (Continued)

of output shaft bearing retainer. Then position retainer on fifth gear as shown (Fig. 92).

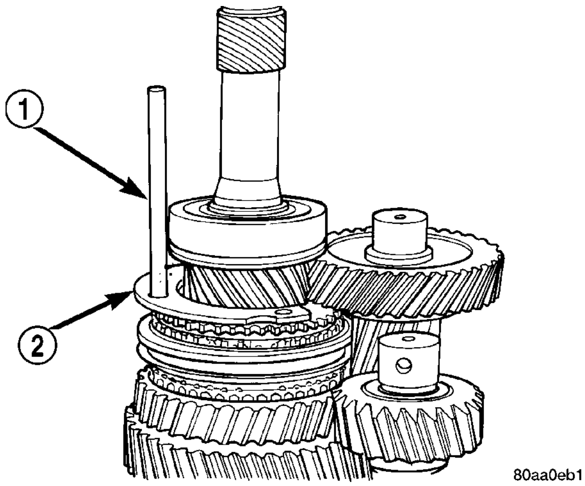


Fig. 92 POSITIONING OUTPUT SHAFT BEARING

1 - ALIGNMENT PIN
2 - OUTPUT SHAFT BEARING RETAINER

(12) Assemble 1-2 and fifth reverse-shift forks (Fig. 93). Arm of fifth-reverse fork goes through slot in 1-2 fork.

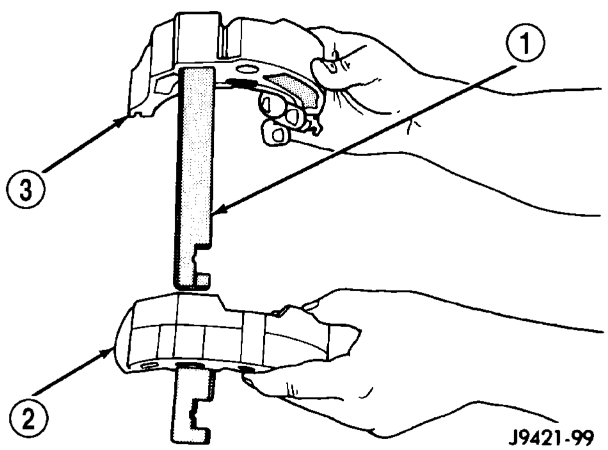


Fig. 93 1-2 AND FIFTH-REVERSE

1 - INSERT ARM THROUGH 1-2 FORK
2 - 1-2 FORK
3 - FIFTH-REVERSE FORK

(13) Install assembled shift forks in synchro sleeves (Fig. 94). Verify forks are properly seated in sleeves.

REAR HOUSING - 2WD

(1) Drive adapter housing alignment dowels back into housing until dowels are flush with mounting surface (Fig. 95).

(2) Apply liberal quantity of petroleum jelly to countershaft rear bearing and bearing race.

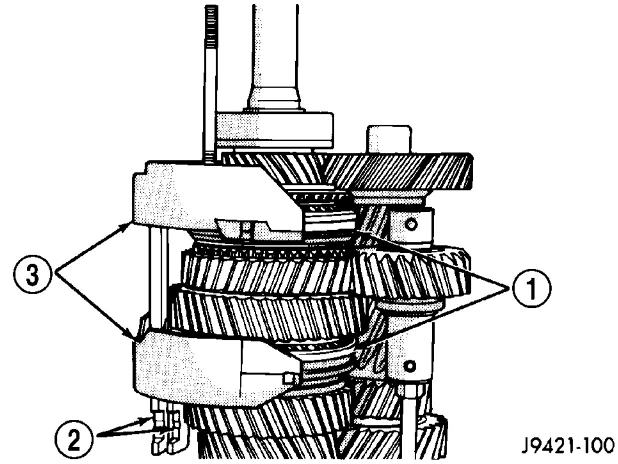


Fig. 94 SHIFT FORKS IN SYNCHRO

1 - SYNCHRO SLEEVES
2 - FORK ARMS
3 - SHIFT FORKS

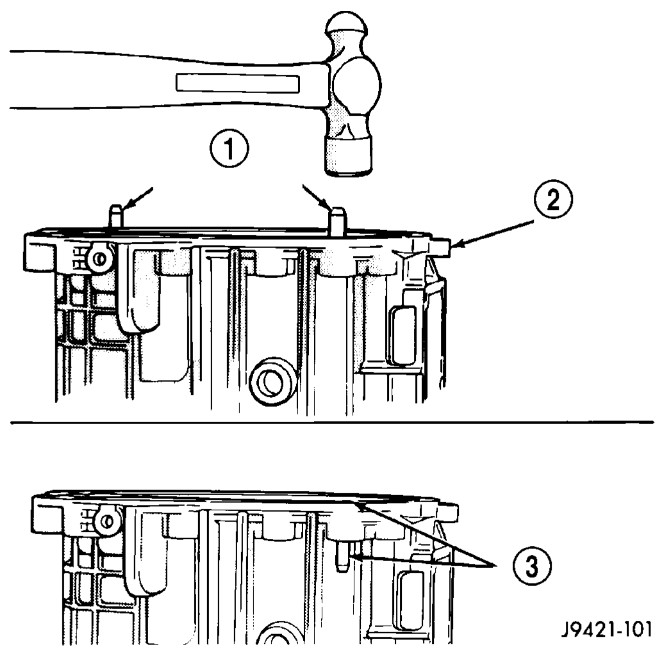


Fig. 95 REAR HOUSING DOWELS

1 - HOUSING ALIGNMENT DOWELS
2 - REAR HOUSING
3 - DOWEL FLUSH WITH SURFACE

MANUAL - NV3550 (Continued)

(3) Install countershaft rear bearing in bearing race (Fig. 96).

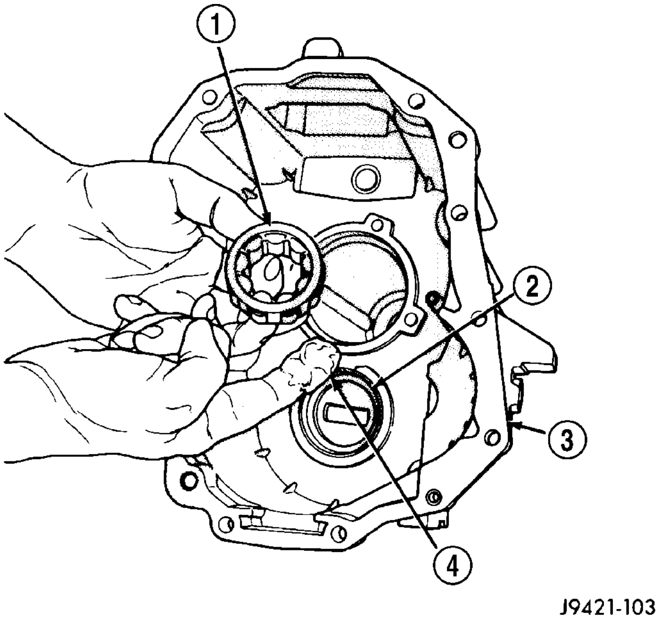


Fig. 96 COUNTERSHAFT REAR BEARING

1 - COUNTERSHAFT REAR BEARING
2 - REAR BEARING RACE
3 - REAR HOUSING
4 - PETROLEUM JELLY

CAUTION: Large diameter side of the roller retainer must face the countershaft and small diameter side must face the race and housing (Fig. 97).

(4) Apply extra petroleum jelly to hold countershaft rear bearing in place when housing is installed.

(5) Apply light coat of petroleum jelly to shift shaft bushing/bearing in rear housing (Fig. 97).

(6) Reach into countershaft rear bearing with finger and push each bearing roller outward against race. Then apply extra petroleum jelly to hold rollers in place. This avoids having rollers becoming displaced during housing installation.

(7) Install rear housing onto geartrain (Fig. 98). Verify bearing retainer pilot stud is in correct bolt hole in the housing and countershaft and output shaft bearings are aligned in housing and on countershaft. If necessary lift upward on countershaft slightly to ensure that the countershaft rear bearing engages to the countershaft before the rear output shaft bearing engages the housing.

(8) Seat rear housing on output shaft rear bearing and countershaft by tapping the housing into place with a rawhide mallet.

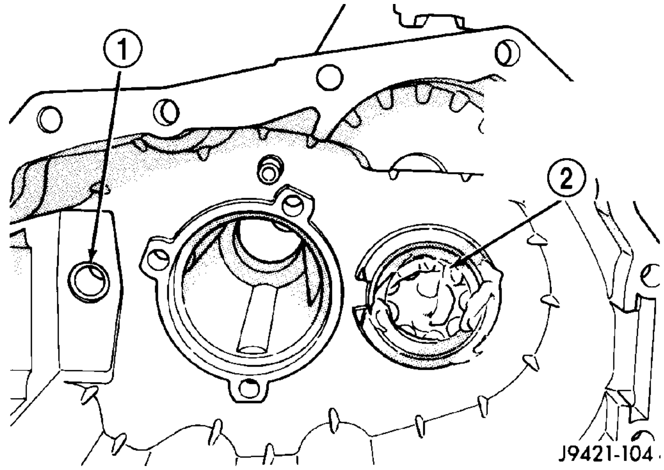


Fig. 97 COUNTERSHAFT REAR BEARING SEATED

1 - SHIFT SHAFT BUSHING/BEARING
2 - COUNTERSHAFT REAR BEARING

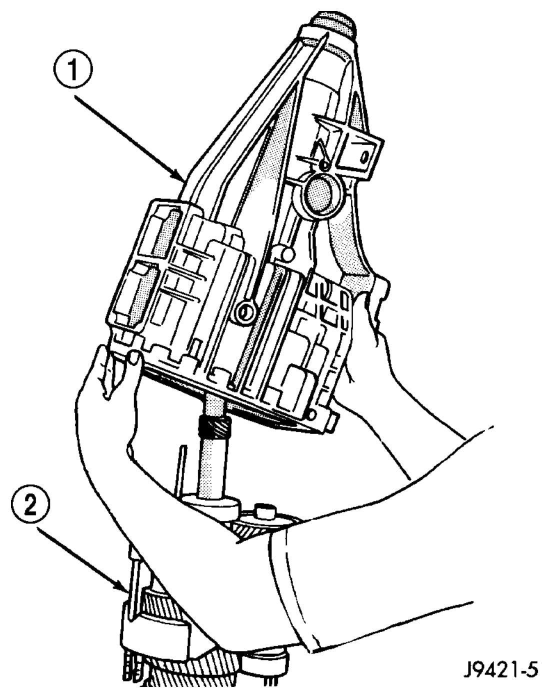


Fig. 98 REAR HOUSING - 2WD

1 - REAR HOUSING
2 - SHIFT FORKS AND GEARTRAIN

MANUAL - NV3550 (Continued)

(9) Apply Mopar Gasket Maker or equivalent to housing bolt threads, bolt shanks and under bolt heads (Fig. 99).

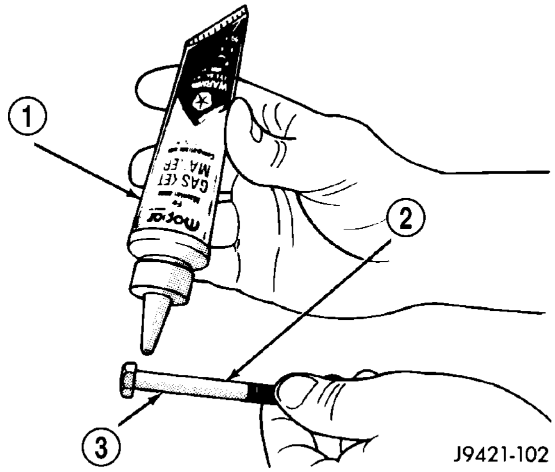


Fig. 99 SEAL RETAING BOLTS

1 - MOPAR GASKET MAKER (OR LOCTITE 518)
2 - RETAINER AND HOUSING BOLTS
3 - APPLY SEALER TO UNDERSIDE OF BOLT HEAD, SHANK AND THREADS

(10) Start first two bolts in retainer (Fig. 100). It may be necessary to move retainer rearward (with pilot stud) in order to start bolts in retainer.

(11) Remove Alignment Pin 8120 and install last retainer bolt (Fig. 100).

(12) Tighten all three retainer bolts to 30-35 N·m (22-26 ft. lbs.).

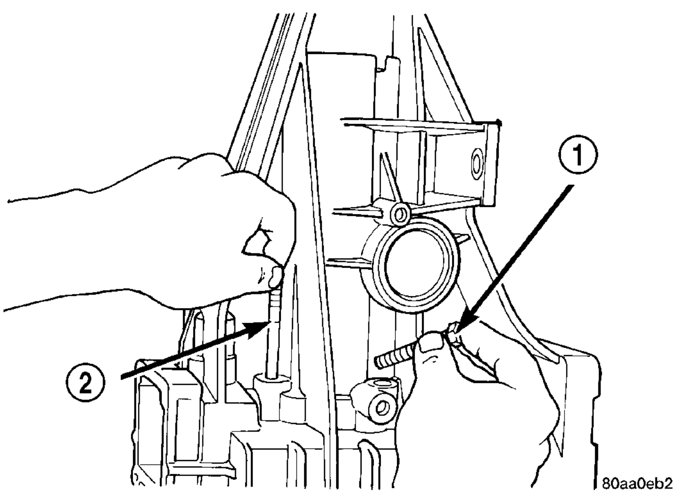


Fig. 100 PILOT STUD AND RETAINER BOLTS - 2WD

1 - BEARING RETAINER BOLT
2 - ALIGNMENT PIN

ADAPTER HOUSING - 4WD

(1) Install rear bearing in adapter housing, by tapping it into place with a wood hammer handle or wood dowel.

(2) Position rear bearing retainer in adapter housing (Fig. 101).

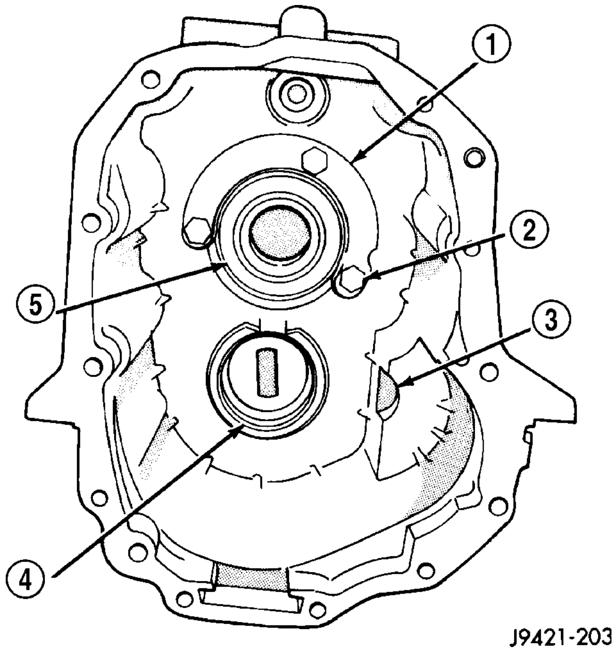


Fig. 101 ADAPTER HOUSING - 4WD

1 - BEARING RETAINER
2 - RETAINER BOLT
3 - IDLER SHAFT NOTCH
4 - COUNTERSHAFT BEARING RACE
5 - REAR BEARING

(3) Apply Mopar Gasket Maker or equivalent to threads, bolt shanks and under hex heads of bearing retainer bolts (Fig. 99).

(4) Apply liberal quantity of petroleum jelly to countershaft rear bearing and bearing race.

(5) Install countershaft rear bearing in bearing race (Fig. 97).

CAUTION: The large diameter side of the roller retainer must face the countershaft and the small diameter side must face the race and housing (Fig. 97).

(6) Apply extra petroleum jelly to hold countershaft rear bearing in place when housing is installed.

(7) Apply light coat of petroleum jelly to shift shaft bushing/bearing in adapter housing (Fig. 97).

(8) Install adapter housing on geartrain.

MANUAL - NV3550 (Continued)

(9) Install rear bearing snap ring on output shaft (Fig. 102).

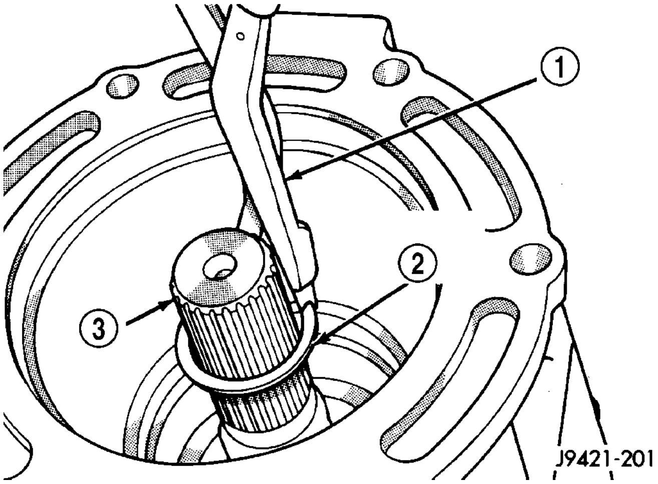


Fig. 102 REAR BEARING SNAP RING - 4WD

1 - SNAP RING PLIERS
2 - SNAP RING
3 - OUTPUT SHAFT

(10) Lubricate lip of new rear seal (Fig. 103) with Mopar Door Ease or transmission fluid.

(11) Install **new** rear seal in adapter housing bore with Installer C-3860-A. Verify seal is seated in housing bore (Fig. 103).

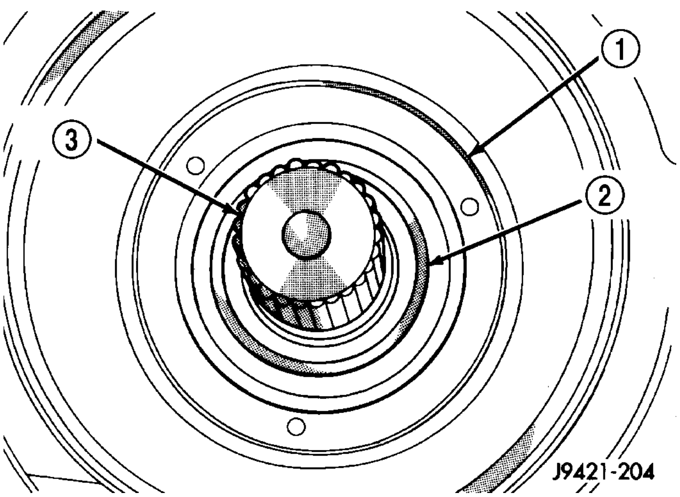


Fig. 103 REAR SEAL

1 - REAR SEAL
2 - SEAL LIP
3 - OUTPUT SHAFT

SHIFT SHAFT, SHAFT LEVER AND BUSHING AND SHIFT SOCKET

CAUTION: Transmission synchros must be in the Neutral position, to prevent damage to the housings, shift forks and gears during installation of the two housings.

(1) Install 3-4 shift fork in synchro sleeve (Fig. 104). Verify groove in fork arm is aligned with grooves in 1-2 and fifth-reverse fork arms as shown.

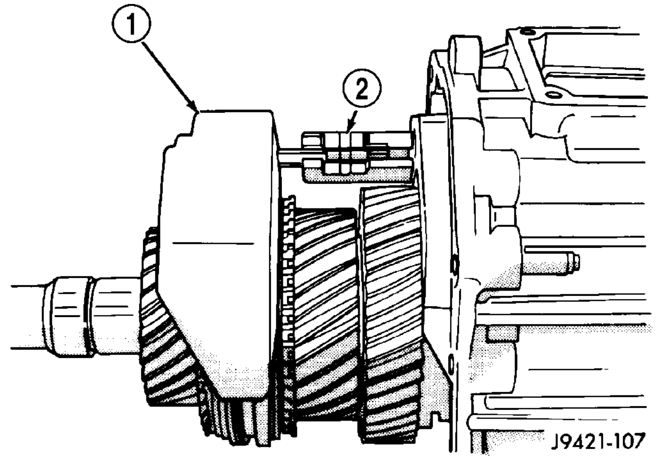


Fig. 104 3-4 SHIFT FORK

1 - 3-4 FORK
2 - ALIGN GROOVES IN FORK ARMS

(2) Slide the end of shift shaft with shaft detent notches through 3-4 shift fork.

(3) Assemble shift shaft shift lever and bushing (Fig. 105). The slot in bushing must face up and roll pin hole for lever must be aligned with hole in shaft.

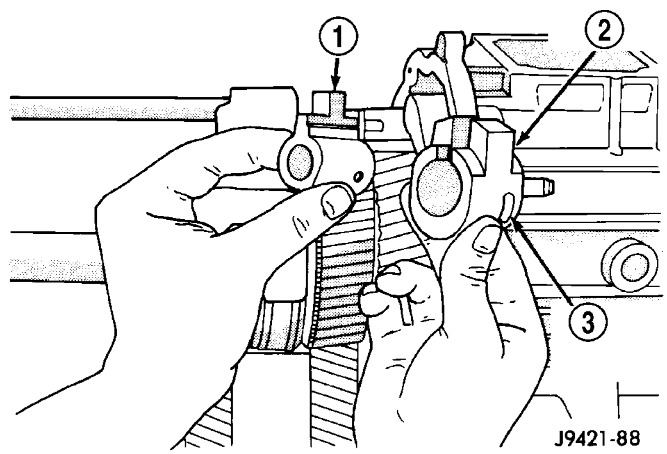


Fig. 105 LEVER AND BUSHING

1 - SHAFT LEVER
2 - LEVER BUSHING
3 - BUSHING LOCK PIN SLOT

MANUAL - NV3550 (Continued)

(4) Install assembled lever and bushing on shift shaft (Fig. 106).

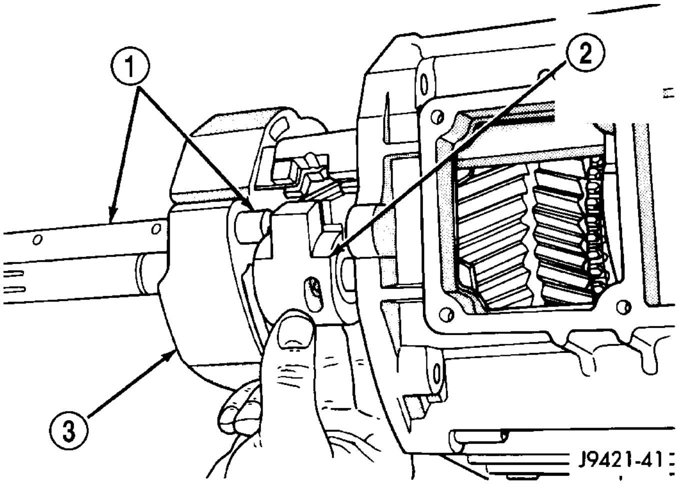


Fig. 106 LEVER AND BUSHING ASSENBLY

1 - SHIFT SHAFT
2 - SHAFT LEVER AND BUSHING
3 - 3-4 FORK

(5) Slide shift shaft through forks (Fig. 107) and into shift lever opening in rear housing (Fig. 108).

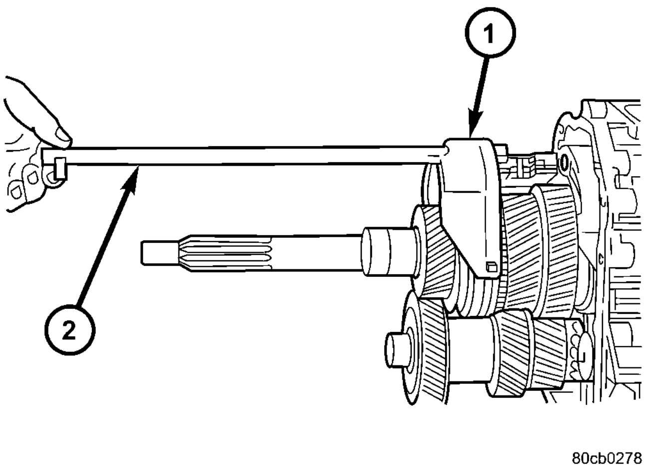


Fig. 107 SHIFT SHAFT

1 - SHIFT SHAFT
2 - 3-4 SHIFT FORK

(6) Align shift socket with shaft and slide shaft through socket and into shift shaft bearing in rear housing (Fig. 109).

(7) Rotate shift shaft so detent notches in shaft are facing the TOP of the transmission housing.

CAUTION: Positioning of the shift shaft detent notch is important. Both of the shaft roll pins can be installed even when the shaft is 180° off. If this occurs, the transmission will have to be disassembled again to correct shaft alignment.

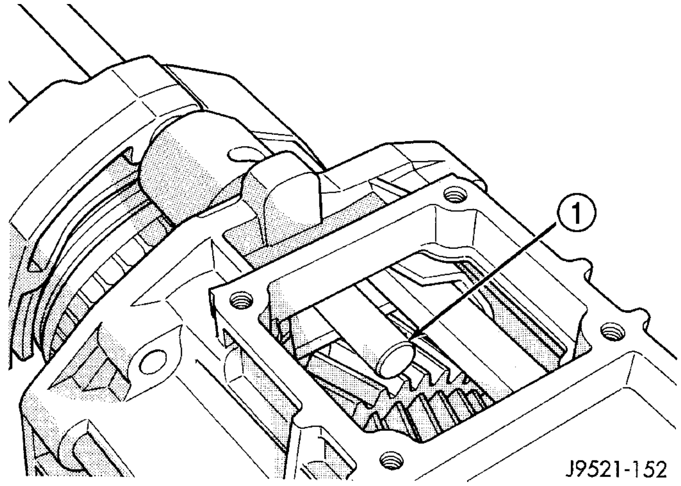


Fig. 108 SHAFT IN LEVER OPENING

1 - SHIFT SHAFT

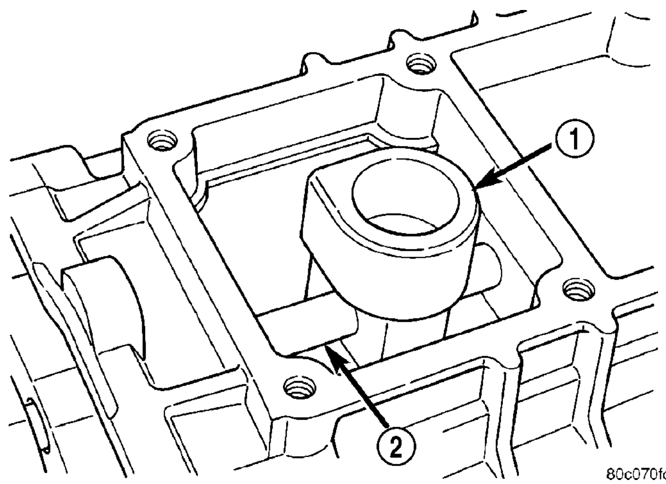


Fig. 109 SHIFT SOCKET

1 - SHIFT SOCKET
2 - SHIFT SHAFT

(8) Select correct new roll pin for shift shaft lever (Fig. 110). Shaft lever roll pin is approximately 22 mm (7/8 in.) long. Shift socket roll pin is approximately 33 mm (1-1/4 in.) long.

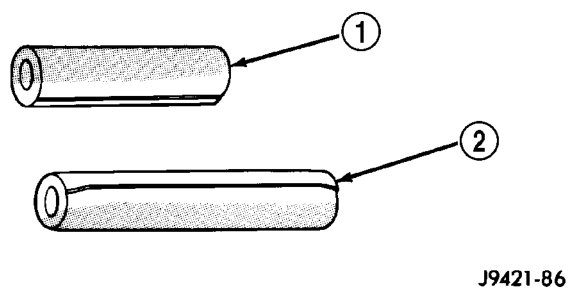


Fig. 110 ROLL PIN IDENTIFICATION

1 - SHAFT LEVER ROLL PIN
2 - SHIFT SOCKET ROLL PIN

MANUAL - NV3550 (Continued)

(9) Align roll pin holes in shift shaft, lever and bushing. Then start roll pin into shaft lever by hand (Fig. 111).

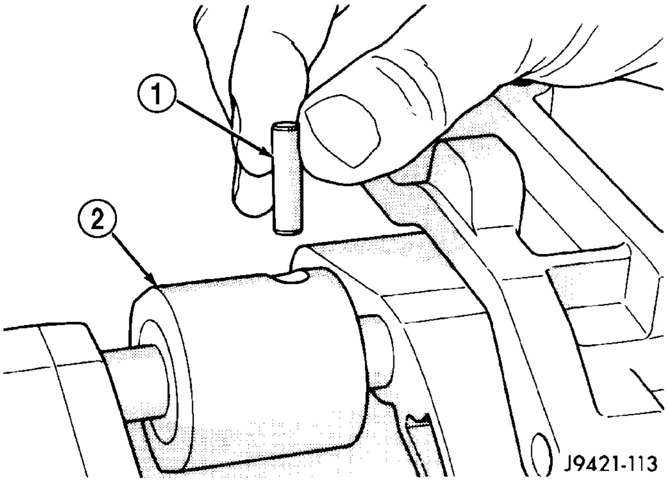


Fig. 111 ROLL PIN IN SHIFT SHAFT

1 - SHAFT LEVER ROLL PIN (7/8 inch)
2 - LEVER AND BUSHING

(10) Seat shaft lever roll pin with pin punch (Fig. 112).

CAUTION: The shaft lever roll pin must be flush with the surface of the lever or lever bushing will bind on the roll pin.

(11) Verify lock pin slot in lever bushing is positioned as shown (Fig. 112).

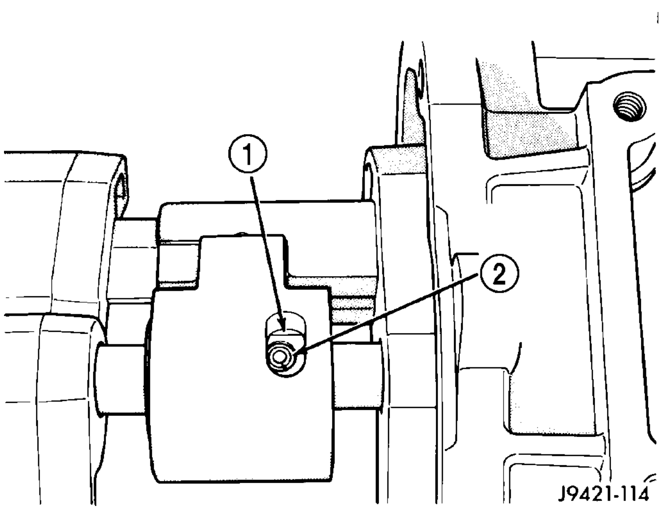


Fig. 112 SHIFT SHAFT LEVER ROLL

1 - BUSHING LOCK PIN SLOT
2 - SEAT ROLL PIN FLUSH WITH LEVER

(12) Align roll pin holes in shift socket and shift shaft. Then start roll pin into shift shaft by hand (Fig. 113).

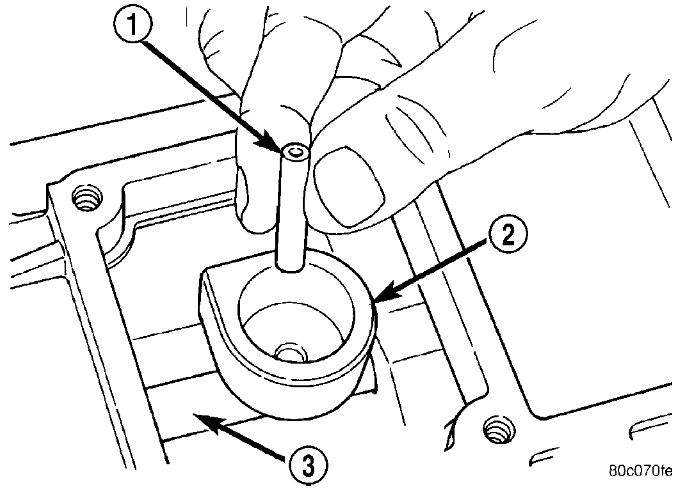


Fig. 113 ROLL PIN IN SHIFT SOCKET

1 - ROLL PIN
2 - SHIFT SOCKET
3 - SHIFT SHAFT

(13) Seat roll pin flush in shift socket with pin punch (Fig. 114).

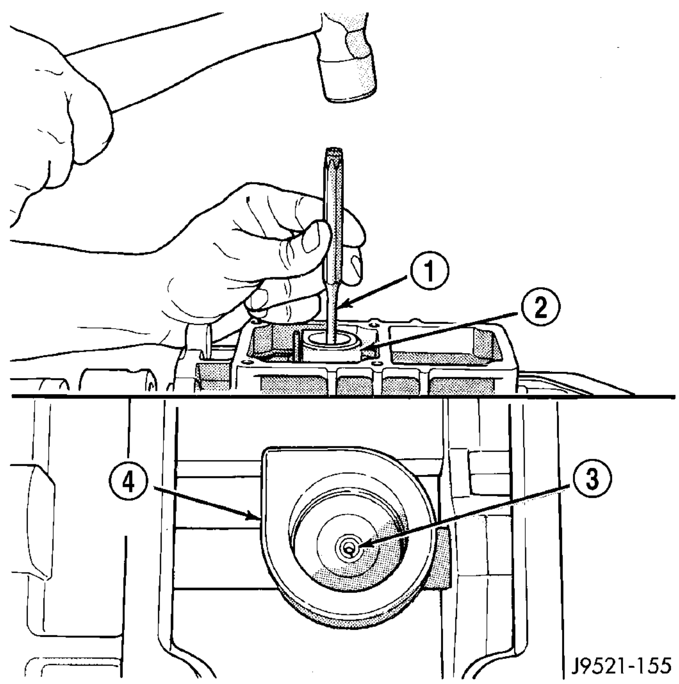


Fig. 114 SEATING SHIFT SOCKET ROLL PIN

1 - PIN PUNCH
2 - SHIFT SOCKET
3 - SEAT ROLL PIN FLUSH
4 - SHIFT SOCKET

MANUAL - NV3550 (Continued)

(14) Verify notches in shift fork arms are aligned (Fig. 115). Realign arms if necessary.

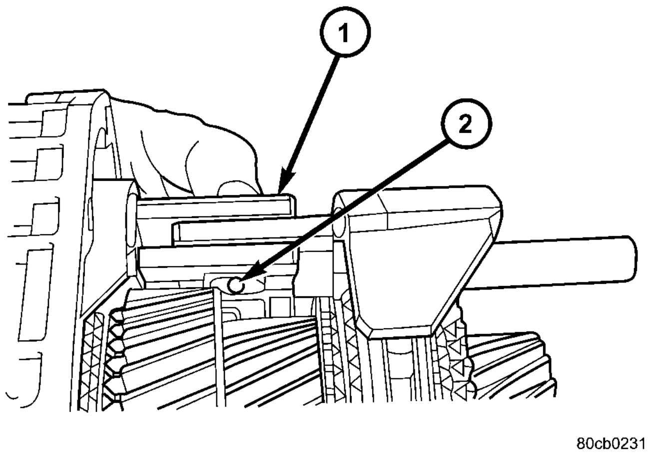


Fig. 115 SHIFT LEVER POSITION

1 - SHIFT FORK ARMS
2 - DETENT BORE

(15) Rotate shift lever and bushing downward to expose detent bore (Fig. 115) in the lever.

(16) Install detent spring then the ball into the detent bore (Fig. 116) and hold the ball in the lever. Then rotate the lever upward into the fork arm notches.

NOTE: Verify detent ball is seated in the fork arms before proceeding.

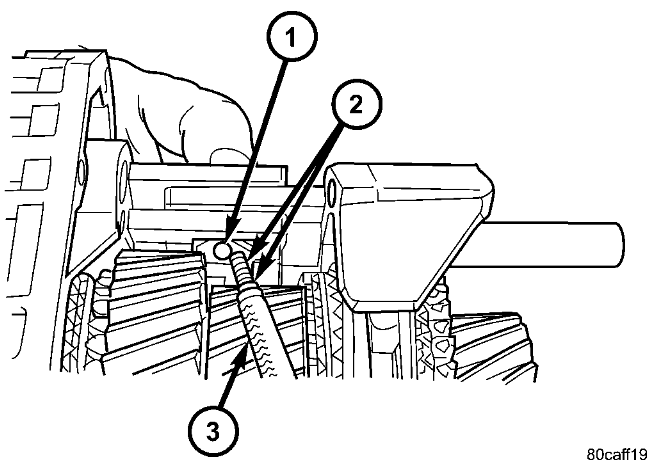


Fig. 116 DETENT SPRING AND BALL

1 - SHAFT LEVER
2 - SPRING AND BALL
3 - MAGNET

FRONT HOUSING AND INPUT SHAFT BEARING RETAINER

(1) Install reverse blocker, retainer and retainer bolt in front housing.

(2) Install input shaft bearing in front housing (Fig. 117). Install snap ring and use plastic mallet to seat bearing. Bearing goes in from front side of housing only.

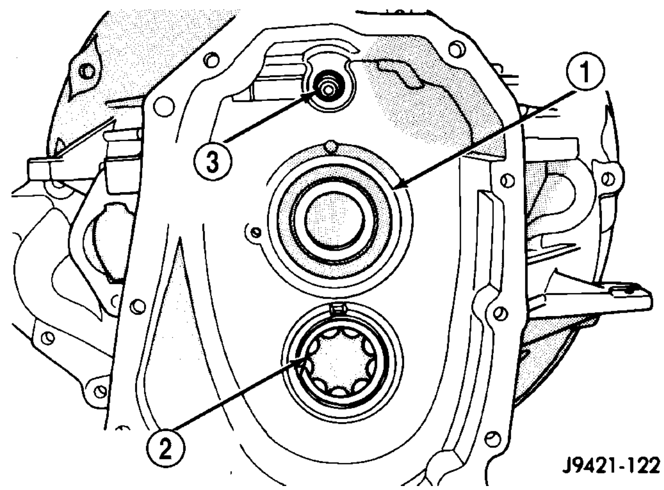


Fig. 117 INPUT SHAFT AND COUNTERSHAFT FRONT BEARING

1 - INPUT SHAFT BEARING
2 - COUNTERSHAFT FRONT BEARING
3 - SHIFT SHAFT BUSHING

(3) Apply liberal quantity of petroleum jelly to countershaft front bearing. Then insert bearing in front housing race (Fig. 117). Large diameter side of bearing cage goes toward countershaft (Fig. 118). Small diameter side goes toward bearing race in housing.

(4) Reach into countershaft front bearing with finger, and push each bearing roller outward against race. Then apply extra petroleum jelly to hold rollers in place. This avoids having rollers becoming displaced during housing installation.

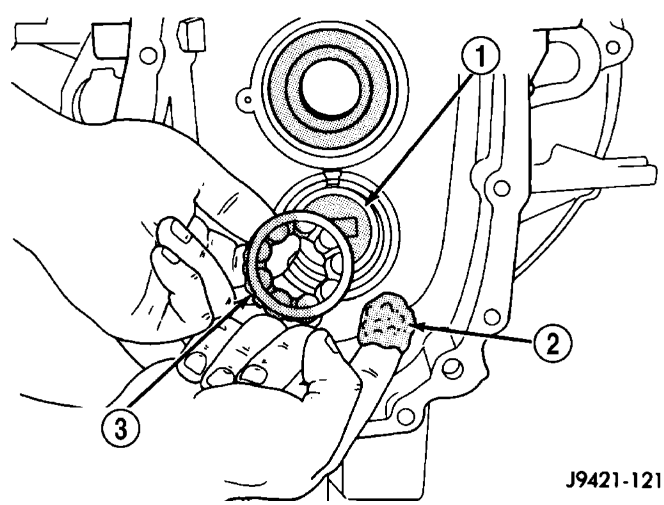


Fig. 118 COUNTERSHAFT FRONT BEARING

1 - BEARING RACE
2 - PETROLEUM JELLY
3 - COUNTERSHAFT FRONT BEARING

MANUAL - NV3550 (Continued)

(5) Apply small amount of petroleum jelly to shift shaft bushing in front housing.

(6) Apply 1/8 in. wide bead of Mopar Gasket Maker or equivalent to mating surfaces of front and rear housings (Fig. 119).

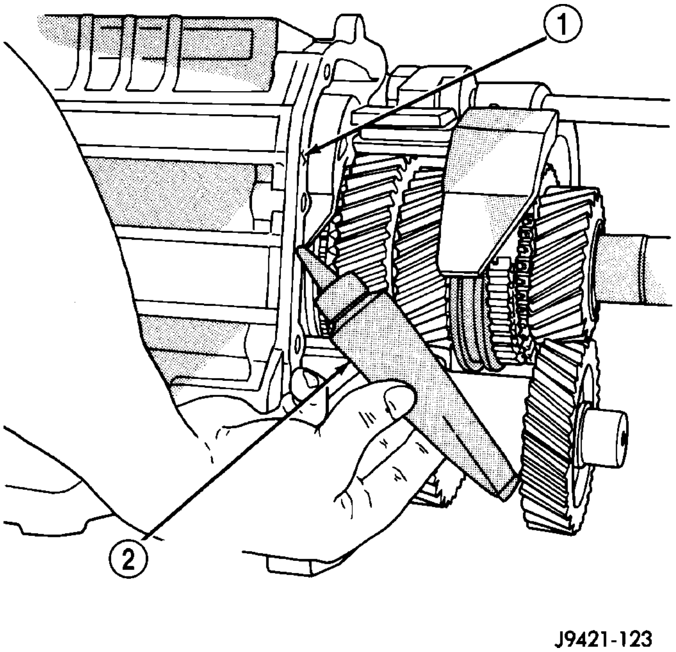


Fig. 119 SEAL FRONT/REAR HOUSINGS

1 - HOUSING FLANGE SURFACE
2 - MOPAR GASKET MAKER (OR LOCTITE 518)

(7) Have helper hold rear housing and geartrain in upright position. Then install front housing on rear housing and geartrain.

(8) Work front housing downward onto geartrain until seated on rear housing.

CAUTION: If the front housing will not seat on the rear housing, either the shift components are not in Neutral, or one or more components are misaligned. Do not force the front housing into place. This will result in damaged components.

(9) Tap rear housing alignment dowels back into place with hammer and pin punch. Both dowels should be flush fit in each housing. Have helper hold transmission upright while dowels are tapped back into place.

(10) Place transmission in horizontal position.

(11) Apply Mopar Gasket Maker or equivalent to housing attaching bolts. Apply sealer material sealer to underside of bolt heads and to bolt shanks and threads (Fig. 120).

(12) Install and start housing attaching bolts by hand (Fig. 120). Then tighten bolts to 34 N·m (25 ft. lbs.).

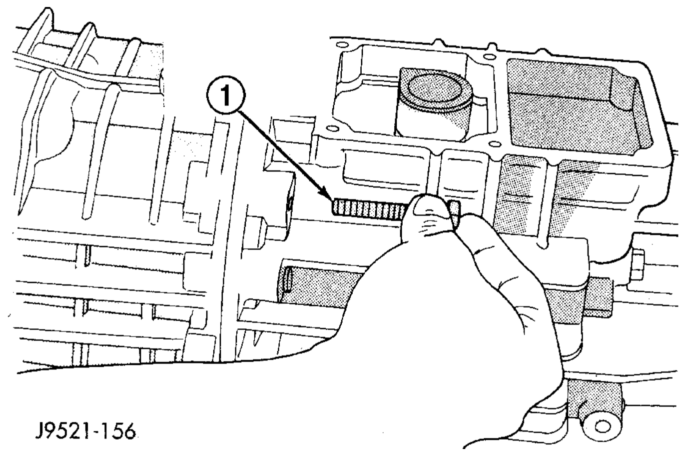


Fig. 120 HOUSING BOLTS

1 - HOUSING ATTACHING BOLTS

(13) Install shift shaft bushing lock bolt (Fig. 121). Apply Mopar Gasket Maker or equivalent to bolt threads, shank and underside of bolt head before installation.

NOTE: This is a special bolt and can not be substituted with any other bolt.

CAUTION: If the lock bolt cannot be fully installed, do not try to force it into place. Either the shift shaft is not in Neutral or the shaft bushing (or lever) is misaligned.

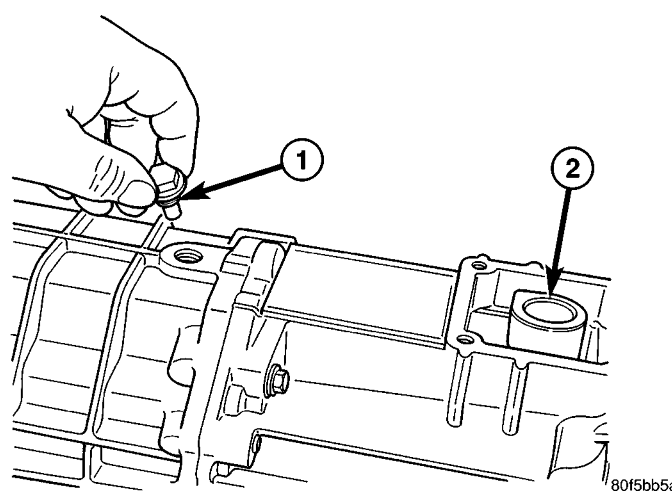


Fig. 121 SHAFT LOCK BOLT

1 - SHIFT SHAFT LOCK BOLT
2 - SHAFT SOCKET

(14) Lubricate then install shift shaft detent plunger in housing bore. Lubricate plunger with Valvoline Dura Blend® semi-synthetic/synthetic grease or equivalent.

MANUAL - NV3550 (Continued)

NOTE: Verify plunger is fully seated in detent notch in shift shaft.

(15) Install detent spring inside plunger.

(16) Install plug on detent spring and compress spring. Then drive detent plug into transmission case until plug seats.

(17) Install backup light switch (Fig. 122).

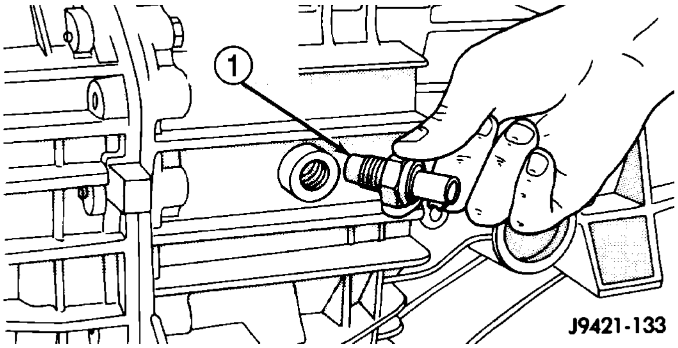


Fig. 122 BACKUP LIGHT SWITCH

1 - BACKUP LIGHT SWITCH

(18) Install input shaft snap ring (Fig. 123).

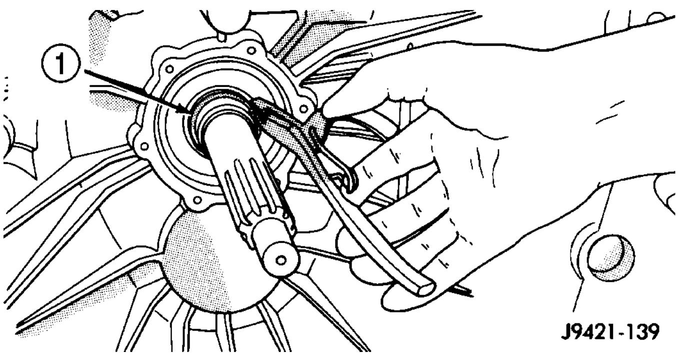


Fig. 123 SHAFT SNAP RING - TYPICAL

1 - INPUT SHAFT SNAP RING

(19) Install **new** oil seal in front bearing retainer with Installer 6448 (Fig. 124).

(20) Apply bead of Mopar silicone sealer or equivalent to flange surface of front bearing retainer (Fig. 125).

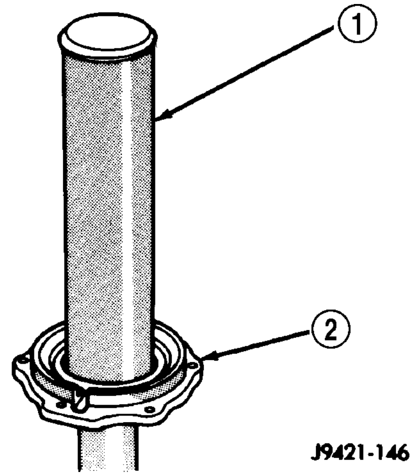


Fig. 124 OIL SEAL IN FRONT BEARING RETAINER

1 - INSTALLER
2 - FRONT BEARING RETAINER

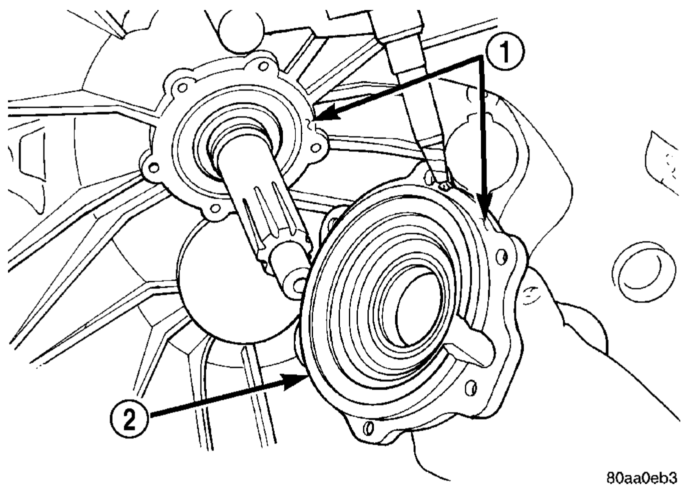


Fig. 125 SEAL BEARING RETAINER AND HOUSING

1 - APPLY SEALER BEAD
2 - INPUT SHAFT BEARING RETAINER

MANUAL - NV3550 (Continued)

(21) Align and install front bearing retainer over input shaft and onto housing mounting surface (Fig. 126). Although retainer is one-way fit on housing, be sure bolt holes are aligned before seating retainer.

CAUTION: Do not allow sealer to get into the oil feed hole in the transmission case or bearing retainer.

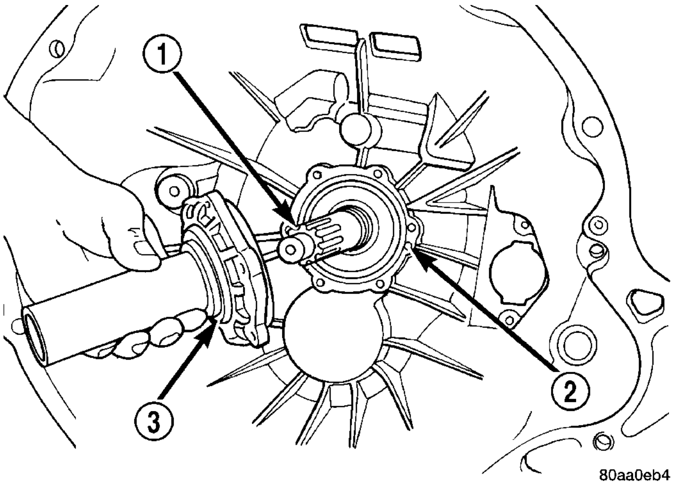


Fig. 126 INPUT SHAFT BEARING RETAINER

1 - INPUT SHAFT
2 - OIL FEED
3 - BEARING RETAINER

(22) Install and tighten bearing retainer bolts to 7-10 N·m (5-7 ft. lbs.) (Fig. 127).

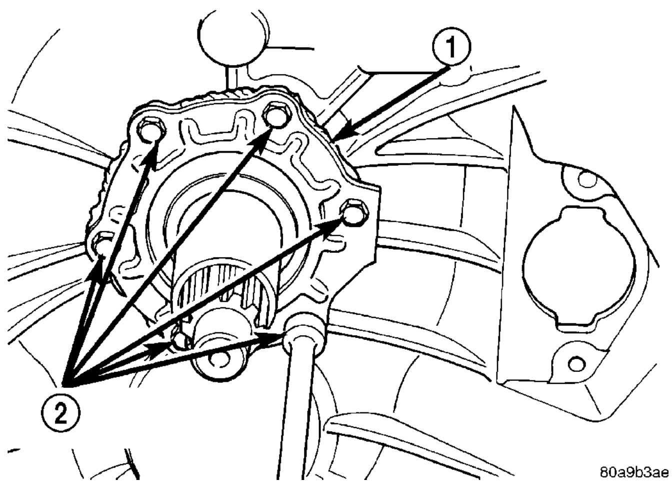


Fig. 127 BEARING RETAINER BOLTS

1 - RETAINER
2 - RETAINER BOLTS

SHIFT TOWER AND LEVER

(1) Apply petroleum jelly to ball end of shift lever and interior of shift socket.

(2) Shift the transmission into third gear.

(3) Align and install shift tower and lever assembly (Fig. 128). Be sure shift ball is seated in socket and the offset in the tower is toward the passenger side of the vehicle before installing tower bolts.

(4) Install shift tower bolts (Fig. 129). Tighten bolts to 8.5 N·m (75.2 in. lbs.).

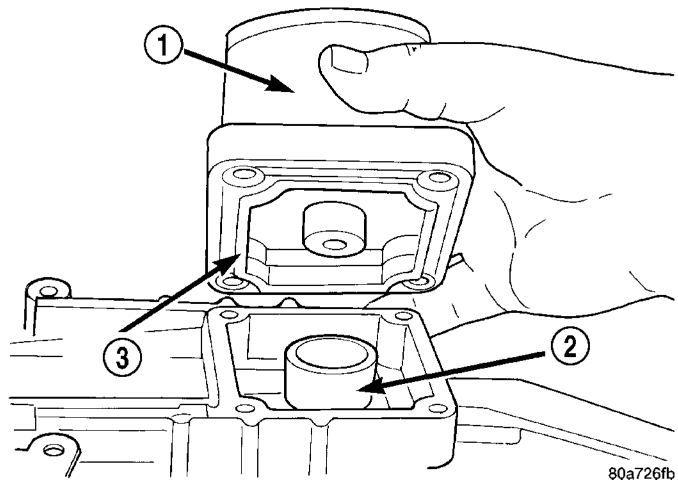


Fig. 128 SHIFT TOWER

1 - SHIFT TOWER
2 - SHIFT SOCKET
3 - SEAL

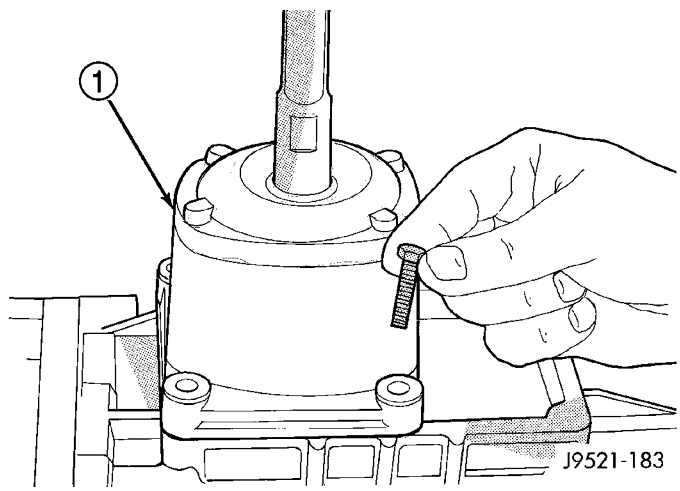


Fig. 129 SHIFT TOWER BOLTS

1 - SHIFT TOWER AND LEVER ASSEMBLY

(5) Fill transmission to bottom edge of fill plug hole with Mopar Transmission Lubricant.

(6) Install and tighten fill plug to 34 N·m (25 ft. lbs.).

(7) Check transmission vent. Be sure vent is open and not restricted.

INSTALLATION

(1) Install clutch housing on transmission and tighten housing bolts to 46 N·m (34 ft. lbs.).

(2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease.

(3) Install release bearing, fork and retainer clip.

MANUAL - NV3550 (Continued)

(4) Position and secure transmission on transmission jack.

(5) Lightly lubricate the transmission input shaft splines with Mopar high temp grease.

(6) Raise transmission and align transmission input shaft and clutch disc splines. Then slide transmission into place.

(7) Install clutch housing-to-engine bolts and tighten to 58 N·m (43 ft.lbs.).

NOTE: Be sure the housing is properly seated on engine block before tightening bolts.

(8) Install shift tower and bolts. Tighten bolts to 7-10 N·m (5-7 ft.lbs.).

(9) Install rear crossmember and tighten crossmember bolts to 41 N·m (31 ft. lbs.).

(10) Install transmission mount bolts and to 54 N·m (40 ft. lbs.).

(11) Install exhaust bracket to crossmember.

(12) Remove support stands from engine and transmission.

(13) Install transfer case, shift cable and vent hose if equipped.

(14) Install wire connectors to transmission/transfer case.

(15) Install propeller shaft/shafts.

(16) Install slave cylinder in clutch housing.

(17) Fill transmission and transfer case if equipped, with recommended lubricants.

(18) Install skid plate if equipped.

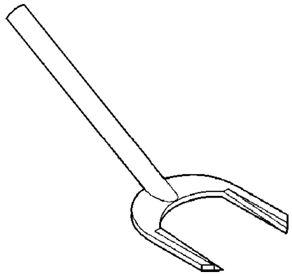
SPECIFICATIONS

TORQUE SPECIFICATIONS

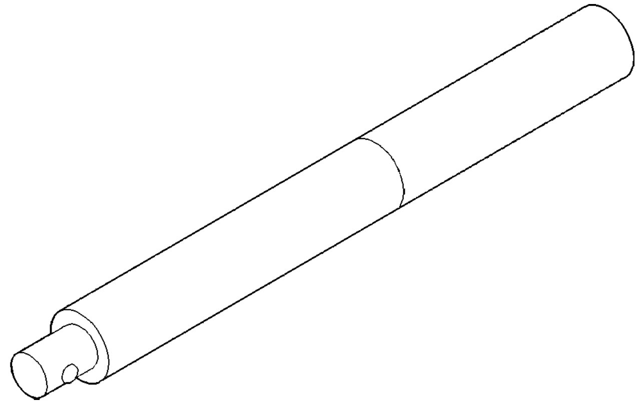
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Clutch Housing To Trans Bolts	46	34	-
Clutch Housing To Engine Bolts	68	50	-
Trans Mount Bolts	47	35	-
Crossmember Frame Bolts	61-75	44-55	-
Crossmember To Insulator Nuts	54-61	40-45	-
Drain/Fill Plug	9-27	14-20	-
Front To Rear Housing Bolts	30-35	22-26	-
Front Bearing Retainer Bolts	7-10	5-7	62-88
Idler Shaft Bolts	19-25	14-18	-
Rear Bearing Retainer Bolts	30-35	22-26	-
Shift Tower Bolts	7-10	5-7	62-88
Slave Cylinder Nuts	23	17	-

MANUAL - NV3550 (Continued)

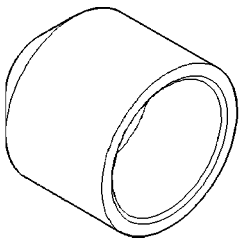
SPECIAL TOOLS



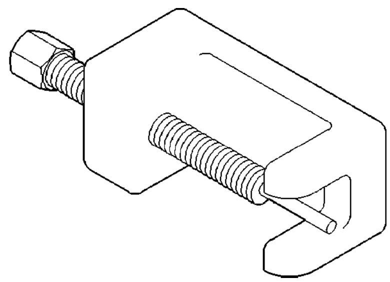
REMOVER C-3985-B



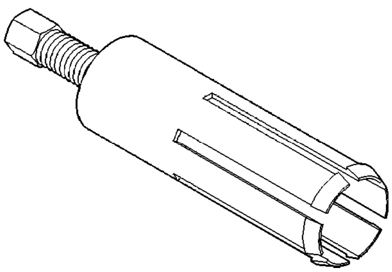
HANDLE C-4171



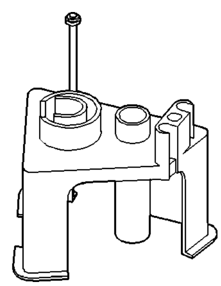
INSTALLER C-3972-A



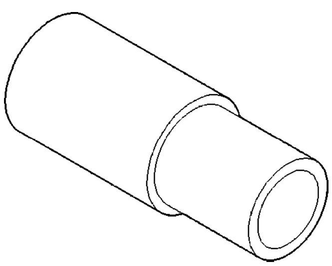
REMOVER/INSTALLER 6858



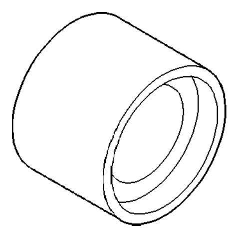
BUSHING REMOVER 6957



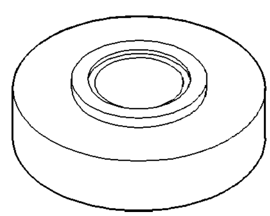
FIXTURE 6747



BUSHING INSTALLER 6951

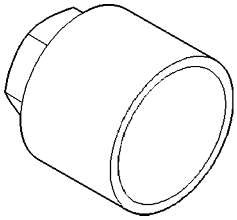


ADAPTER 6747-1A

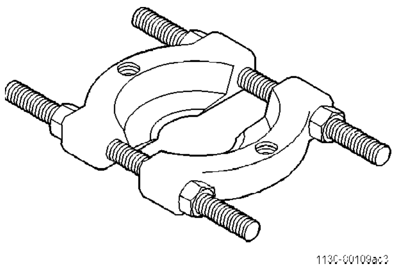


Adapter 6747-2A

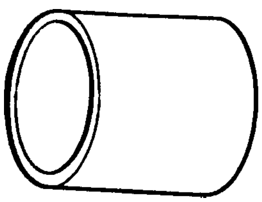
MANUAL - NV3550 (Continued)



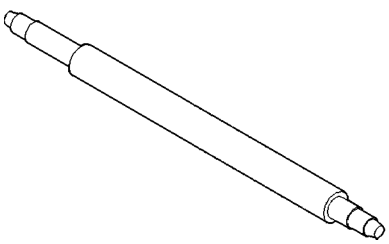
CUP 8115



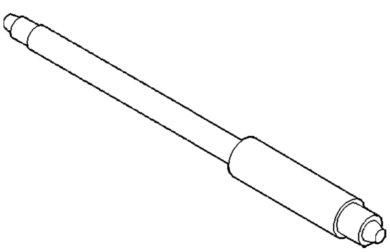
SPLITTER BEARING 1130



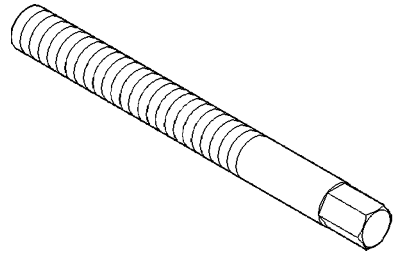
TUBE 6310-1



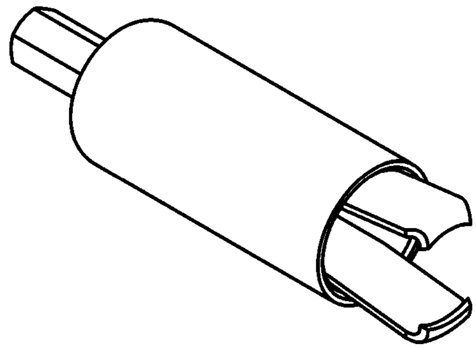
INSTALLER 8118



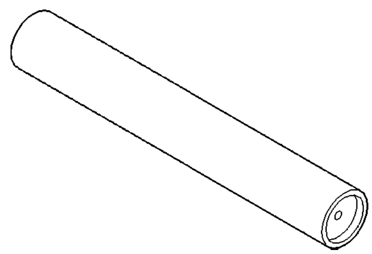
REMOVER/INSTALLER 8119



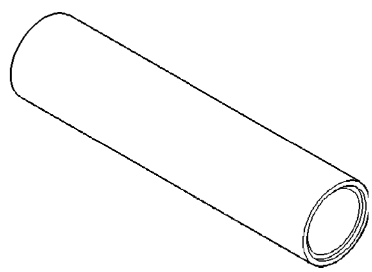
PIN ALIGNMENT 8120



REMOVER 8117A



INSTALLER 8123



INSTALLER BEARING 6448

EXTENSION HOUSING BUSHING

REMOVAL

(1) Raise and support vehicle.

(2) Mark reference lines on the propeller shaft and remove the shaft.

(3) Remove housing yoke seal.

(4) Insert Remover 6957 into rear housing and tighten tool to bushing and remove bushing (Fig. 130).

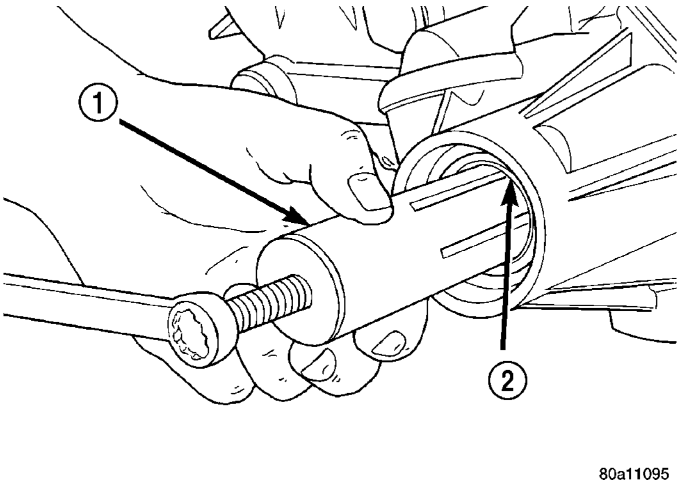


Fig. 130 Bushing Removal - Typical

1 - REMOVER
2 - EXTENSION HOUSING BUSHING

INSTALLATION

(1) Align bushing oil hole with oil slot in rear housing.

(2) Tap bushing into place with Installer 6951 and Handle C-4171.

(3) Install new oil seal in housing using Installer C-3972-A (Fig. 131).

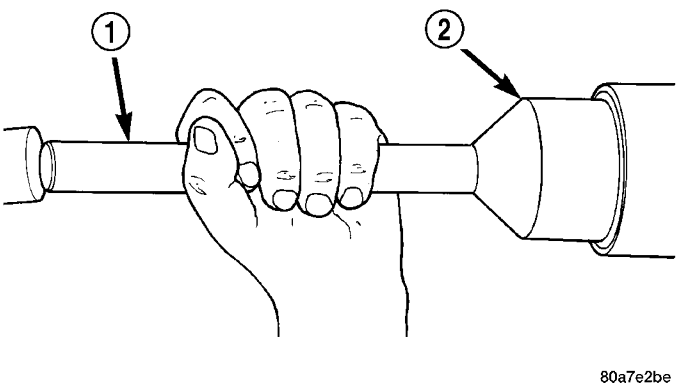


Fig. 131 Rear Housing Seal

1 - HANDLE
2 - INSTALLER

(4) Install propeller shaft with reference marks aligned.

(5) Remove support and lower vehicle.

(6) Check transmission fluid level.

EXTENSION HOUSING SEAL

REMOVAL

(1) Raise raise and support vehicle.

(2) Mark propeller shaft and axle yoke for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Remover C-3985-B (Fig. 132) from transmission housing.

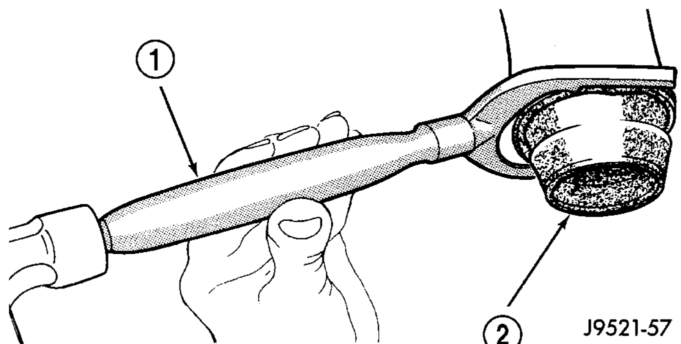


Fig. 132 YOKE SEAL

1 - REMOVER
2 - SEAL

INSTALLATION

(1) Place seal in position on transmission housing.

(2) Drive new seal into transmission housing with Installer C-3972-A and Handle C-4171 (Fig. 133).

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines.

(4) Install propeller shaft with reference marks aligned.

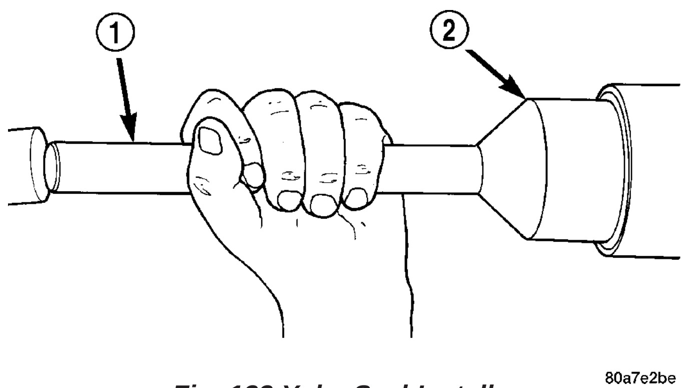


Fig. 133 Yoke Seal Installer

1 - HANDLE
2 - INSTALLER

(5) Remove support and lower vehicle.

(6) Check transmission fluid level.

AUTOMATIC TRANSMISSION - 42RLE

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AUTOMATIC TRANSMISSION - 42RLE

DESCRIPTION

The 42RLE (Fig. 1) is a four-speed transmission that is a conventional hydraulic/mechanical assembly controlled with adaptive electronic controls and monitors. The hydraulic system of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components. An input clutch assembly which houses the underdrive, overdrive, and reverse clutches is used. It also utilizes separate holding clutches: 2nd/4th gear and Low/Reverse. The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Two multiple disc holding clutches
- Four hydraulic accumulators
- Two planetary gear sets
- Hydraulic oil pump
- Valve body
- Solenoid/Pressure switch assembly

Control of the transmission is accomplished by fully adaptive electronics. Optimum shift scheduling is accomplished through continuous real-time sensor feedback information provided to the Powertrain Control Module (PCM).

The PCM is the heart of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the PCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

The PCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB® scan tool.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

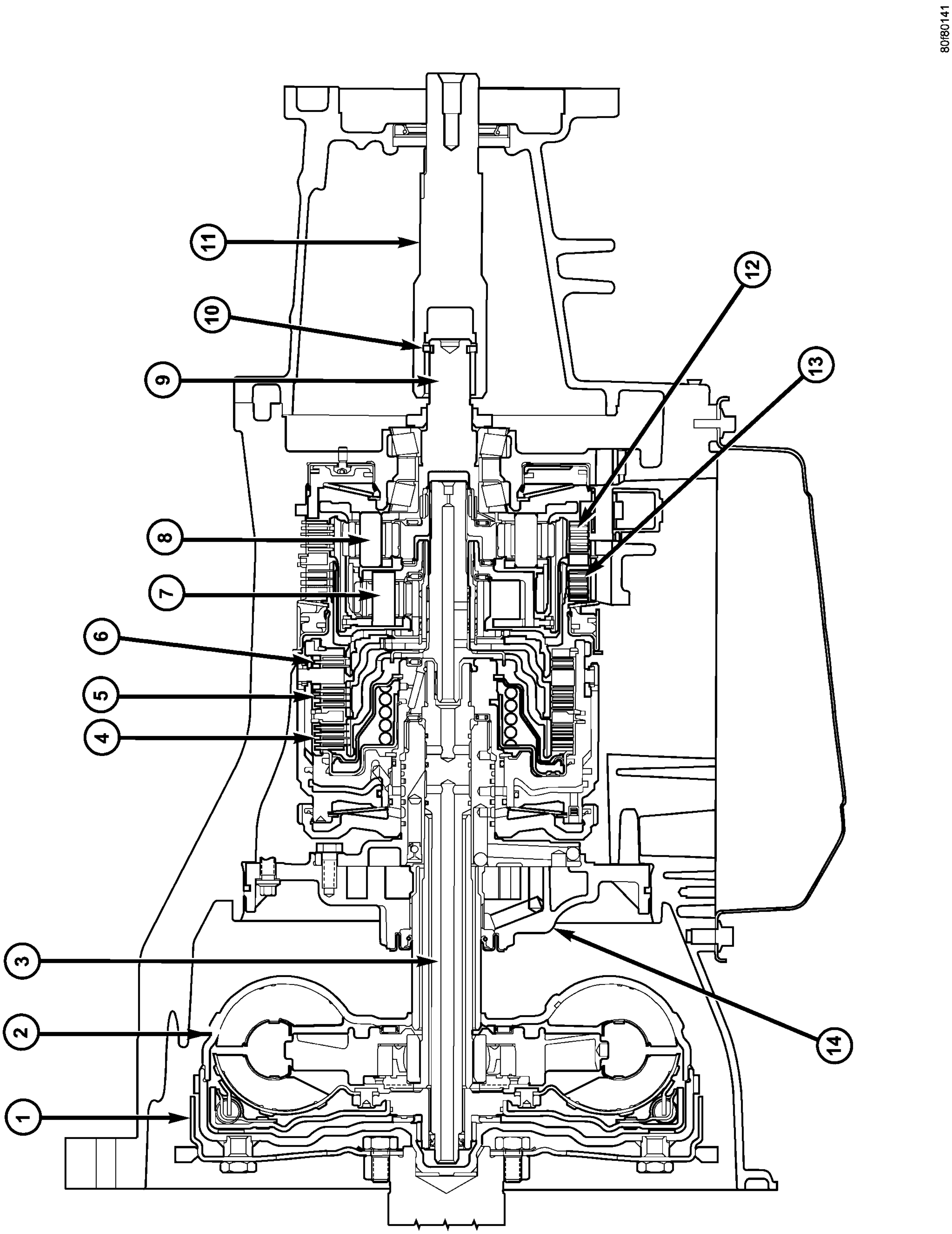


Fig. 1 42RLE Automatic Transmission

AUTOMATIC TRANSMISSION - 42RLE (Continued)

1 - DRIVEPLATE
2 - TORQUE CONVERTER
3 - INPUT SHAFT
4 - UNDERDRIVE CLUTCH
5 - OVERDRIVE CLUTCH
6 - REVERSE CLUTCH
7 - FRONT PLANET CARRIER
8 - REAR PLANET CARRIER
9 - OUTPUT SHAFT
10 - SNAP RING
11 - STUB SHAFT
12 - LOW/REVERSE CLUTCH
13 - 2/4 CLUTCH
14 - OIL PUMP

TRANSMISSION IDENTIFICATION

The 42RLE transmission can be identified by a barcode label that is affixed to the upper left area of the bellhousing.

The label contains a series of digits that can be translated into useful information such as transmission part number, date of manufacture, manufacturing origin, assembly line identifier, build sequence number, etc. Refer to (Fig. 2) for identification label breakdown.

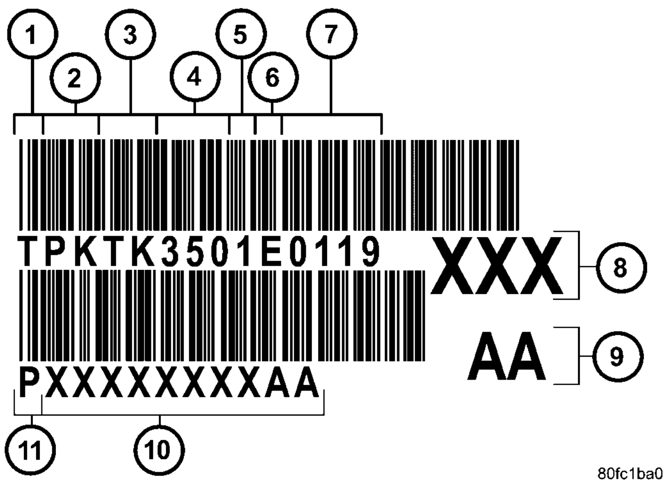


Fig. 2 Identification Label Breakdown

1 - T=TRACEABILITY
2 - SUPPLIER CODE (PK=KOKOMO)
3 - COMPONENT CODE (TK=KOKOMO TRANSMISSION)
4 - BUILD DAY (350=DEC. 15)
5 - BUILD YEAR (1=2001)
6 - ASSEMBLY LINE CODE
7 - BUILD SEQUENCE NUMBER
8 - LAST THREE OF P/N
9 - CHANGE LEVEL
10 - TRANSMISSION PART NUMBER
11 - P=PART NUMBER

If the tag is not legible or is missing, the “PK” number, which is stamped into the left rear flange of the transmission case, can be referred to for identification. The entire part number, build code, and sequence number are stamped into the flange.

OPERATION

The 42RLE transmission ratios are:

First	2.84 : 1
Second	1.57 : 1
Third	1.00 : 1
Overdrive	0.69 : 1
Reverse	2.21 : 1

FIRST GEAR POWERFLOW

In first gear range, torque input is through the underdrive clutch to the underdrive hub assembly (Fig. 3). The underdrive hub is splined to the rear sun gear. When the underdrive clutch is applied, it rotates the underdrive hub and rear sun gear. The L/R clutch is applied to hold the front carrier/rear annulus assembly. The rear sun gear drives the rear planetary pinion gears. The rear planetary pinion gears are forced to walk around the inside of the stationary rear annulus gear. The pinions are pinned to the rear carrier and cause the rear carrier assembly to rotate as they walk around the annulus gear. This provides the torque output for first gear. The other planetary gearset components are freewheeling. The first gear ratio is 2.84:1.

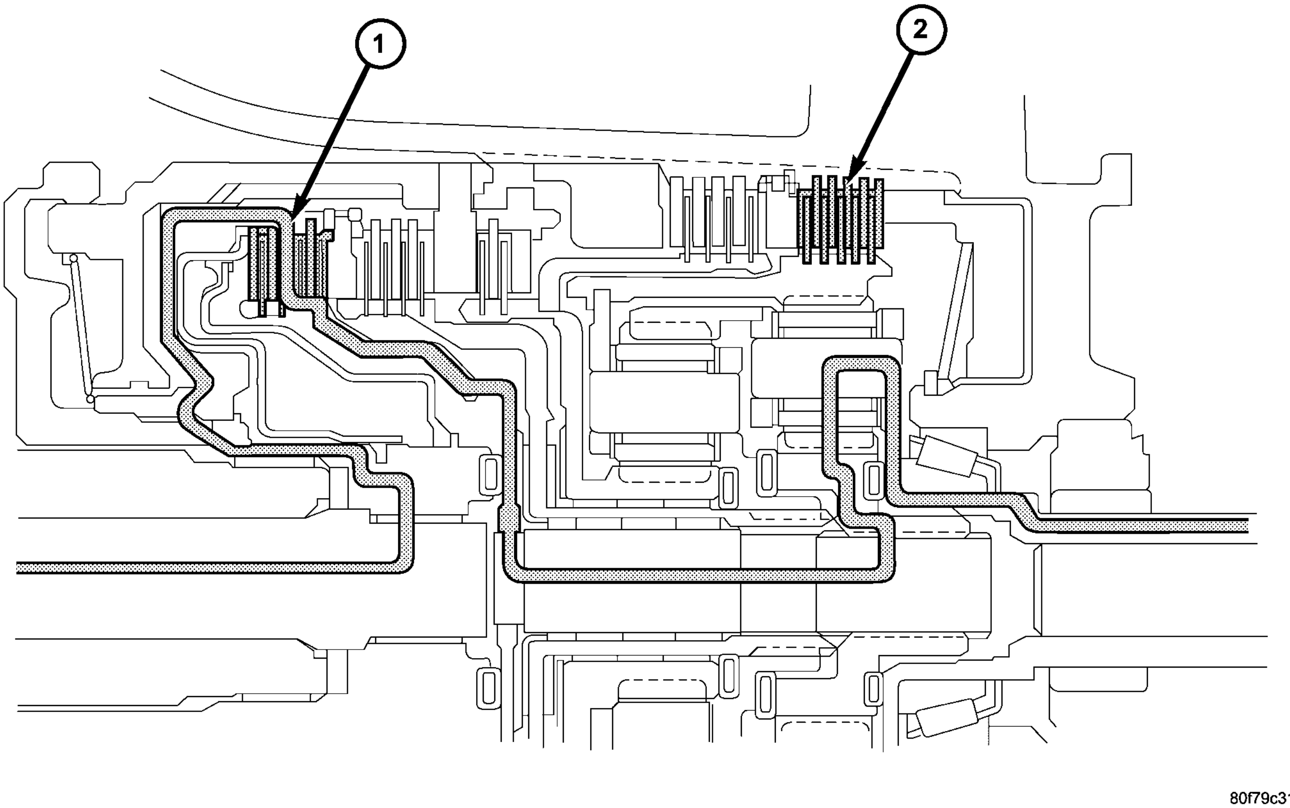


Fig. 3 First Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus/Front Carrier)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

SECOND GEAR POWERFLOW

Second gear is achieved by having both planetary gear sets contribute to torque multiplication (Fig. 4). As in first gear, torque input is through the underdrive clutch to the rear sun gear. The 2/4 clutch is applied to hold the front sun gear stationary. The rotating rear sun gear turns the rear planetary pinions. The rear pinions rotate the rear annulus/front carrier assembly. The pinions of the front carrier walk around the stationary front sun gear. This transmits torque to the front annulus/rear carrier assembly, which provides output torque and a gear ratio of 1.57:1.

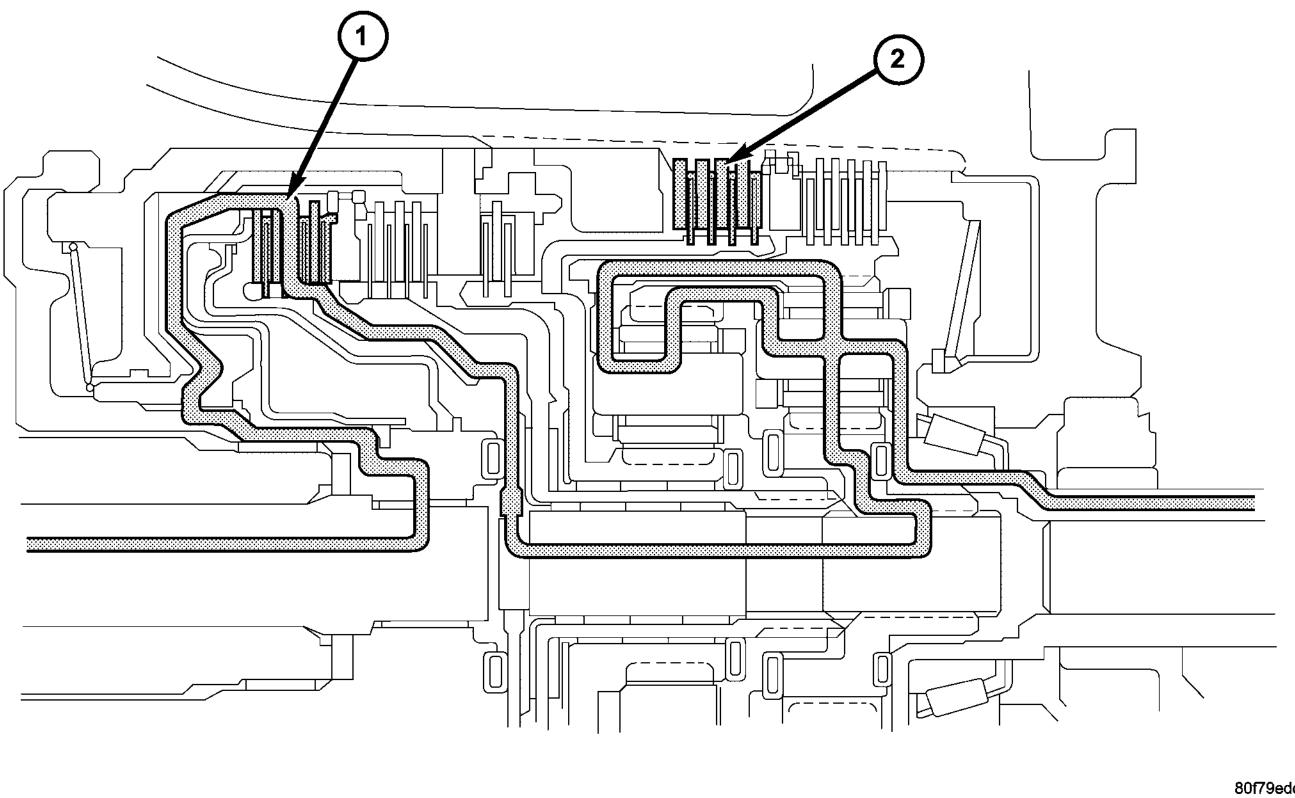


Fig. 4 Second Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

THIRD GEAR POWERFLOW

In third gear, two input clutches are applied to provide torque input: the underdrive clutch and overdrive clutch (Fig. 5). The underdrive clutch rotates the rear sun gear, while the overdrive clutch rotates the front carrier/rear annulus assembly. The result is two components (rear sun gear and rear annulus gear) rotating at the same speed and in the same direction. This effectively locks the entire planetary gearset together and is rotated as one unit. The gear ratio in third is 1:1.

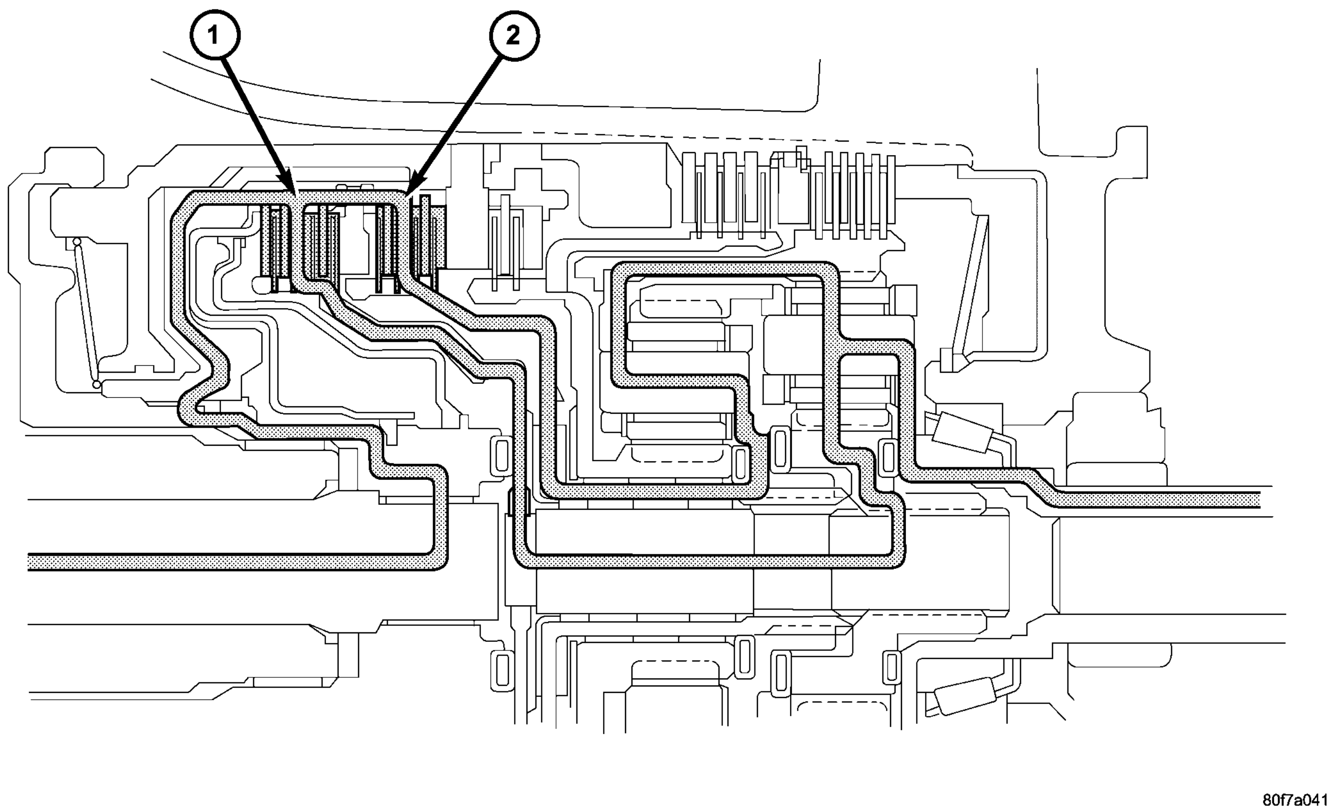


Fig. 5 Third Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - OVERDRIVE CLUTCH APPLIED (Turns Front Carrier/Rear Annulus)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

FOURTH GEAR POWERFLOW

In fourth gear input torque is through the overdrive clutch which drives the front carrier (Fig. 6). The 2/4 clutch is applied to hold the front sun gear. As the overdrive clutch rotates the front carrier, it causes the pinions of the front carrier to walk around the stationary front sun gear. This causes the front carrier pinions to turn the front annulus/rear carrier assembly which provides output torque. In fourth gear, transmission output speed is more than engine input speed. This situation is called overdrive and the gear ratio is 0.69:1.

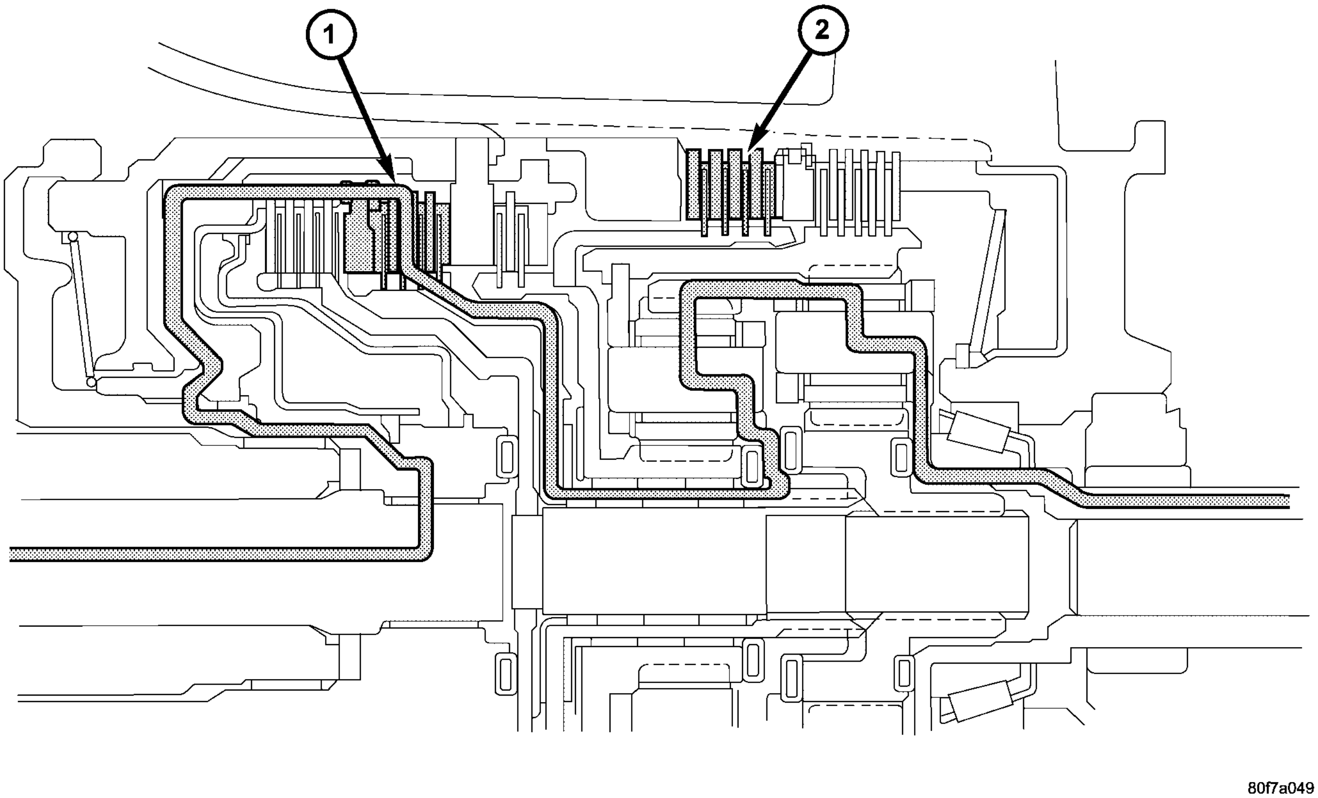


Fig. 6 Fourth Gear Powerflow

1 - OVERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

REVERSE GEAR POWERFLOW

In reverse, input power is through the reverse clutch (Fig. 7). When applied, the reverse clutch drives the front sun gear through the overdrive hub and shaft. The L/R clutch is applied to hold the front carrier/rear annulus assembly stationary. The front carrier is being held by the L/R clutch so the pinions are forced to rotate the front annulus/rear carrier assembly in the reverse direction. Output torque is provided, in reverse, with a gear ratio of 2.21:1.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on the 42RLE Four Speed Automatic Transmission, always check for proper shift linkage adjustment. Also check for diagnostic trouble codes with the DRB® scan tool and the 42RLE Transmission Diagnostic Procedure Manual.

42RLE automatic transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

When diagnosing a problem always begin with recording the complaint. The complaint should be defined as specific as possible. Include the following checks:

- Temperature at occurrence (cold, hot, both)
- Dynamic conditions (acceleration, deceleration, upshift, cornering)
- Elements in use when condition occurs (what gear is transmission in during condition)
- Road and weather conditions
- Any other useful diagnostic information.

After noting all conditions, check the easily accessible variables:

- Fluid level and condition
- Shift linkage adjustment
- Diagnostic trouble code inspection

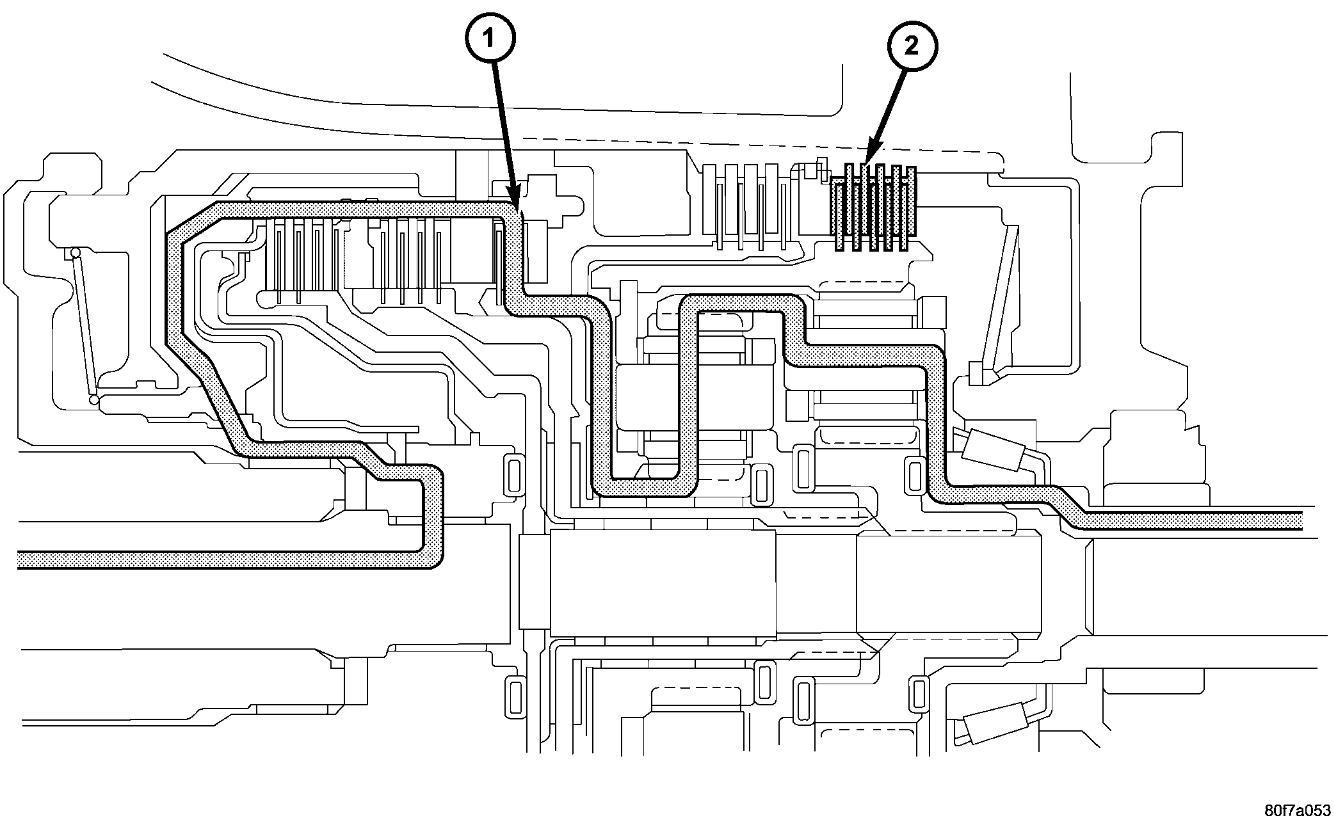


Fig. 7 Reverse Gear Powerflow

1 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus Front Carrier)
2 - REVERSE CLUTCH APPLIED (Turns Front Sun)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

Then perform a road test to determine if the problem has been corrected or that more diagnosis is necessary. If the problem exists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

DIAGNOSIS AND TESTING - ROAD TEST

Prior to performing a road test, verify that the fluid level, fluid condition, and linkage adjustment have been approved.

During the road test, the transmission should be operated in each position to check for slipping and any variation in shifting.

If the vehicle operates properly at highway speeds, but has poor acceleration, the converter stator overrunning clutch may be slipping. If acceleration is normal, but high throttle opening is needed to maintain highway speeds, the converter stator clutch may have seized. Both of these stator defects require replacement of the torque converter and thorough transmission cleaning.

Slipping clutches can be isolated by comparing the “Elements in Use” chart with clutch operation encountered on a road test. This chart identifies which clutches are applied at each position of the selector lever.

A slipping clutch may also set a DTC and can be determined by operating the transmission in all selector positions.

ELEMENTS IN USE AT EACH POSITION OF SELECTOR LEVER

Shift Lever Position	INPUT CLUTCHES			HOLDING CLUTCHES	
	Underdrive	Overdrive	Reverse	2/4	Low/Reverse
P - PARK					X
R - REVERSE			X		X
N - NEUTRAL					X
OD - OVERDRIVE					
First	X				X
Second	X			X	
Direct	X	X			
Overdrive		X		X	
D - DRIVE*					
First	X				X
Second	X			X	
Direct	X	X			
L - LOW*					
First	X				X
Second	X			X	
Direct	X	X			
* Vehicle upshift and downshift speeds are increased when in these selector positions.					

The process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. Road test analysis can diagnose slipping units, but the cause of the malfunction cannot be determined. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

DIAGNOSIS AND TESTING - HYDRAULIC PRESSURE TESTS

Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transmission problems.

Before performing pressure tests, be certain that fluid level and condition, and shift cable adjustments have been checked and approved. Fluid must be at operating temperature (150 to 200 degrees F.).

Install an engine tachometer, raise vehicle on hoist which allows the wheels to turn, and position tachometer so it can be read.

Using special adapters L-4559, attach 300 psi gauge(s) C-3293SP to the port(s) required for test being conducted.

Test port locations are shown in (Fig. 8).

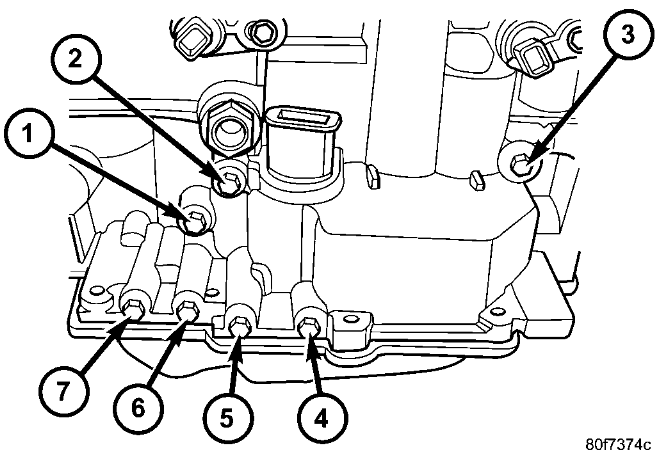


Fig. 8 Pressure Taps

1 - TORQUE CONVERTER CLUTCH OFF
2 - REVERSE
3 - LOW/REVERSE
4 - 2/4
5 - UNDERDRIVE
6 - TORQUE CONVERTER CLUTCH ON
7 - OVERDRIVE

TEST ONE-SELECTOR IN L (1st Gear)

NOTE: This test checks pump output, pressure regulation and condition of the low/reverse clutch hydraulic circuit and shift schedule.

(1) Attach pressure gauge to the low/reverse clutch tap.
(2) Move selector lever to the L position.
(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed to 20 mph.
(4) Low/reverse clutch pressure should read 115 to 145 psi.

TEST TWO-SELECTOR IN DRIVE (Second Gear)

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

(1) Attach gauge to the underdrive clutch tap.
(2) Move selector lever to the 3 position.
(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph.
(4) In second gear the underdrive clutch pressure should read 110 to 145 psi.

TEST TWO A–SELECTOR IN OD (Fourth Gear)

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

(1) Attach gauge to the underdrive clutch tap.
(2) Move selector lever to the OD position.
(3) Allow wheels to rotate freely and increase throttle opening to achieve an indicated speed of 40 mph.
(4) Underdrive clutch pressure should read below 5 psi. If not, than either the solenoid assembly or controller is at fault.

TEST THREE-SELECTOR IN OVERDRIVE (Third and Second Gear)

NOTE: This test checks the overdrive clutch hydraulic circuit as well as the shift schedule.

(1) Attach gauge to the overdrive clutch tap.
(2) Move selector lever to the OD position.
(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 20 mph.
(4) Overdrive clutch pressure should read 74 to 95 psi.
(5) Move selector lever to the 3 position and increase indicated vehicle speed to 30 mph.
(6) The vehicle should be in second gear and overdrive clutch pressure should be less than 5 psi.

TEST FOUR-SELECTOR IN OD (Fourth Gear)

NOTE: This test checks the 2/4 clutch hydraulic circuit.

(1) Attach gauge to the 2/4 clutch tap.
(2) Move selector lever to the OD position.
(3) Allow vehicle front wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph. Vehicle should be in fourth gear.
(4) The 2/4 clutch pressure should read 75 to 95 psi.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

TEST FIVE-SELECTOR IN OVERDRIVE (Fourth Gear, CC on)

NOTE: These tests check the torque converter clutch hydraulic circuit.

(1) Attach gauge to the torque converter clutch off pressure tap.

(2) Move selector lever to the overdrive position.

(3) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph. Vehicle should be in 4th gear, CC on.

CAUTION: Both wheels must turn at the same speed.

(4) Torque converter clutch off pressure should be less than 5 psi.

(5) Now attach the gauge to the torque converter clutch on pressure tap.

(6) Move selector to the overdrive position.

(7) Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph.

(8) Verify the torque converter clutch is applied mode using the RPM display of the DRB scan tool.

(9) Torque converter clutch on pressure should be 60-90 psi.

TEST SIX-SELECTOR IN REVERSE

NOTE: This test checks the reverse clutch hydraulic circuit.

(1) Attach gauge to the reverse and low/reverse clutch tap.

(2) Move selector lever to the reverse position.

(3) Read reverse clutch pressure with output stationary (foot on brake) and throttle opened to achieve 1500 rpm.

(4) Reverse and low/reverse clutch pressure should read 165 to 235 psi.

TEST RESULT INDICATIONS

(1) If proper line pressure is found in any one test, the pump and pressure regulator are working properly.

(2) Low pressure in all positions indicates a defective pump, a clogged filter, or a stuck pressure regulator valve.

(3) Clutch circuit leaks are indicated if pressures do not fall within the specified pressure range.

(4) If the overdrive clutch pressure is greater than 5 psi in Step 6 of Test Three, a worn reaction shaft seal ring or a defective solenoid assembly is indicated.

(5) If the underdrive clutch pressure is greater than 5 psi in Step 4 of Test Two-A, a defective solenoid/pressure switch assembly or controller is the cause.

ALL PRESSURE SPECIFICATIONS ARE PSI (ON HOIST, WITH WHEELS FREE TO TURN)

Gear Selector Position		Actual Gear	PRESSURE TAPS						
			Underdrive Clutch	Overdrive Clutch	Reverse Clutch	Torque Converter Clutch Off	Torque Converter Clutch On	2/4 Clutch	Low/ Reverse Clutch
PARK 0 mph	*	PARK	0-2	0-5	0-2	60-110	45-100	0-2	115-145
REVERSE 0 mph	*	REVERSE	0-2	0-7	165-235	50-100	35-85	0-2	165-235
NEUTRAL 0 mph	*	NEUTRAL	0-2	0-5	0-2	60-110	45-100	0-2	115-145
L 20 mph	#	FIRST	110-145	0-5	0-2	60-110	45-100	0-2	115-145
3 30 mph	#	SECOND	110-145	0-5	0-2	60-110	45-100	115-145	0-2
3 45 mph	#	DIRECT	75-95	75-95	0-2	60-90	45-80	0-2	0-2
OD 30 mph	#	OVERDRIVE	0-2	75-95	0-2	60-90	45-80	75-95	0-2
OD 50 mph	#	OVERDRIVE WITH TCC	0-2	75-95	0-2	0-5	60-95	75-95	0-2
*** Engine Speed at 1500 rpm**									
# CAUTION: Both wheels must be turning at same speed.									

AUTOMATIC TRANSMISSION - 42RLE (Continued)

DIAGNOSIS AND TESTING - CLUTCH AIR PRESSURE TESTS

Inoperative clutches can be located by substituting air pressure for fluid pressure. The clutches may be tested by applying air pressure to their respective passages after the valve body has been removed. Use Special Tool 6599-1 and 6599-2 to perform test (Fig. 9).

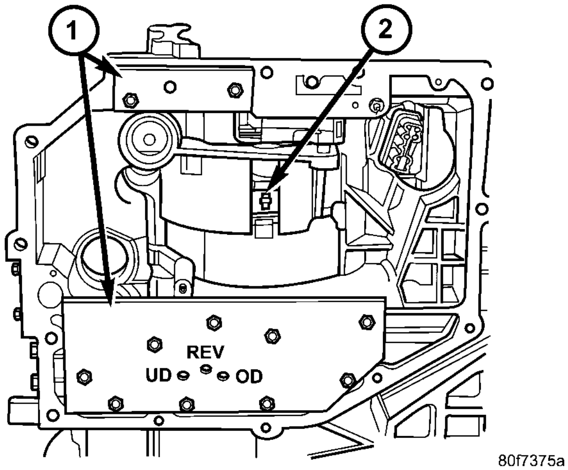


Fig. 9 Air Pressure Test Plate

1 - AIR PRESSURE TEST PLATES
2 - 2/4 CLUTCH RETAINER HOLE

To make air pressure tests, proceed as follows:

NOTE: The compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.

Remove oil pan and valve body. See Valve body recondition.

Apply air pressure to the holes in the special tool, one at a time.

Listen for the clutch to apply. It will give a slight thud sound. If a large amount of air is heard escaping, the transmission must be removed from vehicle, disassembled and all seals inspected.

OVERDRIVE CLUTCH

Apply air pressure to the overdrive clutch apply passage and watch for the push/pull piston to move forward. The piston should return to its starting position when the air pressure is removed.

UNDERDRIVE CLUTCH

Because this clutch piston cannot be seen, its operation is checked by function. Air pressure is applied to the low/reverse or the 2/4 clutches. This locks the output shaft. Use a piece of rubber hose wrapped around the input shaft and a pair of clamp-on pliers to turn the input shaft. Next apply air pressure to the underdrive clutch (Fig. 10). The input shaft should not rotate with hand torque. Release the air pressure and confirm that the input shaft will rotate.

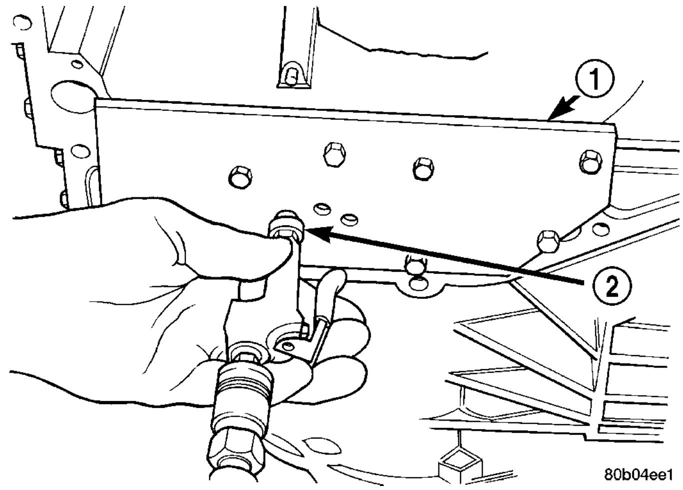


Fig. 10 Testing Underdrive Clutch

1 - AIR PRESSURE TEST PLATE 6599–1
2 - AIR NOZZLE

REVERSE CLUTCH

Apply air pressure to the reverse clutch apply passage and watch for the push/pull piston to move rearward. The piston should return to its starting position when the air pressure is removed.

2/4 CLUTCH

Apply air pressure to the feed hole located on the 2/4 clutch retainer. Look in the area where the 2/4 piston contacts the first separator plate and watch carefully for the 2/4 piston to move rearward. The piston should return to its original position after the air pressure is removed.

LOW/REVERSE CLUTCH

Apply air pressure to the low/reverse clutch feed hole passage. Look in the area where the low/reverse piston contacts the first separator plate. Watch carefully for the piston to move forward. The piston should return to its original position after the air pressure is removed.

DIAGNOSIS AND TESTING - FLUID LEAKAGE

FLUID LEAKAGE - TORQUE CONVERTER HOUSING AREA

When diagnosing converter housing fluid leaks, three actions must be taken before repair:

(1) Verify proper transmission fluid level.

(2) Verify that the leak originates from the converter housing area and is transmission fluid.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(3) Determine the true source of the leak.

Fluid leakage at or around the torque converter area may originate from an engine oil leak (Fig. 11). The area should be examined closely. Factory fill fluid is red and, therefore, can be distinguished from engine oil.

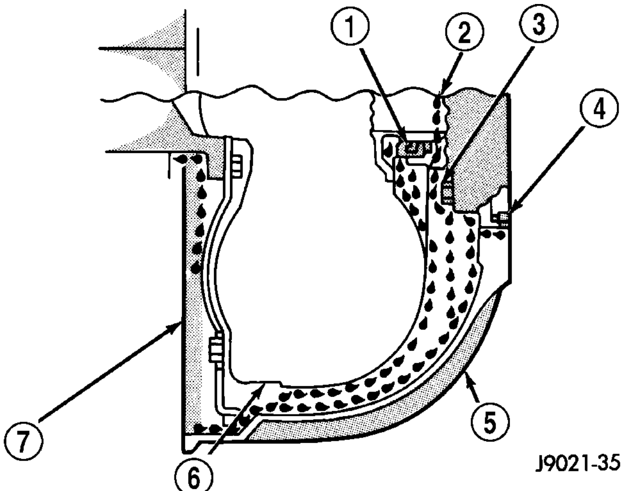


Fig. 11 Converter Housing Leak Paths

1 - PUMP SEAL
2 - PUMP VENT
3 - PUMP BOLT
4 - PUMP GASKET
5 - CONVERTER HOUSING
6 - CONVERTER
7 - REAR MAIN SEAL LEAK

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill, or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair.

Pump seal leaks tend to move along the drive hub and onto the rear of the converter (Fig. 11). Pump o-ring or pump body leaks follow the same path as a seal leak. Pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself. Pump seal or gasket leaks usually travel down the inside of the converter housing (Fig. 11).

TORQUE CONVERTER LEAKAGE

Possible sources of torque converter leakage are:

- Torque converter weld leaks at the outside diameter weld (Fig. 12).
- Torque converter hub weld (Fig. 12).

STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

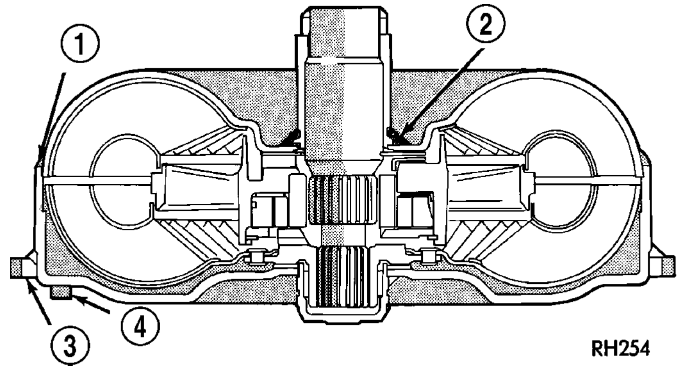


Fig. 12 Converter Leak Points - Typical

1 - OUTSIDE DIAMETER WELD
2 - TORQUE CONVERTER HUB WELD
3 - STARTER RING GEAR
4 - LUG

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

(1) Disconnect the negative battery cable.

(2) Raise and support the vehicle

(3) Remove any necessary skid plates (Fig. 13). (Refer to 13 - FRAMES & BUMPERS/FRAME/ TRANSFER CASE SKID PLATE - REMOVAL)

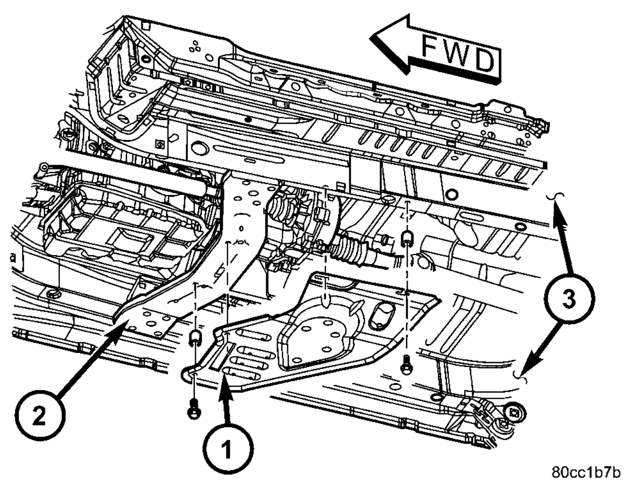


Fig. 13 Remove Skid Plate

1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

(4) Mark propeller shaft and axle companion flanges for assembly alignment.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(5) Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(6) Remove the front propeller shaft, if necessary.(Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(7) Disconnect wires from the input and output speed sensors (Fig. 14).

(8) Disconnect wires from the transmission range sensor (Fig. 14) and the solenoid/pressure switch assembly (Fig. 15).

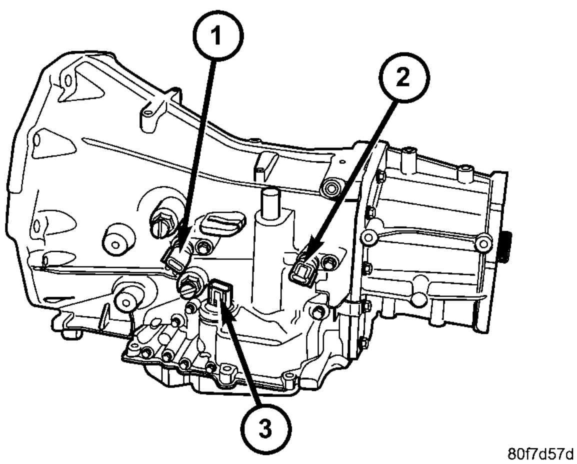


Fig. 14 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

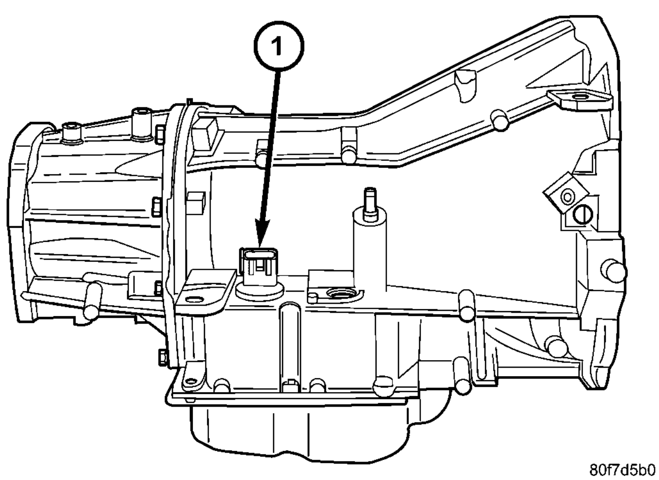


Fig. 15 Solenoid/Pressure Switch Assembly

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY CONNECTOR

(9) Remove the bolts holding the exhaust crossover pipe to the pre-catalytic converter pipe flanges (Fig. 16).

(10) Remove the bolts holding the exhaust crossover pipe to the catalytic converter flange.

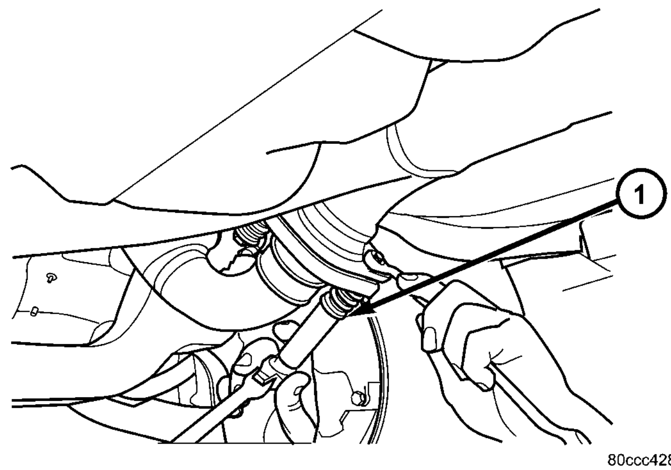


Fig. 16 Remove Exhaust Flange Bolts

1 - EXHAUST FLANGE BOLTS

(11) Disconnect gearshift cable from transmission manual valve lever.

(12) Disengage the shift cable from the cable support bracket.

(13) Remove the starter motor.

(14) Remove the engine to transmission collar.

(15) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(16) Disconnect the transmission vent hose from the transmission.

(17) Remove transfer case.

(18) Support rear of engine with safety stand or jack.

(19) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(20) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 17).

(21) Remove bolts attaching crossmember to frame and remove crossmember.

(22) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(23) Remove all remaining converter housing bolts.

(24) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(25) Hold torque converter in place during transmission removal.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

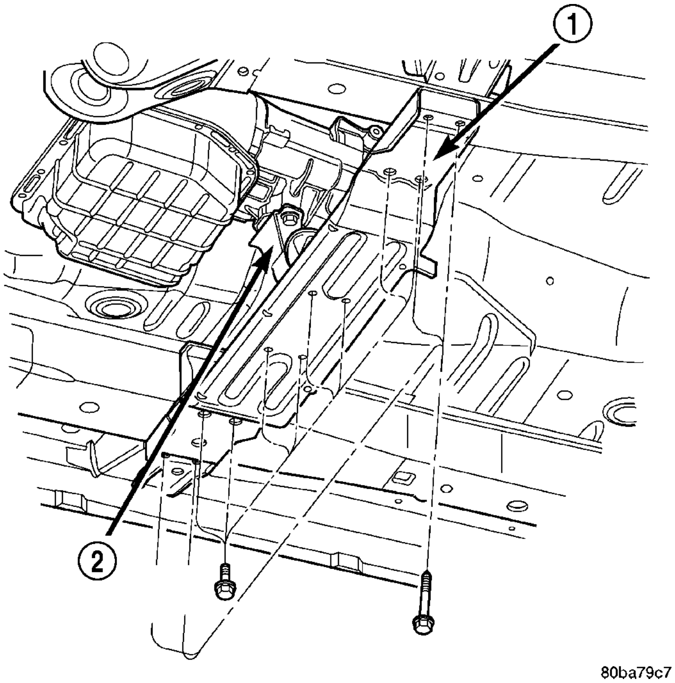


Fig. 17 Rear Transmission Crossmember

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

(26) Lower transmission and remove assembly from under the vehicle.

(27) To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY

NOTE: If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the DRBIII® Scan Tool (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

Before disassembling transmission, move the shift lever clockwise as far as it will go and then remove the shift lever.

NOTE: Tag all clutch pack assemblies, as they are removed, for reassembly identification.

CAUTION: Do not intermix clutch discs or plates as the unit might then fail.

(1) Remove the torque converter from the transmission input shaft (Fig. 18).

(2) Measure input shaft end play using Tool 8266. Set up Tool 8266 and a dial indicator as shown in (Fig. 19). Move input shaft in and out to obtain end play reading. End play specifications are 0.13 to 0.64 mm (0.005 to 0.025 inch). Record indicator reading for reference when reassembling the transmission. If endplay exceeds the specified range, the #4 thrust plate needs to be inspected and changed if necessary.

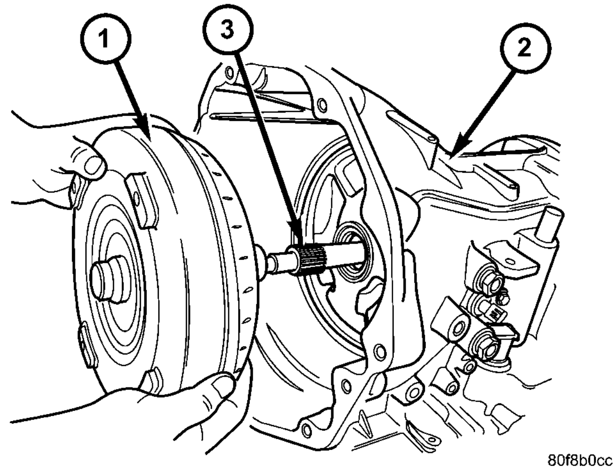


Fig. 18 Remove Torque Converter

1 - TORQUE CONVERTER
2 - TRANSMISSION
3 - INPUT SHAFT

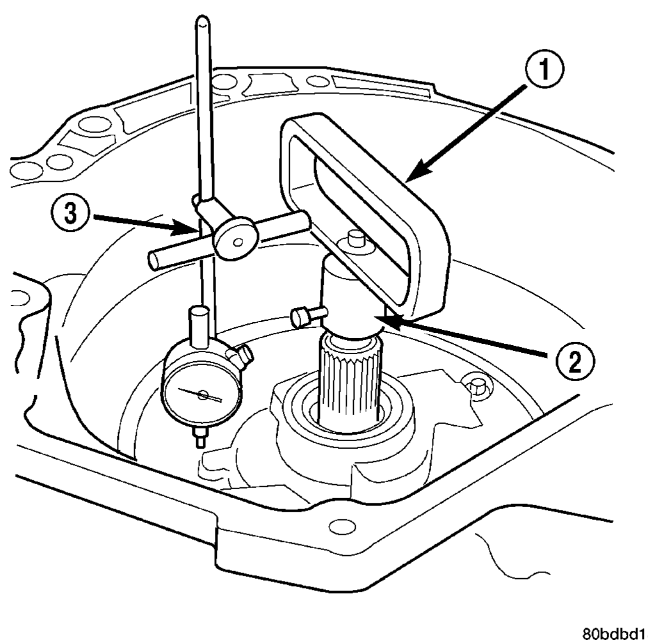


Fig. 19 Measure Input Shaft End Play Using Tool 8266 - Typical

1 - TOOL 8266-8
2 - TOOL 8266-2
3 - TOOL C-3339

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(3) Remove the bolts (Fig. 20) that hold the adapter or extension housing onto the transmission case.

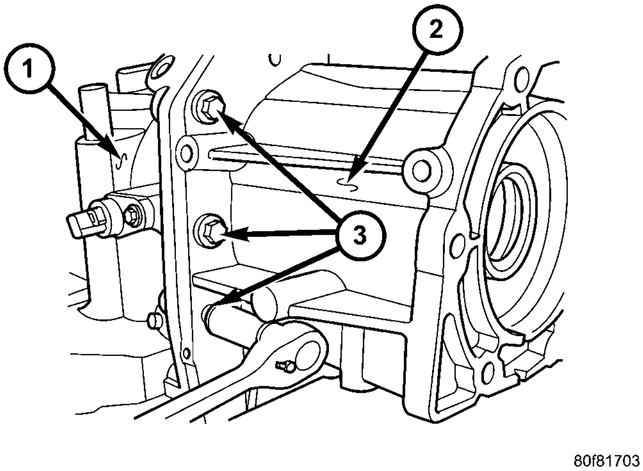


Fig. 20 Remove Adapter Housing Bolts

1 - TRANSMISSION CASE
2 - ADAPTER HOUSING
3 - BOLTS

(4) Remove the adapter (Fig. 21) or extension (Fig. 22) housing from the transmission case. There are two pry slots (Fig. 23) located near the bottom corners of the housing for separating the housing from the transmission case.

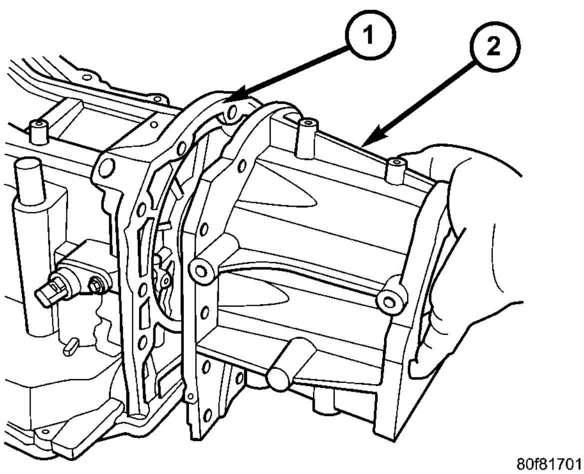


Fig. 21 Remove Adapter Housing

1 - TRANSMISSION CASE
2 - ADAPTER HOUSING

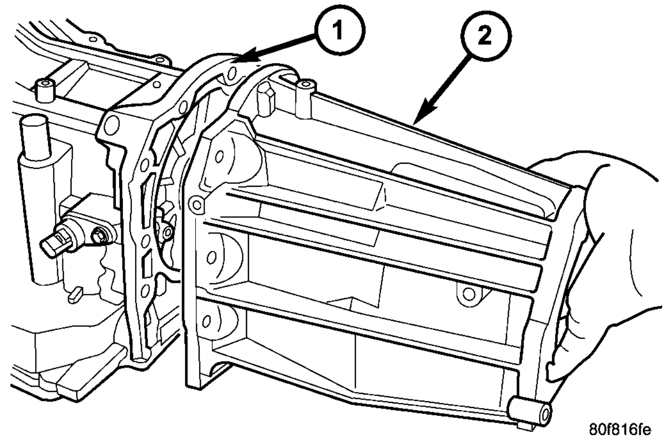


Fig. 22 Remove Extension Housing

1 - TRANSMISSION CASE
2 - EXTENSION HOUSING

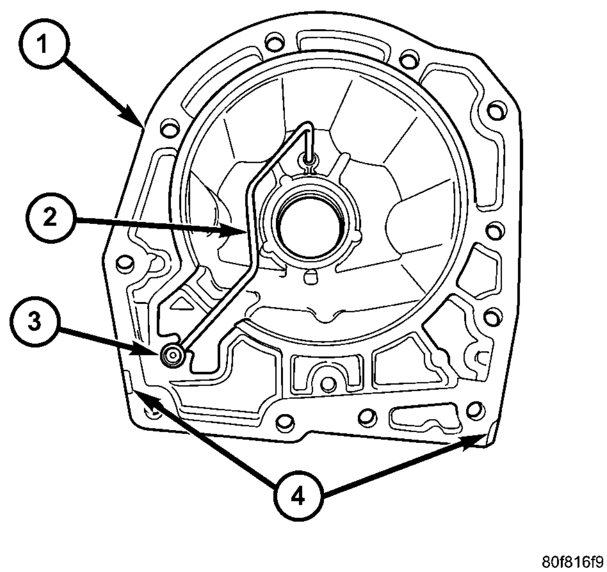


Fig. 23 Lube Tube Grommet

1 - HOUSING
2 - LUBE TUBE
3 - GROMMET
4 - PRY SLOTS

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(5) Inspect the lube tube grommet (Fig. 23) for damage. If the grommet lip is damaged, it will need to be replaced.

(6) On 4X2 transmissions, perform the following, if necessary:

(a) Remove the extension shaft bearing snap ring (Fig. 24) from the extension housing.

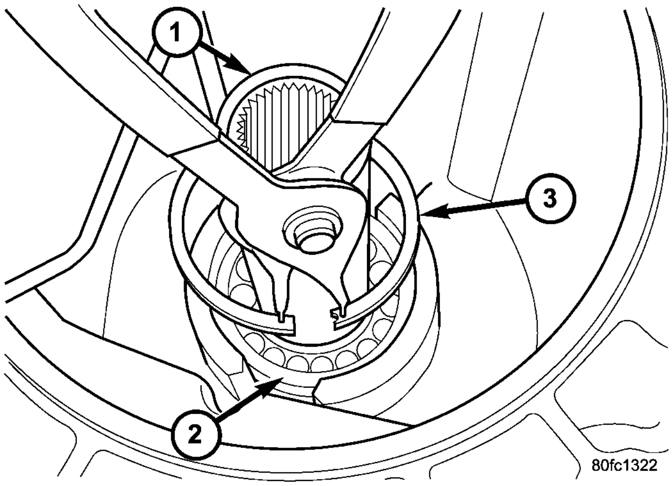


Fig. 24 Remove Extension Shaft Bearing Snap Ring

1 - EXTENSION SHAFT
2 - BEARING
3 - SNAP RING

(b) Remove the extension shaft and bearing assembly (Fig. 25) from the extension housing.

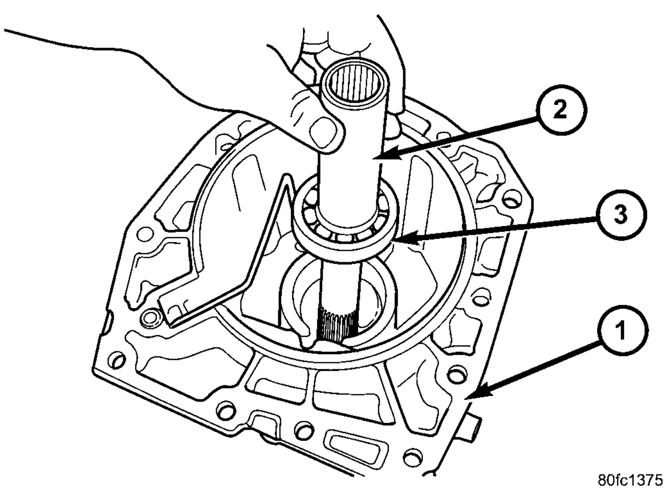


Fig. 25 Remove Extension Shaft and Bearing Assembly

1 - EXTENSION HOUSING
2 - EXTENSION SHAFT
3 - BEARING

(c) Remove the extension shaft bearing retaining ring (Fig. 26) from the extension shaft.

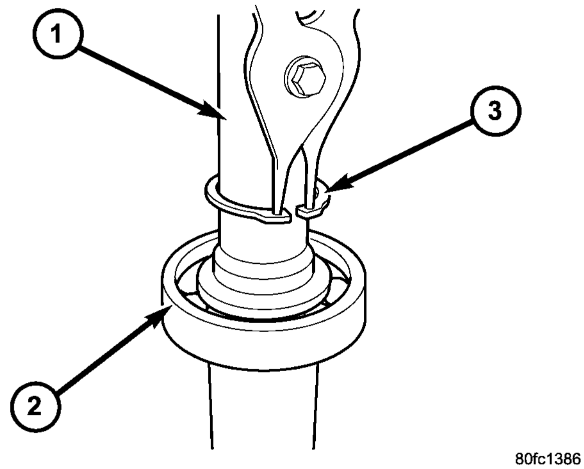


Fig. 26 Remove Extension Shaft Bearing Retaining Ring

1 - EXTENSION SHAFT
2 - BEARING
3 - RETAINING RING

(d) Remove the extension shaft bearing (Fig. 27) from the extension shaft.

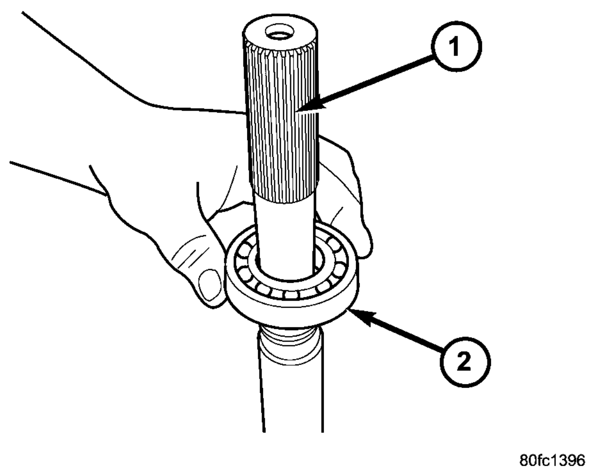


Fig. 27 Remove Extension Shaft Bearing

1 - EXTENSION SHAFT
2 - BEARING

(7) Using a Slide Hammer C-3752 (Fig. 28), remove the 4X4 stub shaft (Fig. 29) from the transmission output shaft.

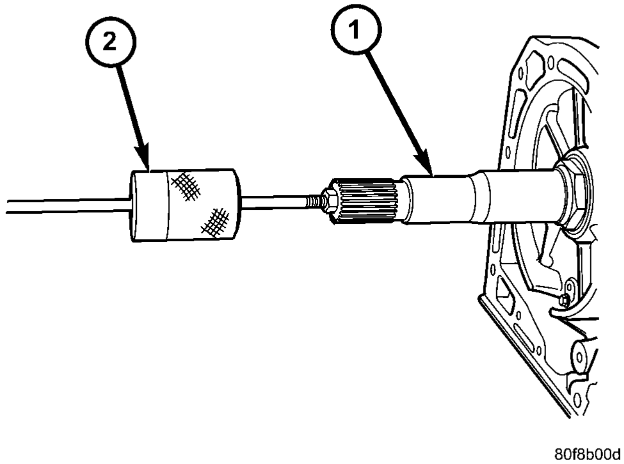


Fig. 28 Remove the 4X4 Stub shaft Using C-3752

1 - 4X4 STUB SHAFT
2 - PULLER C-3752

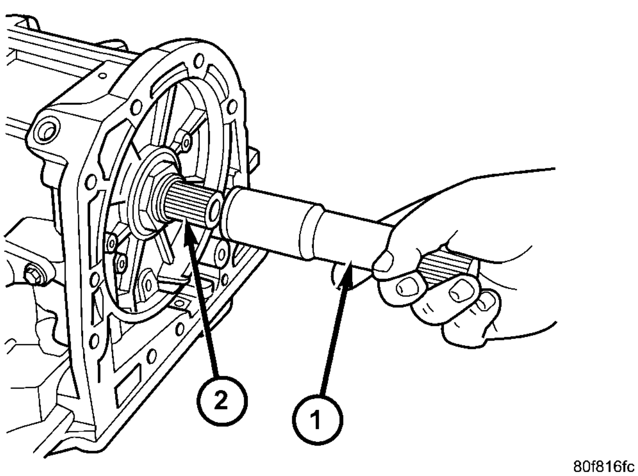


Fig. 29 Remove 4X4 Stub Shaft

1 - STUB SHAFT
2 - OUTPUT SHAFT

(8) Remove the input speed sensor bolt (Fig. 30).

(9) Remove the output speed sensor bolt (Fig. 31).

(10) Remove the input and output speed sensors (Fig. 32). Identify the speed sensors for re-installation since they are not interchangeable.

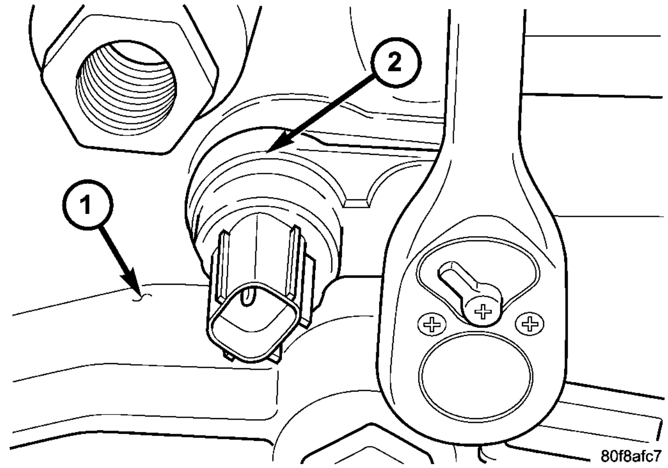


Fig. 30 Remove Input Speed Sensor Bolt

1 - INPUT SPEED SENSOR
2 - TRANSMISSION CASE

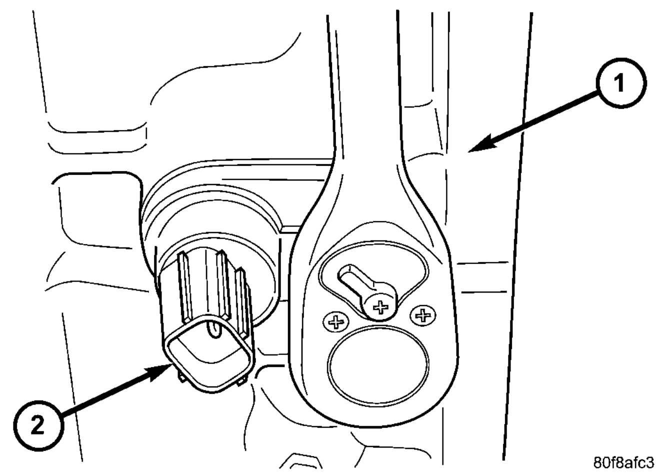


Fig. 31 Remove Output Speed Sensor Bolt

1 - OUTPUT SPEED SENSOR
2 - TRANSMISSION CASE

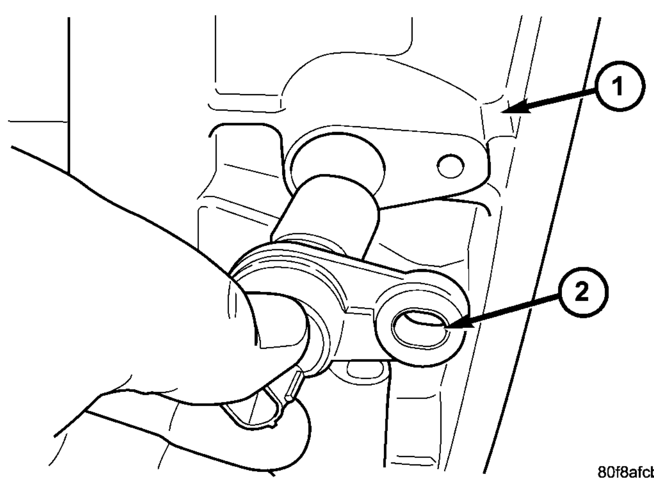


Fig. 32 Remove Output Speed Sensor

1 - OUTPUT SPEED SENSOR
2 - TRANSMISSION CASE

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(11) Remove the transmission oil pan bolts (Fig. 33).

(12) Remove the transmission oil pan (Fig. 34).

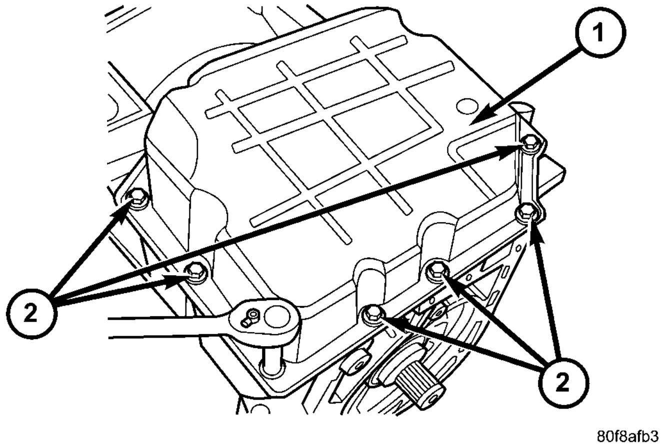


Fig. 33 Remove Transmission Oil Pan Bolts

1 - TRANSMISSION OIL PAN
2 - BOLTS

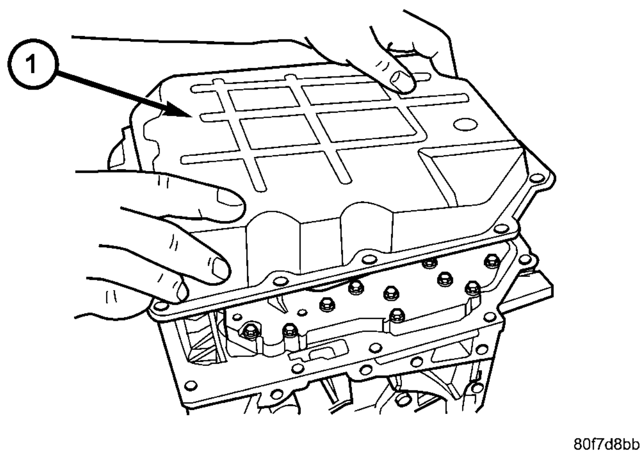


Fig. 34 Remove Transmission Oil Pan

1 - TRANSMISSION OIL PAN

(13) Remove the transmission oil filter screws (Fig. 35).

(14) Remove transmission oil filter (Fig. 36).

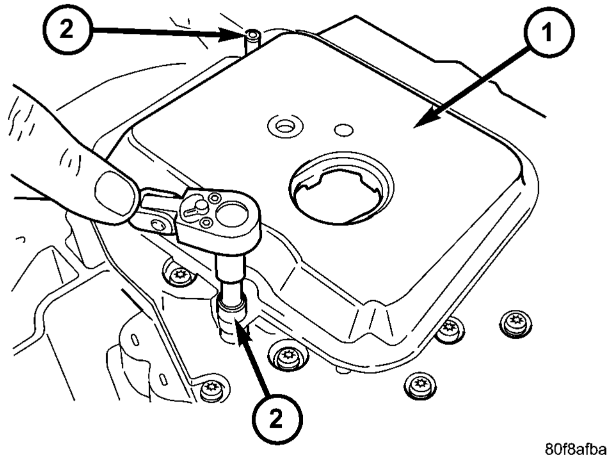


Fig. 35 Remove Oil Filter Screws

1 - OIL FILTER
2 - SCREWS

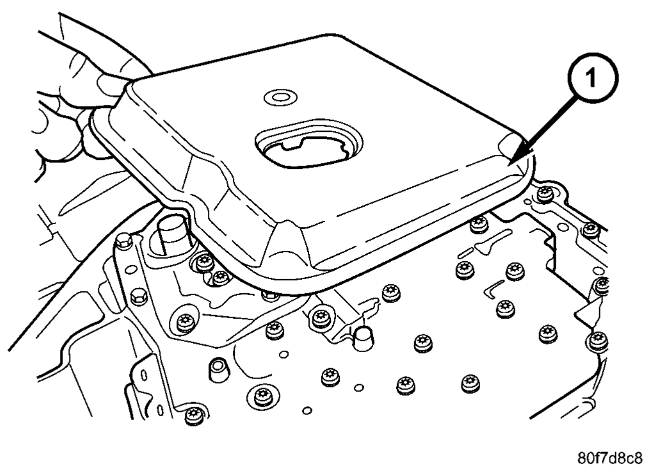


Fig. 36 Remove Transmission Filter

1 - TRANSMISSION FILTER

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(15) Remove the oil filter o-ring from the valve body (Fig. 37).

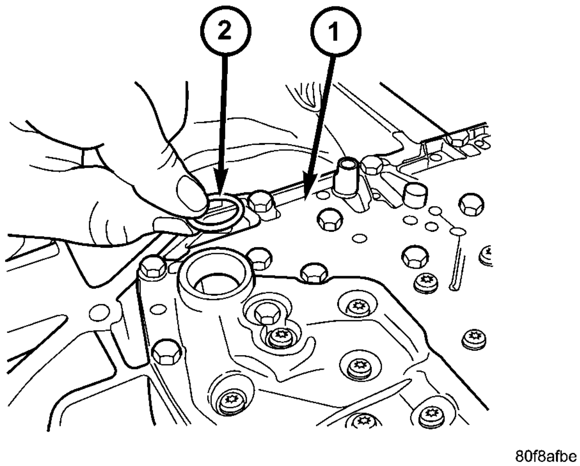


Fig. 37 Remove Oil Filter O-Ring

1 - VALVE BODY
2 - O-RING

(16) Remove valve body-to-case bolts (Fig. 38).

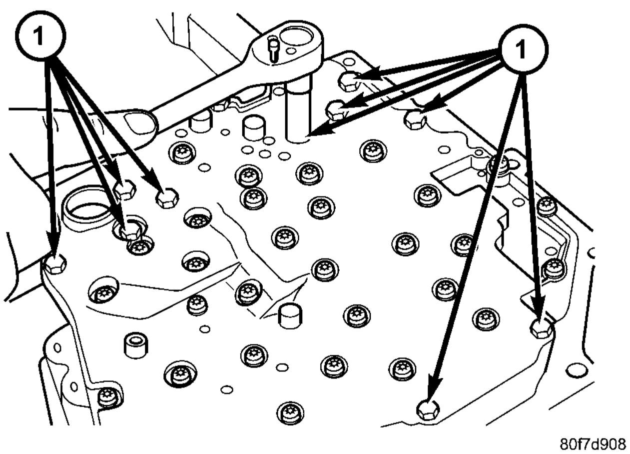


Fig. 38 Remove Valve Body Bolts

1 - BOLTS

CAUTION: Do not handle the valve body by the manual shaft. Damage could result.

(17) Remove valve body from transmission (Fig. 39).

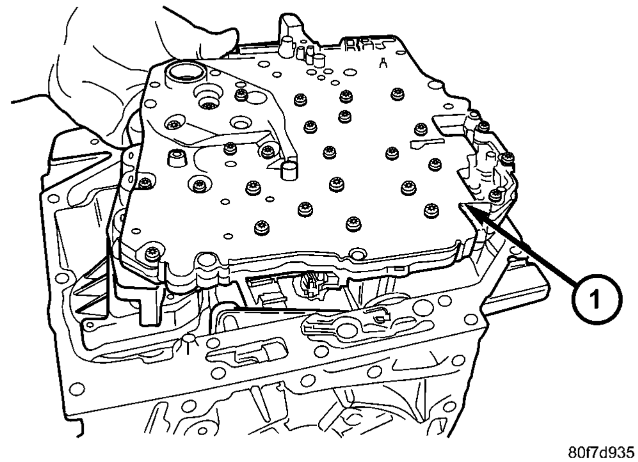


Fig. 39 Remove Valve Body From Transmission

1 - VALVE BODY

(18) Remove underdrive accumulator and spring (Fig. 40) (Fig. 42).

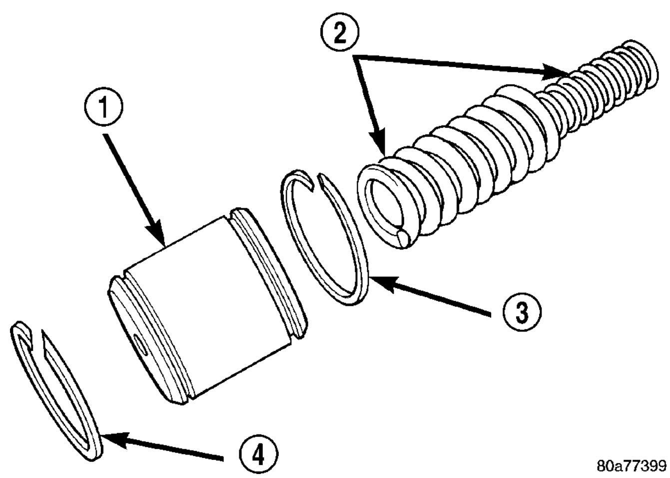


Fig. 40 Remove Underdrive Accumulator and Springs

1 - ACCUMULATOR PISTON (UNDERDRIVE)
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(19) Remove overdrive accumulator and springs (Fig. 41) (Fig. 42).

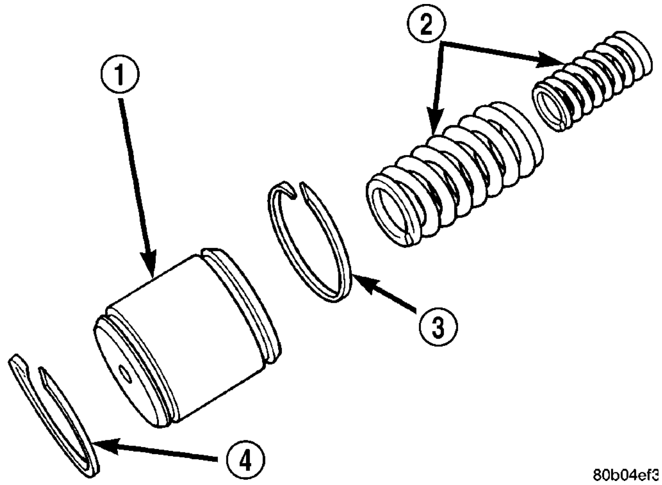


Fig. 41 Remove Overdrive Accumulator and Springs

1 - OVERDRIVE ACCUMULATOR PISTON
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

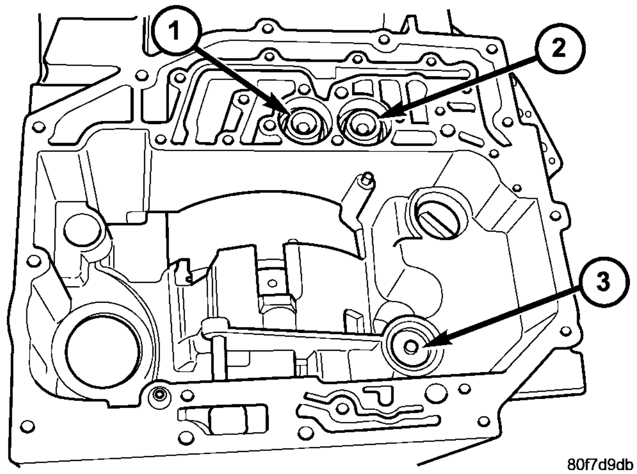


Fig. 42 Accumulator Location

1 - OVERDRIVE ACCUMULATOR LOCATION
2 - UNDERDRIVE ACCUMULATOR LOCATION
3 - LOW/REVERSE ACCUMULATOR

(20) Remove the low/reverse accumulator snap ring (Fig. 43).

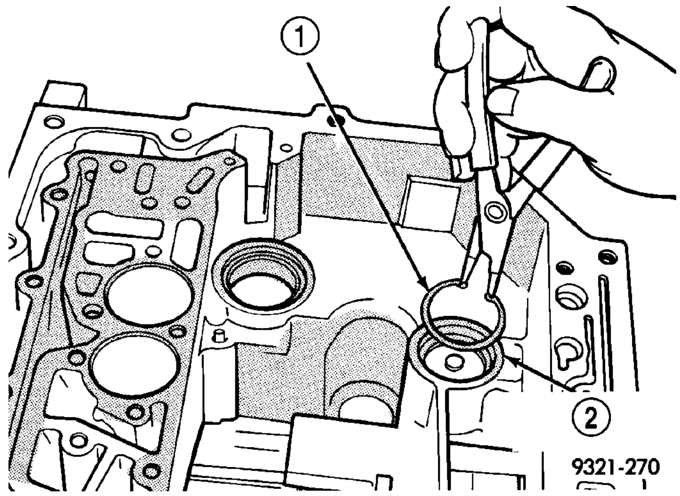


Fig. 43 Remove Low/Reverse Accumulator

1 - SNAP RING
2 - LOW/REVERSE ACCUMULATOR

(21) Remove the low/reverse accumulator plug (Fig. 44).

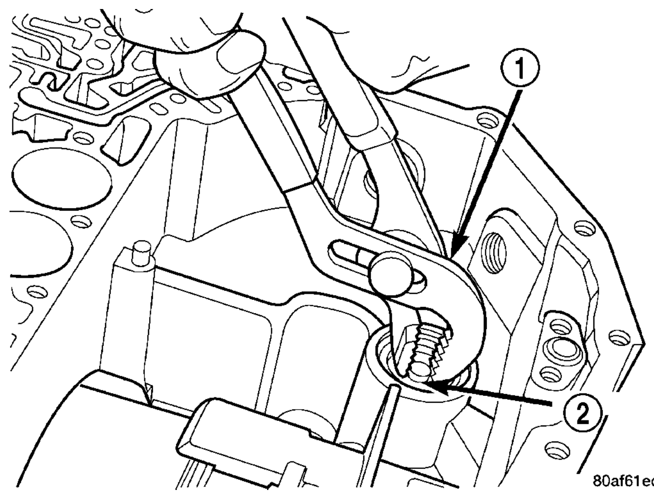


Fig. 44 Remove Low/Reverse Accumulator Plug

1 - ADJUSTABLE PLIERS
2 - PLUG

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(22) Remove low/reverse accumulator piston and springs (Fig. 45) (Fig. 46).

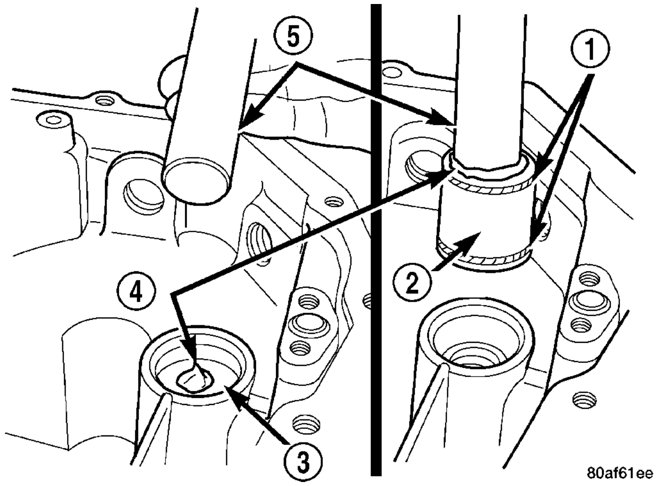


Fig. 45 Remove Low/Reverse Accumulator Piston

1 - SEAL RINGS
2 - PISTON
3 - PISTON
4 - PETROLATUM
5 - SUITABLE TOOL

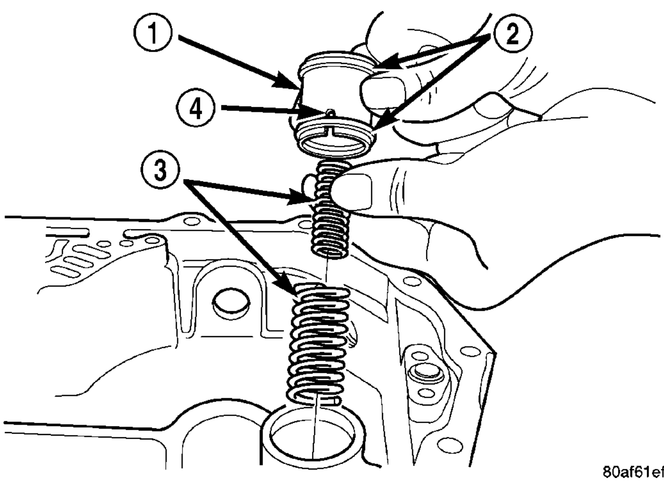


Fig. 46 Low/Reverse Accumulator Components

1 - ACCUMULATOR PISTON
2 - SEAL RINGS
3 - RETURN SPRINGS
4 - NOTE NOTCH

(23) Remove and discard the oil pump-to-case bolts (Fig. 47). The oil pump bolts are not to be reused.

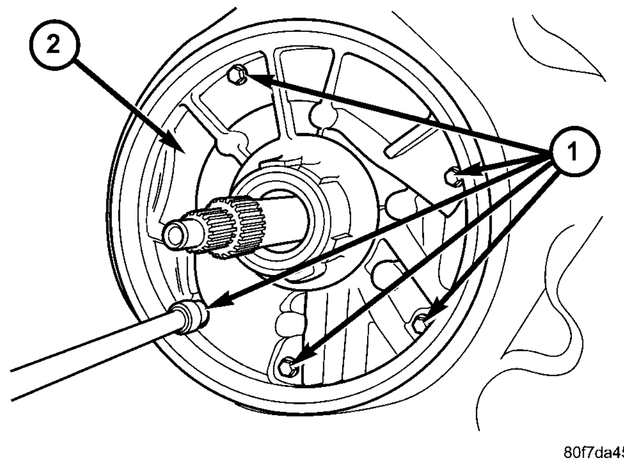


Fig. 47 Remove Oil Pump Attaching Bolts

1 - BOLTS
2 - OIL PUMP

(24) Remove oil pump using C-3752 Pullers (Fig. 48).

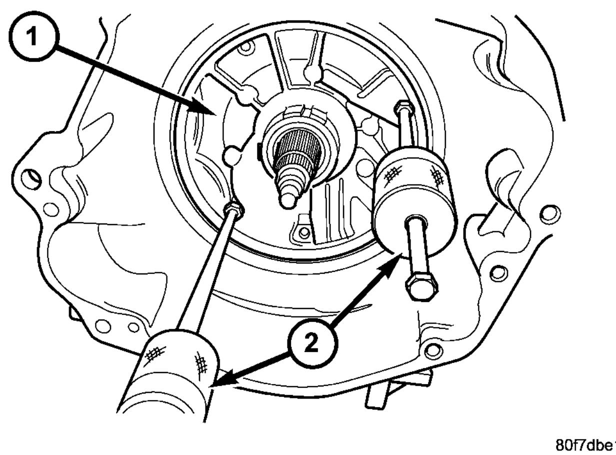


Fig. 48 Oil Pump Pullers

1 - OIL PUMP
2 - PULLERS

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(25) Remove oil pump while pushing in on input shaft (Fig. 49).

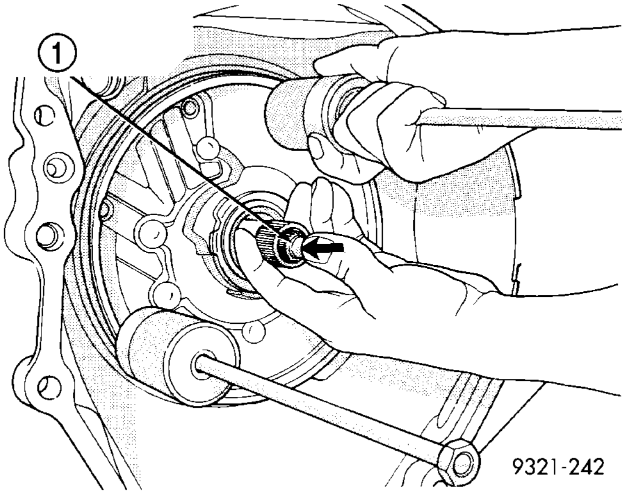


Fig. 49 Remove Oil Pump

1 - “PUSH IN” ON INPUT SHAFT WHILE REMOVING PUMP

(26) Remove oil pump gasket (Fig. 50).

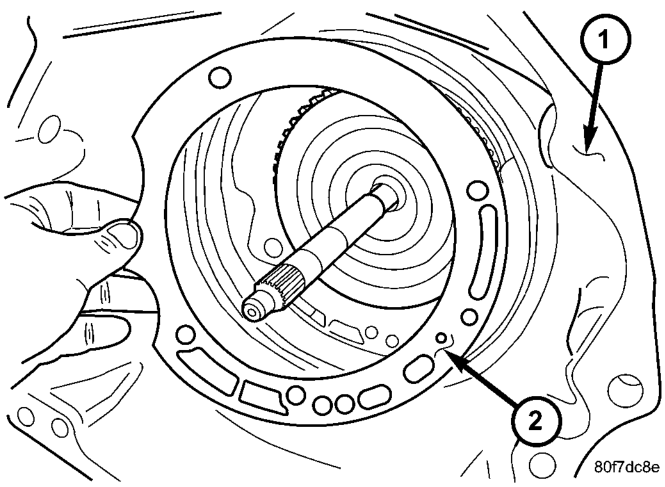


Fig. 50 Remove Oil Pump Gasket

1 - BELLHOUSING
2 - OIL PUMP GASKET

CAUTION: By-pass valve must be replaced if transmission failure occurs.

(27) Remove the cooler by-pass valve (Fig. 51).

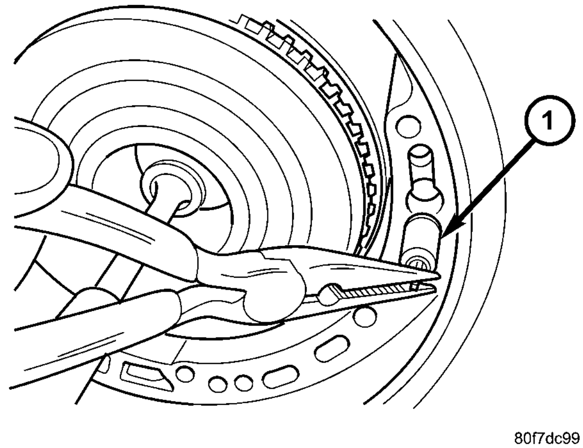


Fig. 51 Remove By-Pass Valve

1 - BYPASS VALVE

(28) Remove the #1 caged needle bearing (Fig. 52).

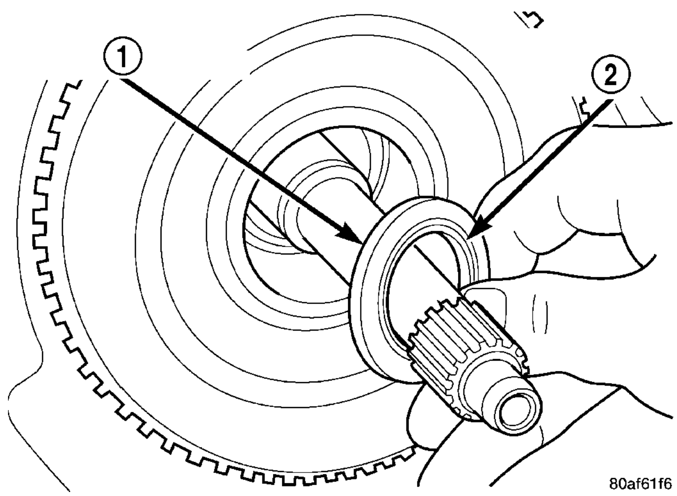


Fig. 52 Remove No. 1 Caged Needle Bearing

1 - #1 CAGED NEEDLE BEARING
2 - NOTE: TANGED SIDE OUT

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(29) Remove the input clutch assembly (Fig. 53).

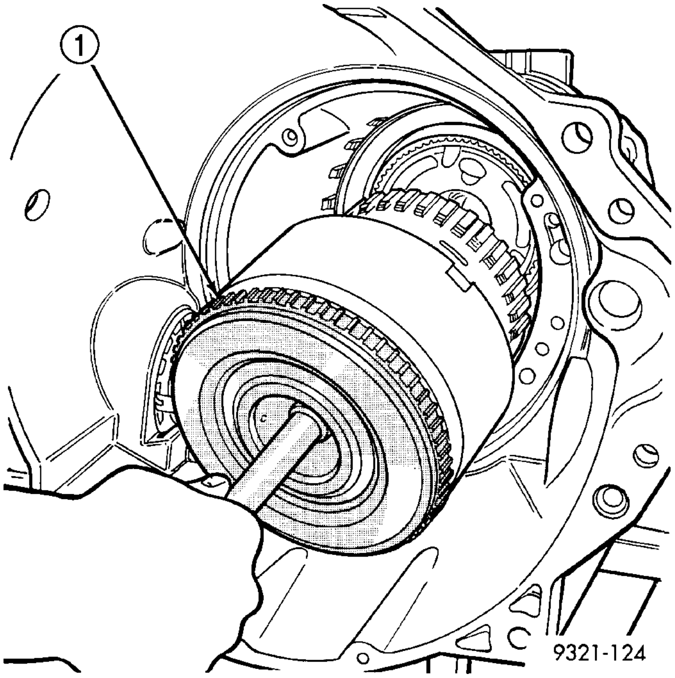


Fig. 53 Remove Input Clutch Assembly

1 - INPUT CLUTCH ASSEMBLY

(30) Remove the #4 thrust plate (Fig. 54).

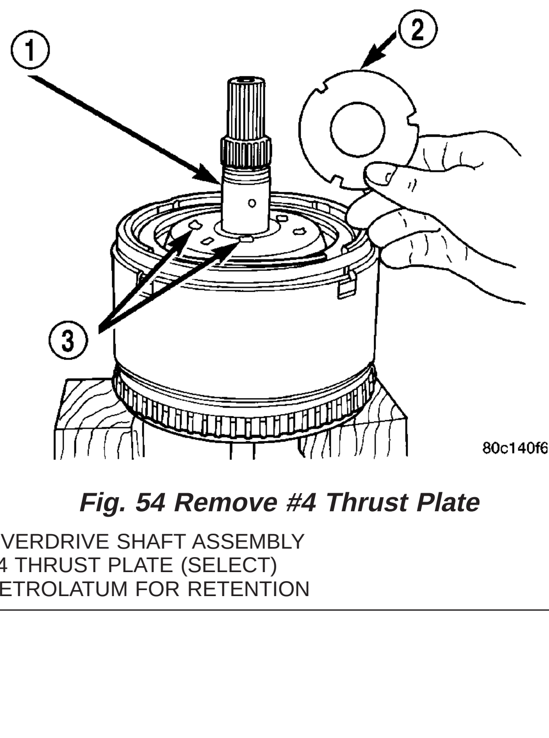


Fig. 54 Remove #4 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #4 THRUST PLATE (SELECT)
3 - PETROLATUM FOR RETENTION

(31) Remove the front sun gear assembly and #4 thrust washer (if still in place) (Fig. 55).

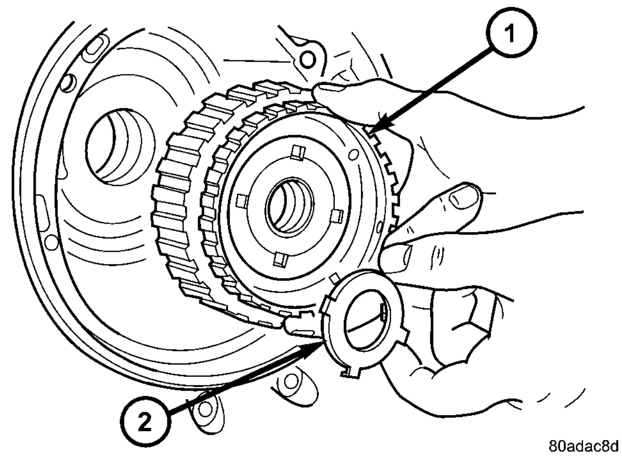


Fig. 55 Remove Front Sun Gear Assembly

1 - FRONT SUN GEAR ASSEMBLY
2 - #4 THRUST WASHER (FOUR TABS)

(32) Remove the front carrier/rear annulus and #6 needle bearing (Fig. 56).

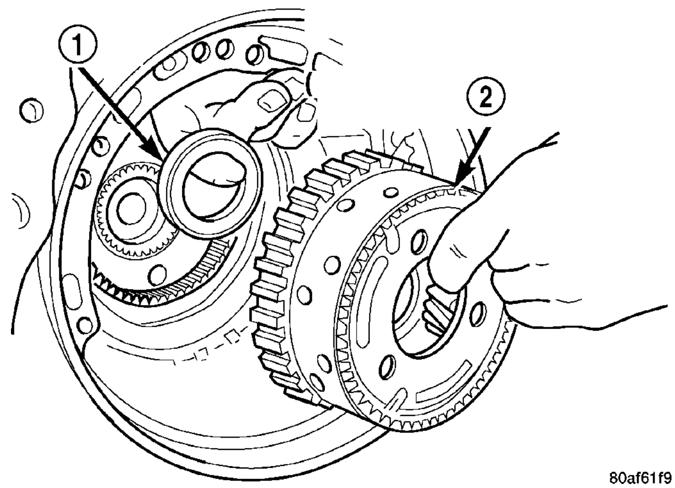


Fig. 56 Remove Front Carrier/Rear Annulus

1 - #6 NEEDLE BEARING
2 - FRONT CARRIER AND REAR ANNULUS ASSEMBLY (TWIST AND PULL OR PUSH TO REMOVE OR INSTALL).

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(33) Remove the rear sun gear and #7 needle bearing (Fig. 57) (Fig. 58).

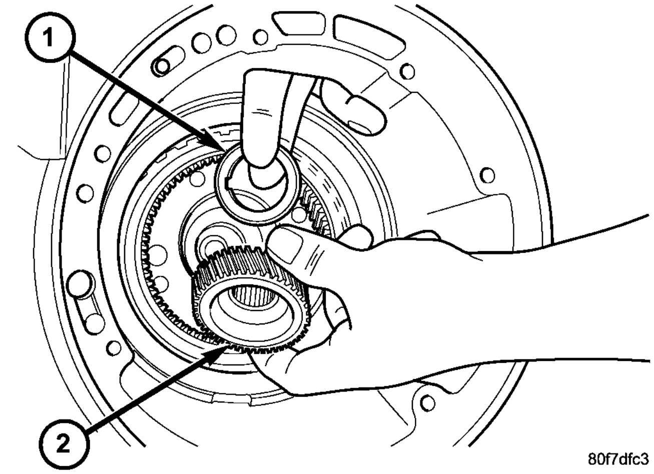


Fig. 57 Remove Rear Sun Gear

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

NOTE: The number seven needle bearing has three antireversal tabs and is common with the number five and number two position. The orientation should allow the bearing to seat flat against the rear sun gear (Fig. 58). A small amount of petrolatum can be used to hold the bearing to the rear sun gear.

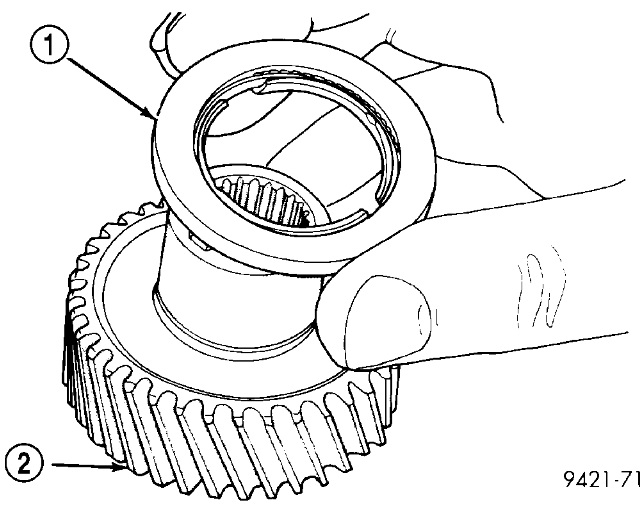


Fig. 58 Number 7 Bearing

1 - #7 BEARING
2 - REAR SUN GEAR

(34) Install and load Tool 5058 to remove the 2/4 clutch retainer snap ring (Fig. 59).

(35) Remove the 2/4 clutch retainer (Fig. 60) (Fig. 61).

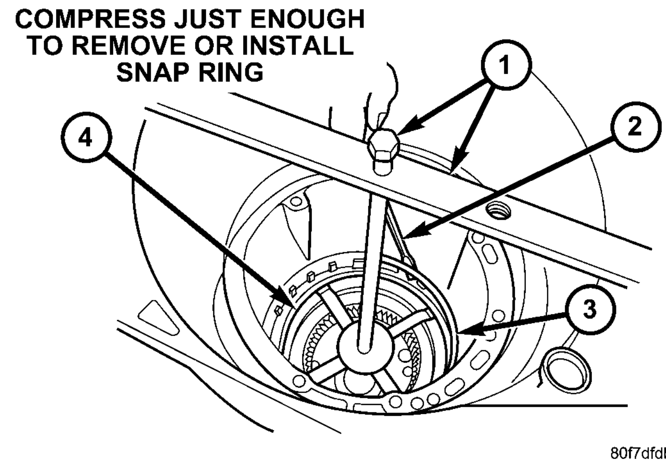


Fig. 59 Remove 2/4 Clutch Retainer Snap Ring

1 - TOOL 5058
2 - SCREWDRIVER
3 - SNAP RING
4 - 2/4 CLUTCH RETAINER

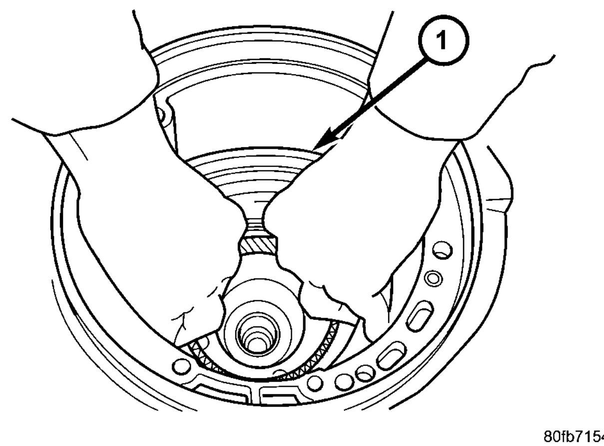


Fig. 60 Remove 2/4 Clutch Retainer

1 - 2/4 CLUTCH RETAINER

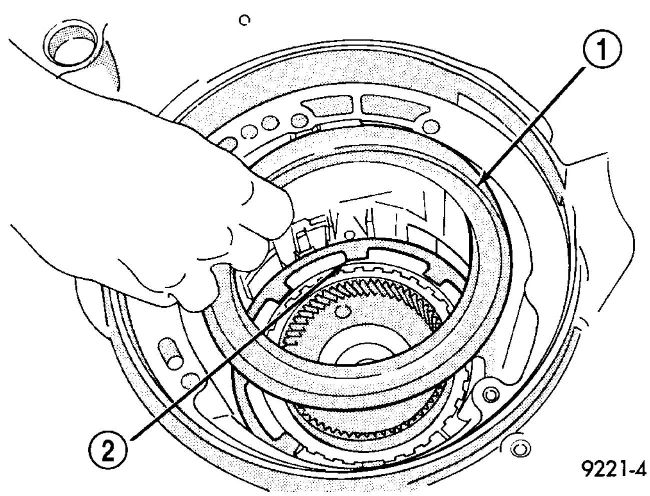


Fig. 61 2/4 Clutch Retainer

1 - 2/4 CLUTCH RETAINER
2 - 2/4 CLUTCH RETURN SPRING

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(36) Remove the 2/4 clutch return spring (Fig. 62).

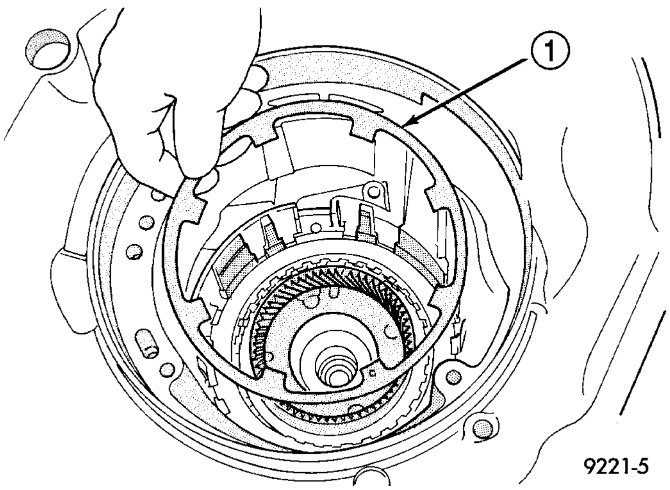


Fig. 62 Remove 2/4 Clutch Return Spring

1 - 2/4 CLUTCH RETURN SPRING

(37) Remove the 2/4 clutch pack (Fig. 63).

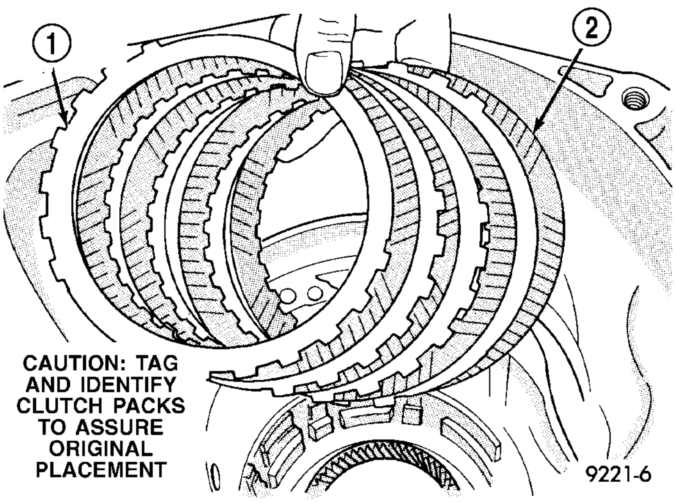


Fig. 63 Remove 2/4 Clutch Pack

1 - CLUTCH PLATE (4)
2 - CLUTCH DISC (4)

(38) Remove the tapered snap ring (Fig. 64).

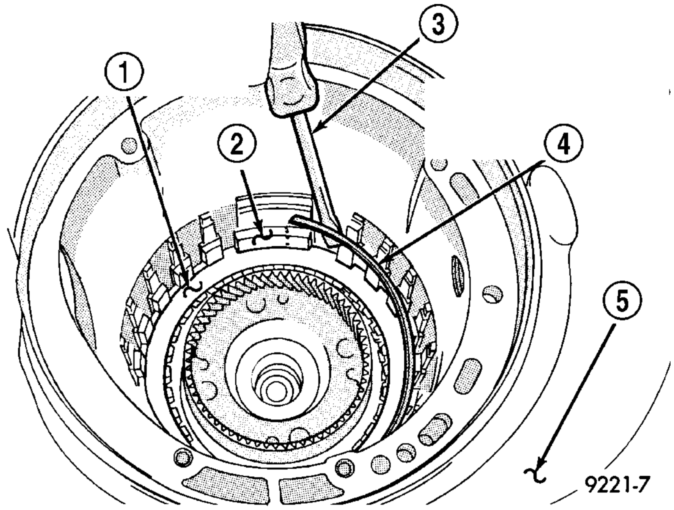


Fig. 64 Remove Tapered Snap Ring

1 - LOW/REVERSE CLUTCH REACTION PLATE
2 - LONG TAB
3 - SCREWDRIVER
4 - LOW/REVERSE TAPERED SNAP RING (TAPERED SIDE UP)
5 - OIL PAN FACE

(39) Remove the low/reverse reaction plate (Fig. 65).

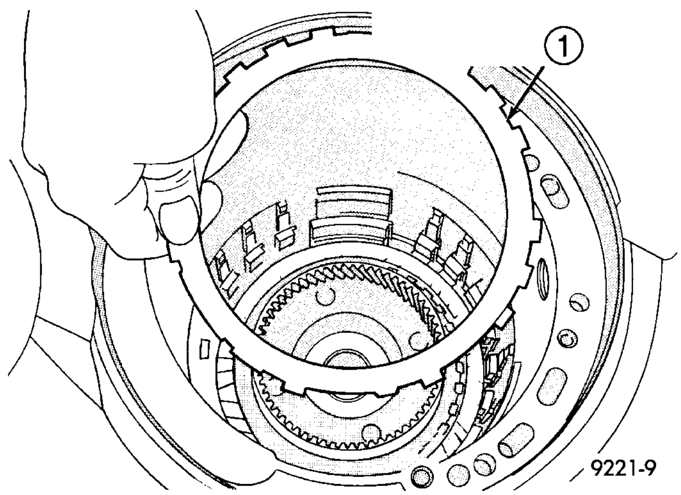


Fig. 65 Remove Low/Reverse Reaction Plate

1 - LOW/REVERSE REACTION PLATE (FLAT SIDE UP)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(40) Remove one (1) low/reverse clutch disc to facilitate snap ring removal (Fig. 66).

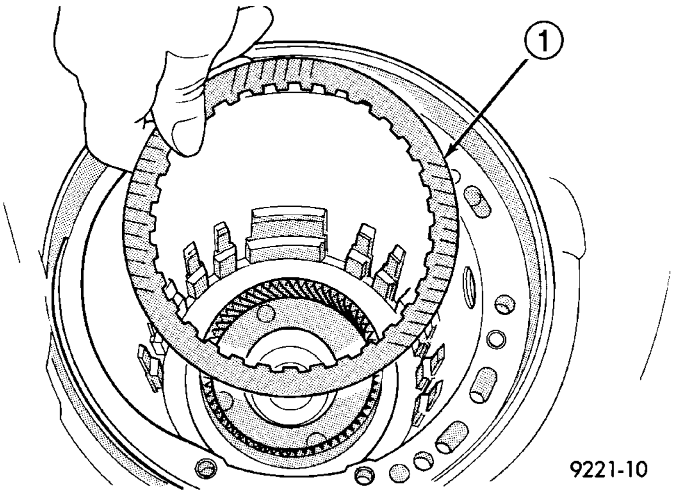


Fig. 66 Remove One Disc

1 - ONE DISC FROM LOW/REVERSE CLUTCH

(41) Remove the low/reverse reaction plate snap ring (Fig. 67).

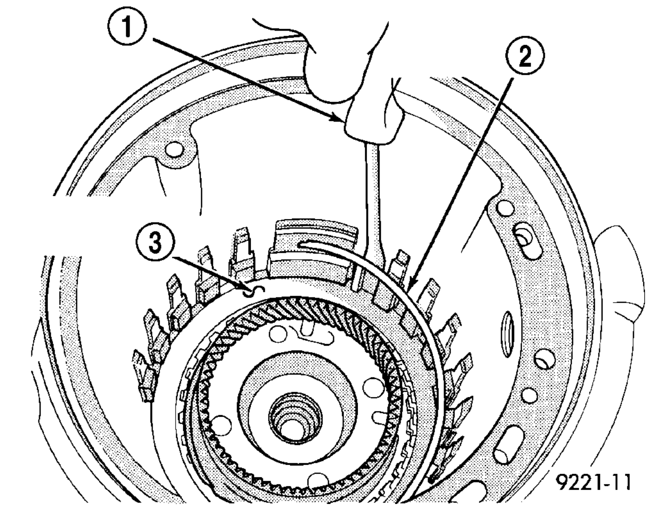


Fig. 67 Remove Low/Reverse Reaction Plate Snap Ring

1 - SCREWDRIVER
2 - LOW/REVERSE REACTION PLATE FLAT SNAP RING
3 - DO NOT SCRATCH CLUTCH PLATE

(42) Remove the low/reverse clutch pack (Fig. 68).

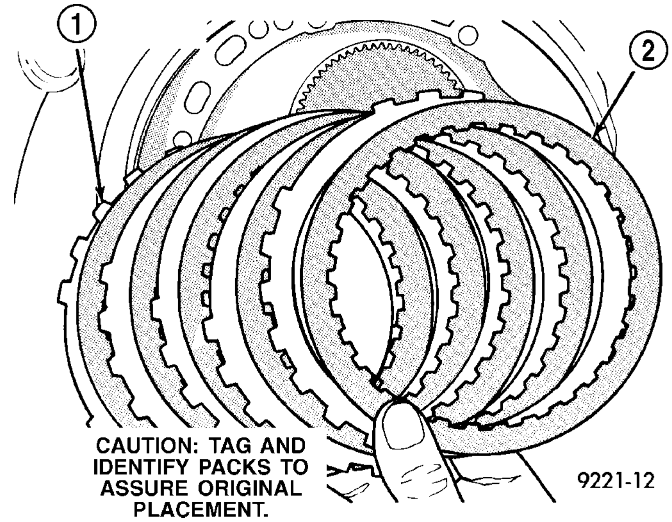


Fig. 68 Remove Low/Reverse Clutch Pack

1 - CLUTCH PLATES (5)
2 - CLUTCH DISCS (5)

CAUTION: Failure to grind and open stakes of the output shaft nut and transfer shaft nut will result in thread damage to the shafts during nut removal.

WARNING: WEAR SAFETY GOGGLES WHILE GRINDING STAKE NUTS.

(43) Using a die grinder or equivalent, grind the stakes in the shoulder of the shaft nuts as shown in (Fig. 69) (Fig. 70). Do not grind all the way through the nut and into the shaft. There are two stakes on each nut.

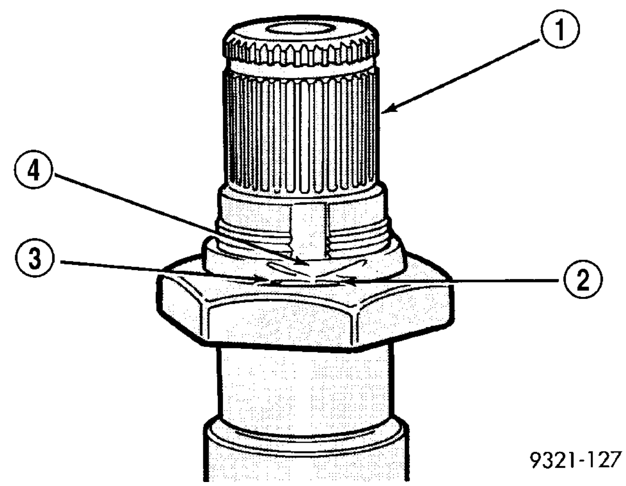


Fig. 69 Grinding Stakes

1 - TRANSFER SHAFT
2 - GRIND HERE
3 - GRIND HERE
4 - NUT STAKE

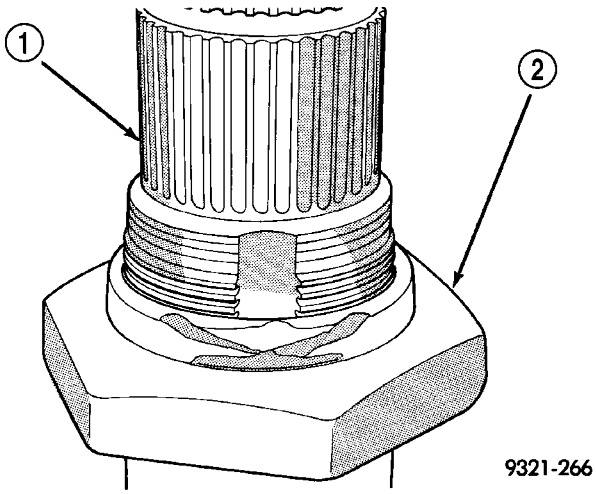


Fig. 70 Stake Grinding Pattern

1 - TRANSFER SHAFT
2 - TRANSFER SHAFT NUT

(44) Using a small chisel, carefully open the stakes on nut (Fig. 71).

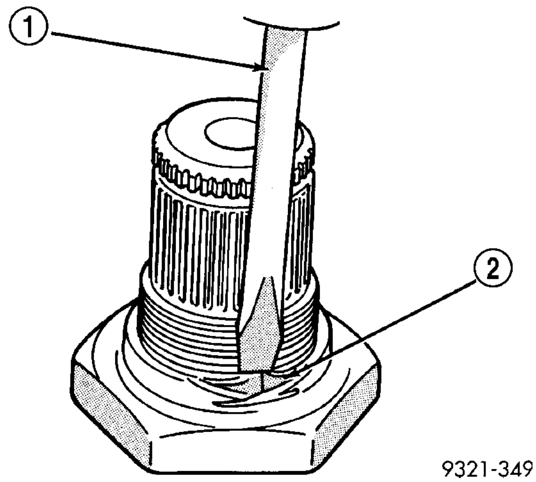


Fig. 71 Opening Nut Stakes

1 - CHISEL
2 - NUT STAKE

(45) Use special tool 6497 and 6498A to remove the transfer shaft nut or the output shaft nut (Fig. 72).

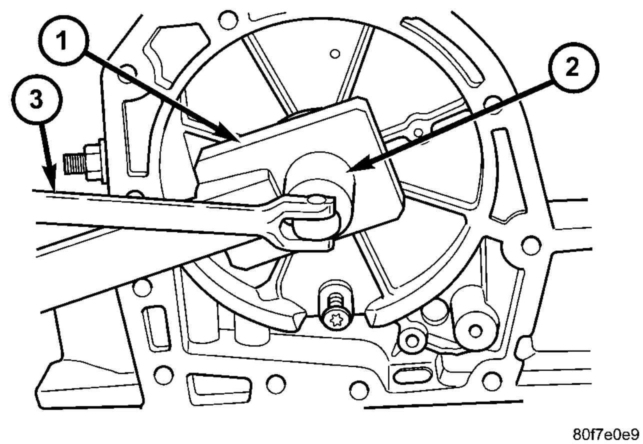


Fig. 72 Remove Output Shaft Nut

1 - SPECIAL TOOL 6497
2 - SPECIAL TOOL 6498A
3 - BREAKER BAR

(46) Remove the output shaft from case using a shop press (Fig. 73).

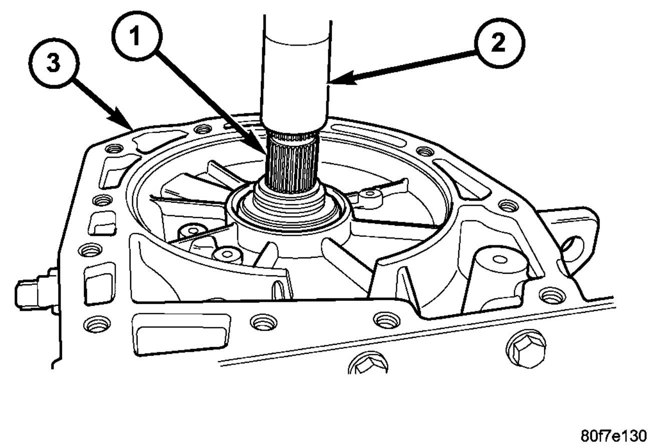


Fig. 73 Use Arbor Press to Remove Output Shaft from Case

1 - OUTPUT SHAFT
2 - ARBOR PRESS
3 - TRANSMISSION CASE

AUTOMATIC TRANSMISSION - 42RLE (Continued)

Use special tool 6596 with a shop press to remove the front output shaft bearing cup (Fig. 74).

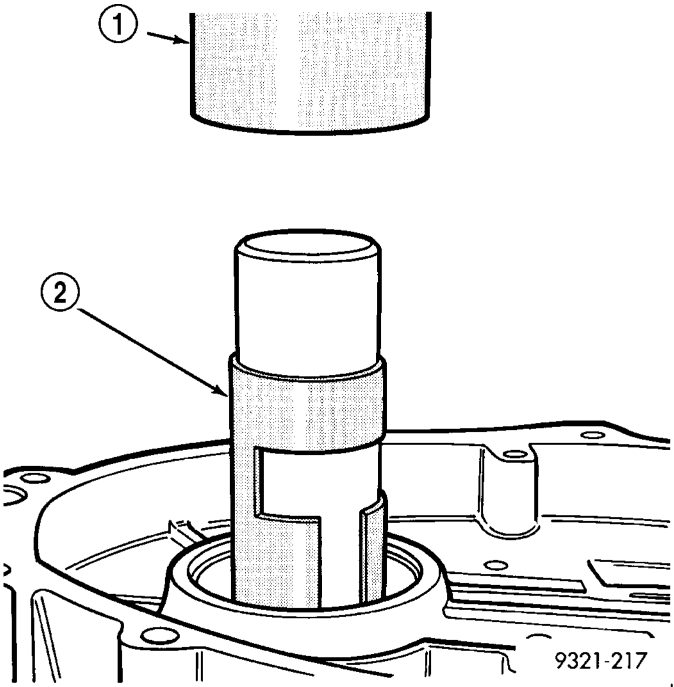


Fig. 74 Remove Front Bearing Cup - Typical

1 - ARBOR PRESS
2 - SPECIAL TOOL 6596

(47) Use special tool 6597 and handle C-4171 and C-4171-2 to press the rear output shaft bearing cup rearward (Fig. 75).

(48) Remove the rear carrier front bearing cone (Fig. 76).

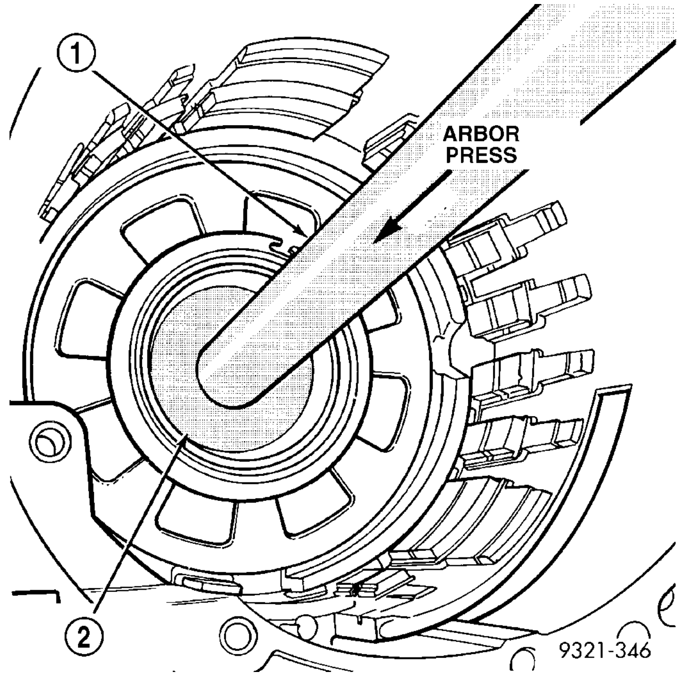


Fig. 75 Remove Rear Bearing Cup

1 - SPECIAL TOOL 4171 AND 4171-2
2 - SPECIAL TOOL 6597

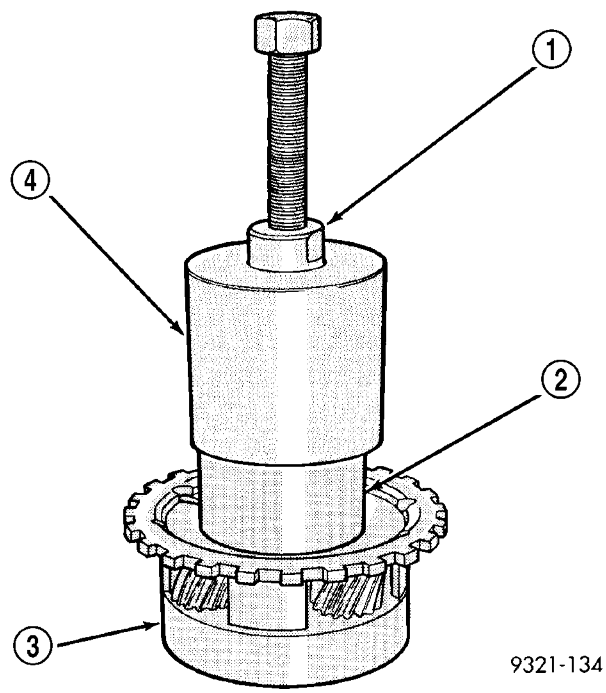


Fig. 76 Remove Rear Carrier Front Bearing Cone

1 - SPECIAL TOOL 5048-1
2 - SPECIAL TOOL 6545
3 - REAR CARRIER
4 - SPECIAL TOOL 5048

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(49) Install and load compressor (Fig. 77) as shown in (Fig. 78).

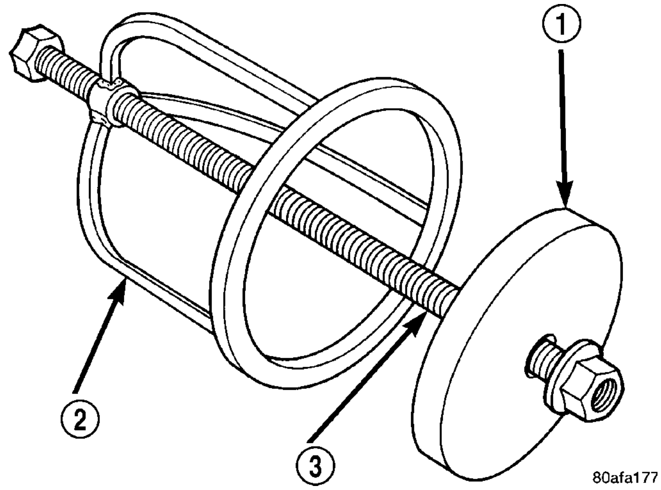


Fig. 77 Low/Reverse Spring Compressor Tool

1 - TOOL 6057
2 - TOOL 5059
3 - TOOL 5058-3

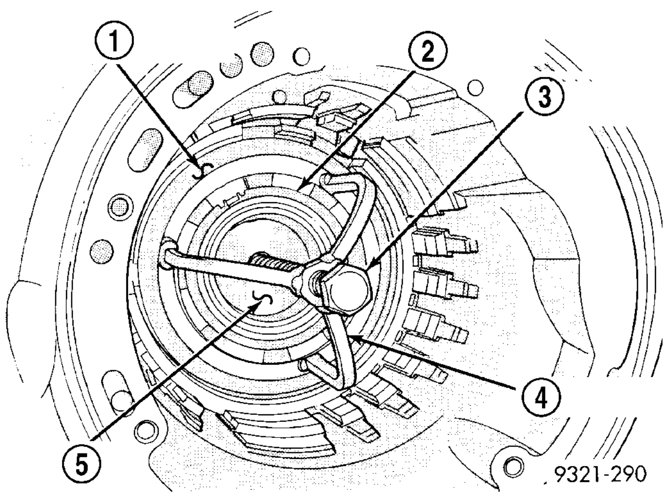


Fig. 78 Compressor Tool in Use

1 - LOW/REVERSE CLUTCH RETURN SPRING
2 - SNAP RING (INSTALL AS SHOWN)
3 - TOOL 5058A-3
4 - TOOL 5059A
5 - SPECIAL TOOL 6057

(50) Remove the low/reverse belleville spring snap ring (Fig. 79).

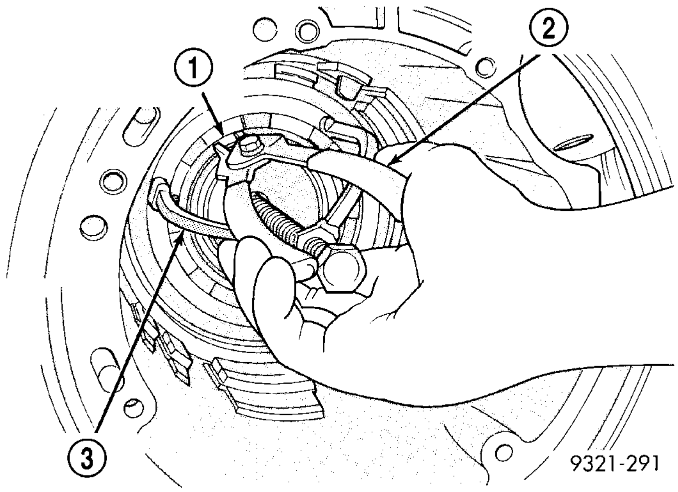


Fig. 79 Remove Snap Ring

1 - SNAP RING OPENING MUST BE BETWEEN SPRING LEVERS (AS SHOWN)
2 - SNAP RING PLIERS
3 - SPECIAL TOOL 5059A

(51) Remove the low/reverse piston belleville spring (Fig. 80).

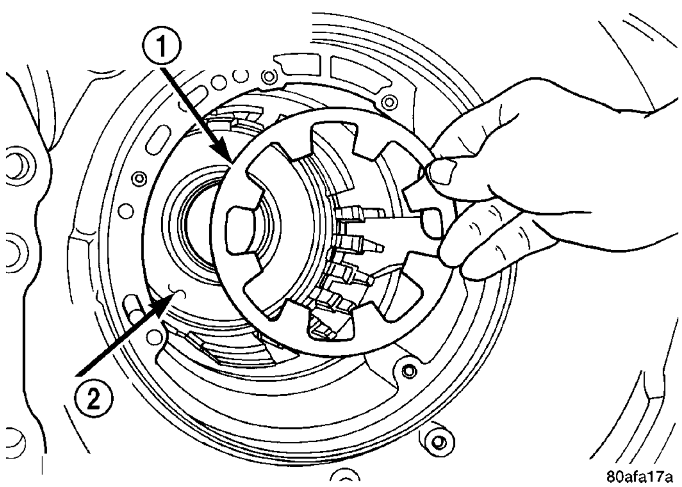


Fig. 80 Low/Reverse Piston Belleville Spring

1 - LOW/REVERSE PISTON RETURN SPRING
2 - PISTON

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(52) Remove the park sprag pivot retaining screw.

(53) Drive out the anchor shaft using suitable punch (Fig. 81).

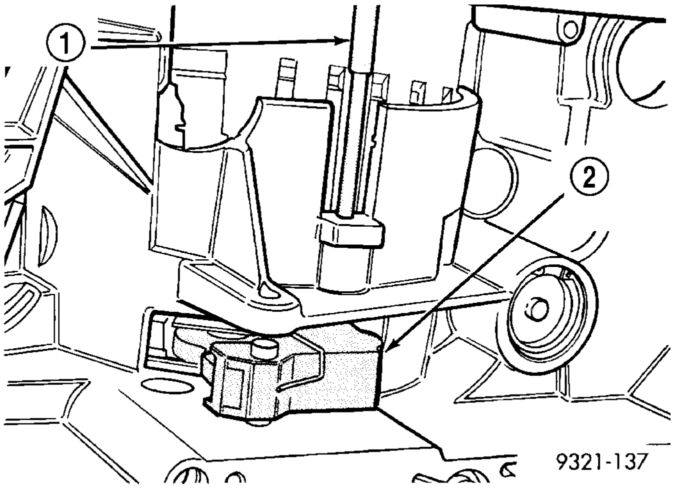


Fig. 81 Anchor Shaft Removal

1 - PIN PUNCH
2 - GUIDE BRACKET ASSEMBLY

(54) Remove the guide bracket pivot shaft (Fig. 82). Inspect all components for wear and replace if necessary.

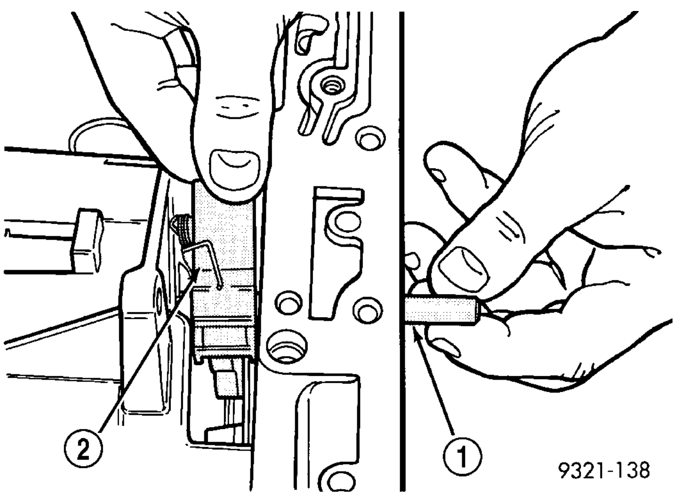


Fig. 82 Remove Guide Bracket Pivot Shaft

1 - PIVOT PIN
2 - GUIDE BRACKET ASSEMBLY

(55) Remove the low/reverse clutch piston (Fig. 83).

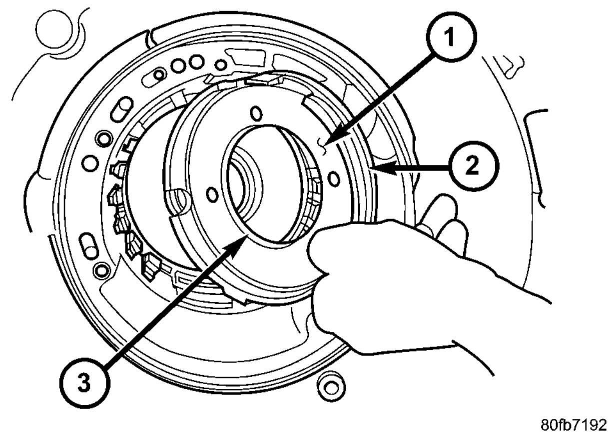


Fig. 83 Remove Low/Reverse Clutch Piston

1 - LOW/REVERSE CLUTCH PISTON
2 - D-RING SEAL
3 - D-RING SEAL

(56) Remove the low/reverse piston retainer screws.

(57) Remove low/reverse piston retainer (Fig. 84).

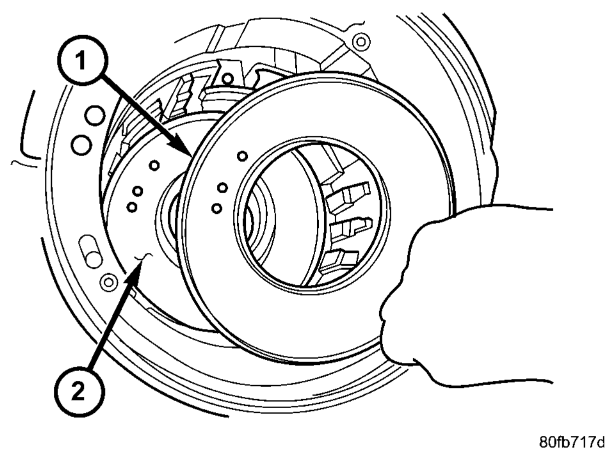


Fig. 84 Remove Piston Retainer

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - GASKET

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(58) Remove the low/reverse piston retainer gasket (Fig. 85).

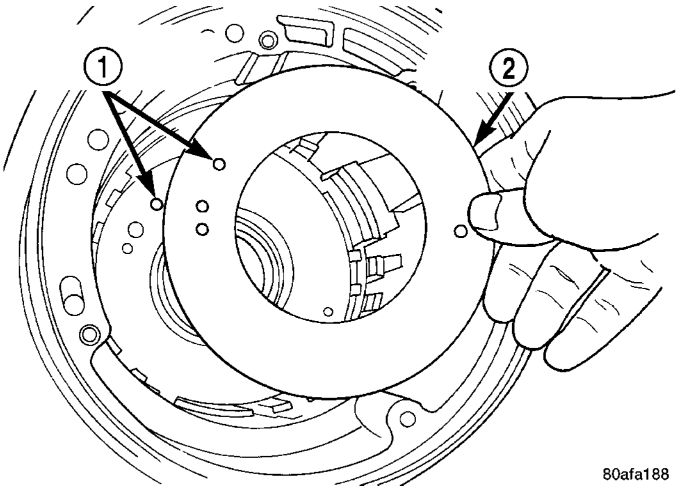


Fig. 85 Remove Piston Retainer Gasket

1 - GASKET HOLES MUST LINE UP
2 - LOW/REVERSE CLUTCH PISTON RETAINER GASKET

ASSEMBLY

NOTE: If the transmission assembly is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the DRBIII® Scan Tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

(1) Install the output bearing cups using Special Tool - 5050A (Fig. 86).

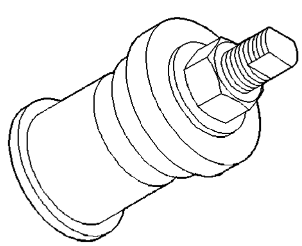


Fig. 86 Bearing Cup Installation Special Tool - 5050A

(2) Install low/reverse piston retainer gasket (Fig. 87).

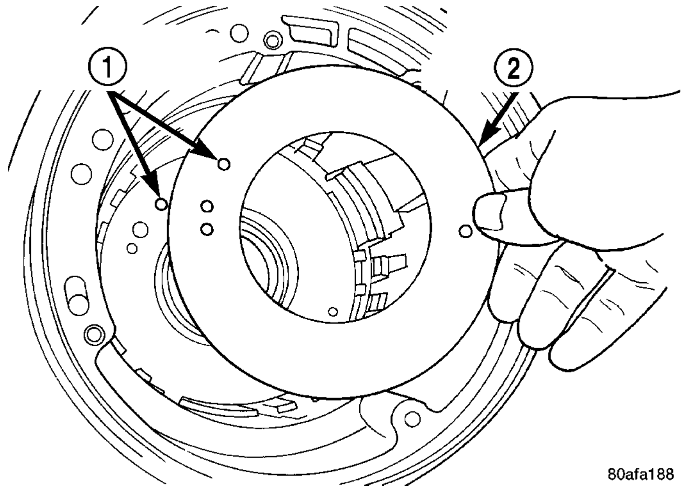


Fig. 87 Install Piston Retainer Gasket

1 - GASKET HOLES MUST LINE UP
2 - LOW/REVERSE CLUTCH PISTON RETAINER GASKET

(3) Install low/reverse piston retainer (Fig. 88).

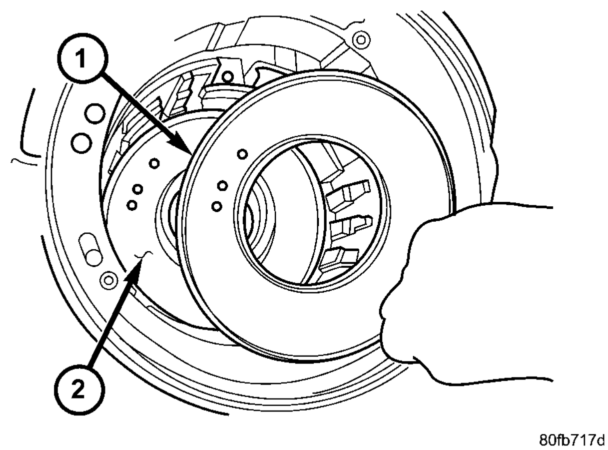


Fig. 88 Install Piston Retainer

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - GASKET

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(4) Install low/reverse piston retainer-to-case screws (Fig. 89) and torque to 5 N·m (45 in. lbs.).

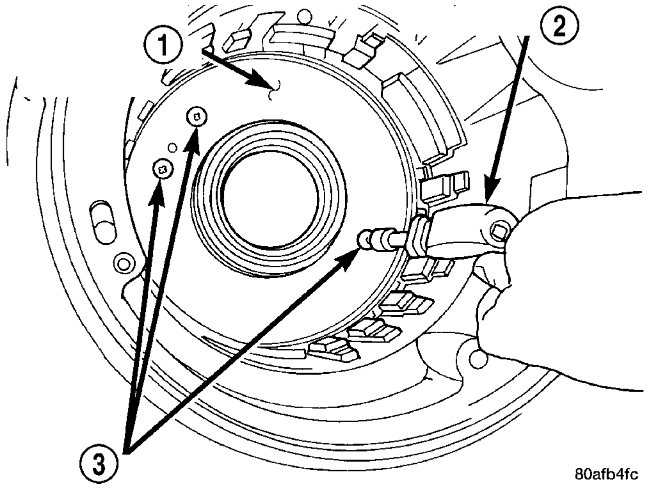


Fig. 89 Install Retainer Attaching Screws

1 - LOW/REVERSE CLUTCH PISTON RETAINER
2 - SCREWDRIVER
3 - TORX-LOC SCREWS

(5) Install low/reverse clutch piston (Fig. 90).

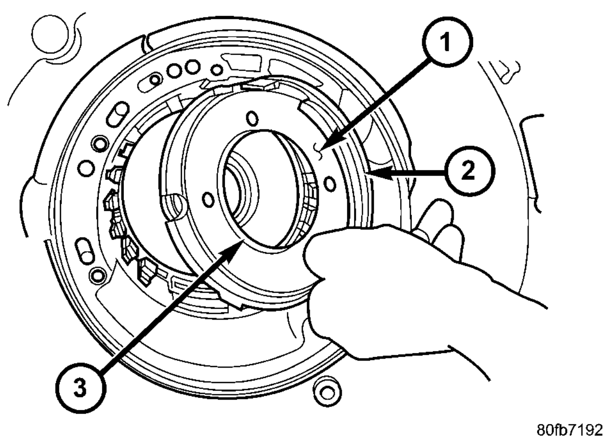


Fig. 90 Install Low/Reverse Clutch Piston

1 - LOW/REVERSE CLUTCH PISTON
2 - D-RING SEAL
3 - D-RING SEAL

(6) Assemble guide bracket assembly as shown in (Fig. 91). if necessary.

(7) Install guide bracket pivot shaft (Fig. 92).

CAUTION: When installing, be sure guide bracket and split sleeve touch the rear of the transmission case.

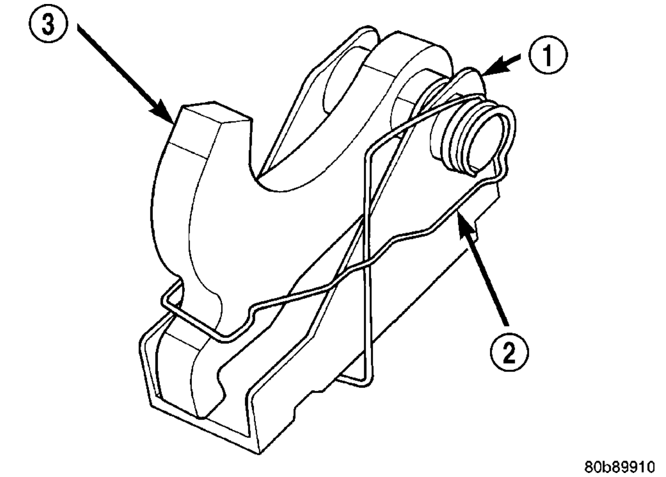


Fig. 91 Guide Bracket

1 - GUIDE BRACKET
2 - ANTIRATCHET SPRING (MUST BE ASSEMBLED AS SHOWN)
3 - PAWL

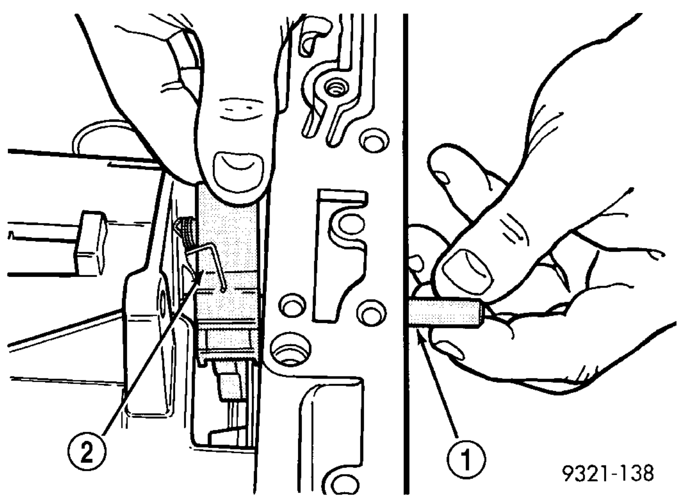


Fig. 92 Install Guide Bracket Pivot Shaft

1 - PIVOT PIN
2 - GUIDE BRACKET ASSEMBLY

(8) Install park sprag pivot retaining screw and torque to 4.5 N·m (40 in. lbs.).

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(9) Install low/reverse piston belleville spring into position (Fig. 93).

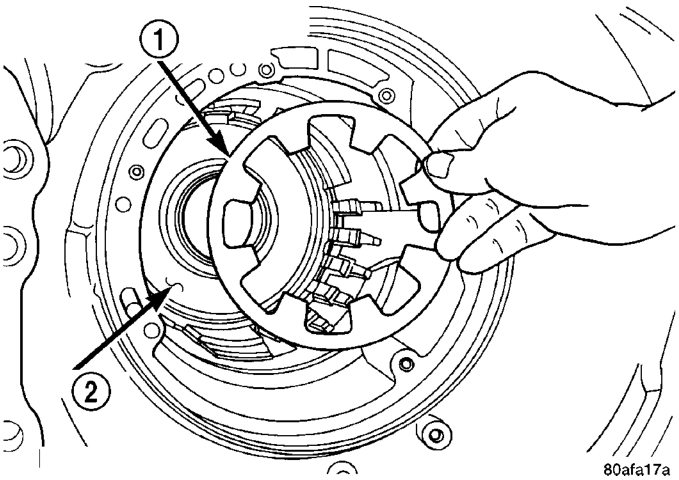


Fig. 93 Install Low/Reverse Piston Return Spring

1 - LOW/REVERSE PISTON RETURN SPRING
2 - PISTON

(10) Install and load low/reverse spring compressor tool as shown in (Fig. 94) (Fig. 95) to facilitate snap ring installation.

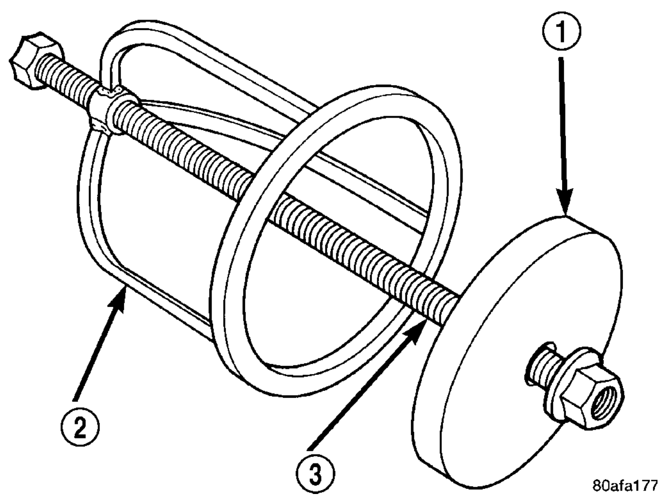


Fig. 94 Low/Reverse Spring Compressor Tool

1 - TOOL 6057
2 - TOOL 5059
3 - TOOL 5058-3

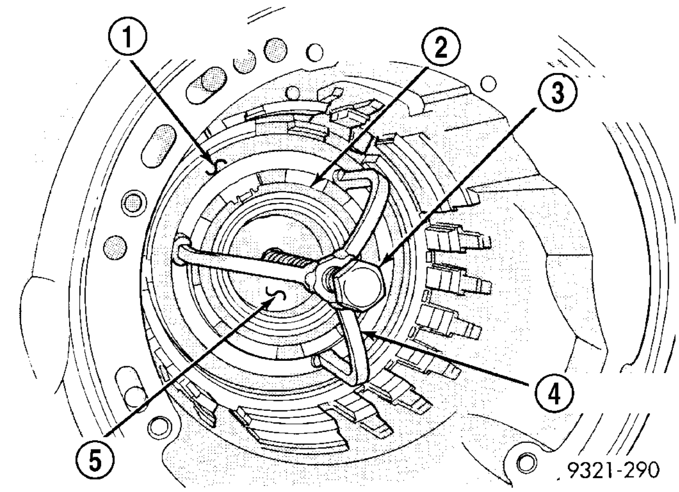


Fig. 95 Compressor Tool in Use

1 - LOW/REVERSE CLUTCH RETURN SPRING
2 - SNAP RING (INSTALL AS SHOWN)
3 - TOOL 5058A-3
4 - TOOL 5059A
5 - SPECIAL TOOL 6057

(11) Install snap ring and remove compressor tool (Fig. 96).

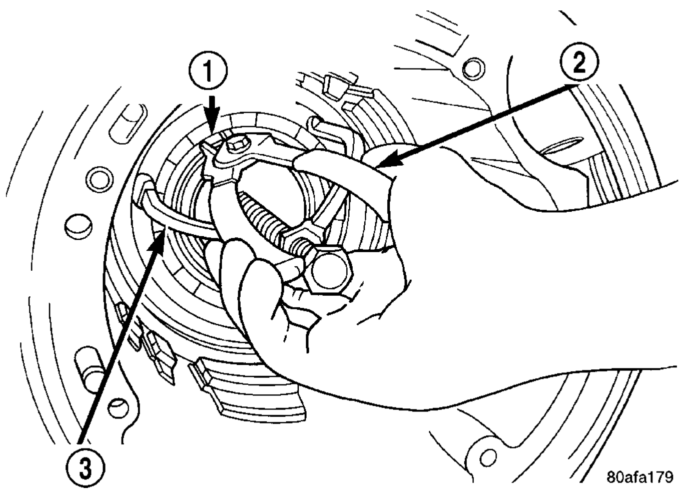


Fig. 96 Install Snap Ring

1 - SNAP RING OPENING MUST BE BETWEEN SPRING LEVERS (AS SHOWN)
2 - SNAP RING PLIERS
3 - TOOL 6057

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(12) Install rear carrier front bearing cone (Fig. 97).

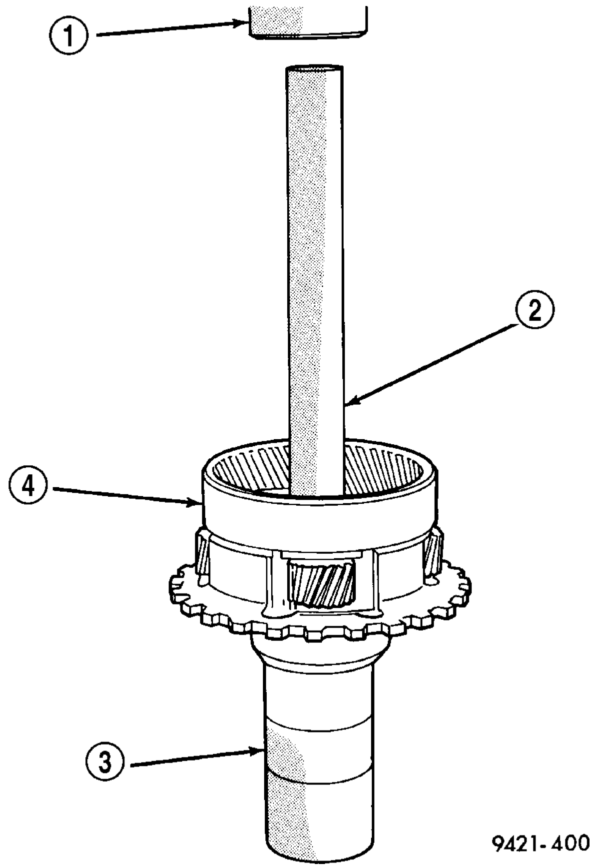


Fig. 97 Install Rear Carrier Front Bearing Cone

1 - ARBOR PRESS
2 - SPECIAL TOOL C-4171
3 - SPECIAL TOOL 6052
4 - REAR CARRIER

(13) Check output bearing preload. **Output bearing preload must be checked and/or adjusted if any of the following items have been replaced:**

- Output shaft (rear carrier assembly)
- Output shaft bearings
- Transmission case

(a) **PRELOAD CHECK/SHIM SELECTION:** Install rear output shaft bearing cone and special tool 6618A (Fig. 98).

(b) Install special tool 6618A (Fig. 99). Lightly tighten retaining screws. Screws should be below the plate surface, but do not snug screws.

(c) Turn case over on arbor press so that the plate is resting on the press base. **CAUTION: The output shaft will extend through the hole of tool 6618A. Ensure your press table has clearance for the output shaft.**

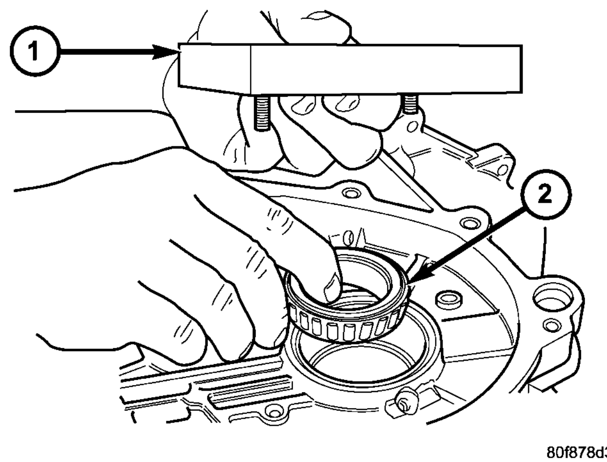


Fig. 98 Bearing Installation

1 - SPECIAL TOOL 6618-A
2 - REAR OUTPUT SHAFT BEARING

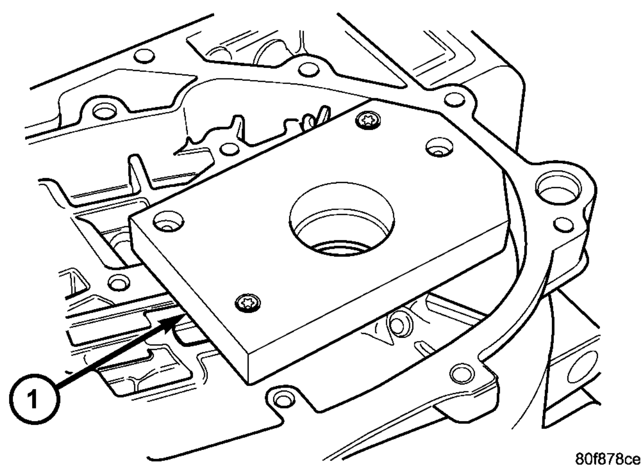


Fig. 99 Special Tool Installed

1 - SPECIAL TOOL 6618-A

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(d) Install shim on output shaft (Fig. 100). Apply small amount of petrolatum onto the shim to hold it in place. Use the original shim as a starting point. If original shim is not available, use the thickest shim available.

(e) Install output shaft/rear carrier into rear bearing. The shaft must be pressed into position. Use special tool MD-998911 (Disc) and C- 4171 and C4171-2 (Handle) to press shaft into rear bearing (Fig. 101).

(f) **Do not re-use old output shaft nut because the removed stake weakens the nut flange.** Using special tools 6497 and 6498-A, install new output shaft nut. Tighten new output shaft nut to 271 N·m (200 ft. lbs.).

(g) Check the turning torque of the output shaft (Fig. 102). The shaft should have 1 to 8 in. lbs. of turning torque. If the turning torque is **higher than** 8 in. lbs., install a thicker shim. If turning torque is **less than** 1 in. lb., install a thinner shim. Make sure there is no end play.

(h) The new nut must be staked after the correct turning torque is obtained (Fig. 103) (Fig. 104). Use special tool 6639 to stake output shaft nut. **CAUTION: Failure to stake nut could allow the nut to back-off during use.**

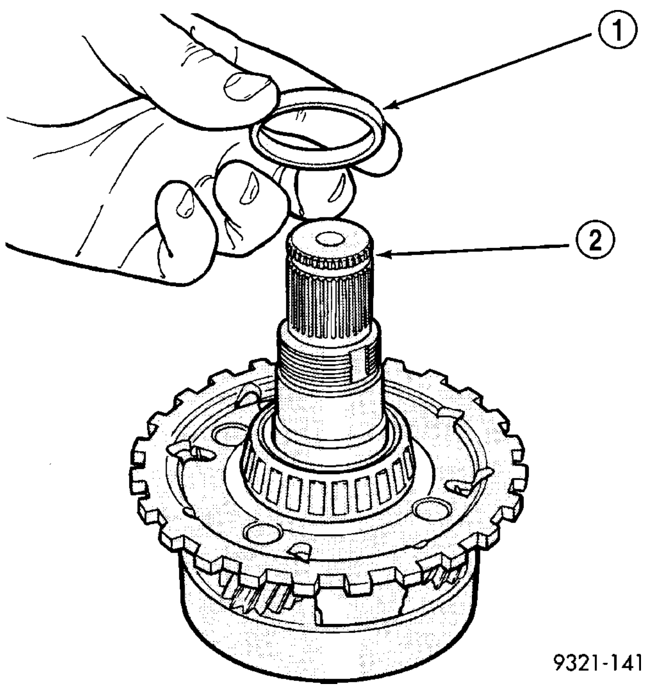


Fig. 100 Shim Installation

1 - SHIM
2 - OUTPUT SHAFT

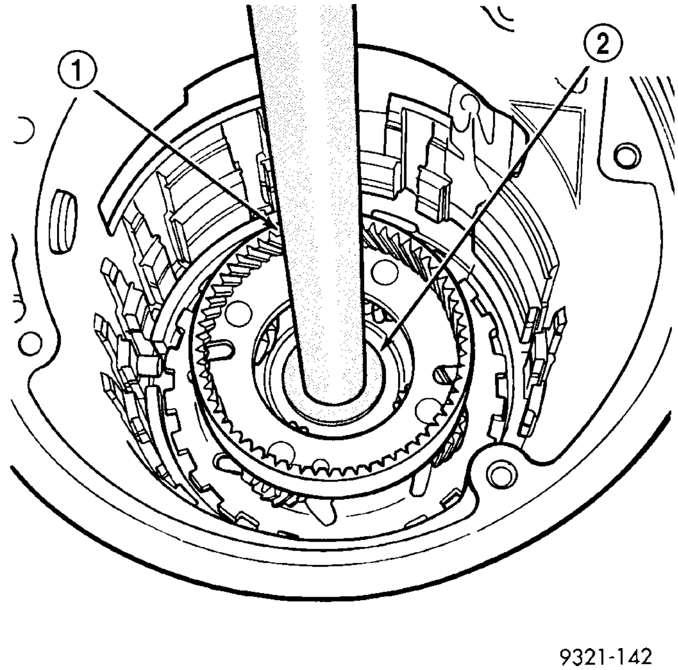


Fig. 101 Press Shaft Into Case

1 - SPECIAL TOOL C-4171 AND C-4171-2
2 - SPECIAL TOOL MD-998911

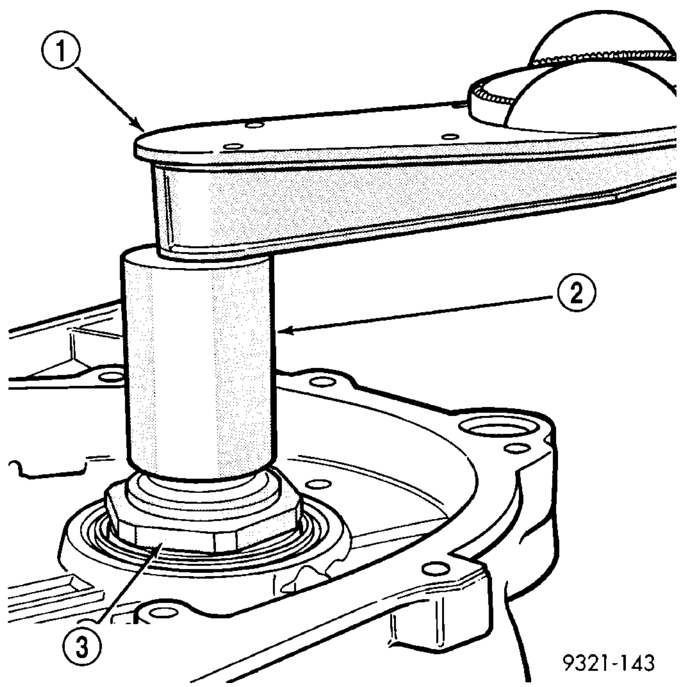


Fig. 102 Checking Turning Torque

1 - TORQUE WRENCH
2 - SPECIAL TOOL 6498-A
3 - OUTPUT SHAFT NUT

AUTOMATIC TRANSMISSION - 42RLE (Continued)

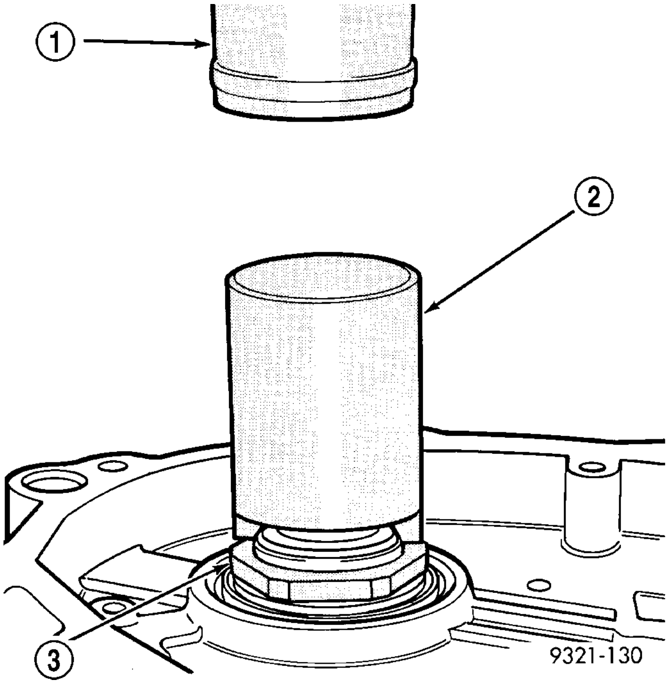


Fig. 103 Staking Output Shaft Nut - Typical

1 - ARBOR PRESS
2 - STAKING TOOL - 6639
3 - NEW NUT

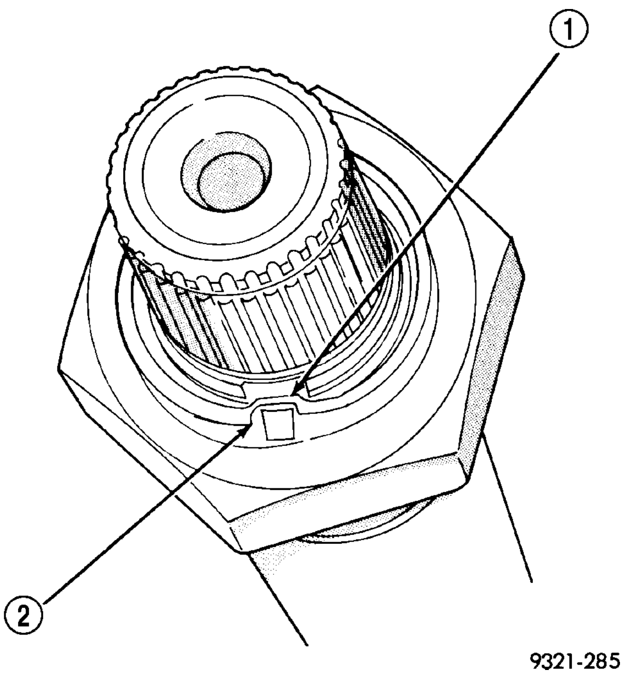


Fig. 104 Properly Staked Nut

1 - BOTTOMED IN SLOT
2 - CORRECTLY STAKED NUT

(14) Install low/reverse clutch pack (Fig. 105). Leave uppermost disc out to facilitate snap ring installation.

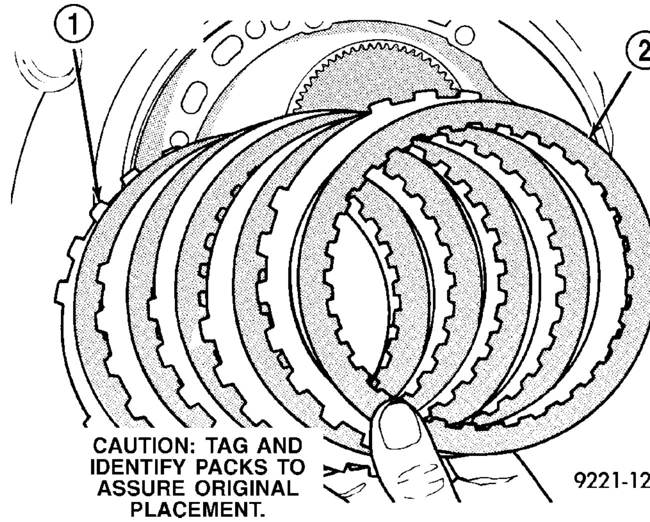


Fig. 105 Install Low/Reverse Clutch Pack

1 - CLUTCH PLATES (5)
2 - CLUTCH DISCS (5)

(15) Install low/reverse reaction plate snap ring (Fig. 106).

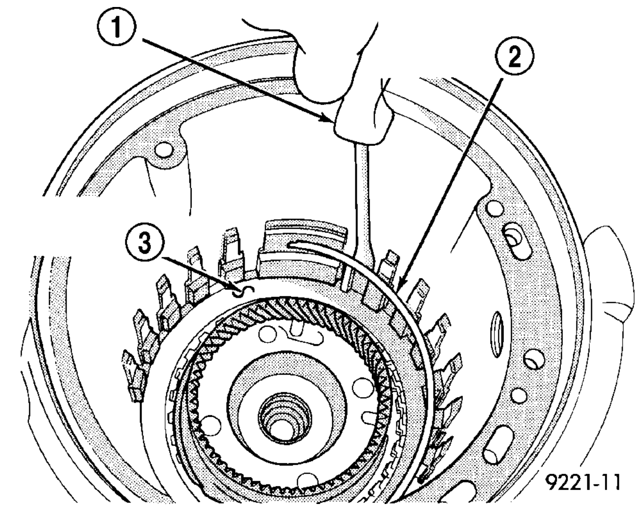


Fig. 106 Install Low/Reverse Reaction Plate Snap Ring

1 - SCREWDRIVER
2 - LOW/REVERSE REACTION PLATE FLAT SNAP RING
3 - DO NOT SCRATCH CLUTCH PLATE

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(16) Install one low/reverse clutch disc (Fig. 107).

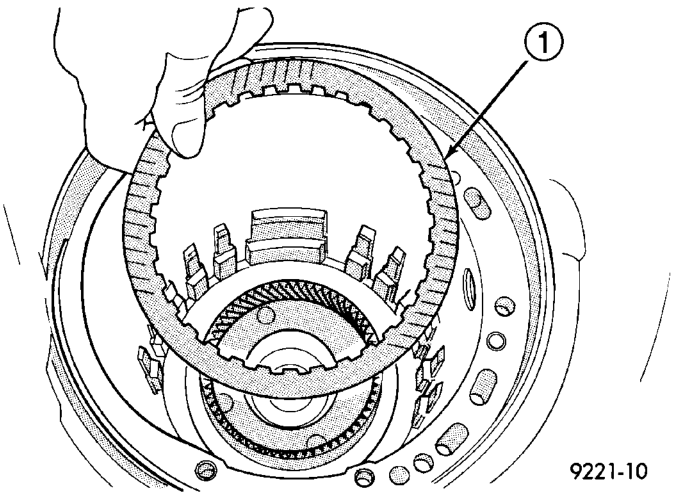


Fig. 107 Install One Disc

1 - ONE DISC FROM LOW/REVERSE CLUTCH

(17) Install low/reverse reaction plate with flat side up (Fig. 108).

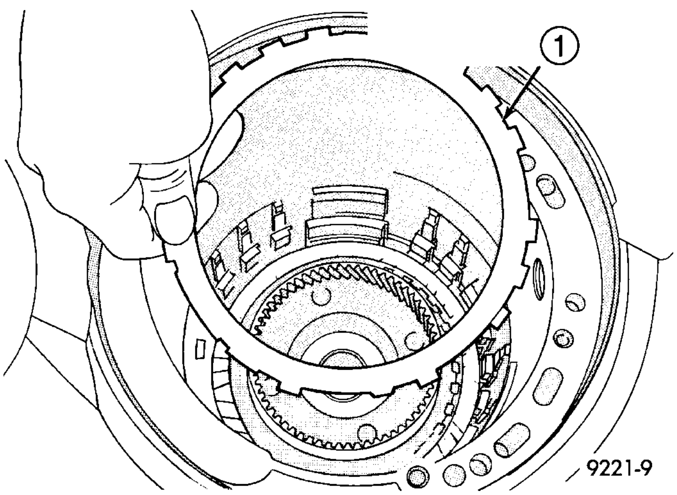


Fig. 108 Install Low/Reverse Reaction Plate

1 - LOW/REVERSE REACTION PLATE (FLAT SIDE UP)

(18) Install tapered snap ring (tapered side out) (Fig. 109). Make sure that the snap ring ends are oriented as shown (Fig. 110)

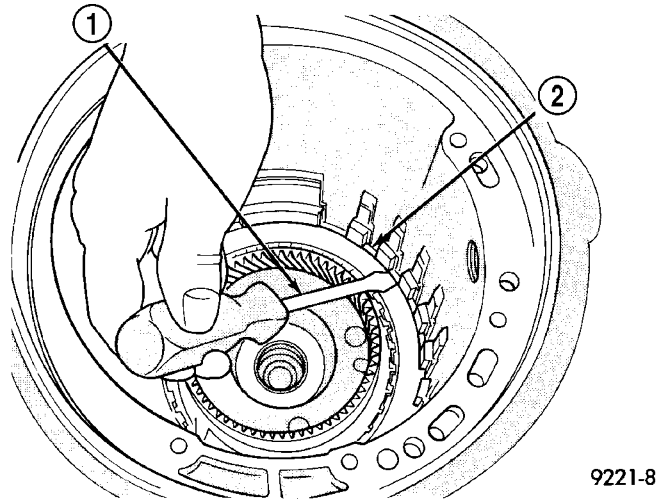


Fig. 109 Snap Ring Installed

1 - SCREWDRIVER
2 - TAPERED SNAP RING (INSTALL AS SHOWN)

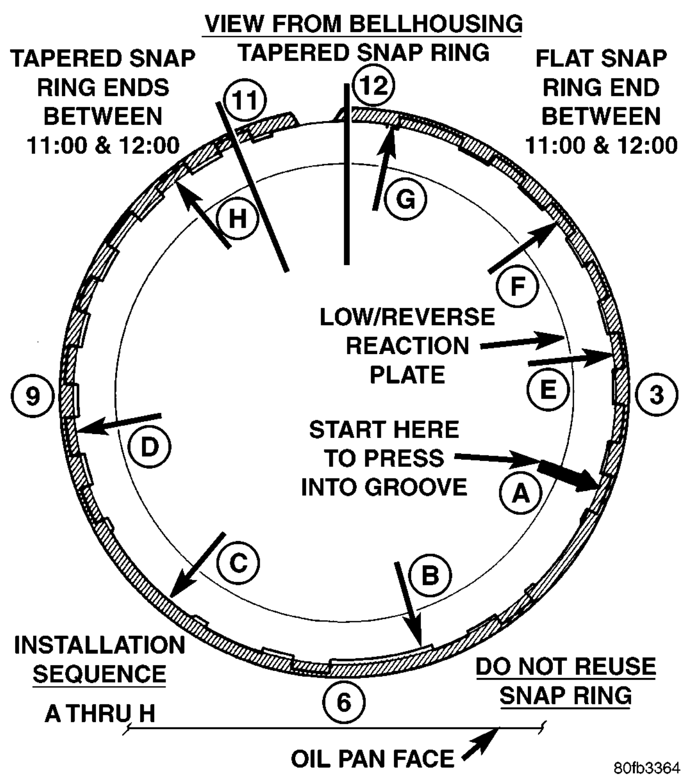


Fig. 110 Tapered Snap Ring Instructions

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(19) Measure low/reverse clutch pack. Set up dial indicator as shown in (Fig. 111). Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **Low/Reverse clutch pack clearance is 0.84 to 1.60 (0.033 to 0.063 inch).**

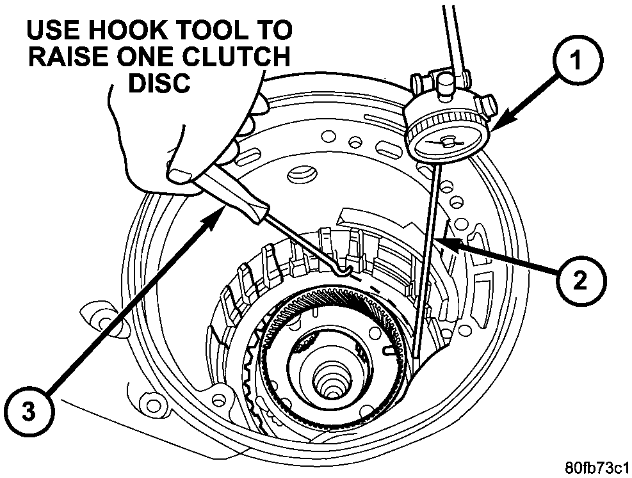


Fig. 111 Check Low/Reverse Clutch Clearance

1 - DIAL INDICATOR
2 - DIAL INDICATOR TIP TOOL 6268
3 - HOOK TOOL

(20) Select the proper low/reverse reaction plate to achieve specifications.

(21) Install 2/4 clutch pack (Fig. 112).

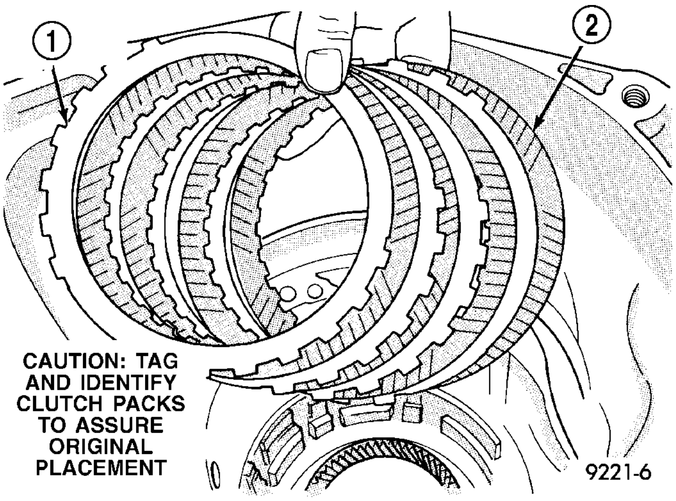


Fig. 112 Install 2/4 Clutch Pack

1 - CLUTCH PLATE (4)
2 - CLUTCH DISC (4)

(22) Install 2/4 clutch belleville spring (Fig. 113) (Fig. 114).

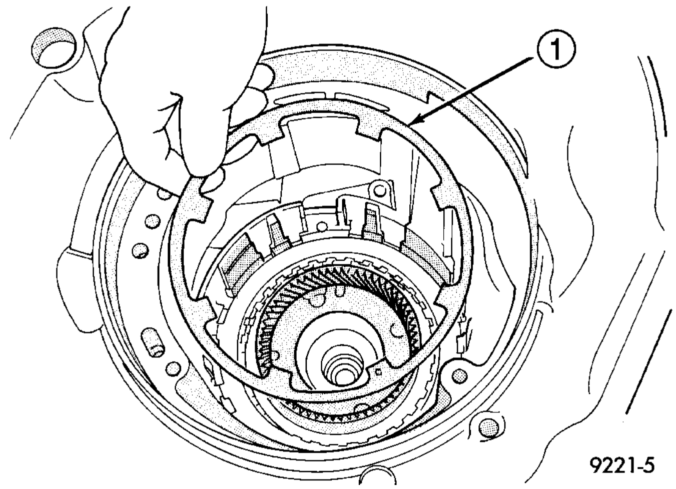


Fig. 113 Install 2/4 Clutch Return Spring

1 - 2/4 CLUTCH RETURN SPRING

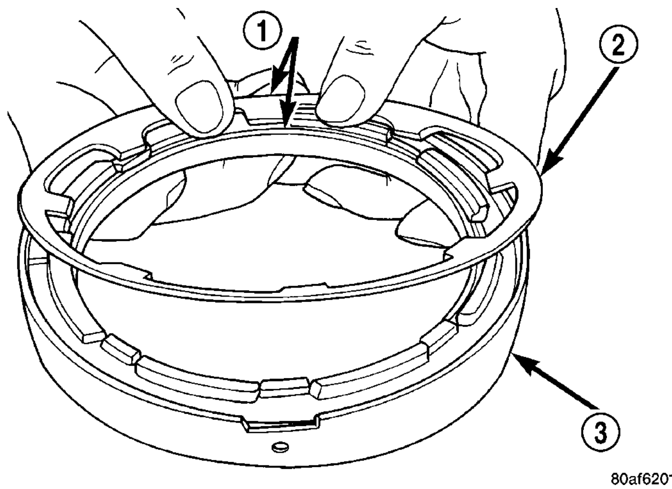


Fig. 114 Proper Orientation of 2/4 Clutch

1 - NOTE POSITION
2 - RETURN SPRING
3 - 2/4 CLUTCH RETAINER

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(23) Install 2/4 clutch retainer (Fig. 115).

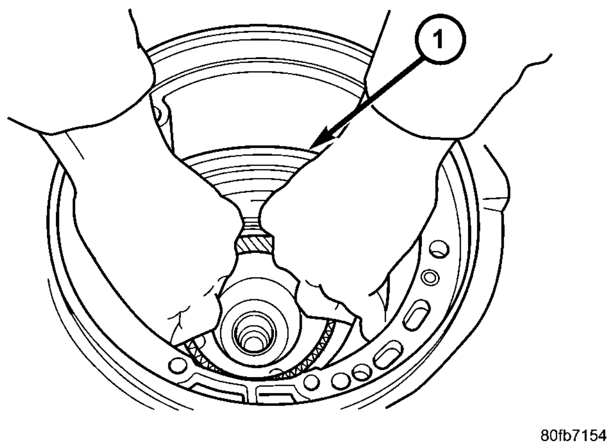


Fig. 115 Install 2/4 Clutch Retainer

1 - 2/4 CLUTCH RETAINER

(24) Set up Tool 5058 as shown in (Fig. 116). Compress 2/4 clutch just enough to facilitate snap ring installation.

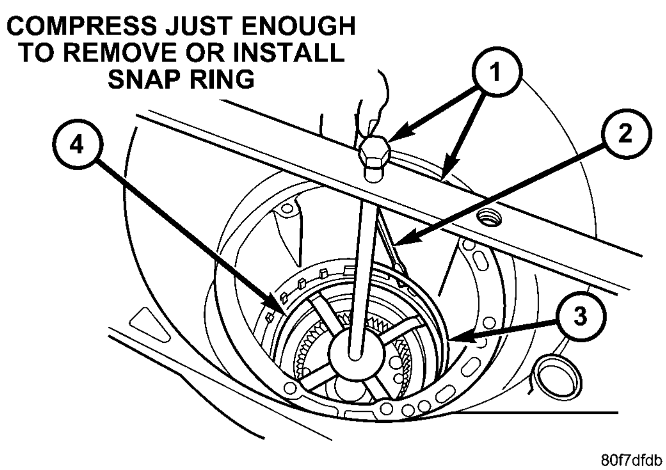


Fig. 116 Remove 2/4 Clutch Retainer Snap Ring

1 - TOOL 5058
2 - SCREWDRIVER
3 - SNAP RING
4 - 2/4 CLUTCH RETAINER

(25) **Measure 2/4 clutch clearance:** Set up dial indicator as shown in (Fig. 117). Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **The 2/4 clutch pack clearance is 0.76 to 2.64 mm (0.030 to 0.104 inch).** If not within specifications, the clutch is not assembled properly. **There is no adjustment for the 2/4 clutch clearance.**

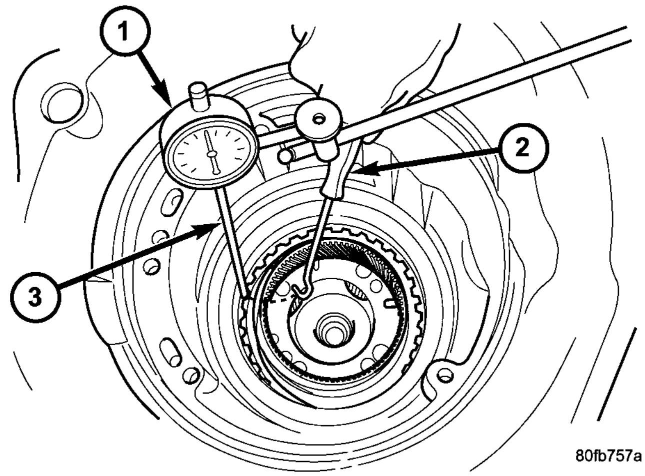


Fig. 117 Check 2/4 Clutch Clearance

1 - DIAL INDICATOR
2 - HOOK TOOL
3 - DIAL INDICATOR TIP TOOL 6268

(26) Install the #7 needle bearing to the rear sun gear (Fig. 118). **The number 7 needle bearing has three antireversal tabs and is common with the number 5 and number 2 position. The orientation should allow the bearing to seat flat against the rear sun gear. A small amount of petrolatum can be used to hold the bearing to the rear sun gear.**

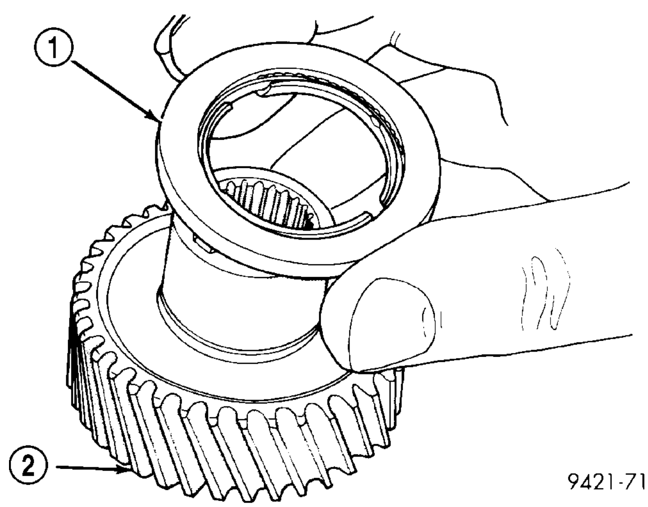


Fig. 118 Number 7 Bearing

1 - #7 BEARING
2 - REAR SUN GEAR

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(27) Install rear sun gear and #7 needle bearing (Fig. 119).

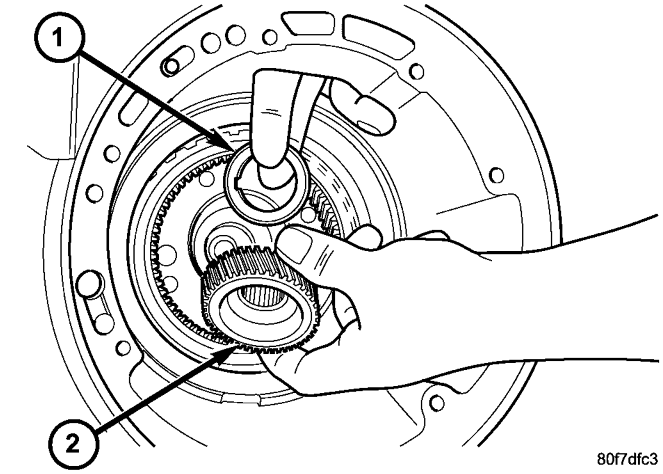


Fig. 119 Install Rear Sun Gear

1 - #7 NEEDLE BEARING
2 - REAR SUN GEAR

(28) Install front carrier/rear annulus assembly and #6 needle bearing (Fig. 120).

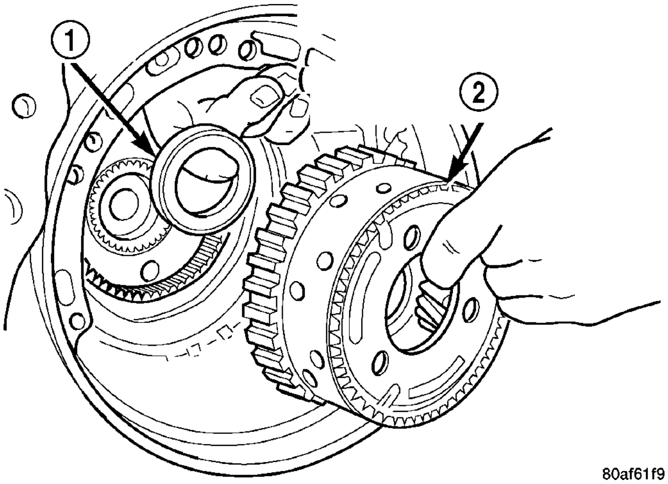


Fig. 120 Install Front Carrier/Rear Annulus

1 - #6 NEEDLE BEARING
2 - FRONT CARRIER AND REAR ANNULUS ASSEMBLY (TWIST AND PULL OR PUSH TO REMOVE OR INSTALL).

(29) Install front sun gear assembly and #4 thrust washer (Fig. 121).

(30) **Determine proper #4 thrust plate thickness.**

(a) Select the thinnest #4 thrust plate thickness.

(b) Install #4 thrust plate (Fig. 122) using petrolatum to hold into position.

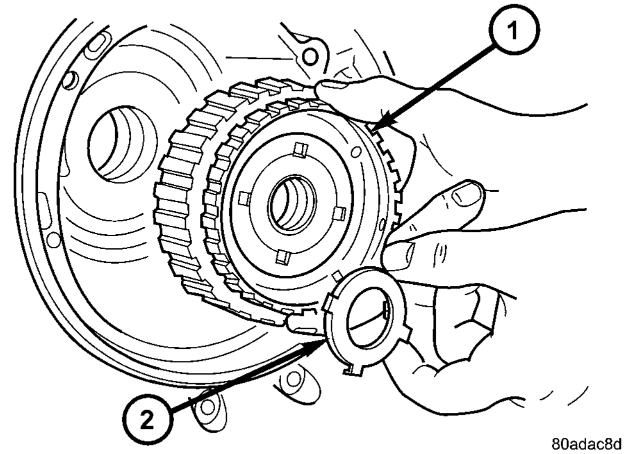


Fig. 121 Install Front Sun Gear Assembly

1 - FRONT SUN GEAR ASSEMBLY
2 - #4 THRUST WASHER (FOUR TABS)

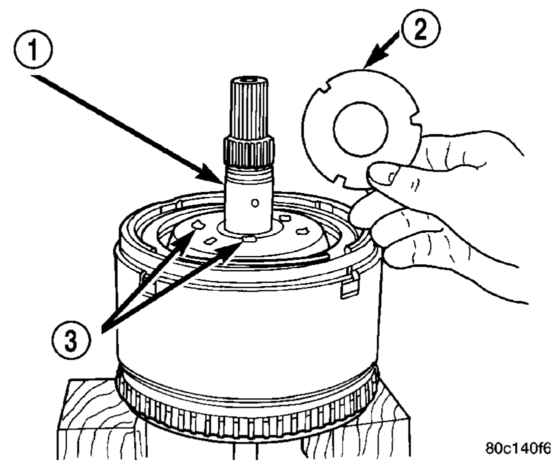


Fig. 122 Install #4 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #4 THRUST PLATE (SELECT)
3 - PETROLATUM FOR RETENTION

(c) Install input clutch assembly. Ensure the input clutch assembly is completely seated by viewing position through input speed sensor hole. **If the speed sensor tone wheel is not centered in the opening, the input clutches assembly is not seated properly.**

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(d) Remove the oil pump o-ring (Fig. 123) and install oil pump and gasket to transmission. **Use screw-in dowels or phillips-head screwdrivers to align pump to case. Be sure to reinstall O-ring on oil pump after selecting the proper No. 4 thrust plate.**

(e) Measure the input shaft end play with the transmission in the vertical position. This will ensure that the measurement will be accurate.

(f) Set up and measure endplay using End Play Set 8266 and Dial Indicator Set C3339 as shown in (Fig. 124).

(g) Measure input shaft end play. **Input shaft end play must be .005 to .025 inch.** For example, if end play reading is 0.055 inch, select No. 4 Thrust Plate which is 0.071 to 0.074 thick. This should provide an input shaft end play reading of 0.020 inch, which is within specifications.

(h) Remove oil pump, gasket, and input clutch assembly to gain access to and install proper #4 thrust plate.

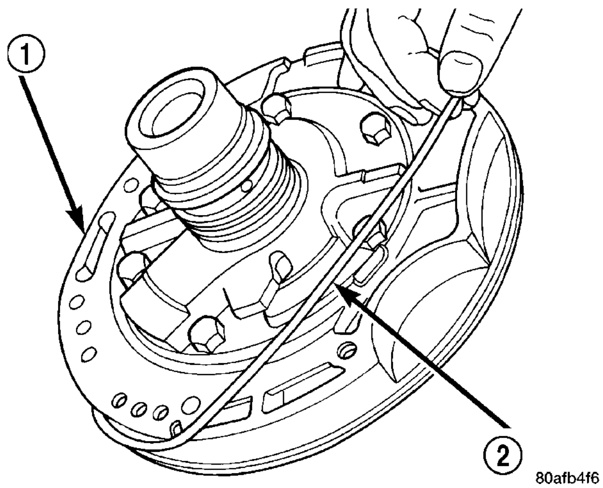


Fig. 123 Remove Oil Pump O-Ring

1 - OIL PUMP ASSEMBLY
2 - O-RING

(31) Install input clutch assembly with proper thrust plate (Fig. 125).

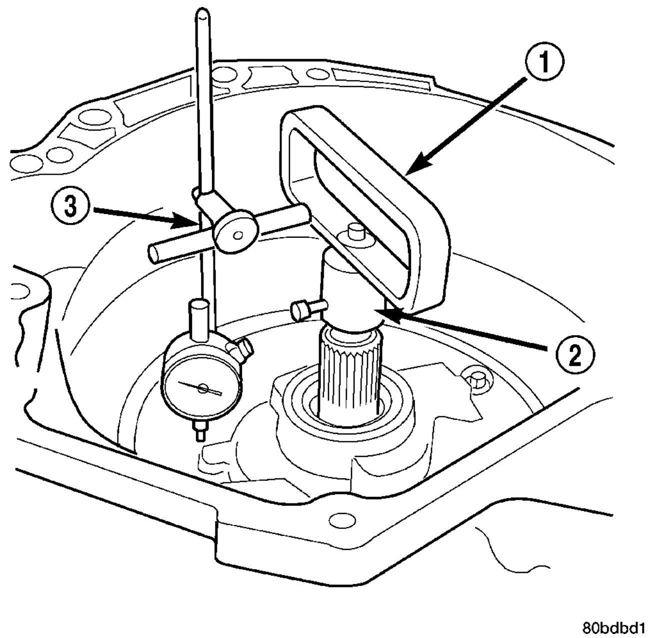


Fig. 124 Measure Input Shaft End Play Using Tool 8266 - Typical

1 - TOOL 8266-8
2 - TOOL 8266-2
3 - TOOL C-3339

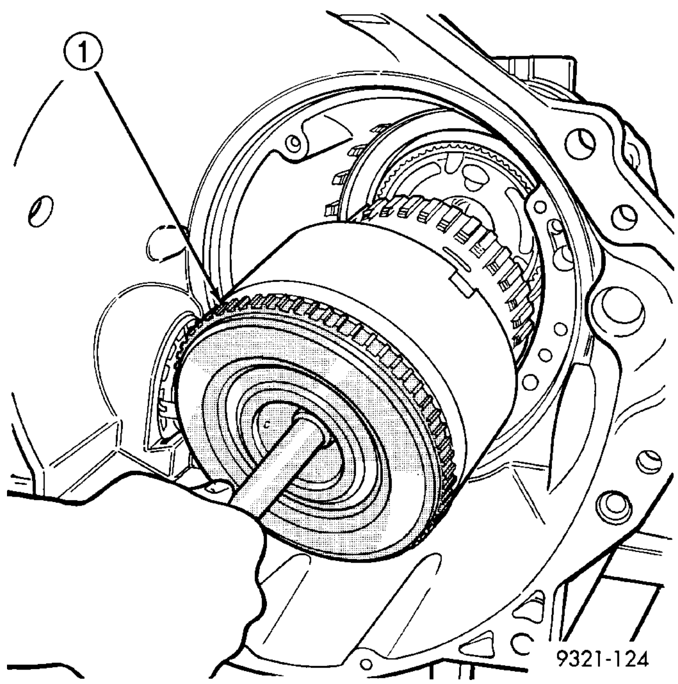


Fig. 125 Install Input Clutch Assembly

1 - INPUT CLUTCH ASSEMBLY

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(32) Install #1 caged needle bearing (Fig. 126).

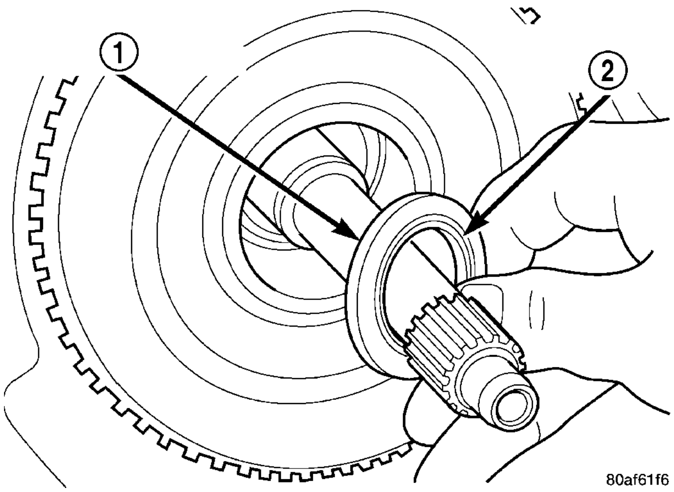


Fig. 126 Install No. 1 Caged Needle Bearing

1 - #1 CAGED NEEDLE BEARING
2 - NOTE: TANGED SIDE OUT

(33) Replace cooler by-pass valve if transmission failure has occurred (Fig. 127).

CAUTION: By-pass valve MUST be replaced if transmission failure occurs.

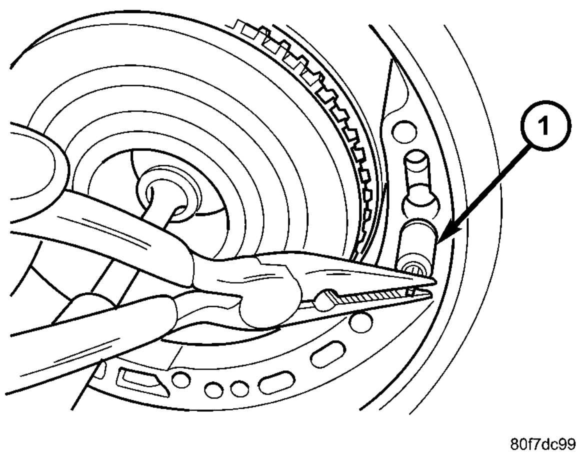


Fig. 127 Install By-Pass Valve

1 - BYPASS VALVE

NOTE: To align oil pump, gasket, and case during installation, use threaded dowels or phillips screwdrivers.

(34) Install oil pump gasket (Fig. 128).

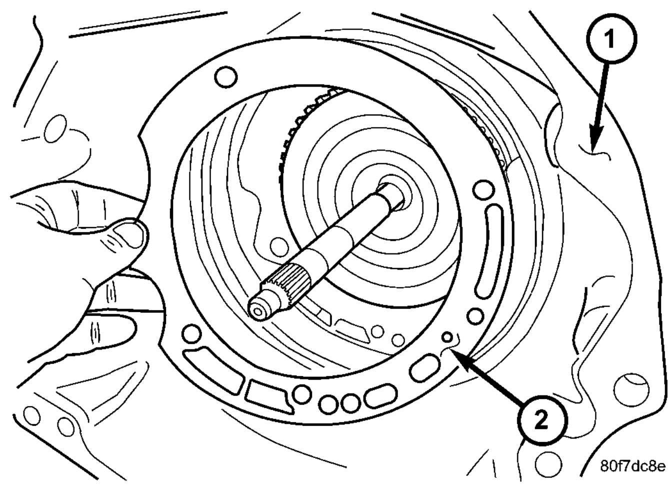


Fig. 128 Install Oil Pump Gasket

1 - BELLHOUSING
2 - OIL PUMP GASKET

(35) Install oil pump and torque oil pump-to-case bolts to 30 N·m (265 in. lbs.) (Fig. 129). Do not reuse original oil pump bolts.

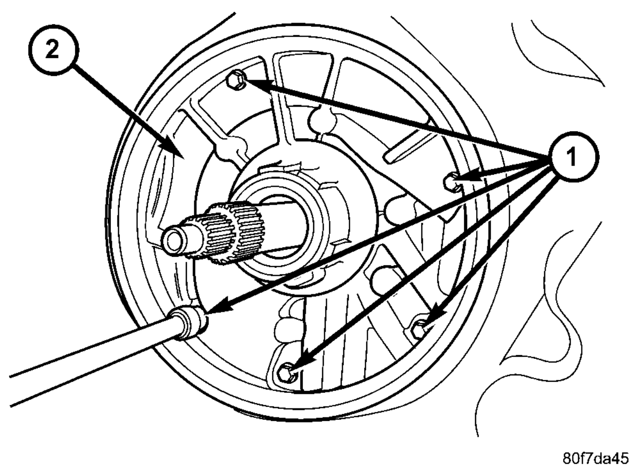


Fig. 129 Install Oil Pump Attaching Bolts

1 - BOLTS
2 - OIL PUMP

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(36) Install low/reverse accumulator as shown in (Fig. 130).

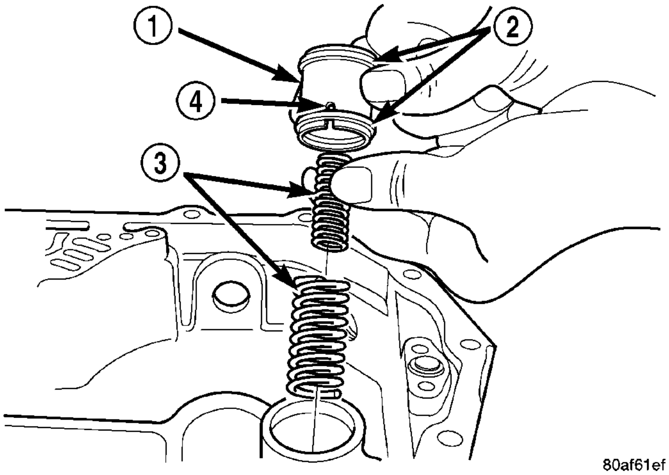


Fig. 130 Low/Reverse Accumulator Components

1 - ACCUMULATOR PISTON
2 - SEAL RINGS
3 - RETURN SPRINGS
4 - NOTE NOTCH

(37) Install low/reverse accumulator plug (Fig. 131).

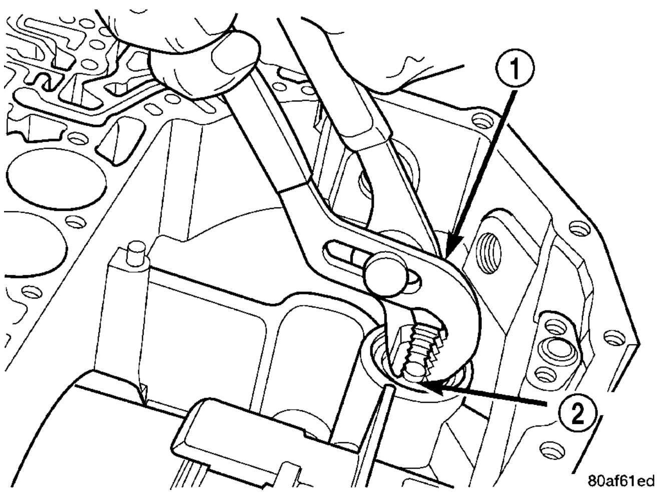


Fig. 131 Install Low/Reverse Accumulator Plug

1 - ADJUSTABLE PLIERS
2 - PLUG

(38) Install low/reverse accumulator snap ring (Fig. 132).

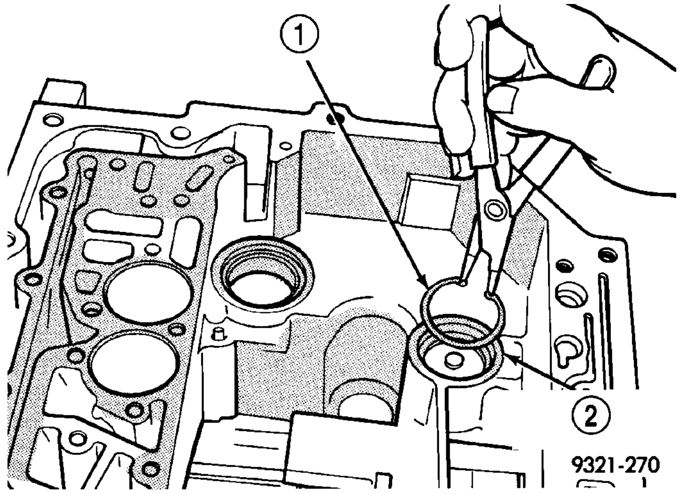


Fig. 132 Install Low/Reverse Accumulator Snap Ring

1 - SNAP RING
2 - LOW/REVERSE ACCUMULATOR

(39) Install underdrive and overdrive accumulators as shown in (Fig. 133) (Fig. 134) (Fig. 135).

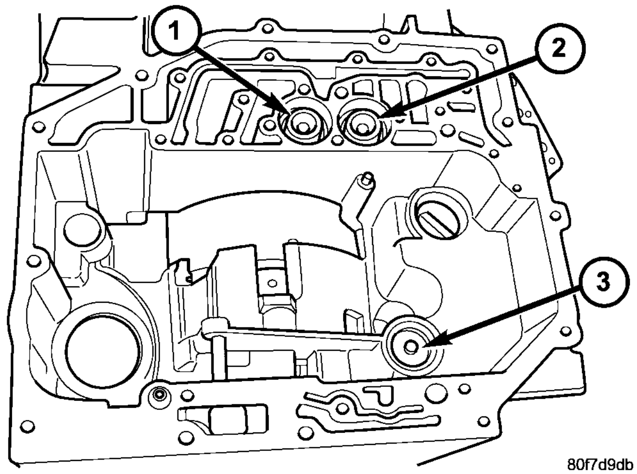


Fig. 133 Accumulator Location

1 - OVERDRIVE ACCUMULATOR LOCATION
2 - UNDERDRIVE ACCUMULATOR LOCATION
3 - LOW/REVERSE ACCUMULATOR

AUTOMATIC TRANSMISSION - 42RLE (Continued)

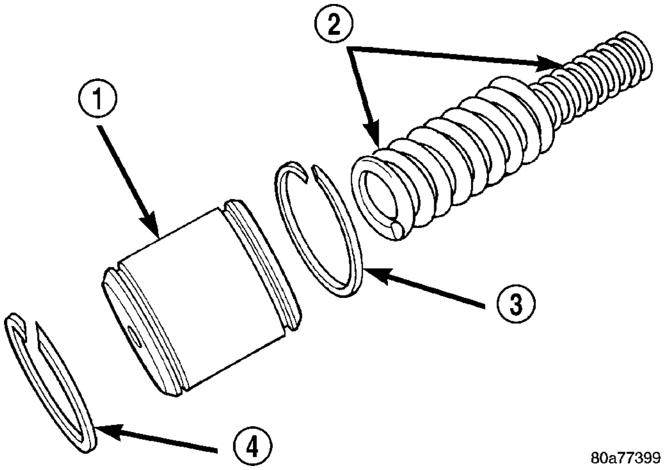


Fig. 134 Install Underdrive Accumulator and Springs

1 - ACCUMULATOR PISTON (UNDERDRIVE)
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

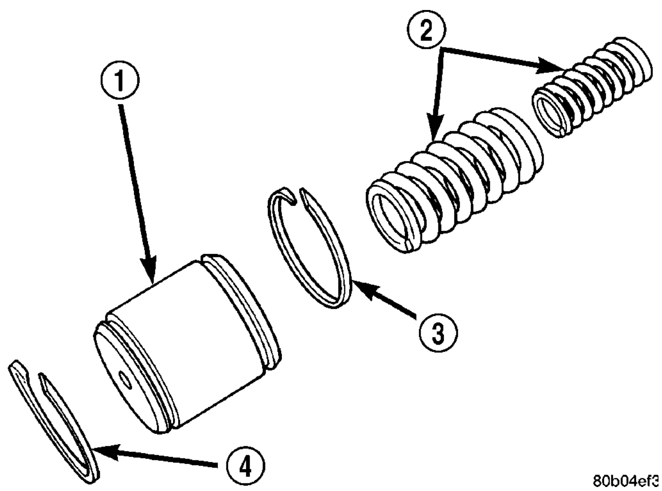


Fig. 135 Install Overdrive Accumulator and Springs

1 - OVERDRIVE ACCUMULATOR PISTON
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

CAUTION: Do not handle the valve body by the manual shaft. Damage could result.

(40) Install valve body into place as shown in (Fig. 136).

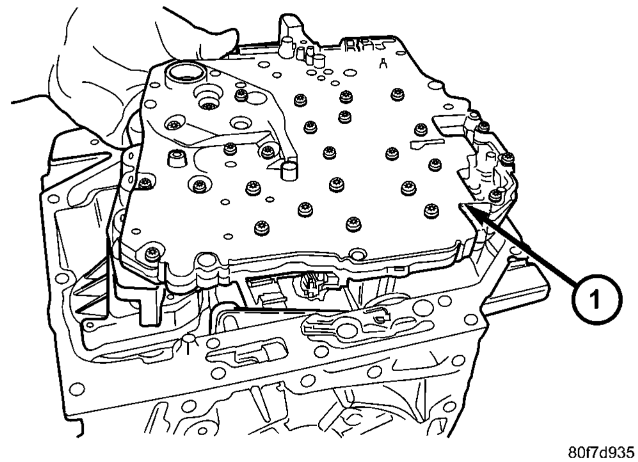


Fig. 136 Install Valve Body Onto Transmission

1 - VALVE BODY

(41) Install seven (7) valve body-to-case bolts (Fig. 137) and torque to 12 N·m (105 in. lbs.).

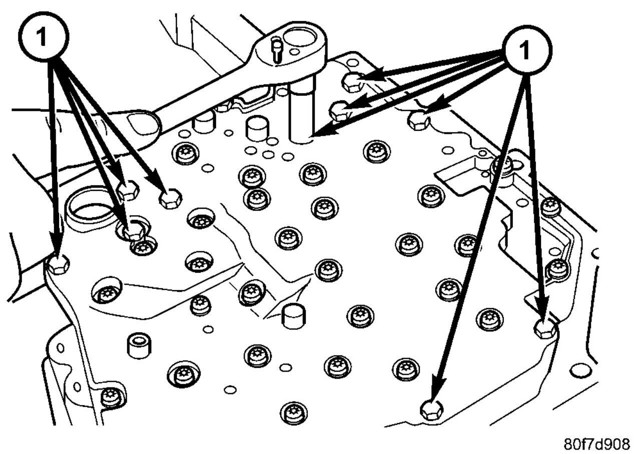


Fig. 137 Install Valve Body Bolts (7)

1 - BOLTS

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(42) Install transmission oil filter (Fig. 138). Tighten the bolts to 5 N·m (45 in. lbs.).

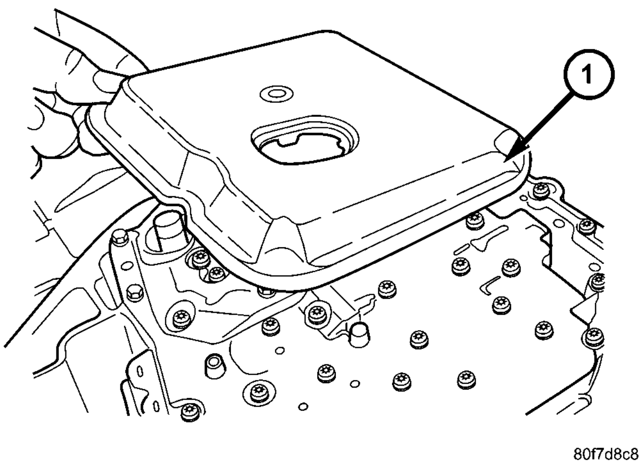


Fig. 138 Install Transmission Filter

1 - TRANSMISSION FILTER

(43) Install transmission oil pan (Fig. 139) with a bead of Mopar® ATF RTV (MS-GF41). Torque oil pan-to-case bolts to 20 N·m (14.5 ft. lbs.).

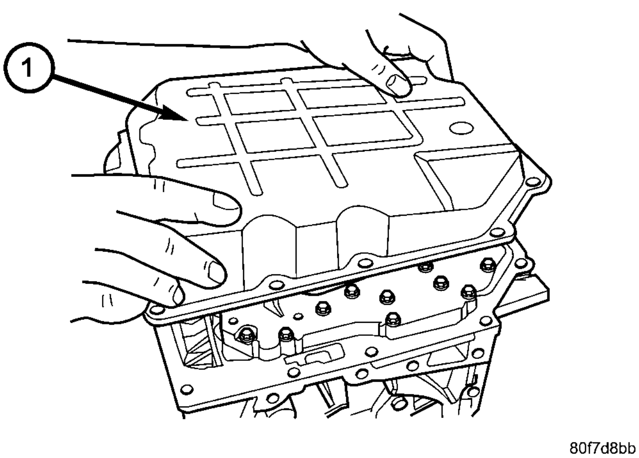


Fig. 139 Install Transmission Oil Pan

1 - TRANSMISSION OIL PAN

(44) Install both speed sensors into transmission case (Fig. 140). Torque the speed sensor bolts to 9 N·m (80 in. lbs.).

(45) As a final check of the transmission, measure the input shaft end play. This will indicate when a #4 thrust plate change is required. The #4 thrust plate is located behind the overdrive clutch hub. Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft (Fig. 141).

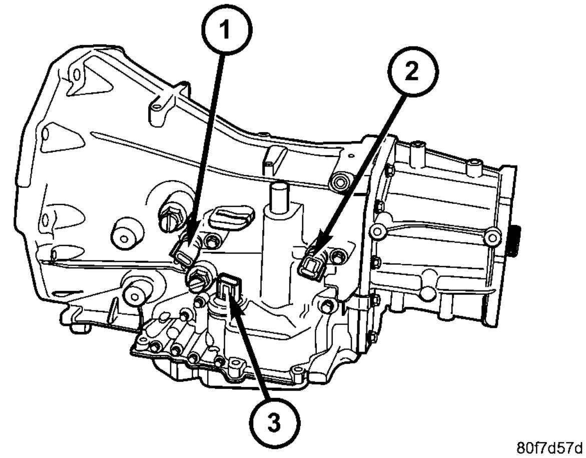


Fig. 140 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

Move input shaft in and out to obtain end play reading. End play specifications are 0.13 to 0.64 mm (0.005 to 0.025 inch). If not within specifications, make the necessary thrust plate adjustment.

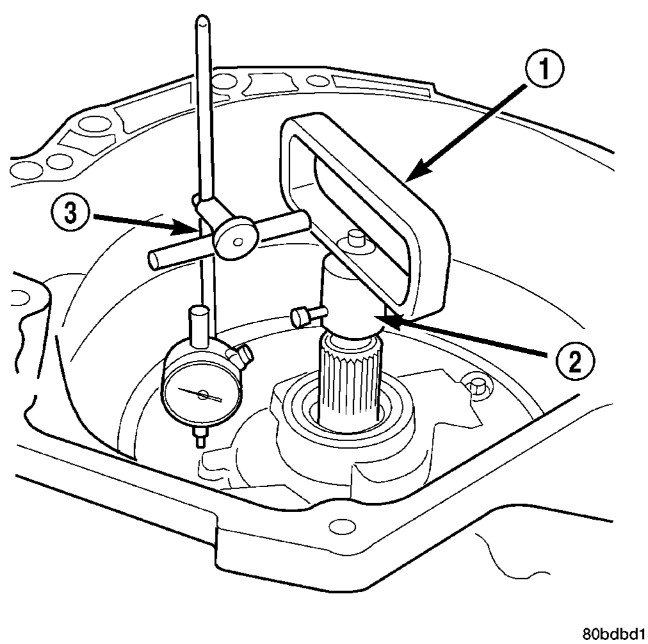


Fig. 141 Measure Input Shaft End Play Using Tool 8266 - Typical

1 - TOOL 8266-8
2 - TOOL 8266-2
3 - TOOL C-3339

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(46) On 4X2 transmissions, perform the following, if necessary:

(a) Install the extension shaft bearing (Fig. 142) onto the extension shaft.

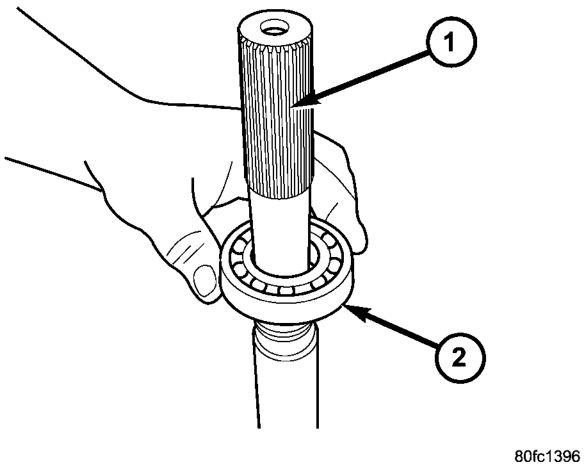


Fig. 142 Install Extension Shaft Bearing

1 - EXTENSION SHAFT
2 - BEARING

(b) Install the extension shaft bearing retaining ring (Fig. 143) onto the extension shaft.

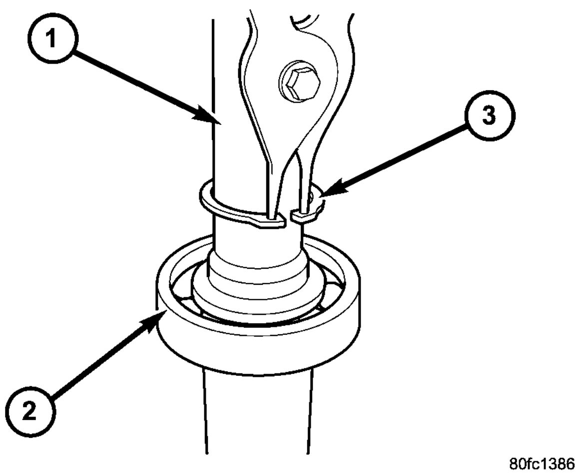


Fig. 143 Install Extension Shaft Bearing Retaining Ring

1 - EXTENSION SHAFT
2 - BEARING
3 - RETAINING RING

(c) Install the extension shaft and bearing assembly (Fig. 144) into the extension housing.

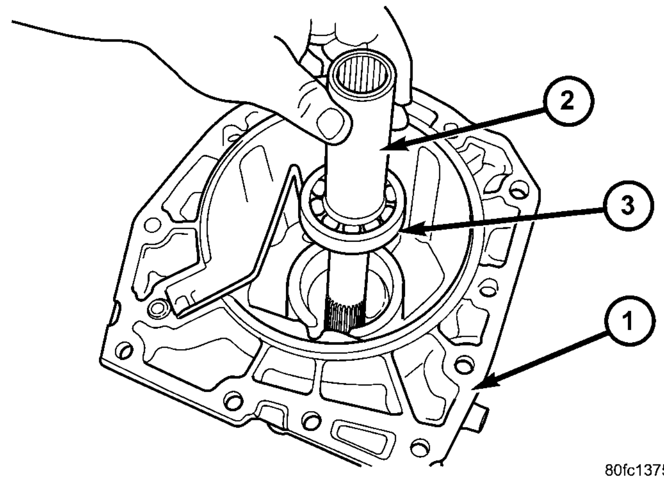


Fig. 144 Install Extension Shaft and Bearing Assembly

1 - EXTENSION HOUSING
2 - EXTENSION SHAFT
3 - BEARING

(d) Install the extension shaft bearing snap ring (Fig. 145) into the extension housing.

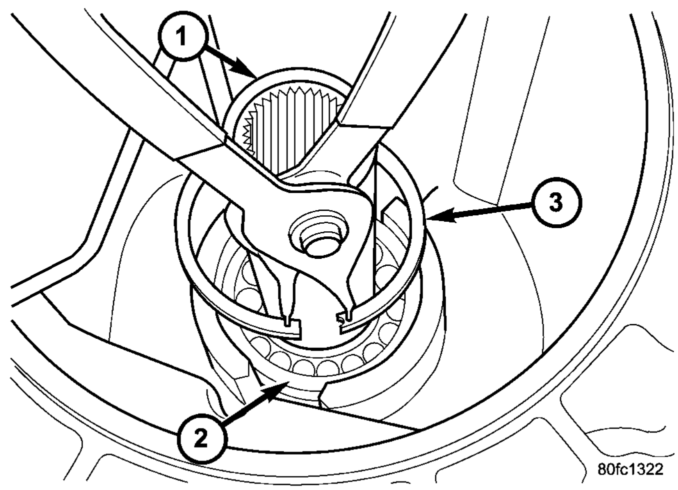


Fig. 145 Install Extension Shaft Bearing Snap Ring

1 - EXTENSION SHAFT
2 - BEARING
3 - SNAP RING

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(e) Verify that the extension shaft snap ring (Fig. 146) is fully engaged in the snap ring groove.

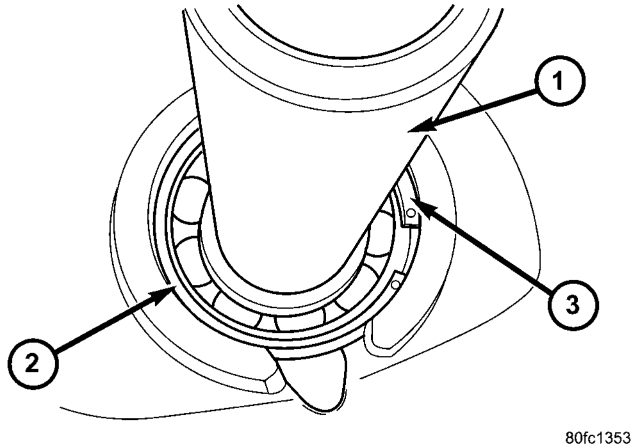


Fig. 146 Extension Shaft Bearing Snap Ring Installed

1 - EXTENSION SHAFT
2 - BEARING
3 - SNAP RING

(47) Inspect the lube tube grommet (Fig. 147) for damage. If the grommet lip is damaged, it will need to be replaced.

(48) Install the 4X4 stub shaft onto the transmission output shaft.

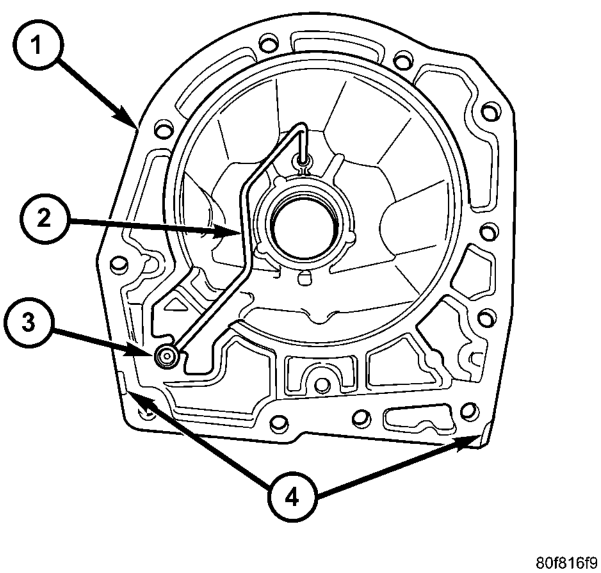


Fig. 147 Lube Tube Grommet

1 - HOUSING
2 - LUBE TUBE
3 - GROMMET
4 - PRY SLOTS

(49) Place a bead of Mopar® ATF RTV (MS-GF41) on the rear surface of the transmission case for the adapter/extension housing.

(50) Install the adapter (Fig. 148) or extension (Fig. 149) housing onto the transmission case.

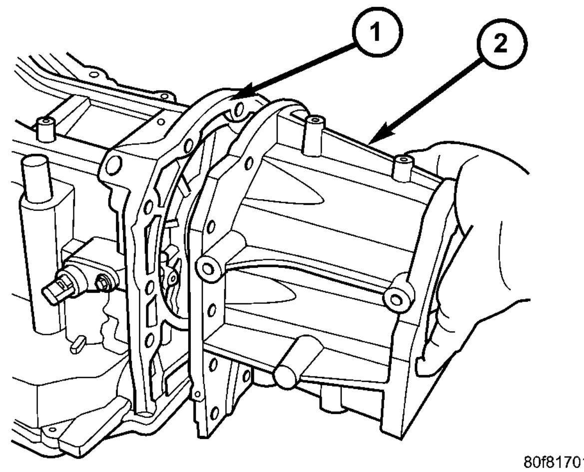


Fig. 148 Install Adapter Housing

1 - TRANSMISSION CASE
2 - ADAPTER HOUSING

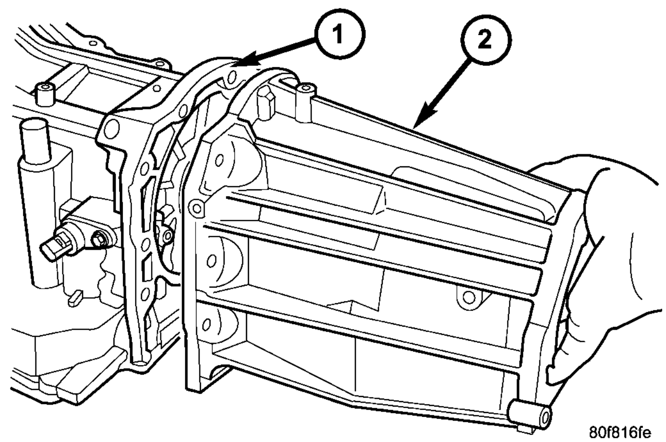


Fig. 149 Install Extension Housing

1 - TRANSMISSION CASE
2 - EXTENSION HOUSING

(51) Install the bolts (Fig. 150) that hold the adapter or extension housing onto the transmission case. Be sure to install any stud bolts to their original locations. Tighten the bolts to 54 N·m (40 ft.lbs.).

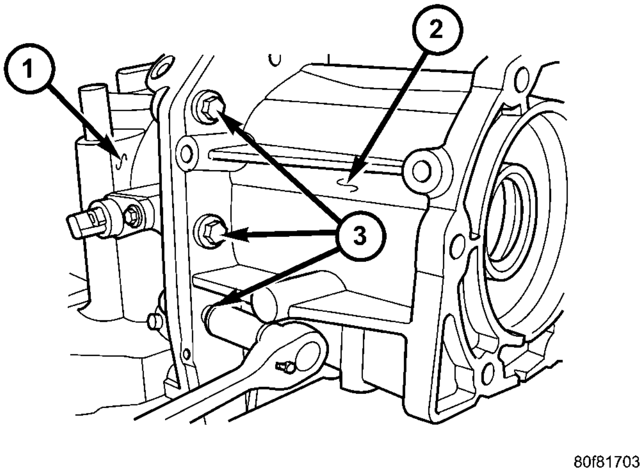


Fig. 150 Install Adapter Housing Bolts

1 - TRANSMISSION CASE
2 - ADAPTER HOUSING
3 - BOLTS

INSTALLATION

(1) Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free of any debris. The hub must be smooth to avoid damaging pump seal at installation.

(2) If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.

(3) Lubricate oil pump seal lip with transmission fluid.

(4) Align converter and oil pump.

(5) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(6) Check converter seating with steel scale and straightedge (Fig. 151). Surface of converter lugs should be at least 13mm (1/2 in.) to rear of straightedge when converter is fully seated.

(7) Temporarily secure converter with C-clamp.

(8) Position transmission on jack and secure it with chains.

(9) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

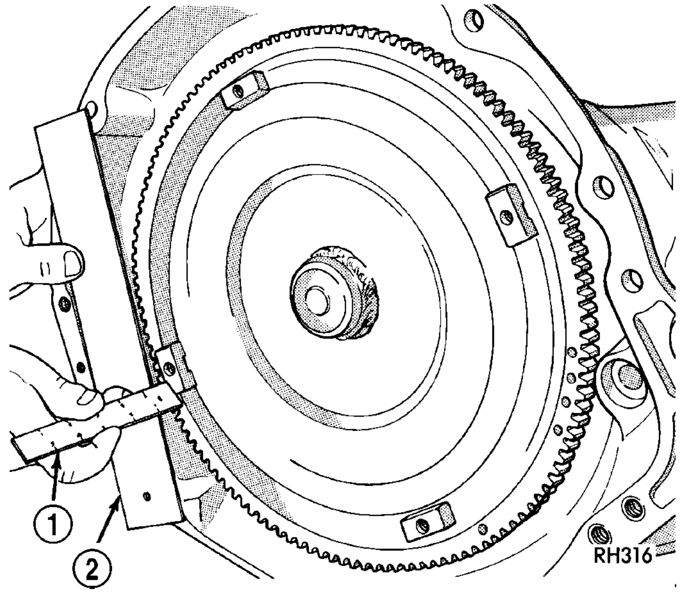


Fig. 151 Checking Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

(10) Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.

(11) Raise transmission and align the torque converter with the drive plate and transmission converter housing with the engine block.

(12) Move transmission forward. Then raise, lower or tilt transmission to align the converter housing with engine block dowels.

(13) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.

(14) Install two bolts to attach the transmission to the engine.

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).

(16) Install transfer case, if equipped. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).

(17) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).

(18) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).

(19) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).

(20) Remove engine support fixture.

(21) Connect gearshift cable to support bracket and transmission manual lever.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(22) Connect input and output speed sensor wires (Fig. 152).

(23) Connect wires to the transmission range sensor (Fig. 152) and the solenoid/pressure switch assembly (Fig. 153).

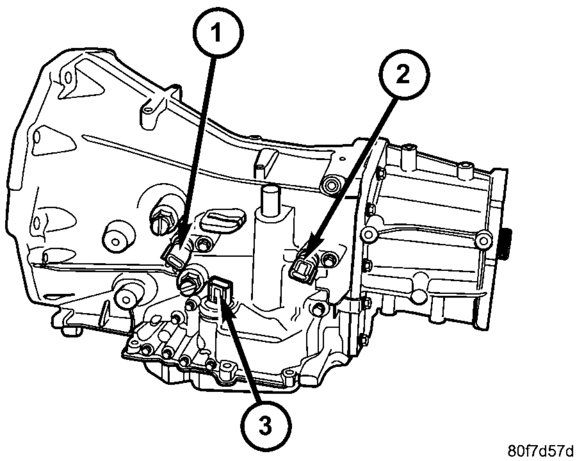


Fig. 152 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

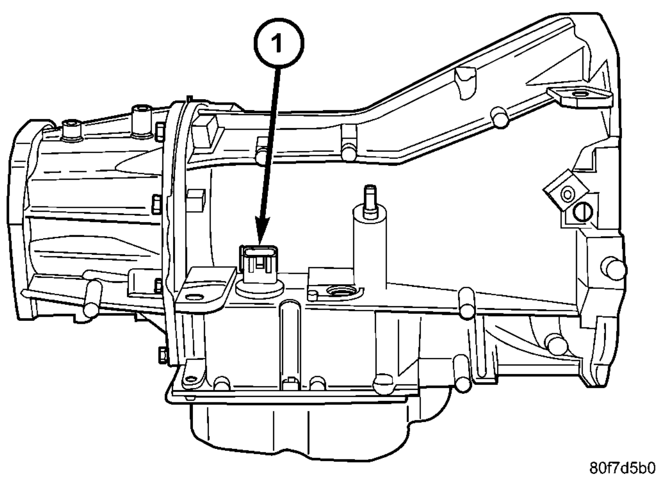


Fig. 153 Solenoid/Pressure Switch Assembly

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY CONNECTOR

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(24) Install torque converter-to-driveplate bolts. Tighten bolts to 88 N·m (65 in. lbs.).

(25) Install starter motor and cooler line bracket.

(26) Connect cooler lines to transmission.

(27) Install transmission fill tube.

(28) Install exhaust components (Fig. 154).

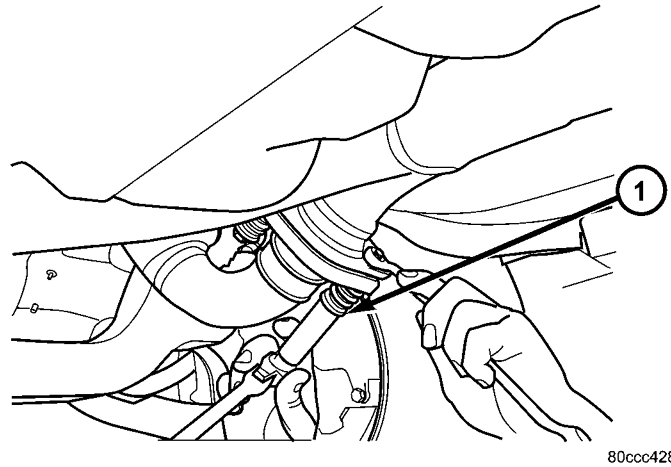


Fig. 154 Install Exhaust Flange Bolts

1 - EXHAUST FLANGE BOLTS

(29) Align and connect propeller shaft(s).

(30) Adjust gearshift cable if necessary.

(31) Install any skid plates removed previously (Fig. 155). (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)

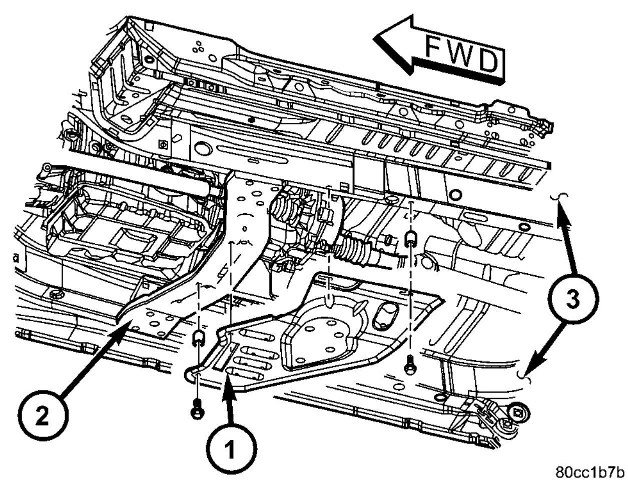


Fig. 155 Install Skid Plate

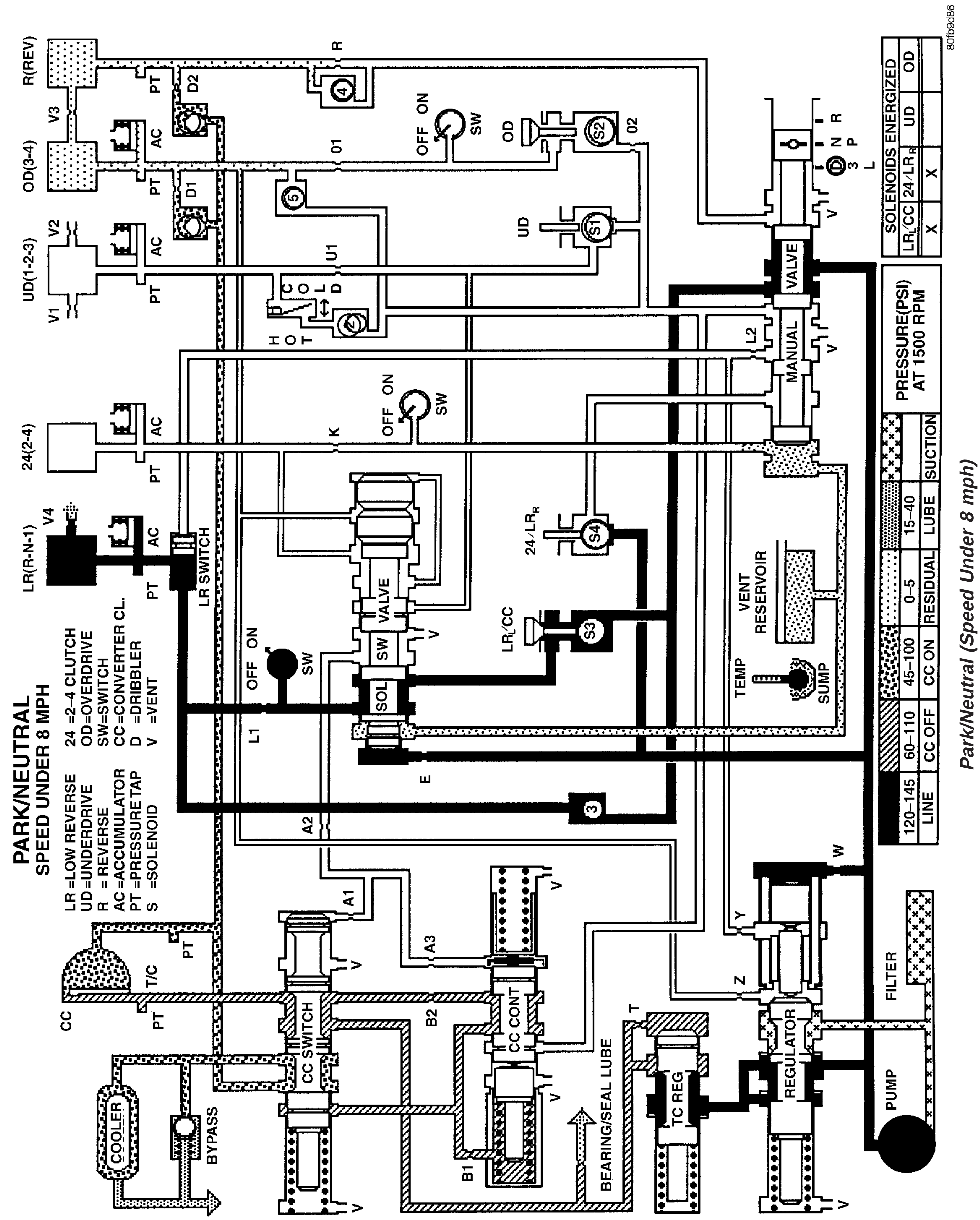
1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

(32) Lower vehicle.

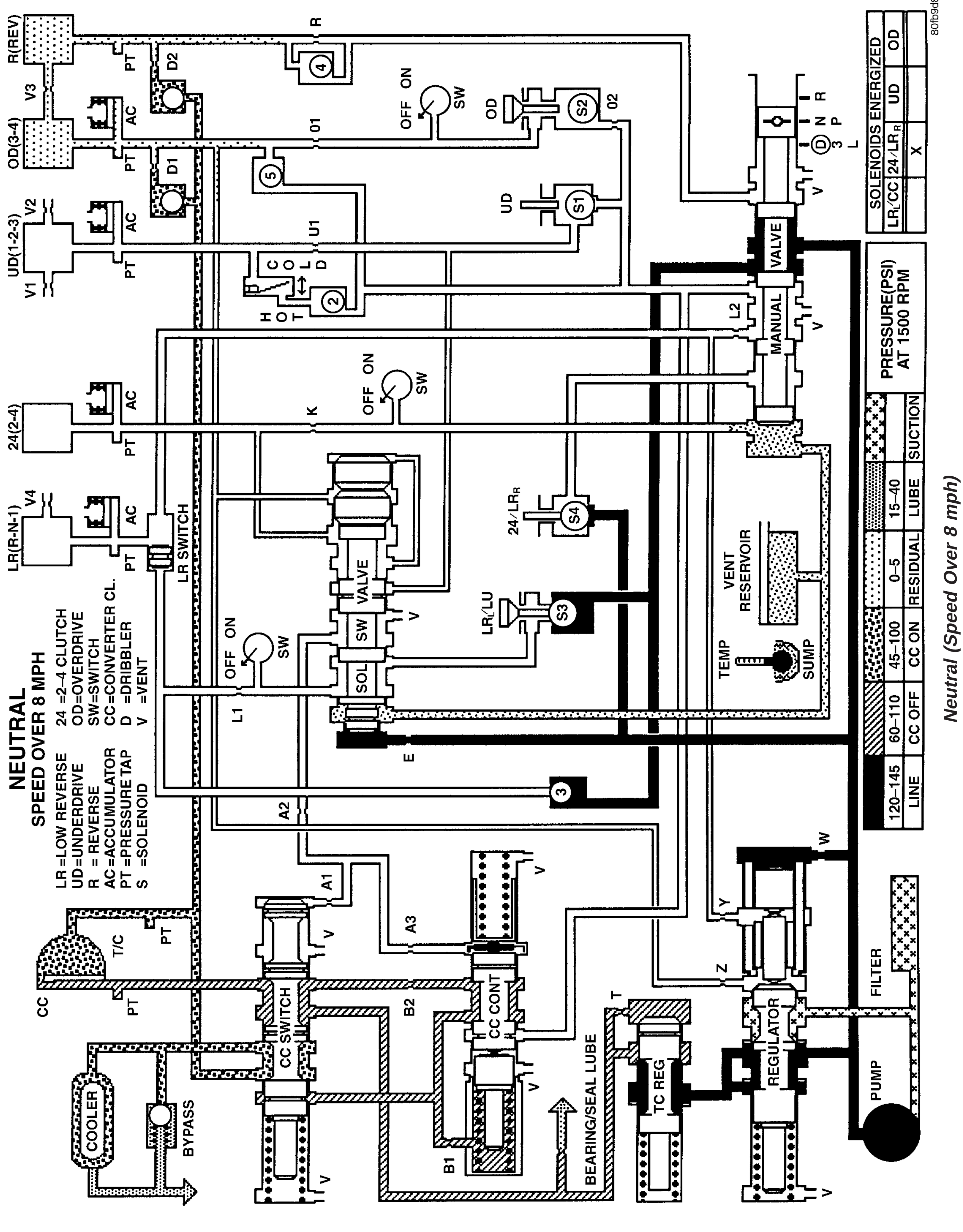
(33) Fill transmission with Mopar® ATF +4, Automatic Transmission Fluid.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

SCHEMATICS AND DIAGRAMS - 42RLE TRANSMISSION

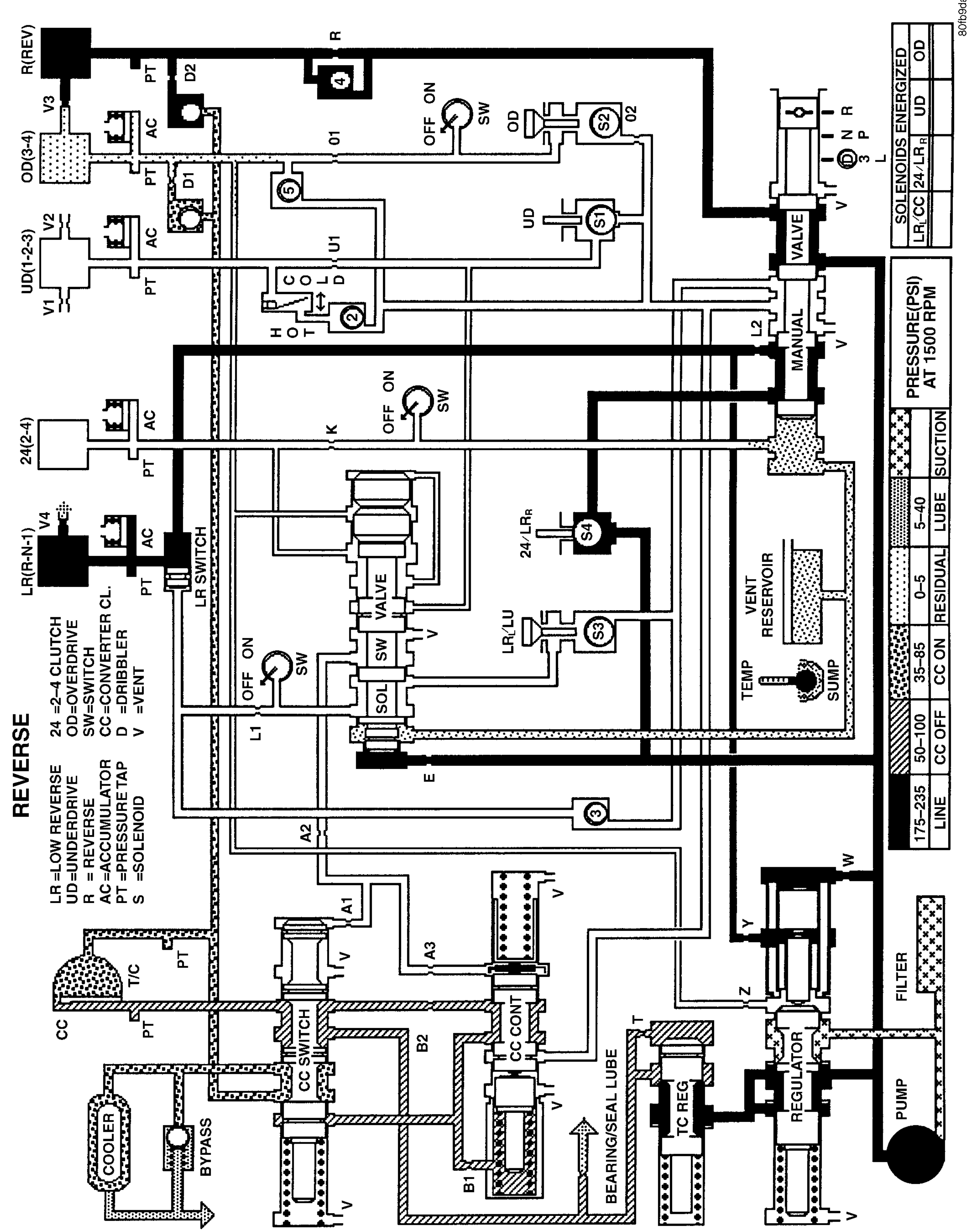


AUTOMATIC TRANSMISSION - 42RLE (Continued)



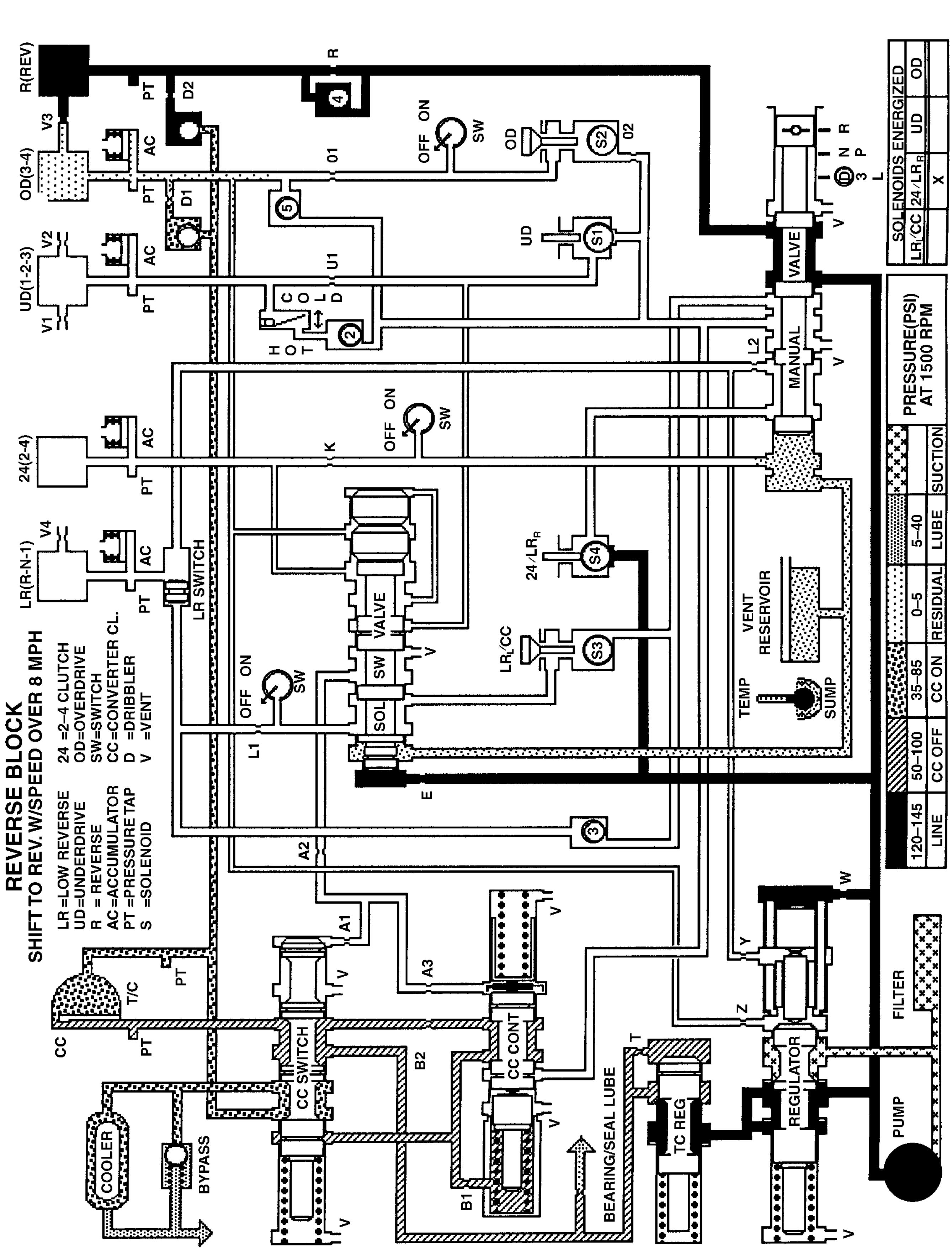
Neutral (Speed Over 8 mph)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



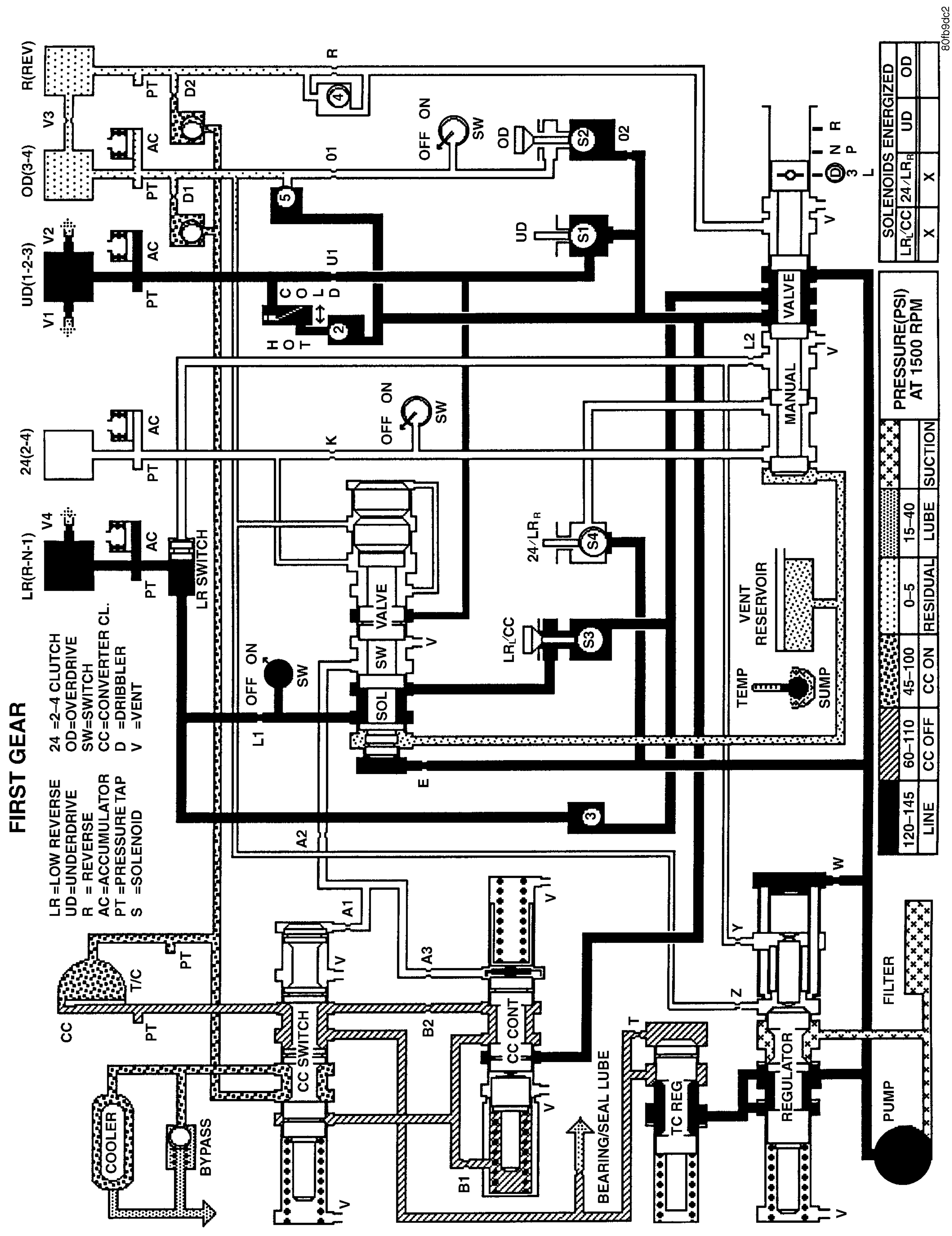
Reverse

AUTOMATIC TRANSMISSION - 42RLE (Continued)



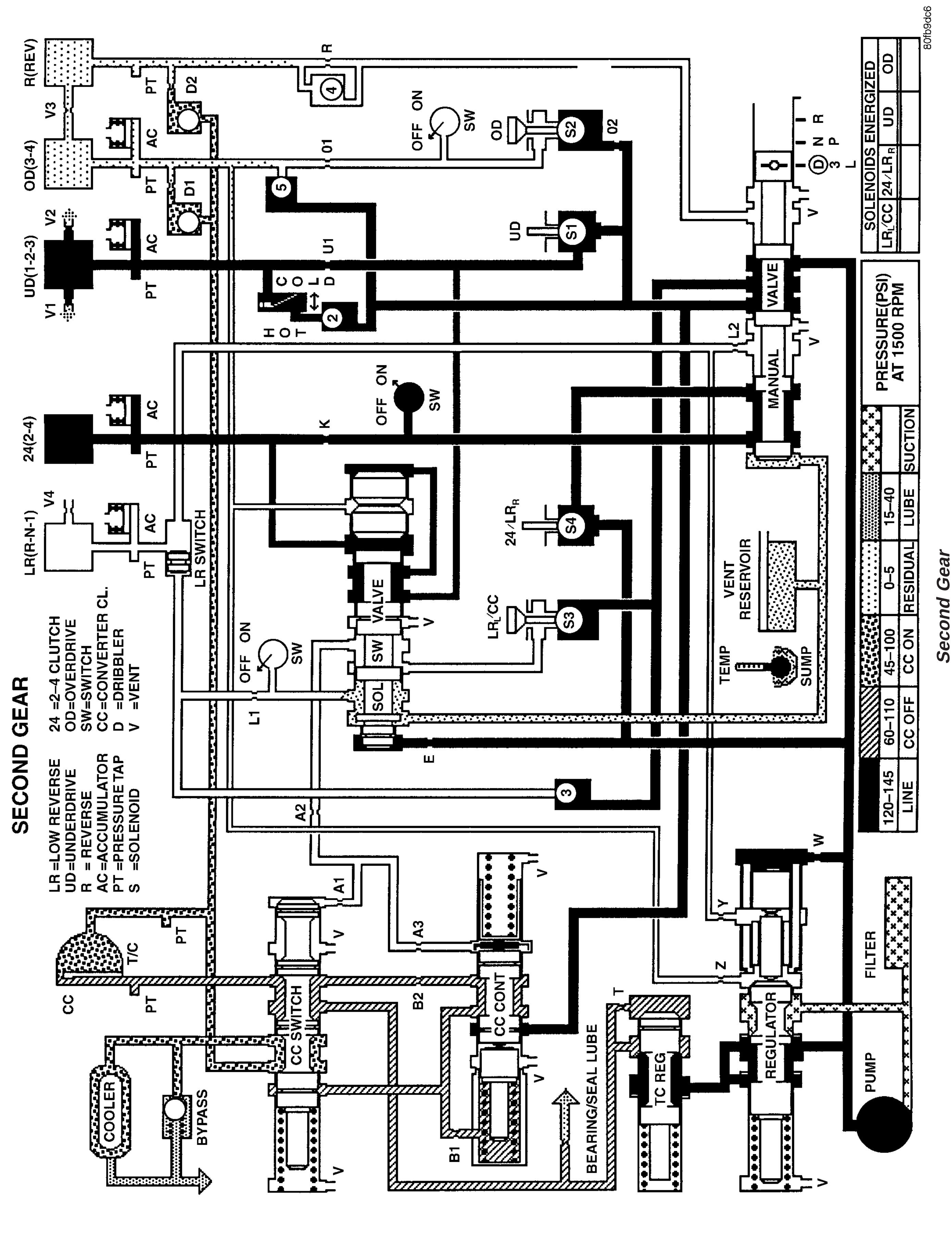
Reverse Block (Shift to Reverse w/Speed Over 8 mph)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



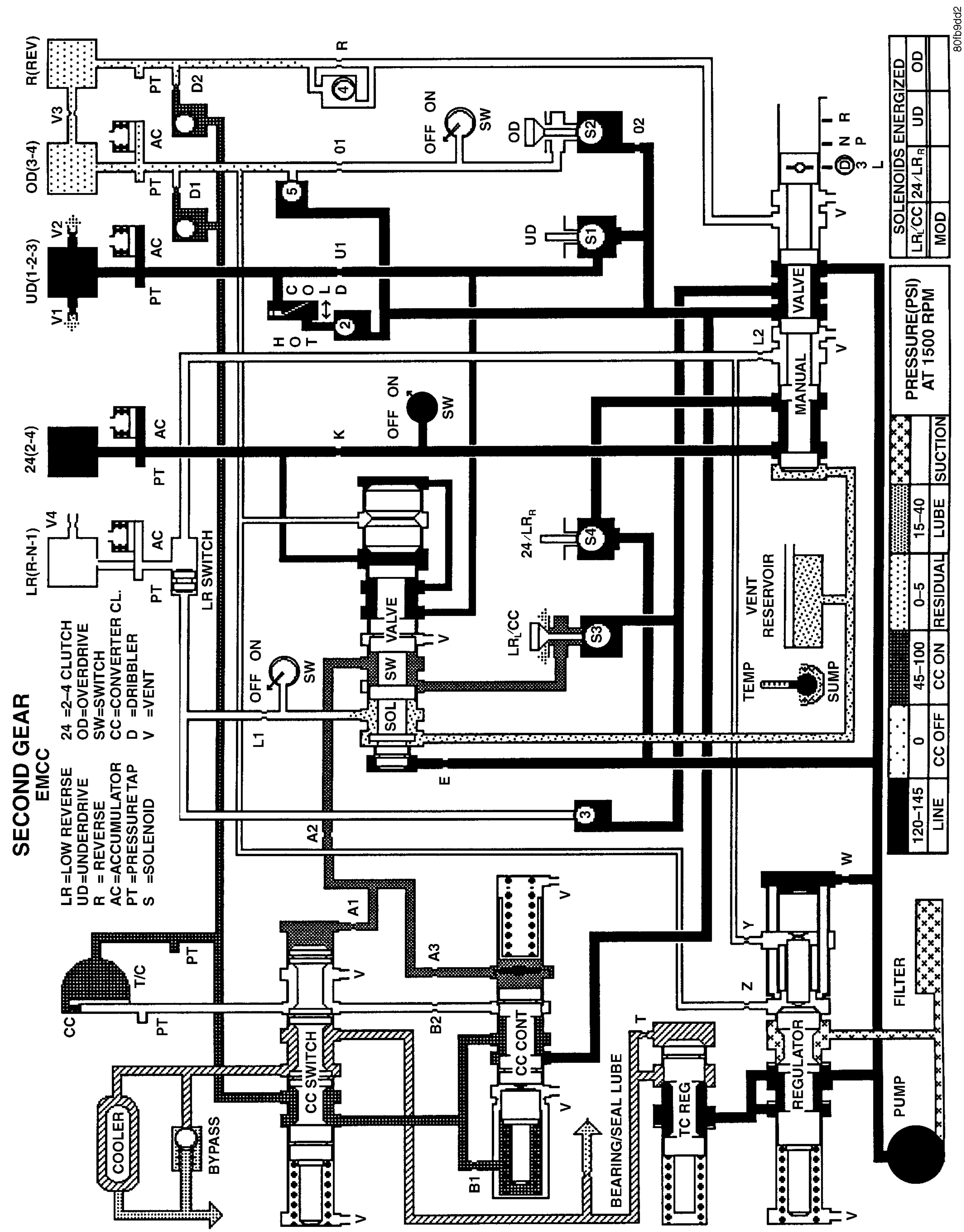
First Gear

AUTOMATIC TRANSMISSION - 42RLE (Continued)



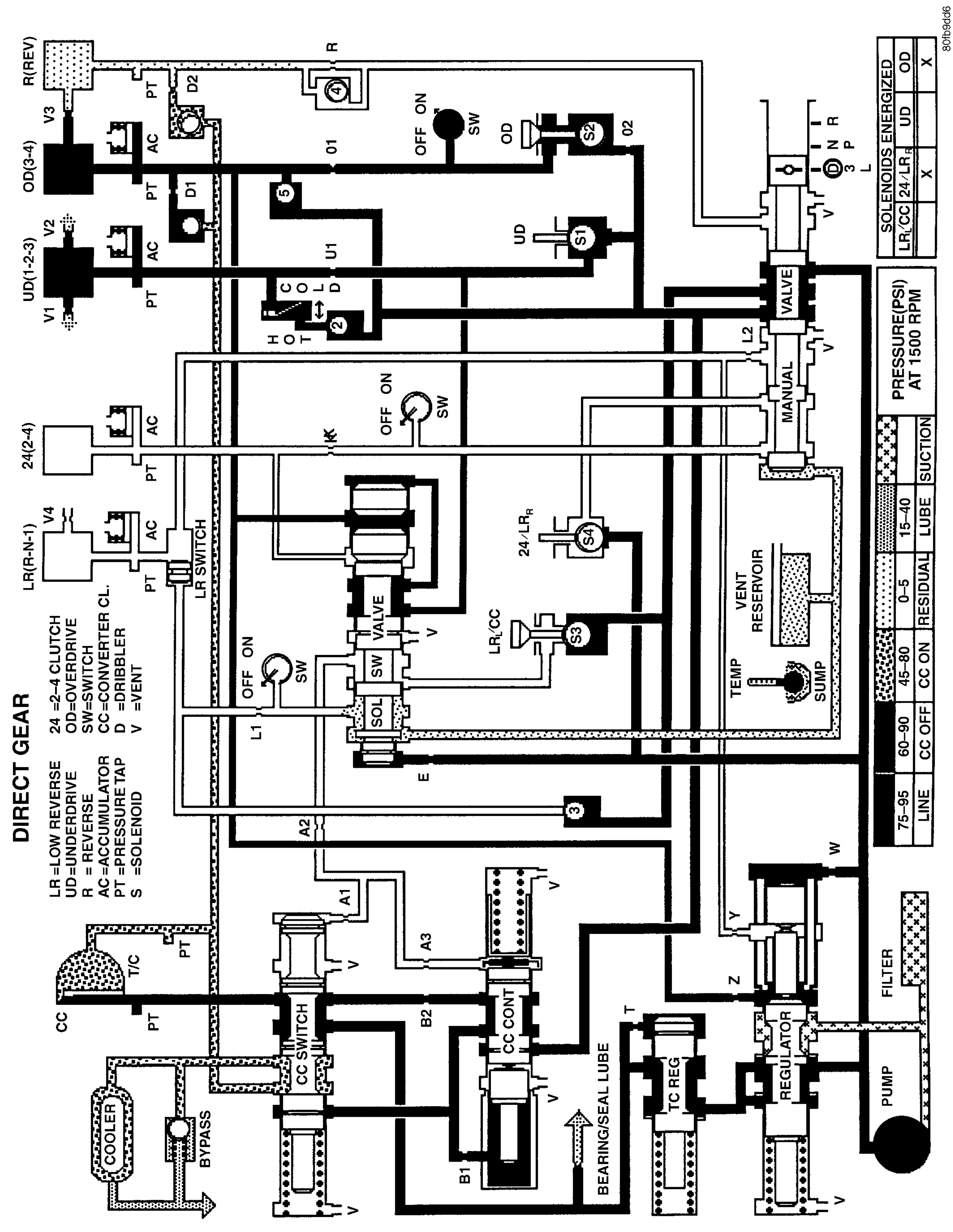
Second Gear

AUTOMATIC TRANSMISSION - 42RLE (Continued)



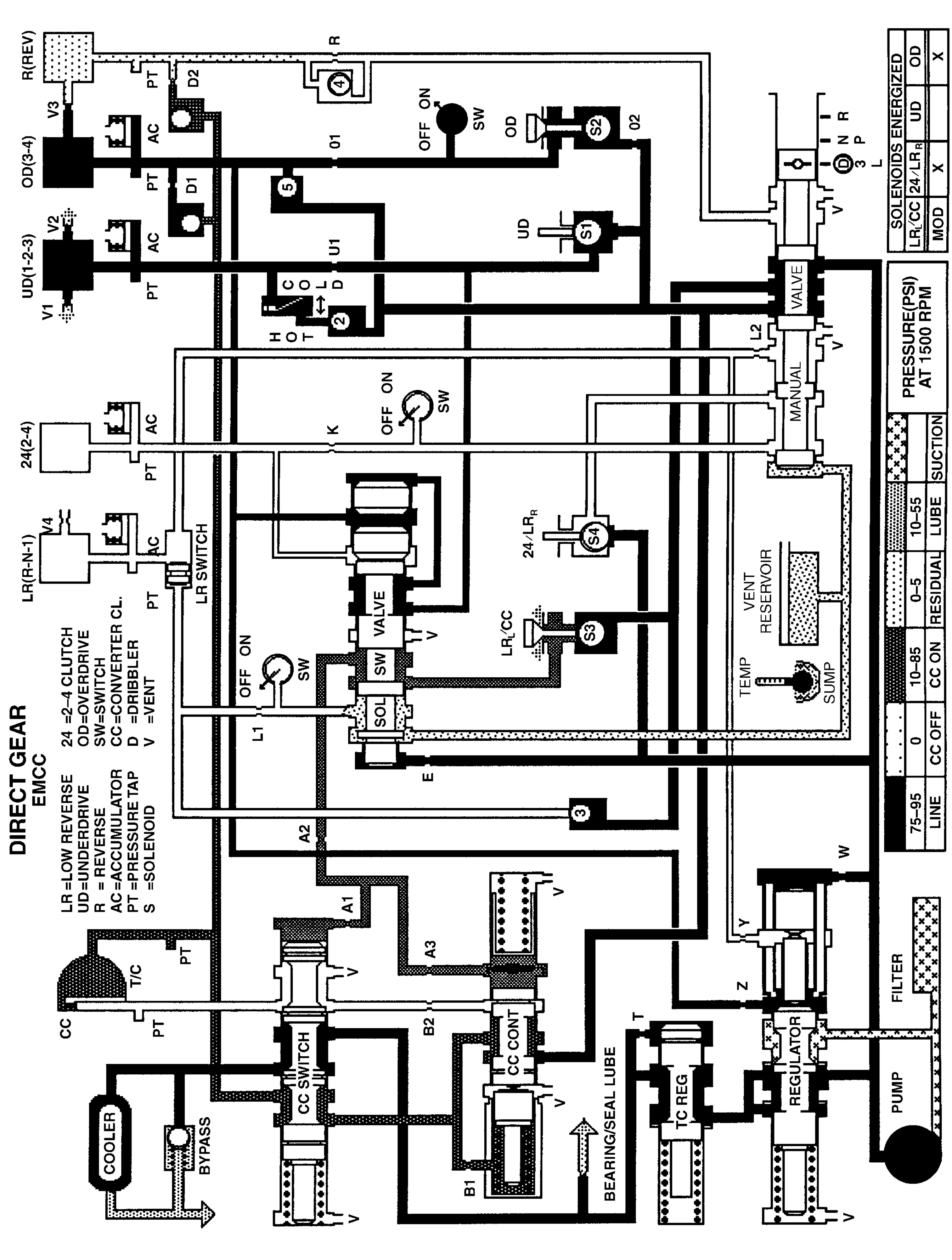
Second Gear (EMCC)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



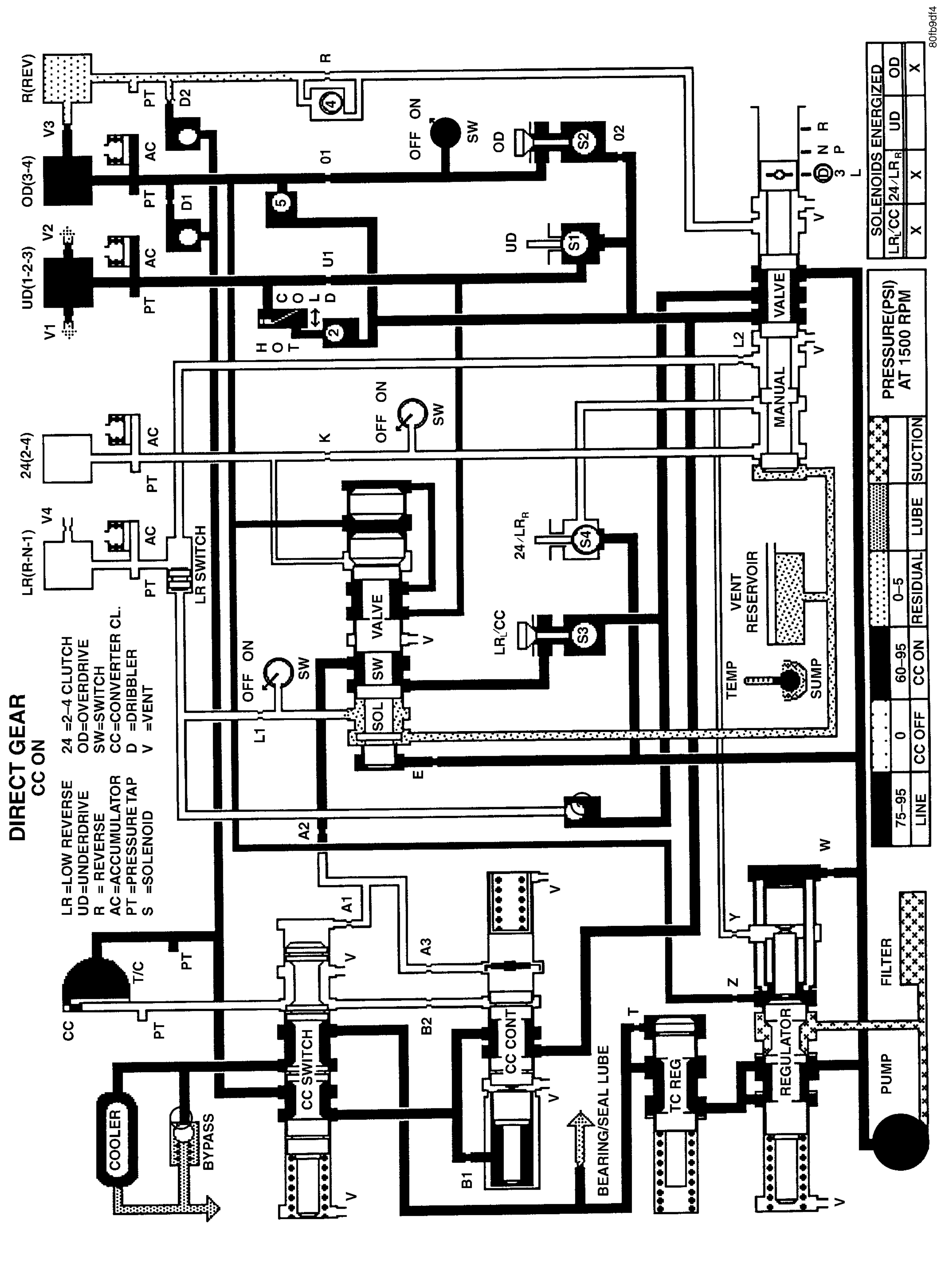
Direct Gear

AUTOMATIC TRANSMISSION - 42RLE (Continued)



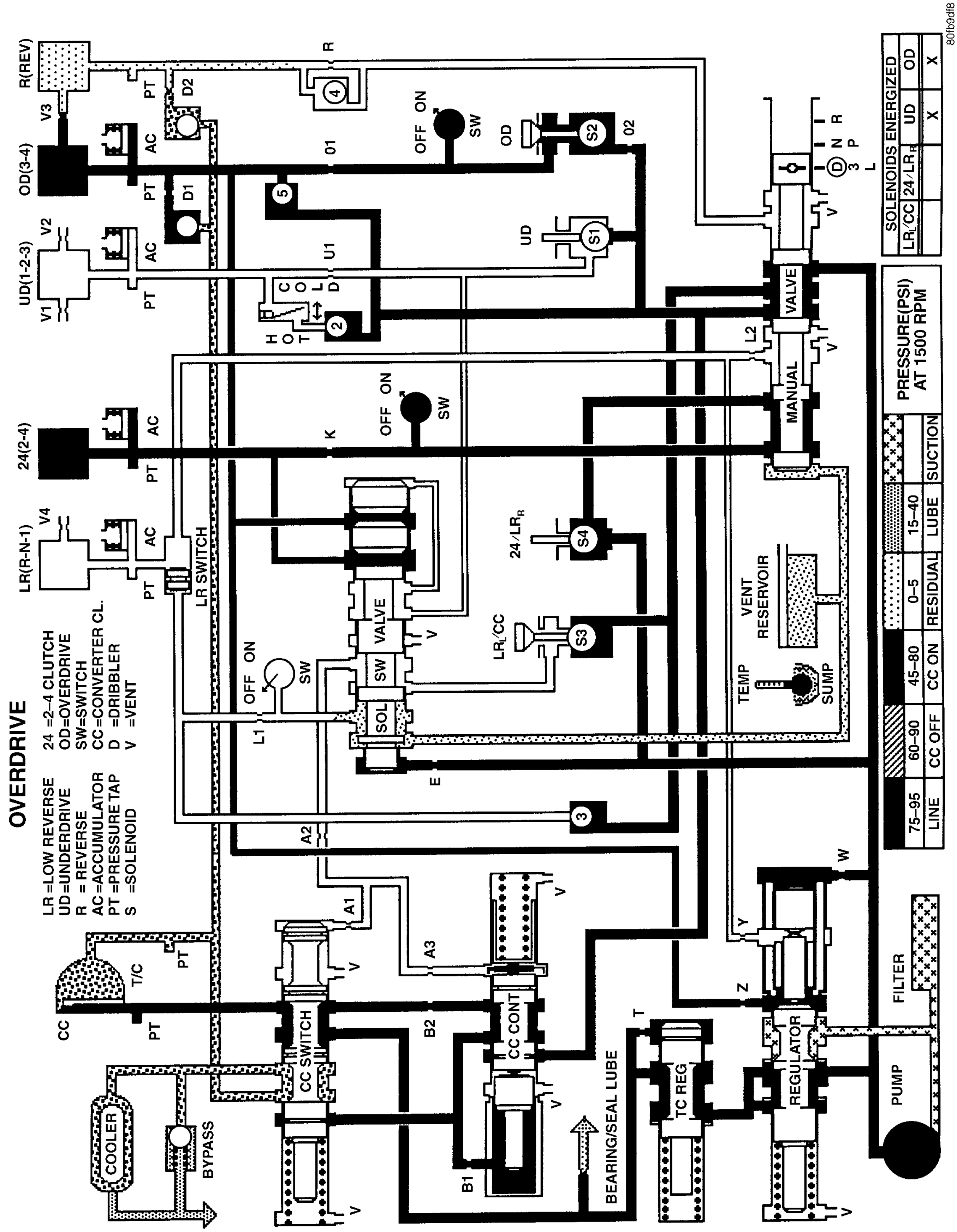
Direct Gear (EMCC)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



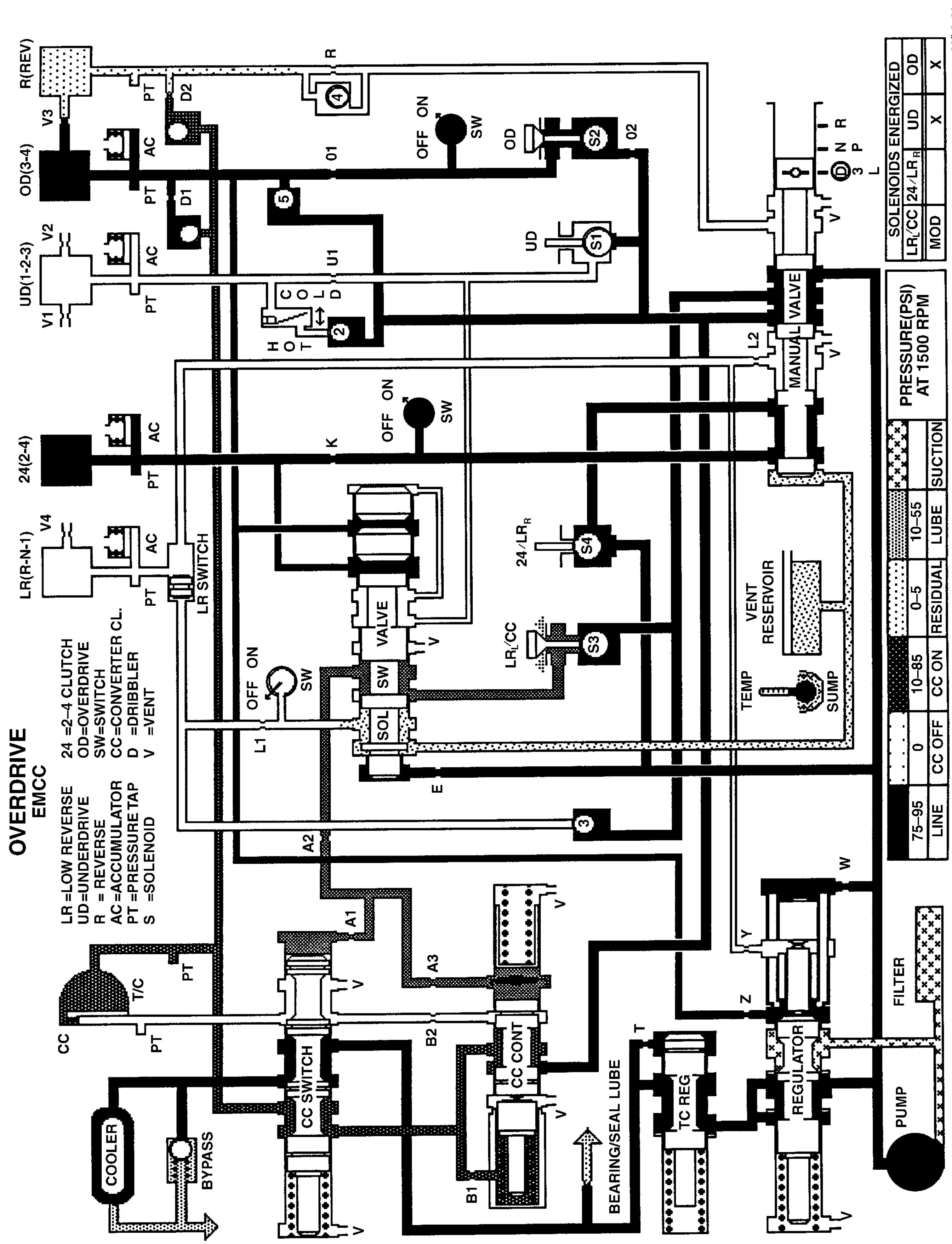
Direct Gear (CC On)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



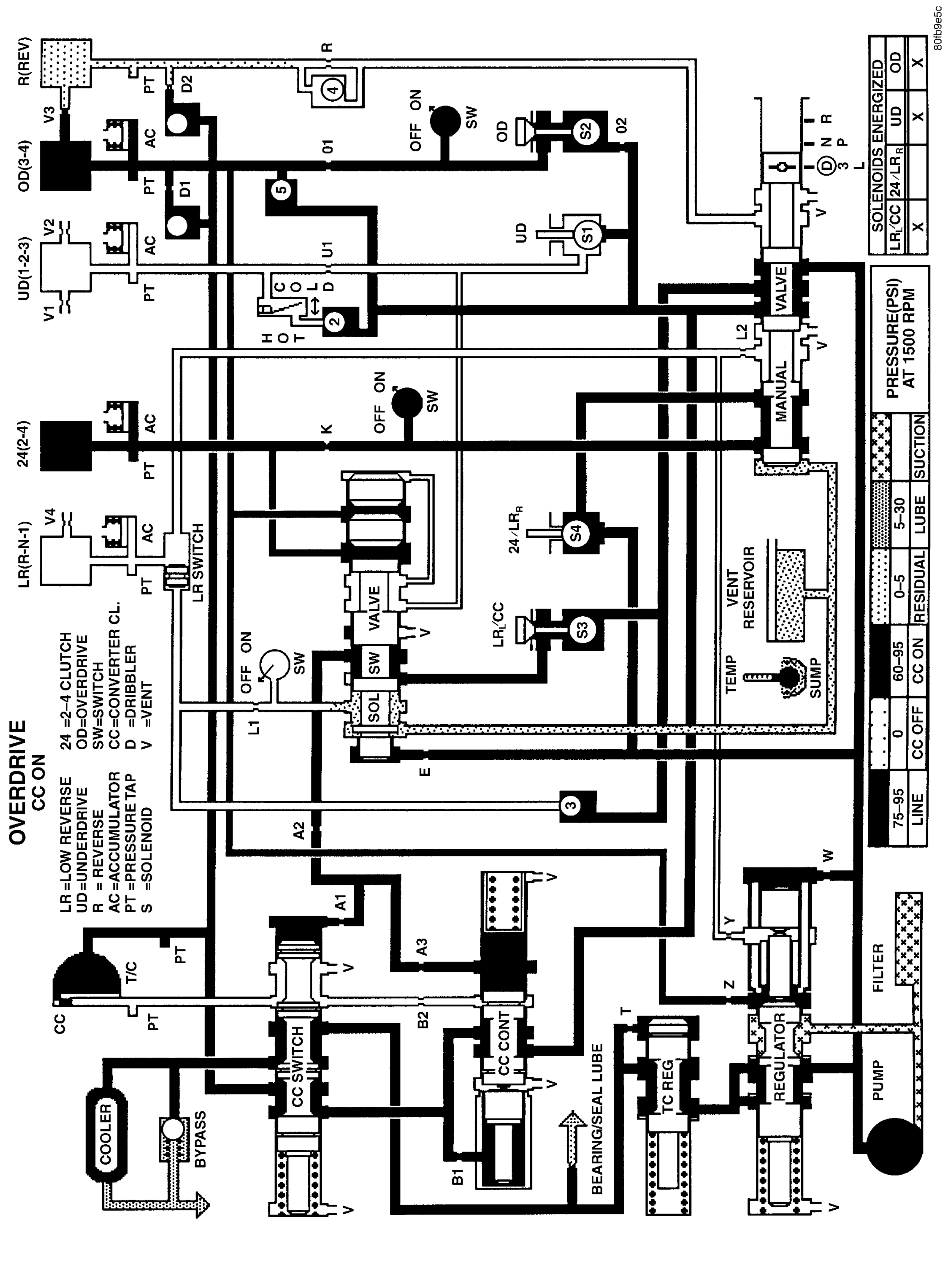
Overdrive

AUTOMATIC TRANSMISSION - 42RLE (Continued)



Overdrive (EMCC)

AUTOMATIC TRANSMISSION - 42RLE (Continued)



Overdrive (CC On)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

SPECIFICATIONS

42RLE AUTOMATIC TRANSMISSION

GENERAL SPECIFICATIONS

Transmission Type	Four-Speed Automatic, Electronically Controlled, Fully Adaptive, Electronically Modulated Torque Converter
Lubrication Method	Pump (internal - external gear-type)
Cooling Method	Water Heat Exchanger and/or Air-to-Oil Heat Exchanger

GEAR RATIOS

1st Gear	2.84:1
2nd Gear	1.57:1
3rd Gear (Direct)	1.00:1
4th Gear (Overdrive)	0.69:1
Reverse Gear	2.21:1

BEARING PRELOAD (DRAG TORQUE)

Description	Metric	Standard
Output Shaft	0.22-0.903 N·m	1-8 in. lbs.

CLUTCH PACK

Description	Metric	Standard
Low/Reverse Clutch (Select Reaction Plate)	0.84-1.60 mm	0.033-0.063 in.
Two/Four Clutch (No Select)	0.76-2.64 mm	0.030-0.104 in.
Reverse Clutch (Select Snap Ring)	0.89-1.37 mm	0.035-0.054 in.
Overdrive Clutch (No Select)	1.07-3.25 mm	0.042-0.128 in.
Underdrive Clutch (Select Reaction Plate)	0.94-1.50 mm	0.037-0.059 in.

INPUT SHAFT

Description	Metric	Standard
End Play	0.12-0.63 mm	0.005-0.025 in.

AUTOMATIC TRANSMISSION - 42RLE (Continued)

OIL PUMP CLEARANCES

DESCRIPTION	METRIC	STANDARD
Outer Gear-to-Crescent	0.060-0.298 mm	0.0023-0.0117 in.
Inner Gear-to-Crescent	0.093-0.385 mm	0.0036-0.0151 in.
Outer Gear-to-Pocket	0.089-0.202 mm	0.0035-0.0079 in.
Outer Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.
Inner Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.

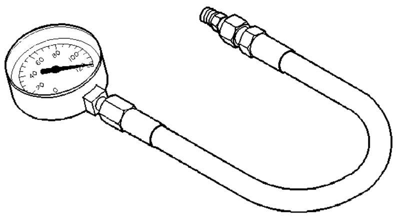
TORQUE SPECIFICATIONS

Description	N·m	Ft. Lbs.	In. Lbs.
Bolt, Converter-to-Driveplate	88	65	-
Bolt, Fluid Filter-to-Valve Body	5	-	45
Bolt, L/R Clutch Retainer-to-Case	5	-	45
Bolt, Adapter/Extension Housing	54	40	-
Bolt, Manual Valve Lever-to-Manual Valve	5	-	45
Bolt, Oil Pan-to-Case	20	14.5	-
Bolt, Oil Pump-to-Case	30	-	265
Bolt, Park Sprag Retainer	4.5	-	40
Bolt, Reaction Shaft Support Halves	28	-	250
Bolt, Solenoid/Pressure Switch Assy-to-Valve Body	5.5	-	50
Bolt, Valve Body-to-Case	12	-	105
Bolt, Valve Body-to-Transfer Plate	5	-	45
Fitting, Cooler Line	47.5	35	-
Nut, Output Shaft	271	200	-
Plug, Pressure Tap	5	-	45
Bolt, Input Speed-to-Case Sensor	9	-	80
Bolt, Output Speed-to-Case Sensor	9	-	80

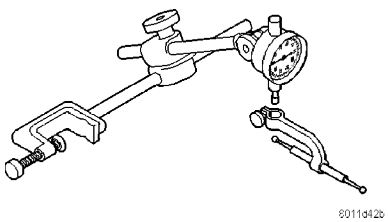
AUTOMATIC TRANSMISSION - 42RLE (Continued)

SPECIAL TOOLS

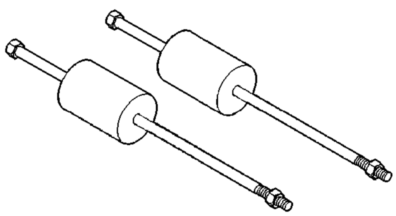
42RLE AUTOMATIC TRANSMISSION



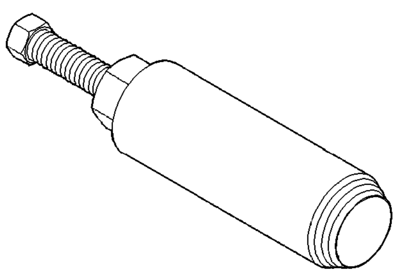
Pressure Gauge (High) C-3293SP



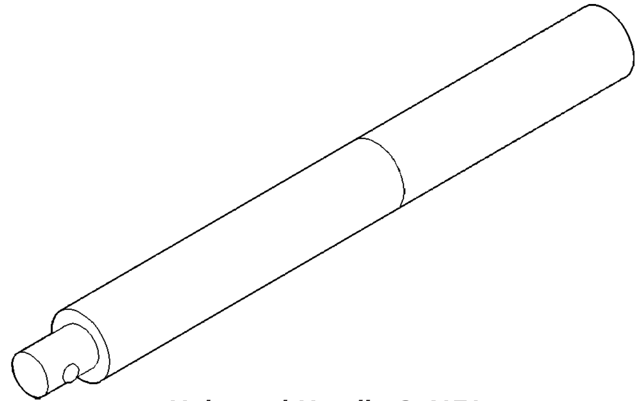
Dial Indicator C-3339



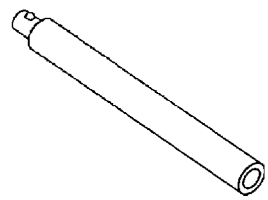
Slide Hammer C-3752



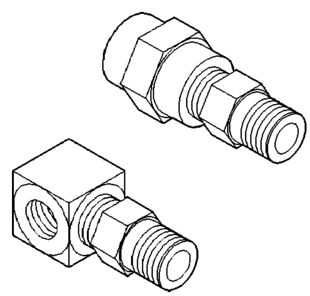
Seal Puller C-3981B



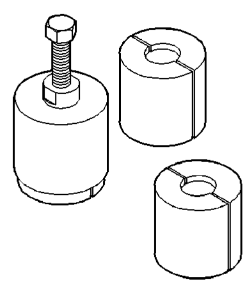
Universal Handle C-4171



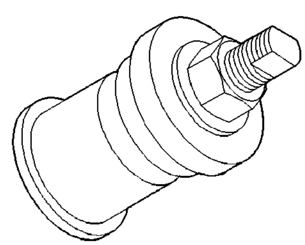
Handle Extension C-4171-2



Adapter Set L-4559

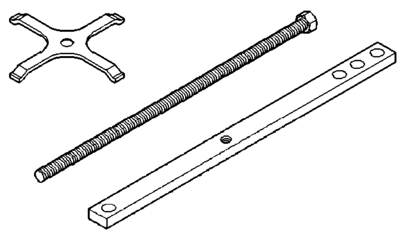


Puller Set 5048

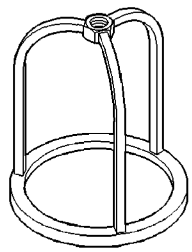


Installer 5050A

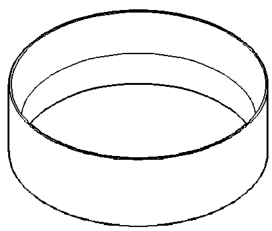
AUTOMATIC TRANSMISSION - 42RLE (Continued)



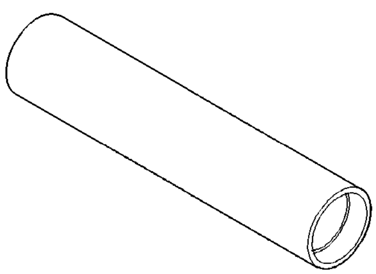
Compressor 5058A



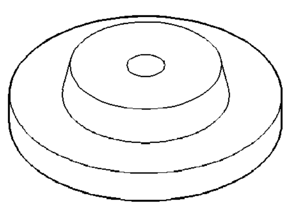
Compressor 5059-A



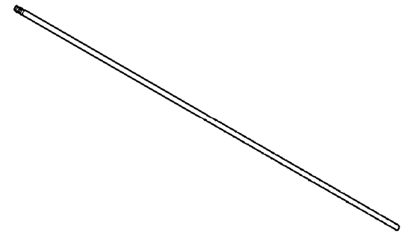
Installer 5067



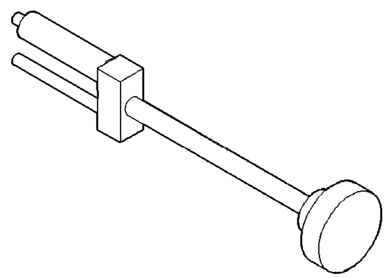
Installer 6052



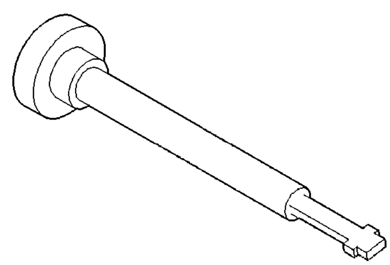
Disk 6057



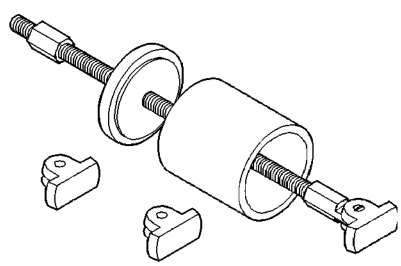
Tip 6268



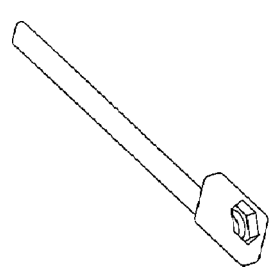
Remover/Installer 6301



Remover/Installer 6302

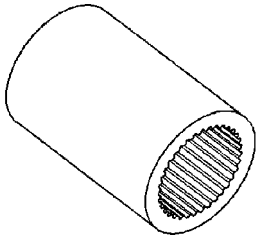


Remover 6310

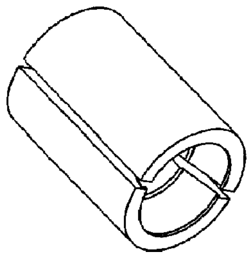


Wrench 6497

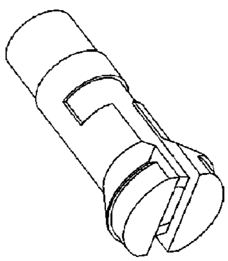
AUTOMATIC TRANSMISSION - 42RLE (Continued)



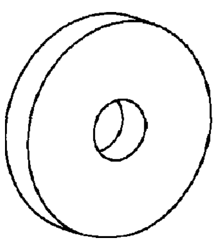
Wrench 6498-A



Puller Jaws 6545



Remover 6596



Remover 6597

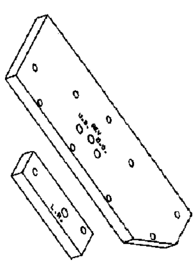
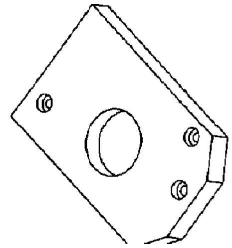
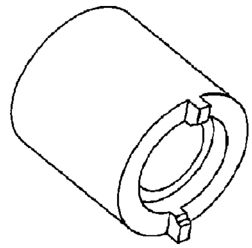


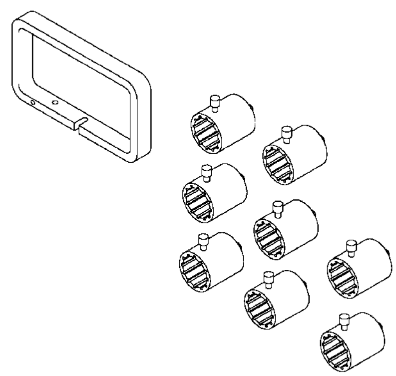
Plate Set 6599



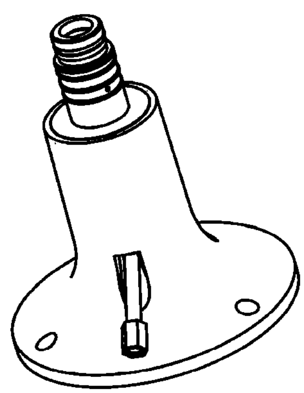
Support Plate 6618A



Staking Tool 6639



End Play Set 8266



Pressure Fixture 8391

ACCUMULATOR

DESCRIPTION

The 42RLE underdrive, overdrive, low/reverse, and 2/4 clutch hydraulic circuits each contain an accumulator. An accumulator assembly typically consists of a piston, seals, return spring), and a cover or plug (Fig. 156).

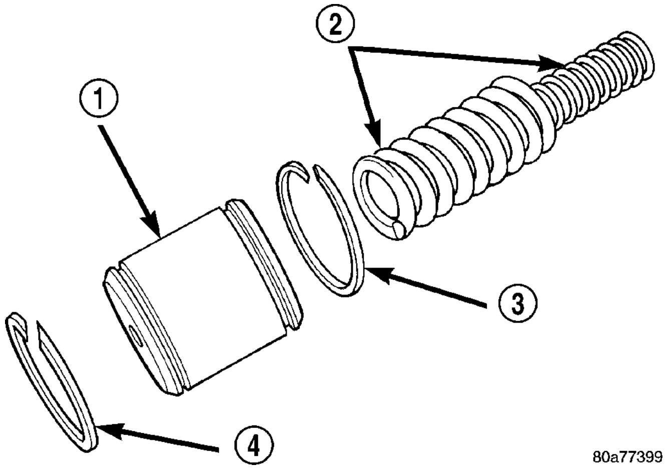


Fig. 156 Accumulator Assembly - Typical

1 - ACCUMULATOR PISTON (UNDERDRIVE)
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

The overdrive and underdrive accumulators are located within the transmission case, and are retained by the valve body (Fig. 157).

The low reverse accumulator (Fig. 157) is also located within the transmission case, but the assembly is retained by a cover and a snap-ring.

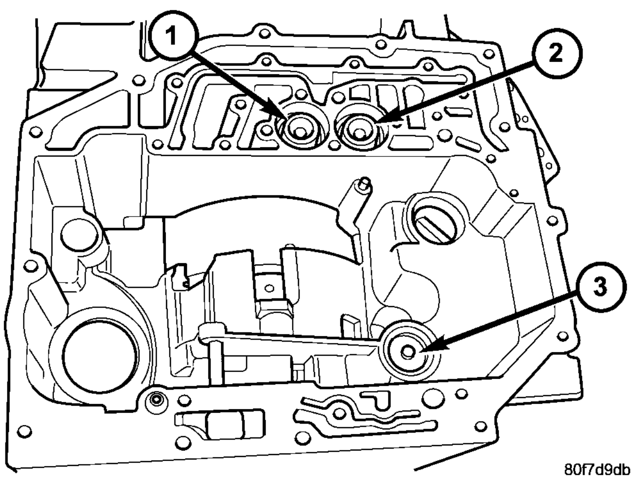


Fig. 157 Accumulator Location

1 - OVERDRIVE ACCUMULATOR LOCATION
2 - UNDERDRIVE ACCUMULATOR LOCATION
3 - LOW/REVERSE ACCUMULATOR

The 2/4 accumulator is located in the valve body. It is retained by a cover and retaining screws (Fig. 158).

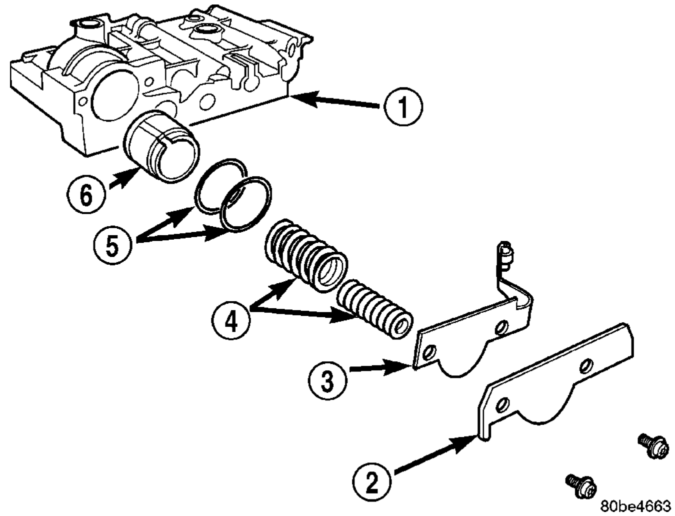


Fig. 158 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - SPRINGS
5 - SEALS
6 - PISTON

OPERATION

The function of an accumulator is to cushion the application of a frictional clutch element. When pressurized fluid is applied to a clutch circuit, the application force is dampened by fluid collecting in the respective accumulator chamber against the piston and springs. The intended result is a smooth, firm clutch application.

ADAPTER HOUSING SEAL

REMOVAL

(1) Remove the transfer case (Refer to 21 - TRANSMISSION/TRANSFER CASE - REMOVAL).

(2) Using a screw mounted in a slide hammer, remove the adapter housing seal.

INSTALLATION

(1) Install a new adapter housing seal with Tool Handle C-4171 and Installer C-3860-A.

(2) Install the transfer case (Refer to 21 - TRANSMISSION/TRANSFER CASE - INSTALLATION).

BEARINGS

ADJUSTMENTS

BEARING ADJUSTMENT PROCEDURES

Take extreme care when removing and installing bearing cups and cones. **Use only an arbor press for installation,** as a hammer may not properly align the bearing cup or cone. Burrs or nicks on the bearing seat will give a false end play reading, while gauging for proper shims. Improperly seated bearing cup and cones are subject to low-mileage failure.

Bearing cups and cones should be replaced if they show signs of pitting or heat distress.

If distress is seen on either the cup or bearing rollers, both cup and cone must be replaced.

NOTE: Bearing drag torque specifications must be maintained to avoid premature bearing failures.

Used (original) bearing may lose up to 50 percent of the original drag torque after break-in.

NOTE: All bearing adjustments must be made with no other component interference or gear inter-mesh.

Oil all bearings before checking turning torque.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shift Interlock Sytem (BTSI), consists of a Park-Interlock cable and a solenoid mounted in the shift lever assembly. The Park-Interlock cable connects the automatic transmission floor mounted shifter to the steering column ignition switch.

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in the shift lever assembly is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

DRIVING CLUTCHES

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly (Fig. 159). The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.

DRIVING CLUTCHES (Continued)

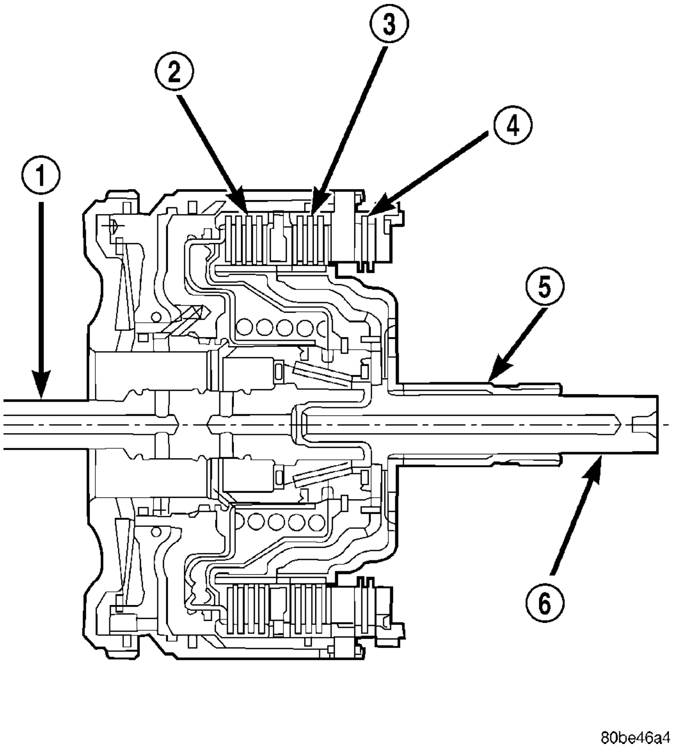


Fig. 159 Input Clutch Assembly

1 - INPUT SHAFT
2 - UNDERDRIVE CLUTCH
3 - OVERDRIVE CLUTCH
4 - REVERSE CLUTCH
5 - OVERDRIVE SHAFT
6 - UNDERDRIVE SHAFT

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the rear sun gear.

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and overdrive gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the front planet carrier.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear only by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the front sun gear assembly is driven.

EXTENSION HOUSING SEAL

REMOVAL

(1) Raise vehicle.

(2) Mark propeller shaft and axle yoke, or companion flange, for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Seal Remover C-3985-B (Fig. 160) from overdrive extension housing.

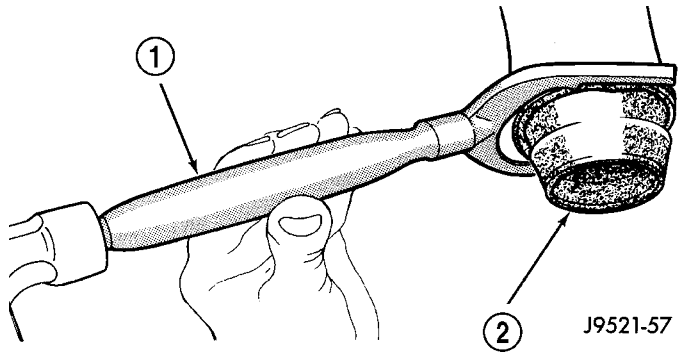


Fig. 160 Removing Transmission Housing Yoke Seal

1 - SPECIAL TOOL C-3985-B
2 - SEAL

INSTALLATION

(1) Place seal in position on overdrive housing.

(2) Drive seal into overdrive housing with Seal Installer C-3995-A (Fig. 161).

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

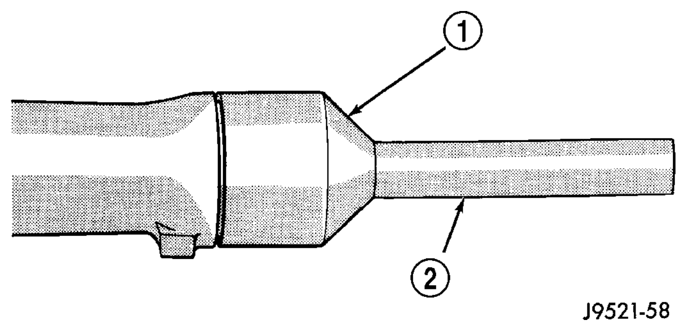


Fig. 161 Installing Overdrive Housing Seal

1 - SPECIAL TOOL C-3995-A OR C-3972-A
2 - SPECIAL TOOL C-4471

FLUID AND FILTER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

DIAGNOSIS AND TESTING - EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

DIAGNOSIS AND TESTING - FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

STANDARD PROCEDURE - FLUID LEVEL CHECK

FLUID LEVEL CHECK

The transmission sump has a dipstick to check oil similar to most automatic transmissions. It is located on the left side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the PARK and NEUTRAL positions. Place the selector lever in PARK to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level should be in COLD region at 70° F fluid temperature. Adjust fluid level as necessary. Use only Mopar® ATF+4, Automatic Transmission Fluid.

FLUID LEVEL CHECK USING DRB

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.
(2) Connect DRBIII® scan tool and select transmission.
(3) Select sensors.
(4) Read the transmission temperature value.
(5) Compare the fluid temperature value with the chart.

FLUID AND FILTER (Continued)

(6) Adjust transmission fluid level shown on the dipstick according to the chart (Fig. 162). Use only Mopar® ATF+4, Automatic Transmission Fluid.

(7) Check transmission for leaks.

STANDARD PROCEDURE - FLUID/FILTER SERVICE

NOTE: Only fluids of the type labeled Mopar® ATF+4, Automatic Transmission Fluid, should be used in the transmission sump. A filter change should be made at the time of the transmission oil change. The magnet (on the inside of the oil pan) should also be cleaned with a clean, dry cloth.

NOTE: If the transmission is disassembled for any reason, the fluid and filter should be changed.

(1) Raise vehicle on a hoist. Place a drain container with a large opening, under transmission oil pan.

(2) Loosen pan bolts and tap the pan at one corner to break it loose allowing fluid to drain, then remove the oil pan.

(3) Install a new filter and o-ring on bottom of the valve body and tighten retaining screws to 5 N·m (40 in. lbs.).

(4) Clean the oil pan and magnet. Reinstall pan using new Mopar® Silicone Adhesive sealant. Tighten oil pan bolts to 19 N·m (165 in. lbs.).

(5) Pour four quarts of Mopar® ATF+4, Automatic Transmission Fluid, through the dipstick opening.

(6) Start engine and allow to idle for at least one minute. Then, with parking and service brakes applied, move selector lever momentarily to each position, ending in the park or neutral position.

(7) Check the transmission fluid level and add an appropriate amount to bring the transmission fluid level to 3mm (1/8 in.) below the lowest mark on the dipstick.

(8) Recheck the fluid level after the transmission has reached normal operating temperature (180°F.).

(9) To prevent dirt from entering transmission, make certain that dipstick is fully seated into the dipstick opening.

STANDARD PROCEDURE - TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF +4, Automatic Transmission Fluid, to transmission:

(a) If only fluid and filter were changed, add **6 pints (3 quarts)** of ATF +4 to transmission.

(b) If transmission was completely overhauled, or torque converter was replaced or drained, add **10 pints (5 quarts)** of ATF +4 to transmission.

(3) Apply parking brakes.

(4) Start and run engine at normal curb idle speed.

(5) Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.

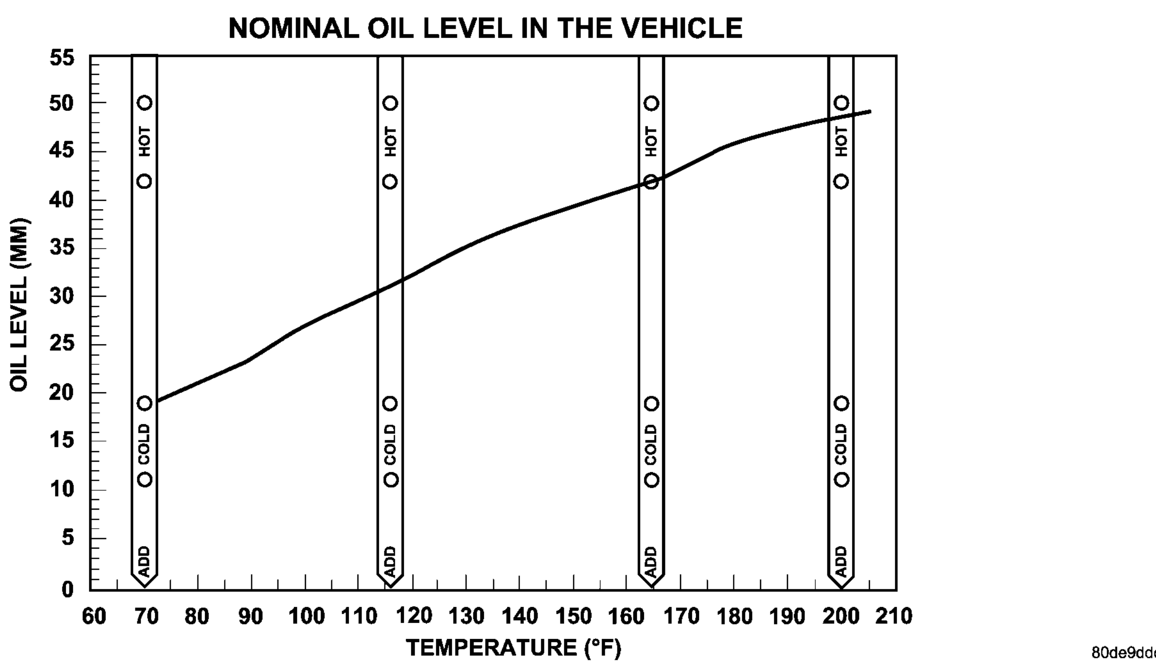


Fig. 162 42RLE Fluid Temperature Chart

FLUID AND FILTER (Continued)

(6) Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.

(7) Drive vehicle until transmission fluid is at normal operating temperature.

(8) With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

(9) Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

GEARSHIFT CABLE

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position - Normal position. Engine starts must be possible.

(d) NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

REMOVAL

(1) Shift transmission into PARK.

(2) Raise vehicle.

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 163).

(4) Remove shift cable from the cable support bracket.

(5) Lower vehicle.

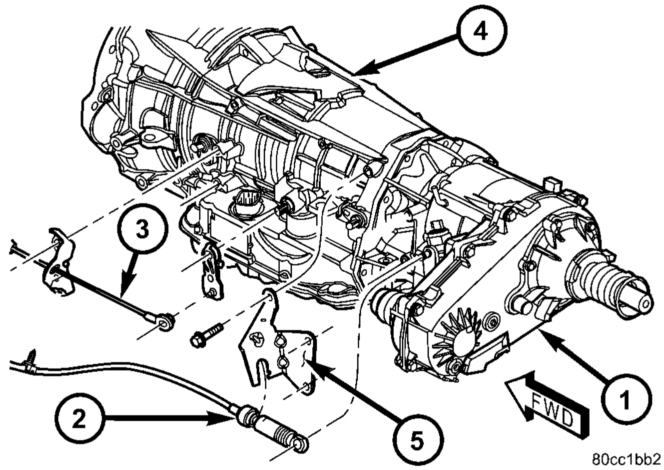


Fig. 163 Remove Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

(6) Remove necessary console parts for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 164).

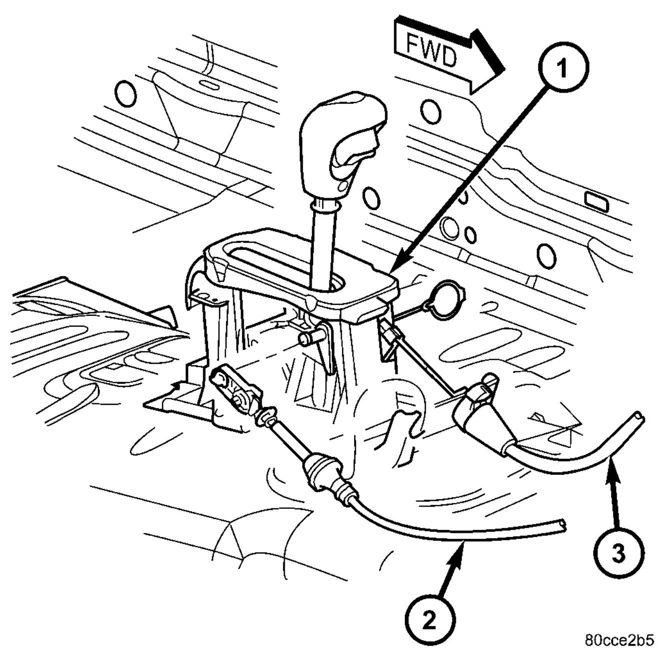


Fig. 164 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

GEARSHIFT CABLE (Continued)

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 165).

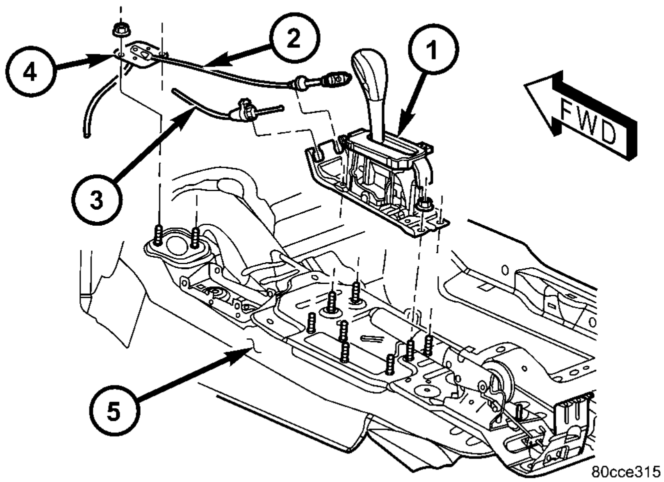


Fig. 165 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

(9) Pull cable through floor panel opening.
(10) Remove shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.
(2) Install seal plate to studs in floor pan (Fig. 166).
(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in.lbs.).

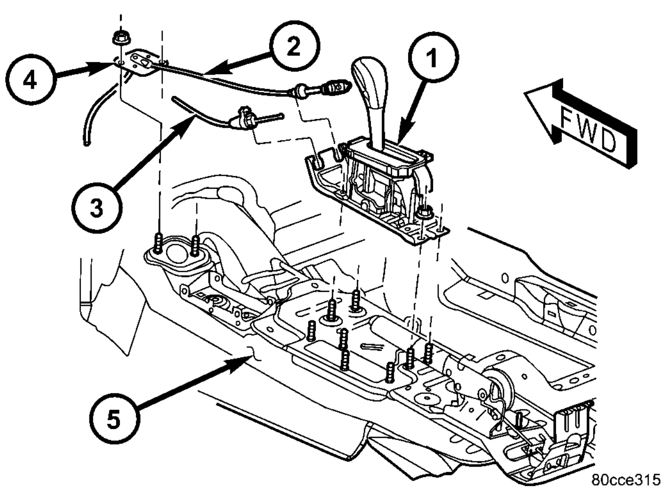


Fig. 166 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

(4) Install the shift cable to the shifter assembly bracket (Fig. 167). Push cable into the bracket until secure.
(5) Place the floor shifter lever in PARK position.
(6) Loosen the adjustment screw on the shift cable.
(7) Snap the shift cable onto the shift lever pin.

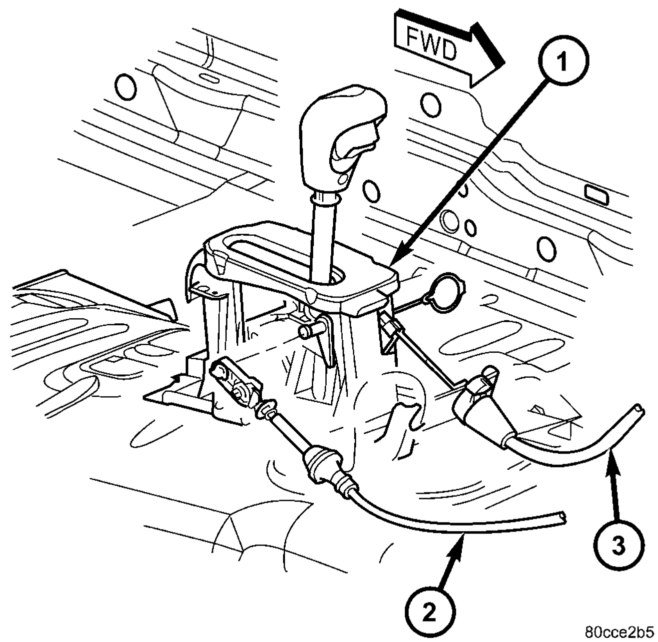


Fig. 167 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(8) Raise the vehicle.
(9) Install the shift cable to the shift cable support bracket (Fig. 168).
(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.
(11) Snap the shift cable onto the transmission manual shift lever.
(12) Lower vehicle.
(13) Verify that the shift lever is in the PARK position.
(14) Tighten the adjustment screw to 7 N·m (65 in.lbs.).
(15) Verify correct shifter operation.
(16) Install any console parts removed for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

GEARSHIFT CABLE (Continued)

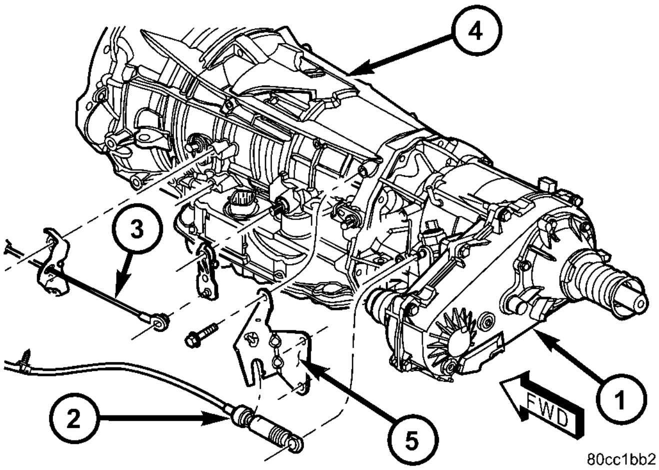


Fig. 168 Install Shift Cable

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the TRS may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into PARK.

(2) Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(3) Loosen the shift cable adjustment screw (Fig. 169).

(4) Raise vehicle.

(5) Unsnap cable eyelet from transmission shift lever.

(6) Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Snap cable eyelet onto transmission shift lever.

(9) Lower vehicle

(10) Tighten the shift cable adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct operation.

(12) Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

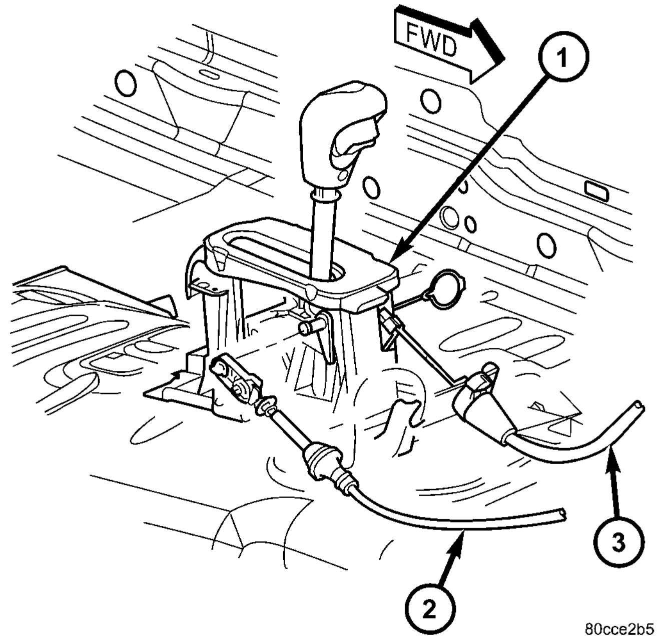


Fig. 169 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

HOLDING CLUTCHES

DESCRIPTION

Two hydraulically applied multi-disc clutches are used to hold planetary geartrain components stationary while the input clutches drive others. The 2/4 and Low/Reverse clutches are considered holding clutches and are contained at the rear of the transmission case (Fig. 170).

OPERATION

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.

2/4 CLUTCH

The 2/4 clutch is hydraulically applied in second and fourth gears by pressurized fluid against the 2/4 clutch piston. When the 2/4 clutch is applied, the front sun gear assembly is held or grounded to the transmission case.

HOLDING CLUTCHES (Continued)

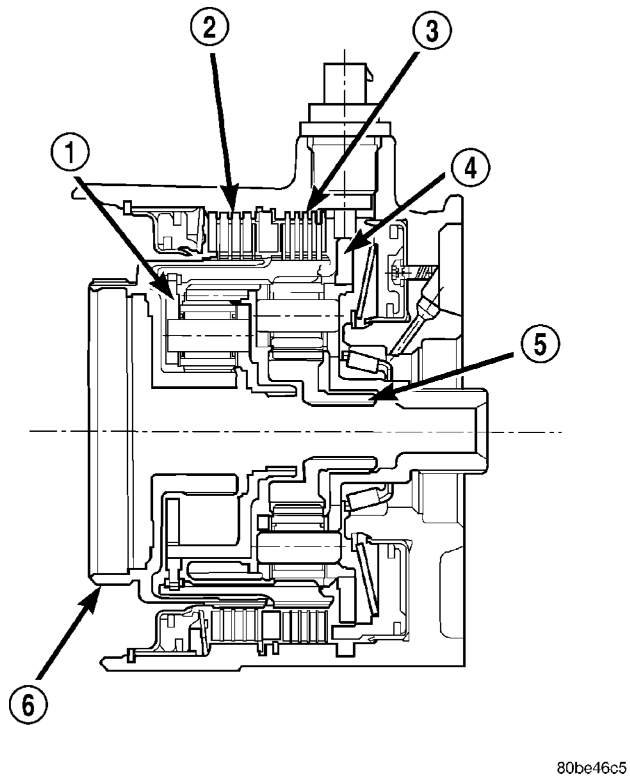


Fig. 170 2/4 and Low/Reverse Clutches

1 - FRONT PLANET CARRIER/REAR ANNULUS
2 - 2/4 CLUTCH
3 - L/R CLUTCH
4 - REAR PLANET CARRIER/FRONT ANNULUS
5 - REAR SUN GEAR
6 - FRONT SUN GEAR ASSEMBLY

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gears by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the front planet carrier/rear annulus assembly is held or grounded to the transmission case.

INPUT CLUTCH ASSEMBLY

DISASSEMBLY

(1) Mount input clutch assembly to Input Clutch Pressure Fixture (Tool 8391).

(2) Tap down reverse clutch reaction plate to release pressure from snap ring (Fig. 171).

(3) Remove reverse clutch snap ring (Fig. 172).

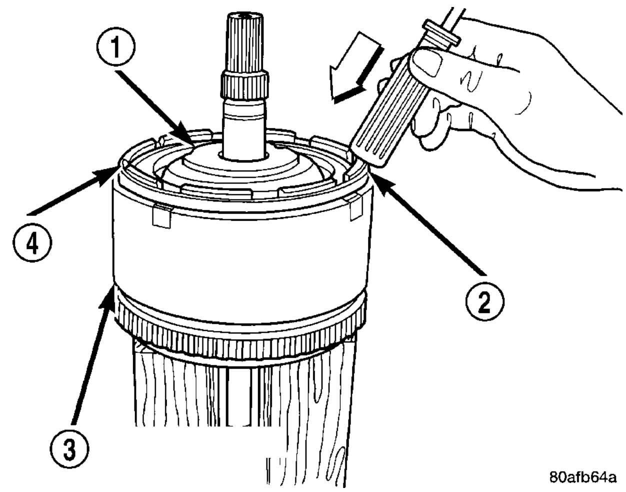


Fig. 171 Tapping Reaction Plate

1 - #4 THRUST PLATE (SELECT)
2 - TAP DOWN REVERSE CLUTCH REACTION PLATE TO REMOVE OR INSTALL SNAP RING
3 - INPUT CLUTCH RETAINER
4 - REVERSE CLUTCH REACTION PLATE

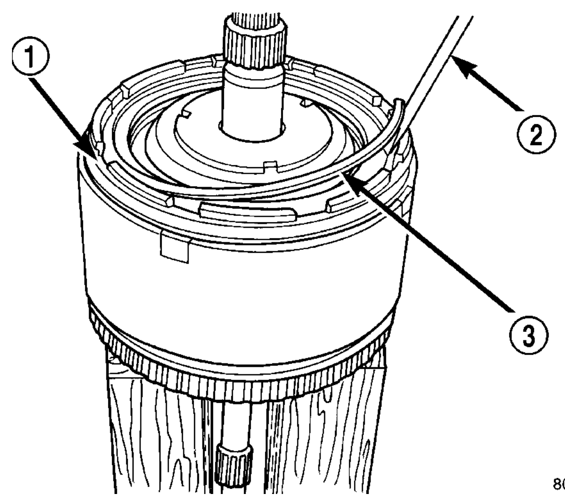


Fig. 172 Reverse Clutch Snap Ring

1 - REACTION PLATE
2 - SCREWDRIVER
3 - REVERSE CLUTCH SNAP RING (SELECT)

INPUT CLUTCH ASSEMBLY (Continued)

(4) Pry up and remove reverse clutch reaction plate (Fig. 173) (Fig. 174).

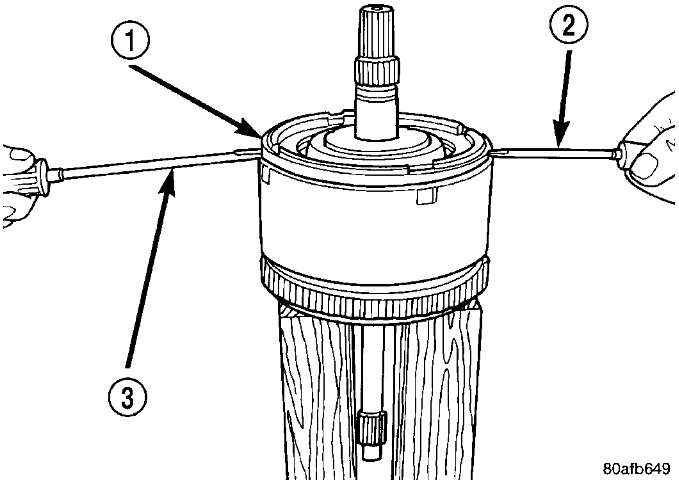


Fig. 173 Pry Reverse Clutch Reaction Plate

1 - REVERSE CLUTCH REACTION PLATE
2 - SCREWDRIVER
3 - SCREWDRIVER

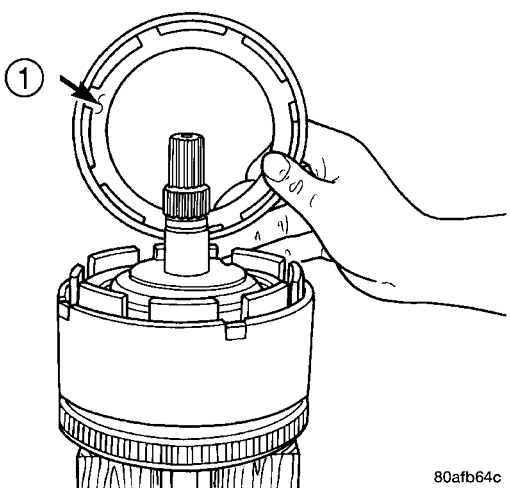


Fig. 174 Reverse Clutch Reaction Plate

1 - REVERSE CLUTCH REACTION PLATE (INSTALL FLAT SIDE DOWN)

(5) Remove the reverse clutch pack (two fibers/one steel) (Fig. 175).

NOTE: Tag reverse clutch pack for reassembly identification.

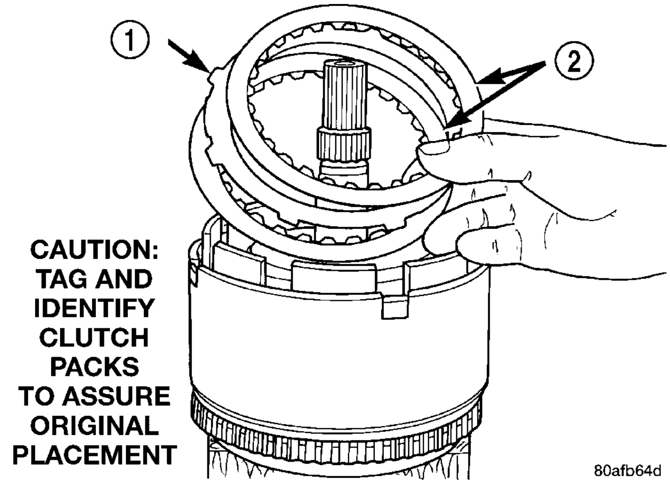


Fig. 175 Reverse Clutch Pack

1 - REVERSE CLUTCH PLATE
2 - REVERSE CLUTCH DISC

(6) Remove the OD/Reverse reaction plate snap ring (Fig. 176).

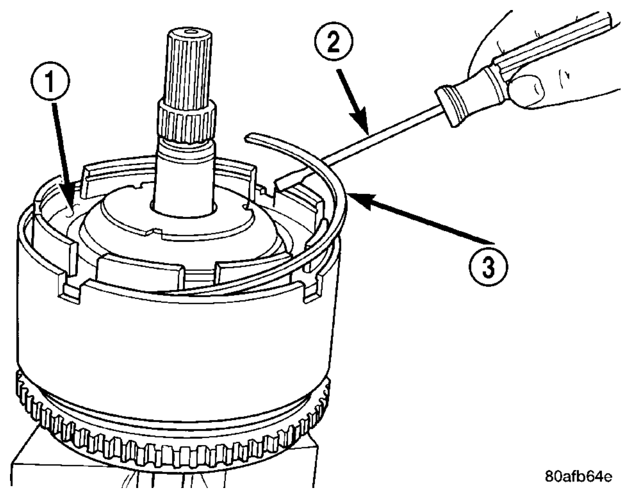


Fig. 176 OD/Reverse Pressure Plate Snap Ring

1 - OD/REVERSE PRESSURE PLATE
2 - SCREWDRIVER
3 - OD/REVERSE PRESSURE PLATE SNAP RING

INPUT CLUTCH ASSEMBLY (Continued)

(7) Remove OD/Reverse pressure plate (Fig. 177).

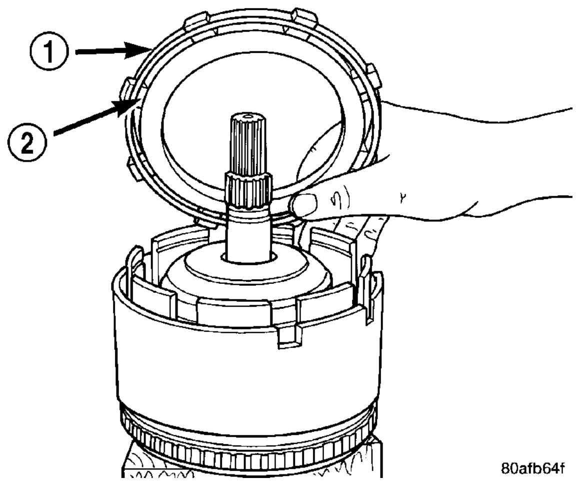


Fig. 177 OD/Reverse Reaction Plate

1 - OD/REVERSE PRESSURE PLATE (STEP SIDE DOWN)
2 - (STEP SIDE DOWN)

(8) Remove OD/Reverse reaction plate wave snap ring (Fig. 178).

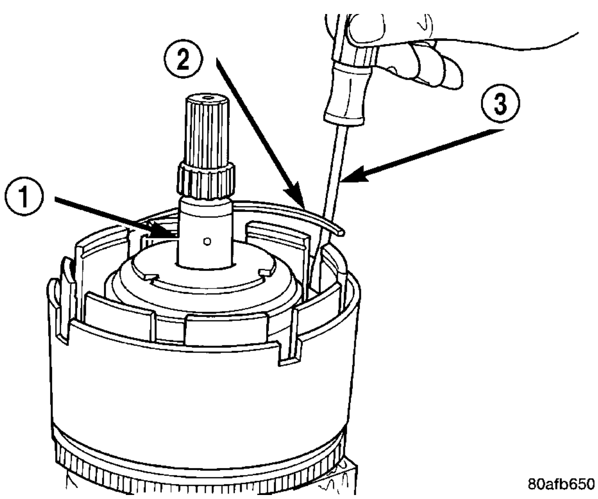


Fig. 178 Waved Snap Ring

1 - OVERDRIVE SHAFT ASSEMBLY
2 - OD/REVERSE CLUTCH WAVED SNAP RING
3 - SCREWDRIVER

(9) Remove OD shaft/hub and OD clutch pack (Fig. 179), (Fig. 180).

NOTE: Tag overdrive clutch pack for reassembly identification.

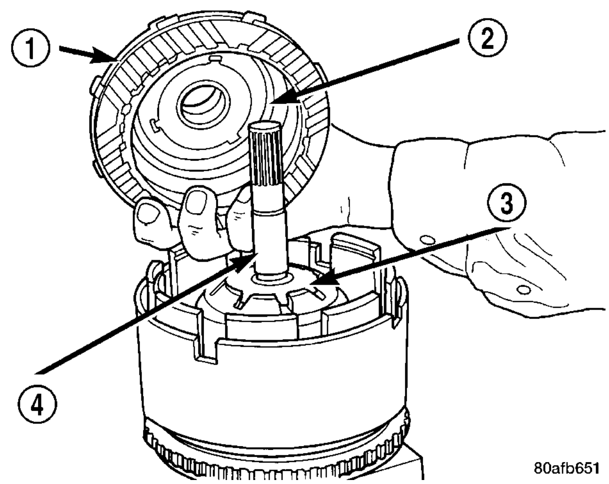


Fig. 179 Remove OD Clutch Pack

1 - OVERDRIVE SHAFT ASSEMBLY AND OD CLUTCH PACK
2 - #3 THRUST PLATE
3 - #3 THRUST WASHER
4 - UNDERDRIVE SHAFT ASSEMBLY

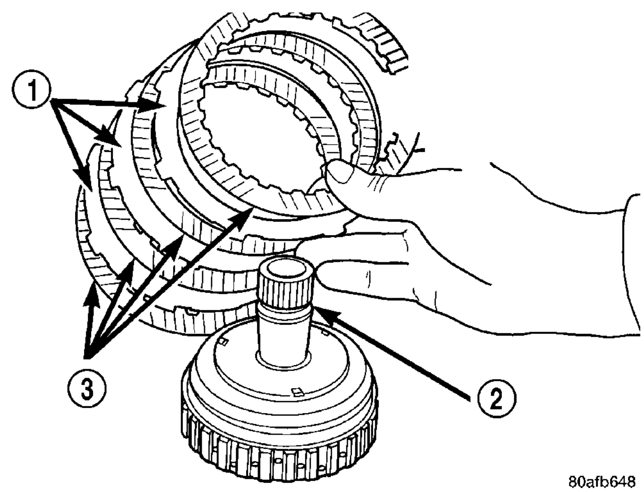


Fig. 180 Overdrive Clutch Pack

1 - OVERDRIVE CLUTCH PLATE
2 - OVERDRIVE SHAFT ASSEMBLY
3 - OVERDRIVE CLUTCH DISC

INPUT CLUTCH ASSEMBLY (Continued)

(10) Remove and inspect #3 & #4 thrust washers (Fig. 181).

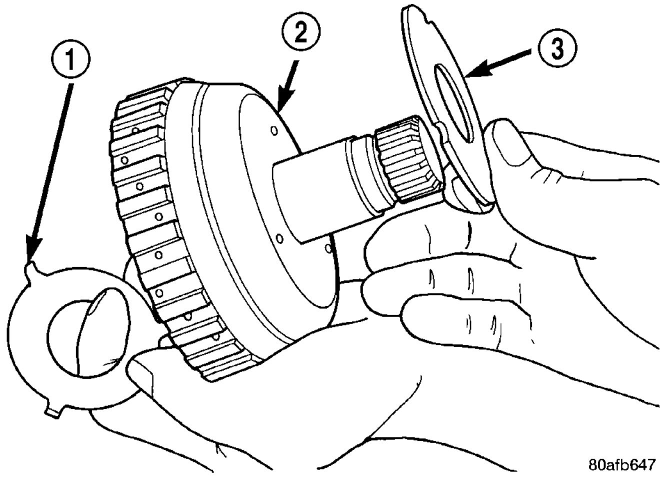


Fig. 181 #3 and #4 Thrust Washers

1 - #3 THRUST PLATE (3 TABS)
2 - OD SHAFT ASSEMBLY
3 - #4 THRUST PLATE (3 SLOTS)

(11) Remove the underdrive shaft assembly (Fig. 182).

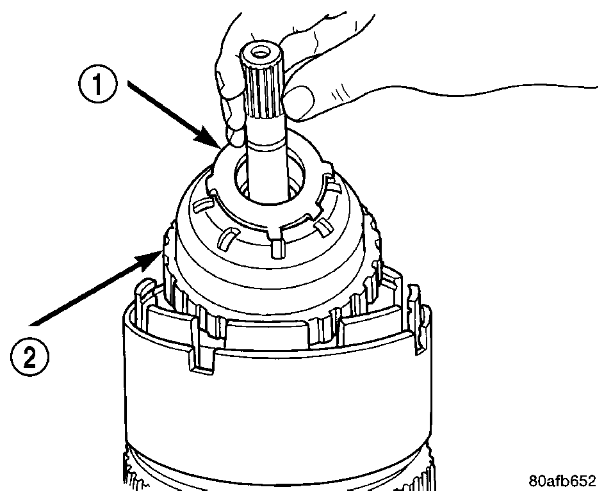


Fig. 182 Underdrive Shaft Assembly

1 - #3 THRUST WASHER (5 TABS)
2 - UNDERDRIVE SHAFT ASSEMBLY

(12) Remove the #2 needle bearing (Fig. 183).

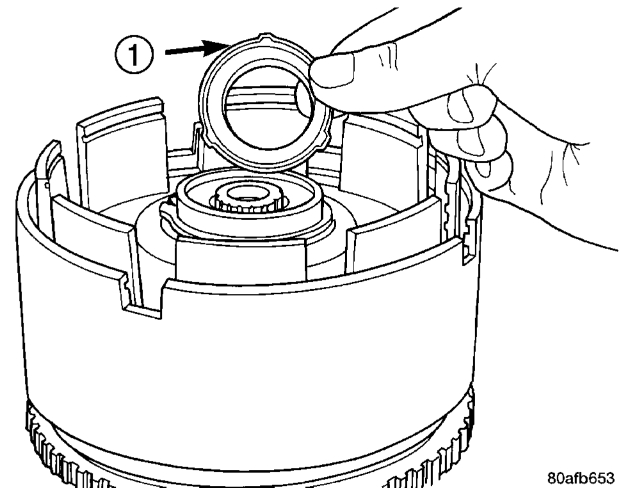


Fig. 183 No 2 Needle Bearing

1 - #2 NEEDLE BEARING (NOTE 3 TABS)

(13) Remove the OD/UD reaction plate tapered snap ring (Fig. 184).

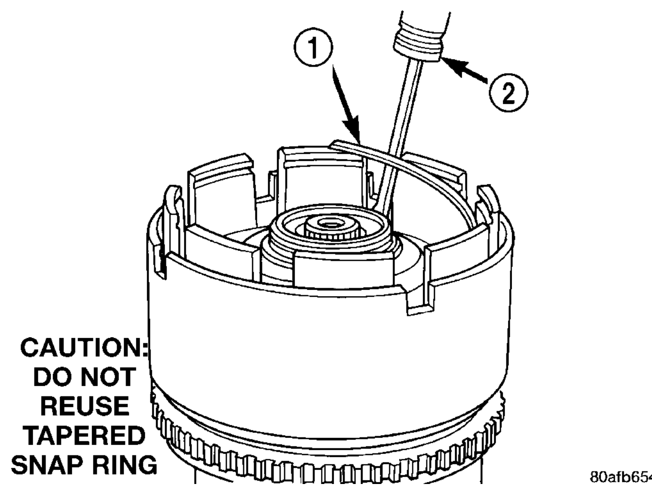


Fig. 184 Tapered Snap Ring

1 - OVERDRIVE/UNDERDRIVE CLUTCHES REACTION PLATE TAPERED SNAP RING
2 - SCREWDRIVER (DO NOT SCRATCH REACTION PLATE)

INPUT CLUTCH ASSEMBLY (Continued)

NOTE: The OD/UD clutch reaction plate has a step on both sides. The OD/UD clutches reaction plate goes tapered step side up.

(14) Remove the OD/UD reaction plate (Fig. 185).

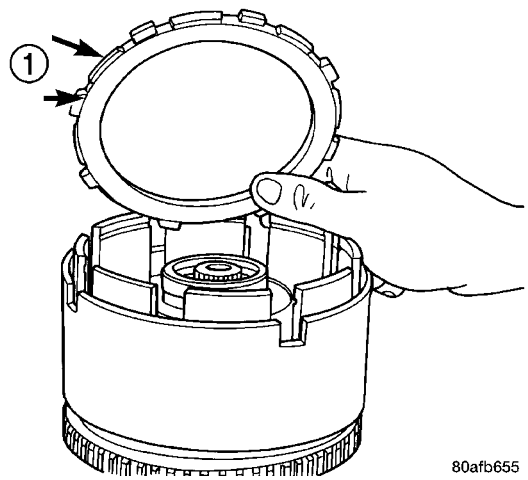


Fig. 185 OD/UD Reaction Plate

1 - OD/UD CLUTCH REACTION PLATE (STEP SIDE DOWN)

(15) Remove the first UD clutch disc (Fig. 186).

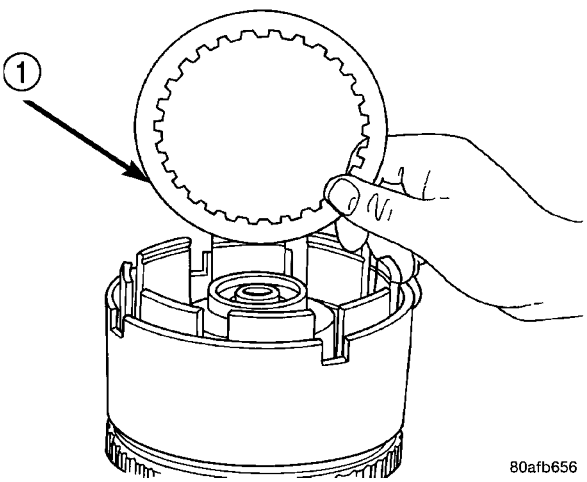


Fig. 186 Remove Last UD Clutch Disc

1 - ONE UNDERDRIVE CLUTCH DISC

(16) Remove the UD clutch flat snap ring (Fig. 187).

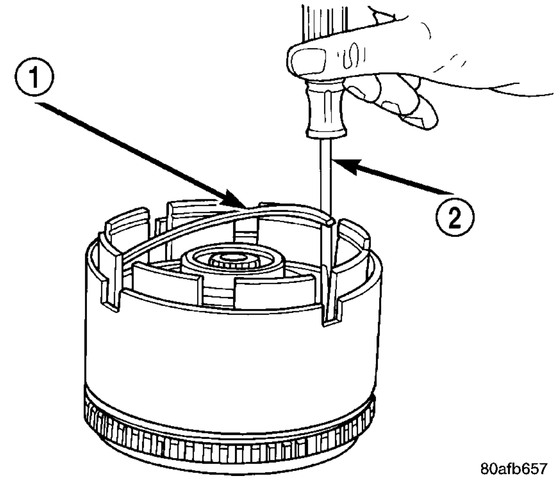


Fig. 187 UD Clutch Flat Snap Ring

1 - UNDERDRIVE CLUTCH REACTION PLATE FLAT SNAP RING
2 - SCREWDRIVER

NOTE: Tag underdrive clutch pack for reassembly identification.

(17) Remove the UD clutch pack (Fig. 188).

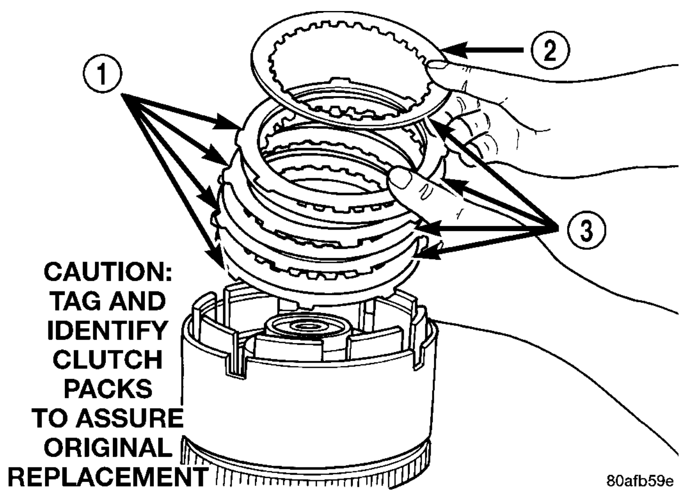


Fig. 188 Underdrive Clutch Pack

1 - CLUTCH PLATE
2 - ONE UD CLUTCH DISC
3 - CLUTCH DISC

INPUT CLUTCH ASSEMBLY (Continued)

CAUTION: Compress return spring just enough to remove or install snap ring.

(18) Using Tool 5059A and an arbor press, compress UD clutch piston enough to remove snap ring (Fig. 189), (Fig. 190).

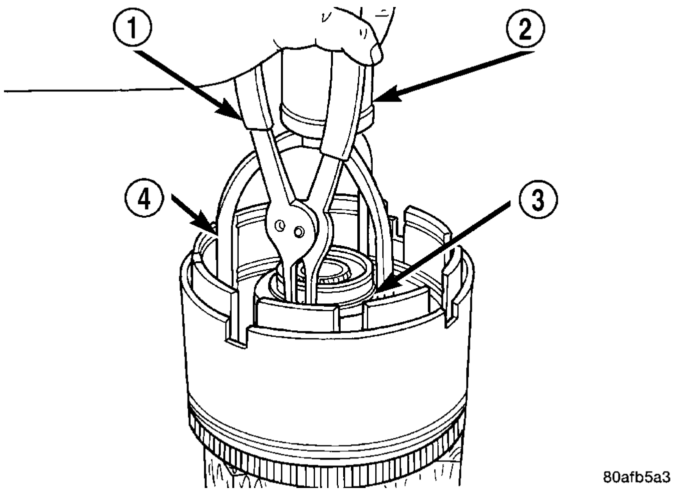


Fig. 189 UD Spring Retainer Snap Ring

1 - SNAP RING PLIERS
2 - ARBOR PRESS RAM
3 - SNAP RING
4 - SPECIAL TOOL 5059A

(19) Remove spring retainer (Fig. 190).

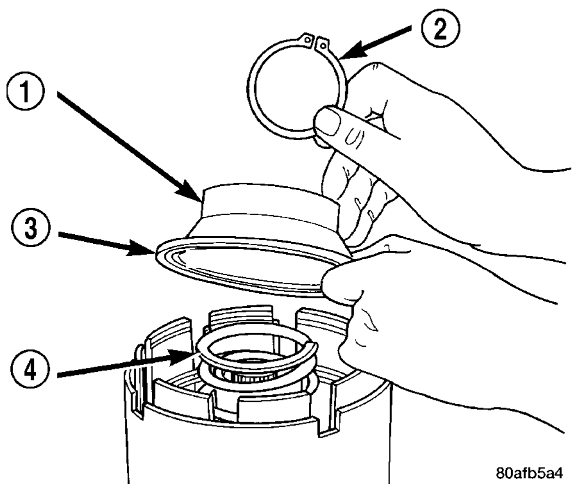


Fig. 190 UD Return Spring and Retainer

1 - UNDERDRIVE SPRING RETAINER
2 - SNAP RING
3 - SEAL
4 - PISTON RETURN SPRING

(20) Remove UD clutch piston (Fig. 191).

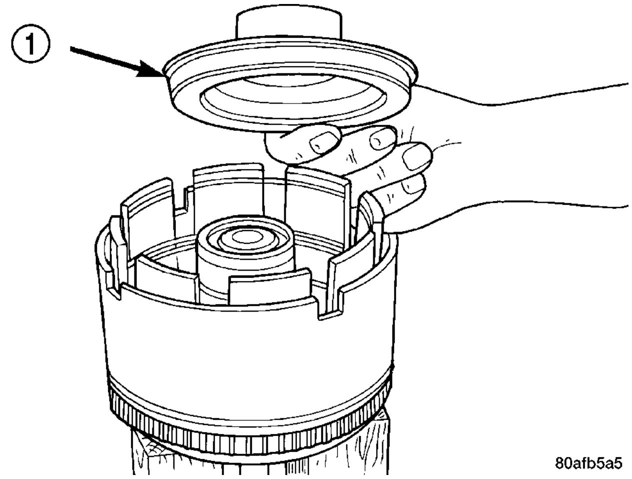


Fig. 191 Underdrive Clutch Piston

1 - PISTON

(21) Remove input hub tapered snap ring (Fig. 192).

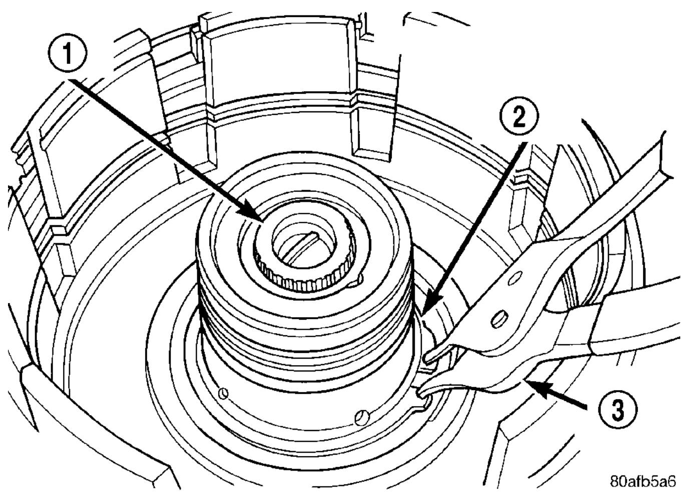


Fig. 192 Input Hub Tapered Snap Ring

1 - INPUT SHAFT
2 - INPUT HUB SNAP RING (TAPERED SIDE UP WITH TABS IN CAVITY)
3 - SNAP RING PLIERS

INPUT CLUTCH ASSEMBLY (Continued)

(22) Tap on input hub with soft faced hammer and separate input hub from OD/Reverse piston and clutch retainer (Fig. 193), (Fig. 194).

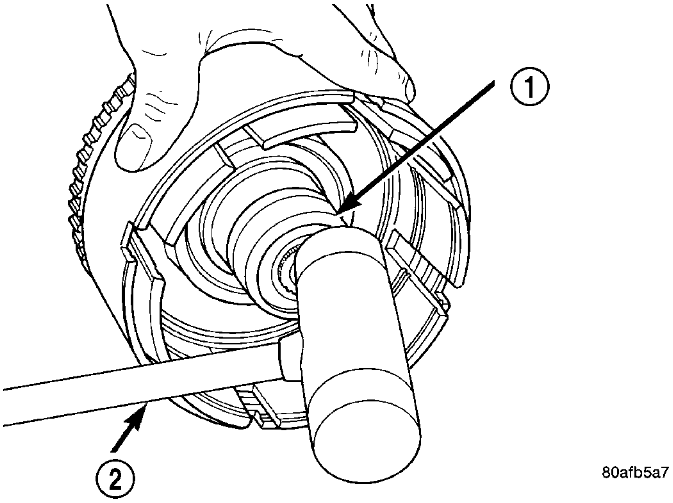


Fig. 193 Tap on Input Hub

1 - INPUT SHAFT AND HUB ASSEMBLY
2 - PLASTIC HAMMER

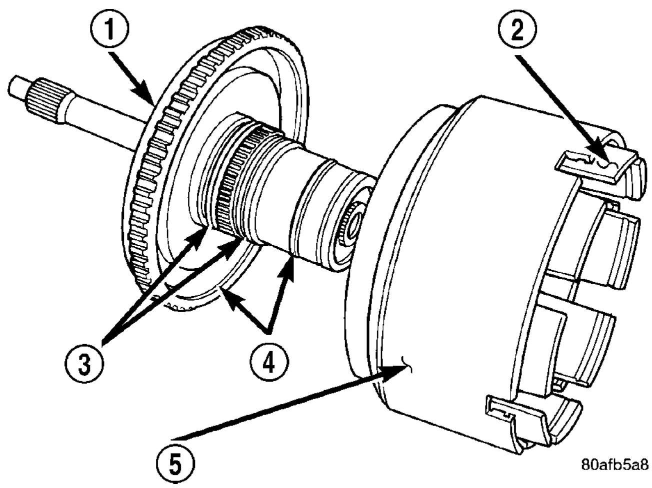


Fig. 194 Input Hub Removed

1 - INPUT SHAFT AND HUB ASSEMBLY
2 - INPUT CLUTCH RETAINER
3 - O-RING
4 - SEAL
5 - OVERDRIVE/REVERSE PISTON

(23) Separate clutch retainer from OD/Reverse piston (Fig. 195).

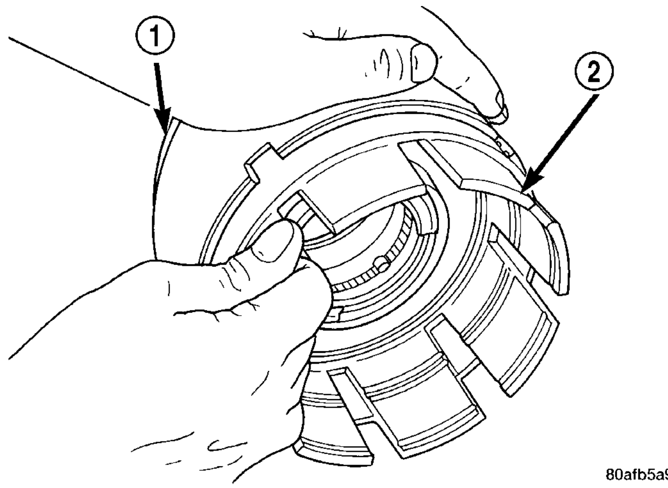


Fig. 195 Pull Retainer from Piston

1 - OVERDRIVE/REVERSE PISTON
2 - INPUT CLUTCH RETAINER

(24) Using Tool 6057 and an arbor press, compress return OD/Reverse piston return spring just enough to remove snap ring (Fig. 196), (Fig. 197).

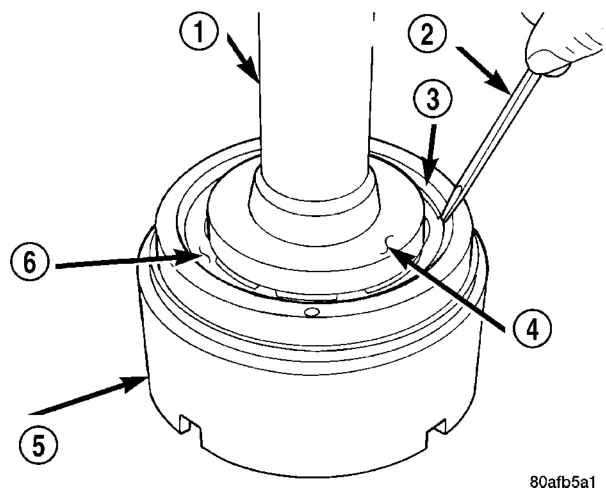


Fig. 196 Remove Snap Ring

1 - ARBOR PRESS RAM (COMPRESS RETURN SPRING JUST ENOUGH TO REMOVE OR INSTALL SNAP RING)
2 - SCREWDRIVER
3 - SNAP RING
4 - SPECIAL TOOL 6057
5 - OD/REVERSE PISTON
6 - RETURN SPRING

INPUT CLUTCH ASSEMBLY (Continued)

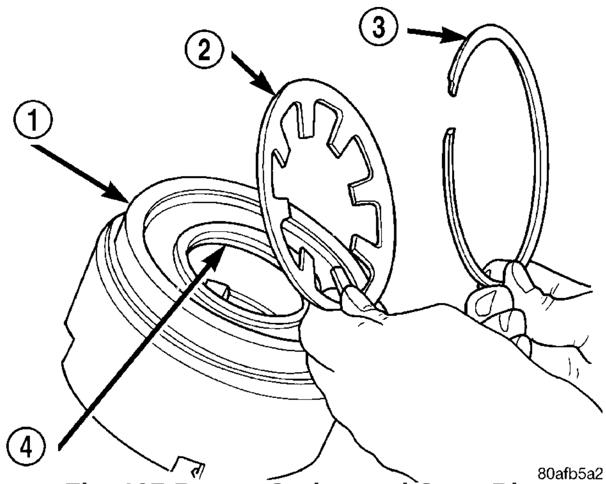


Fig. 197 Return Spring and Snap Ring

1 - OD/REVERSE PISTON
2 - RETURN SPRING
3 - SNAP RING
4 - O-RING

(25) Remove input shaft to input clutch hub snap ring (Fig. 198).

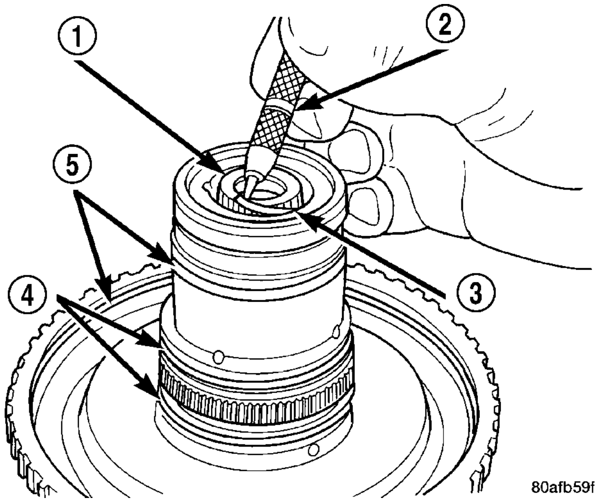


Fig. 198 Remove Input Shaft Snap Ring

1 - INPUT SHAFT
2 - SHARP-POINTED TOOL
3 - SNAP RING
4 - O-RINGS
5 - SEALS

(26) Using a suitably sized socket and an arbor press, remove input shaft from input shaft hub (Fig. 199).

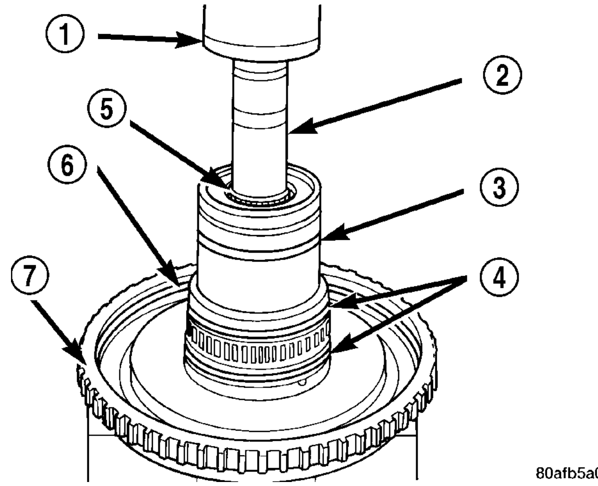


Fig. 199 Remove Input Shaft

1 - ARBOR PRESS RAM
2 - SOCKET
3 - SEAL
4 - O-RINGS
5 - INPUT SHAFT
6 - SEAL
7 - INPUT CLUTCH HUB

ASSEMBLY

Use petrolatum on all seals to ease assembly of components.

(1) Using an arbor press, install input shaft to input shaft hub (Fig. 200).

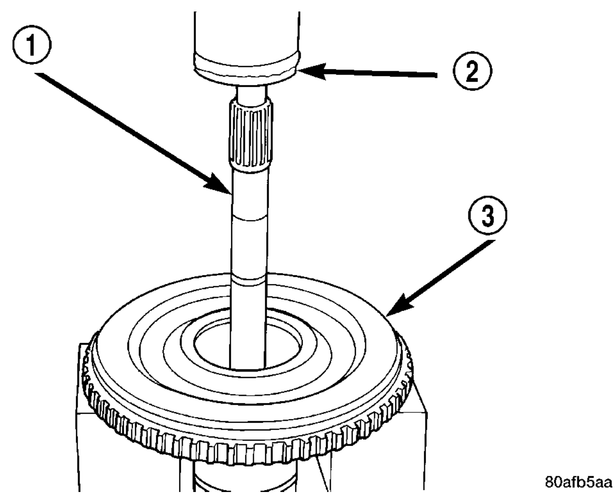


Fig. 200 Install Input Shaft

1 - INPUT SHAFT
2 - ARBOR PRESS RAM
3 - INPUT CLUTCH HUB

INPUT CLUTCH ASSEMBLY (Continued)

(2) Install input shaft snap ring (Fig. 201).

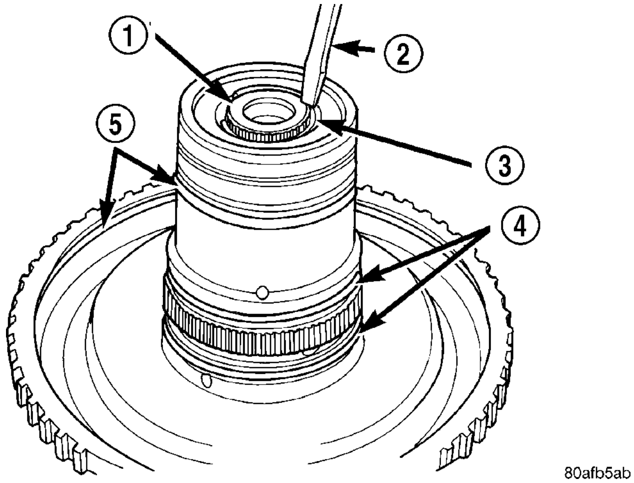


Fig. 201 Install Input Shaft Snap Ring

1 - INPUT SHAFT
2 - SCREWDRIVER (DO NOT SCRATCH BEARING SURFACE)
3 - SNAP RING
4 - O-RINGS
5 - SEALS

(3) Using an arbor press and Tool 6057, Install OD/Reverse piston return spring and snap ring (Fig. 202), (Fig. 203).

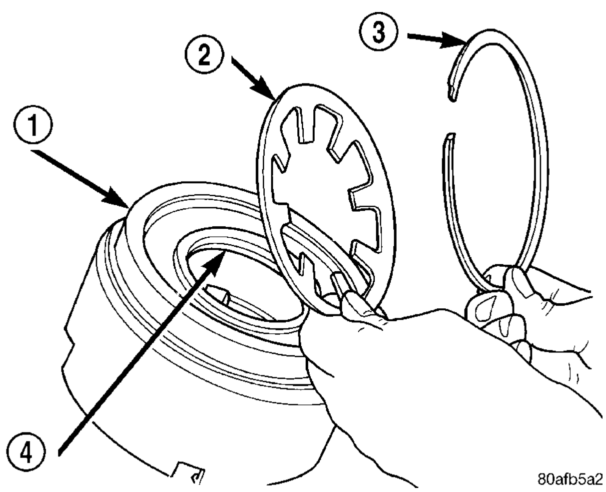


Fig. 202 Return Spring and Snap Ring

1 - OD/REVERSE PISTON
2 - RETURN SPRING
3 - SNAP RING
4 - O-RING

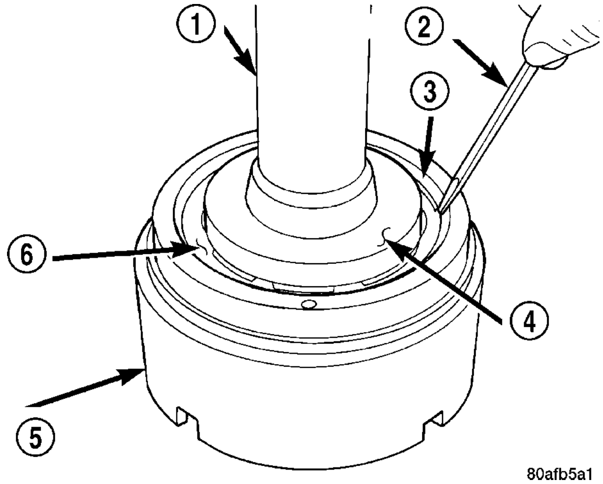


Fig. 203 Install Snap Ring

1 - ARBOR PRESS RAM (COMPRESS RETURN SPRING JUST ENOUGH TO REMOVE OR INSTALL SNAP RING)
2 - SCREWDRIVER
3 - SNAP RING
4 - SPECIAL TOOL 6057
5 - OD/REVERSE PISTON
6 - RETURN SPRING

(4) Install the OD/Reverse piston assembly to the input clutch retainer as shown in (Fig. 204).

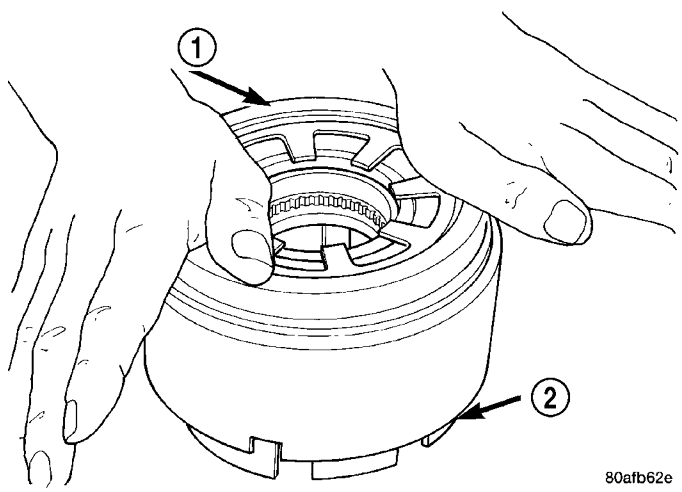


Fig. 204 Install OD/Reverse Piston

1 - PUSH DOWN TO INSTALL OVERDRIVE/REVERSE PISTON
2 - INPUT CLUTCHES RETAINER

INPUT CLUTCH ASSEMBLY (Continued)

(5) Install the input hub/shaft assembly to the OD/Reverse piston/clutch retainer assembly (Fig. 205).

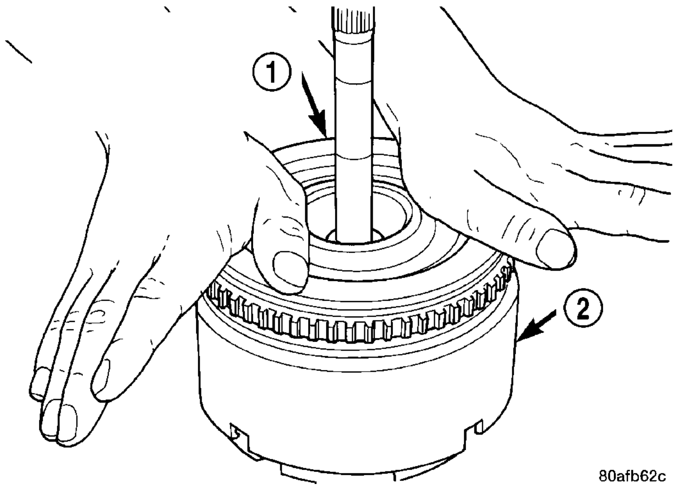


Fig. 205 Install Input Shaft Hub Assembly

1 - PUSH DOWN TO INSTALL INPUT SHAFT HUB ASSEMBLY (ROTATE TO ALIGN SPLINES)
2 - OD/REV. PISTON

(6) Install input hub tapered snap ring (Fig. 206). **Make sure snap ring is fully seated.**

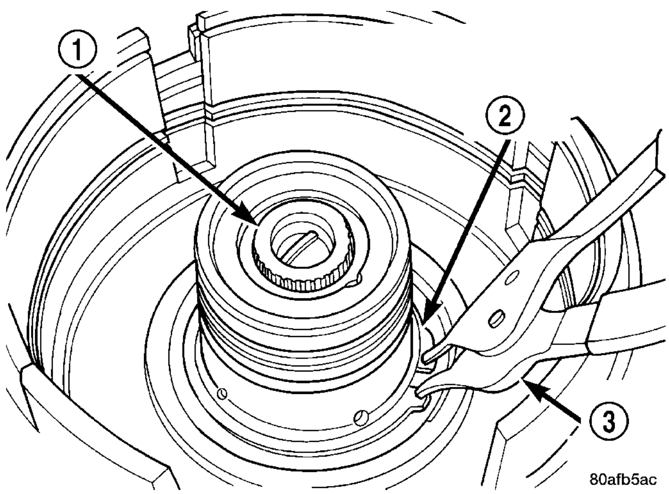


Fig. 206 Install Input Hub Tapered Snap Ring

1 - INPUT SHAFT
2 - INPUT HUB SNAP RING (TAPERED SIDE UP WITH TABS IN CAVITY)
3 - SNAP RING PLIERS

(7) Install UD clutch piston (Fig. 207).

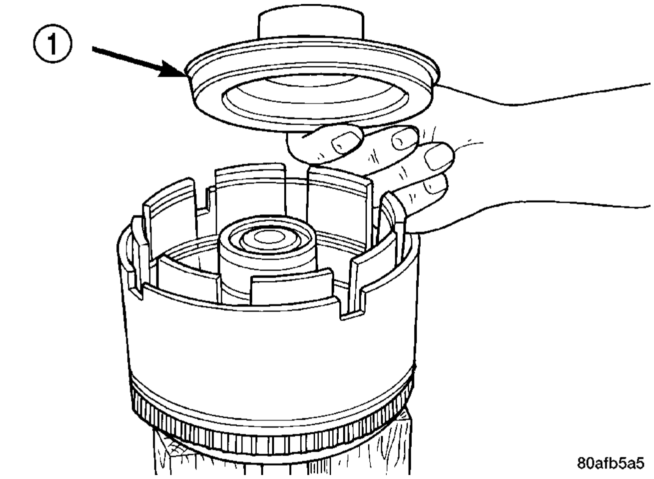


Fig. 207 Underdrive Clutch Piston

1 - PISTON

(8) Install UD piston return spring and Tool 5067 as shown in (Fig. 208).

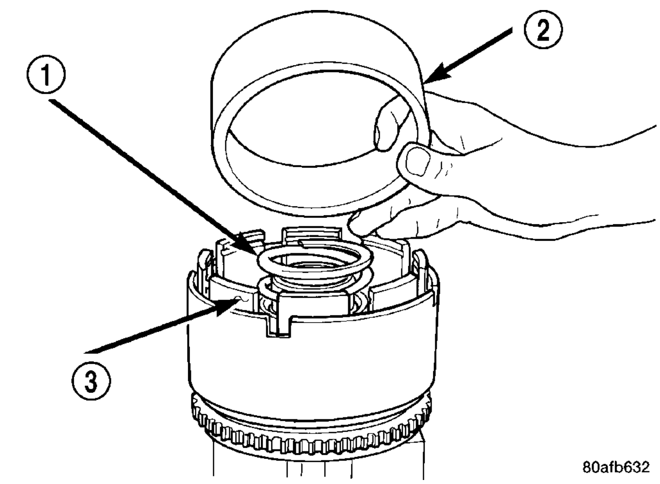


Fig. 208 Seal Compressor Special Tool 5067

1 - PISTON RETURN SPRING
2 - SPECIAL TOOL 5067
3 - INPUT CLUTCH RETAINER

INPUT CLUTCH ASSEMBLY (Continued)

(9) Using Tool 5059A and an arbor press, install the UD spring retainer and snap ring. (Fig. 209), (Fig. 210) Compress just enough to install snap ring.

CAUTION: Compress return spring just enough to install snap ring.

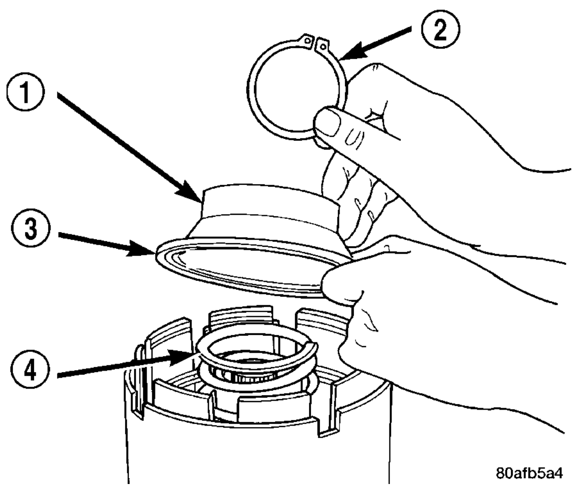


Fig. 209 UD Return Spring and Retainer

1 - UNDERDRIVE SPRING RETAINER
2 - SNAP RING
3 - SEAL
4 - PISTON RETURN SPRING

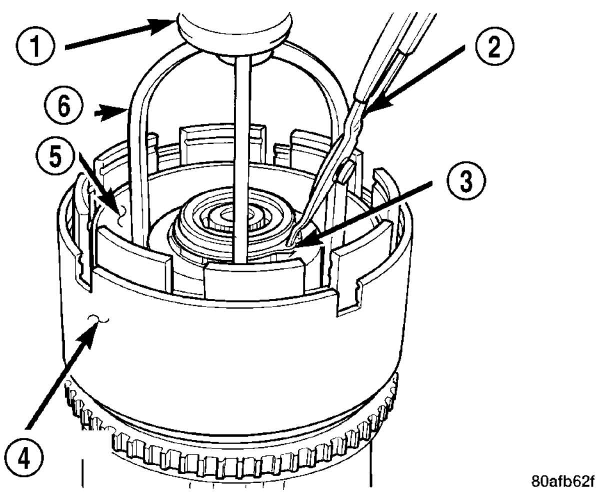


Fig. 210 Install UD Spring Retainer and Snap Ring

1 - ARBOR PRESS RAM
2 - SNAP RING PLIERS
3 - SNAP RING
4 - OD/REVERSE PISTON
5 - TOOL 5067
6 - TOOL 5059A

(10) Install the UD clutch pack (four fibers/four steels) (Fig. 211). Leave the top disc out until after the snap ring is installed.

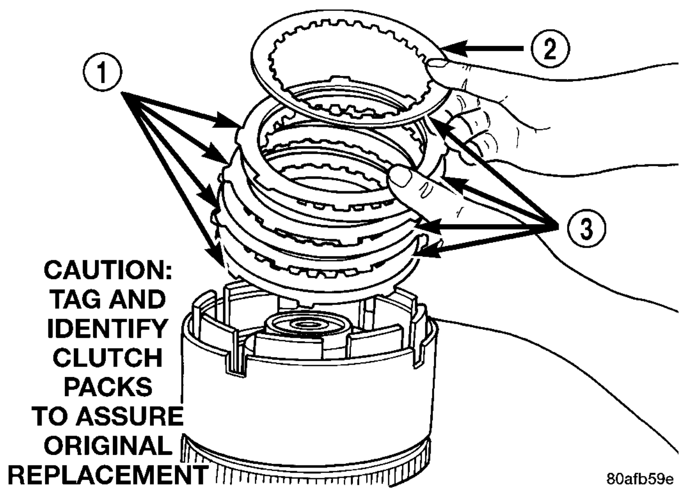


Fig. 211 Underdrive Clutch Pack

1 - CLUTCH PLATE
2 - ONE UD CLUTCH DISC
3 - CLUTCH DISC

(11) Install the UD clutch flat snap ring (Fig. 212).

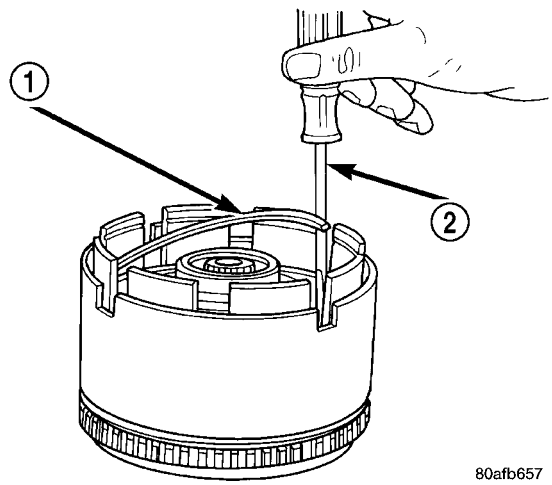


Fig. 212 UD Clutch Flat Snap Ring

1 - UNDERDRIVE CLUTCH REACTION PLATE FLAT SNAP RING
2 - SCREWDRIVER

INPUT CLUTCH ASSEMBLY (Continued)

(12) Install the last UD clutch disc (Fig. 213).

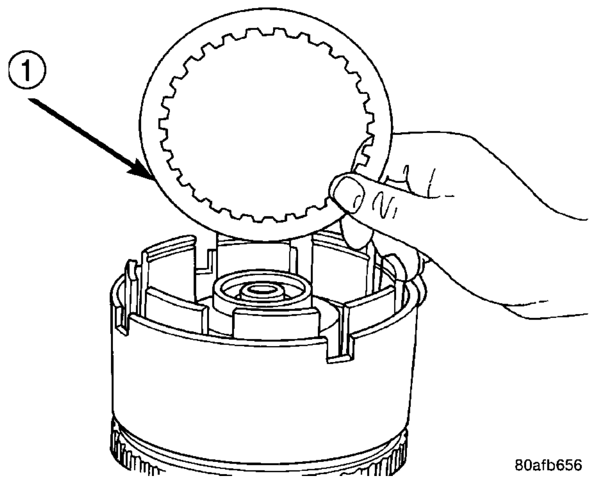


Fig. 213 Install Last UD Clutch Disc

1 - ONE UNDERDRIVE CLUTCH DISC

(13) Install the OD/UD clutch reaction plate and snap ring (Fig. 214), (Fig. 215). The OD/UD clutches reaction plate has a step on both sides. Install the OD/UD clutches reaction plate tapered step side up.

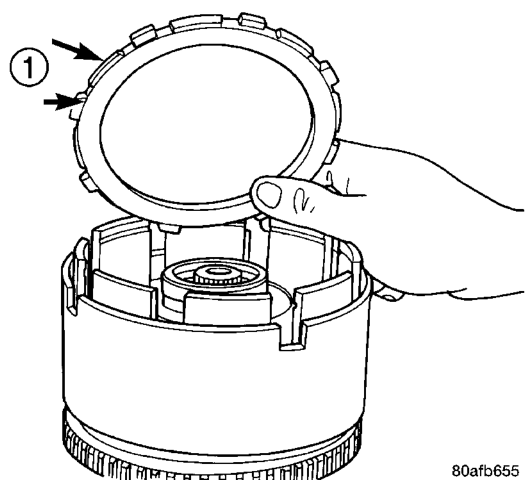


Fig. 214 OD/UD Reaction Plate

1 - OD/UD CLUTCH REACTION PLATE (STEP SIDE DOWN)

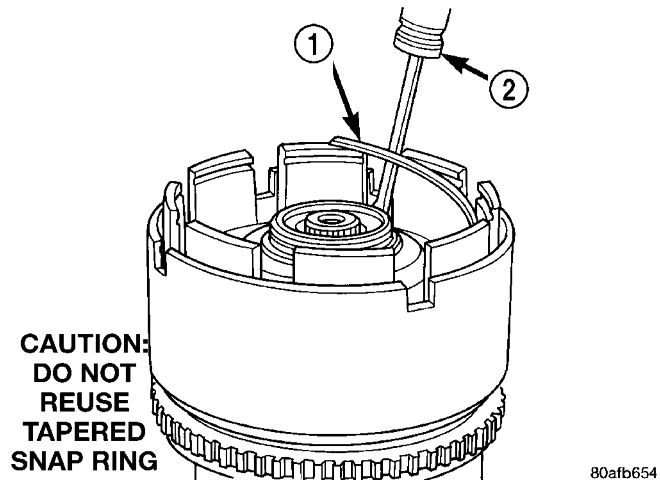


Fig. 215 Tapered Snap Ring

1 - OVERDRIVE/UNDERDRIVE CLUTCHES REACTION PLATE TAPERED SNAP RING
2 - SCREWDRIVER (DO NOT SCRATCH REACTION PLATE)

NOTE: Snap ring ends must be located within one finger of the input clutch hub. Be sure that snap ring is fully seated, by pushing with screwdriver, into snap ring groove all the way around.

(14) Seat tapered snap ring to ensure proper installation (Fig. 216).

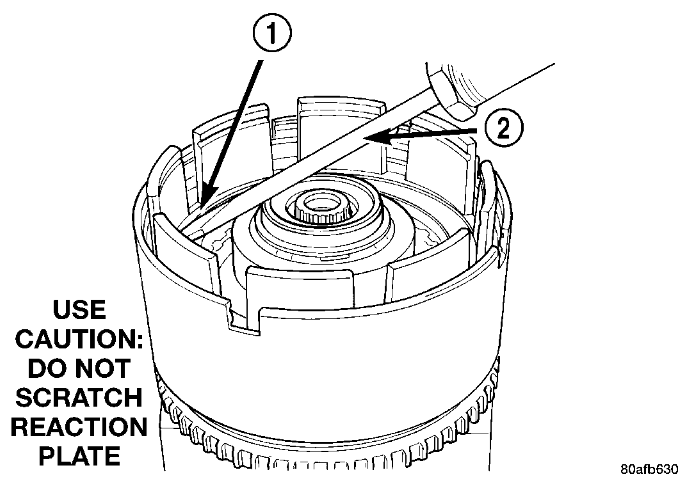


Fig. 216 Seating Tapered Snap Ring

1 - OVERDRIVE/UNDERDRIVE CLUTCHES REACTION PLATE TAPERED SNAP RING
2 - SCREWDRIVER

INPUT CLUTCH ASSEMBLY (Continued)

(15) Install input clutch assembly to the Input Clutch Pressure Fixture - Tool 8391 (Fig. 217).

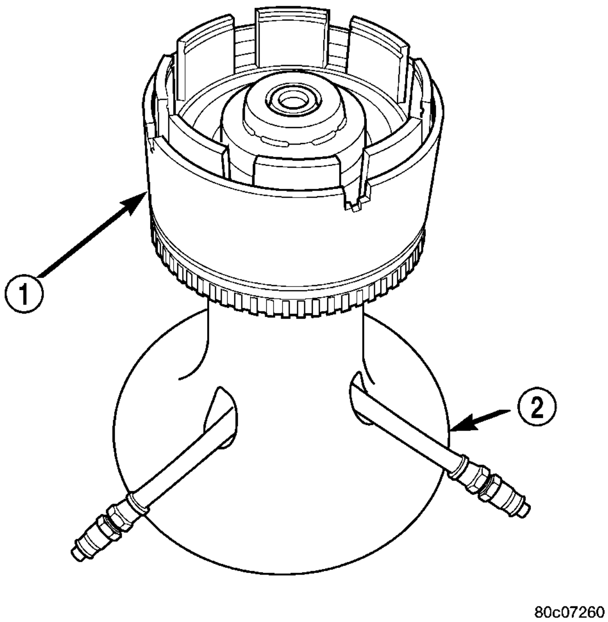


Fig. 217 Input Clutch Assembly on Pressure Fixture Tool - 8391

1 - INPUT CLUTCH ASSEMBLY
2 - INPUT CLUTCH PRESSURE FIXTURE - 8391

(16) Set up dial indicator on the UD clutch pack as shown in (Fig. 218).

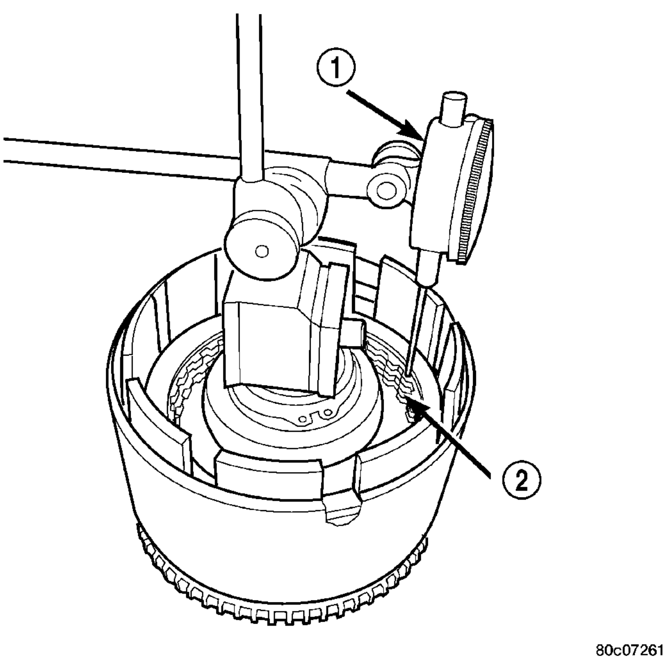


Fig. 218 Set Up Dial Indicator to Measure UD Clutch Clearance

1 - DIAL INDICATOR
2 - UNDERDRIVE CLUTCH

(17) Using moderate pressure, press down and hold (near indicator) the UD clutch pack with screwdriver or suitable tool and zero dial indicator (Fig. 219). When releasing pressure on clutch pack, indicator reading should advance 0.005–0.010.

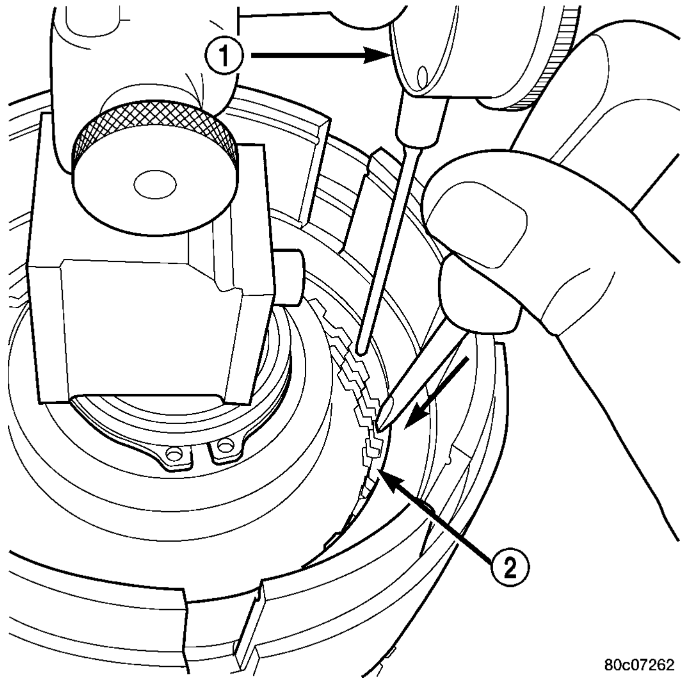


Fig. 219 Press Down on UD Clutch Pack and Zero Dial Indicator

1 - DIAL INDICATOR
2 - UNDERDRIVE CLUTCH

CAUTION: Do not apply more than 30 psi (206 kPa) to the underdrive clutch pack.

(18) Apply 30 psi (206 kPa) to the underdrive hose on Tool 8391 and measure UD clutch clearance. Measure and record UD clutch pack measurement in four (4) places, 90° apart.

(19) Take average of four measurements and compare with UD clutch pack clearance specification. **Underdrive clutch pack clearance must be 0.94-1.50 mm (0.037-0.059 in.).**

(20) If necessary, select the proper reaction plate to achieve specifications:

INPUT CLUTCH ASSEMBLY (Continued)

(21) Install the OD clutch pack (four fibers/three steels) (Fig. 220).

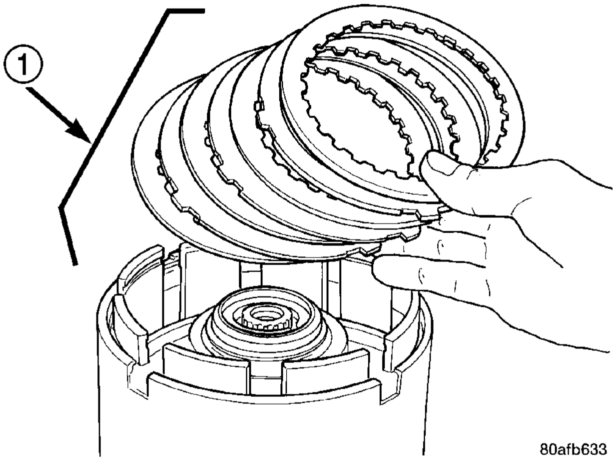


Fig. 220 Install OD Clutch Pack

1 - OVERDRIVE CLUTCH PACK

(22) Install OD reaction plate waved snap ring (Fig. 221).

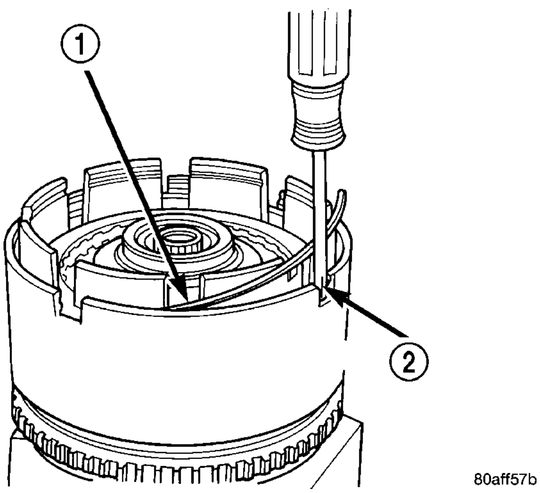


Fig. 221 Install Waved Snap Ring

1 - OVERDRIVE REACTION PLATE WAVED SNAP RING
2 - SCREWDRIVER

(23) Install the OD/Reverse reaction plate with large step down (towards OD clutch pack) (Fig. 222).

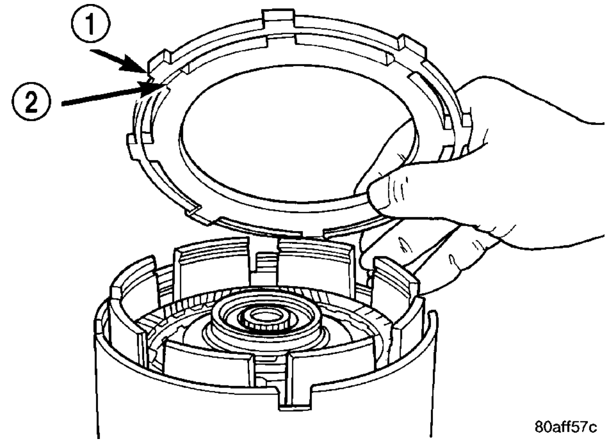


Fig. 222 OD/Reverse Reaction Plate

1 - OVERDRIVE/REVERSE PRESSURE PLATE
2 - (STEP SIDE DOWN)

(24) Install OD reaction plate flat snap ring (Fig. 223).

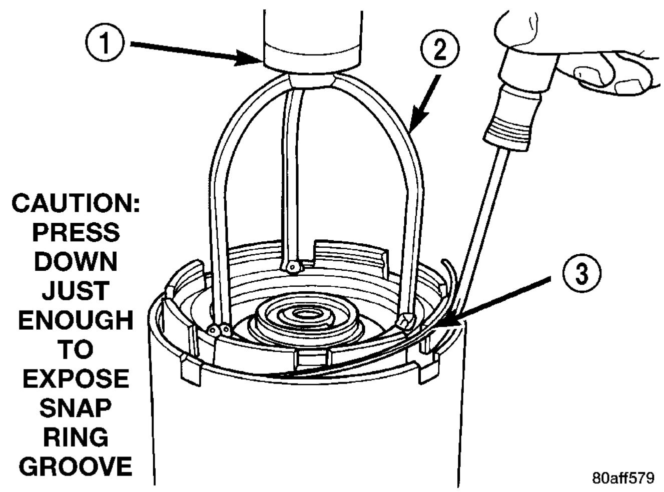


Fig. 223 Install Flat Snap Ring

1 - ARBOR PRESS RAM
2 - TOOL 5059A
3 - FLAT SNAP RING

INPUT CLUTCH ASSEMBLY (Continued)

(25) Measure OD clutch pack clearance. Set up dial indicator on top of the OD/Reverse reaction plate as shown in (Fig. 224).

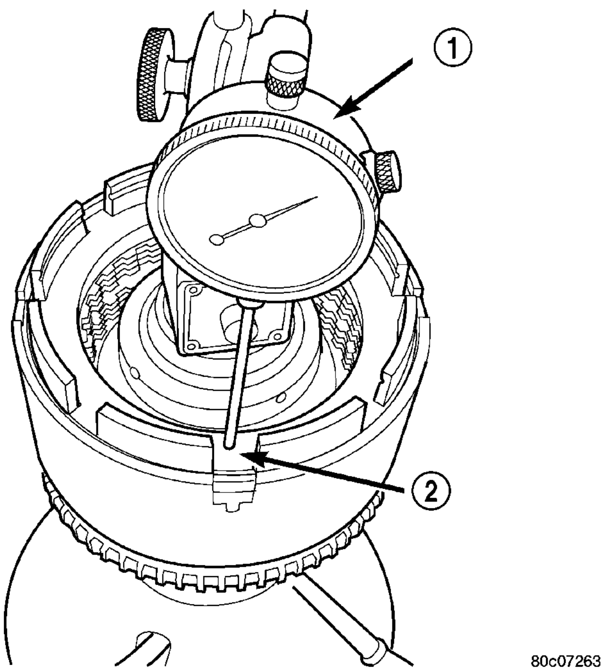


Fig. 224 Measure OD Clutch Pack Clearance

1 - DIAL INDICATOR
2 - OD/REVERSE PRESSURE PLATE

(26) Zero dial indicator and apply 30 psi (206 kPa) air pressure to the overdrive clutch hose on Tool 8391. Measure and record OD clutch pack measurement in four (4) places, 90° apart.

(27) Take average of four measurements and compare with OD clutch pack clearance specification. **The overdrive (OD) clutch pack clearance is 1.07-3.25 mm (0.042-0.128 in.).**

If not within specifications, the clutch is not assembled properly. There is no adjustment for the OD clutch clearance.

(28) Install reverse clutch pack (two fibers/one steel) (Fig. 225).

(29) Install reverse clutch reaction plate with the flat side down towards reverse clutch (Fig. 226).

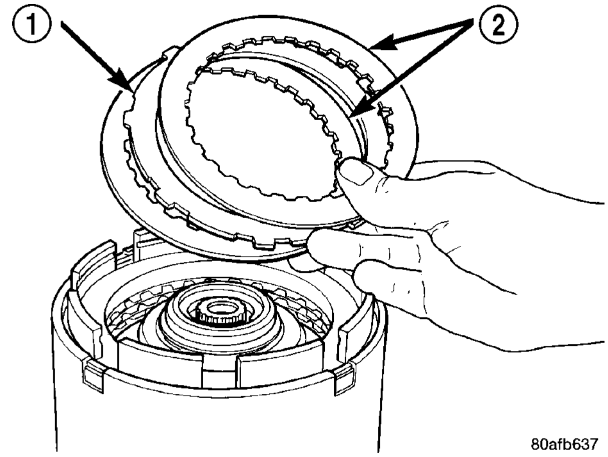


Fig. 225 Install Reverse Clutch Pack

1 - REVERSE CLUTCH PLATE
2 - REVERSE CLUTCH DISCS

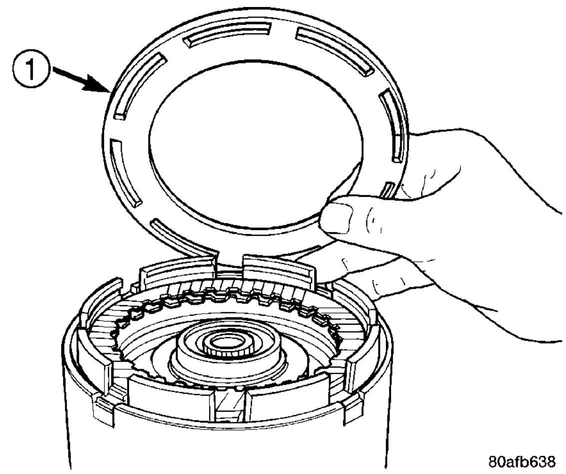


Fig. 226 Install Reaction Plate

1 - REVERSE CLUTCH REACTION PLATE (FLAT SIDE DOWN)

INPUT CLUTCH ASSEMBLY (Continued)

(30) Tap reaction plate down to allow installation of the reverse clutch snap ring. Install reverse clutch snap ring (Fig. 227).

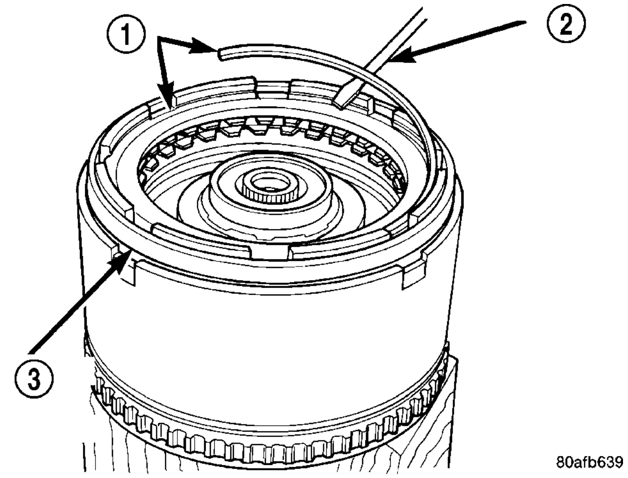


Fig. 227 Install Reverse Clutch Snap Ring

1 - REVERSE CLUTCH SNAP RING (SELECT)
2 - SCREWDRIVER
3 - REVERSE CLUTCH REACTION PLATE

(31) Pry up reverse reaction plate to seat against snap ring (Fig. 228).

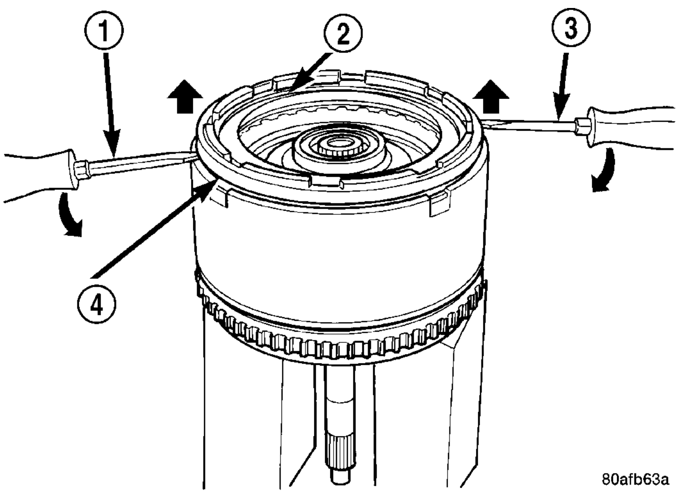


Fig. 228 Pry Up Reaction Plate

1 - SCREWDRIVER
2 - SNAP RING
3 - SCREWDRIVER
4 - MUST RAISE REVERSE REACTION PLATE TO RAISE SNAP RING

(32) Set up a dial indicator on the reverse clutch pack as shown in (Fig. 229).

(33) Using moderate pressure, press down and hold (near indicator) reverse clutch disc with screwdriver or suitable tool and zero dial indicator (Fig. 230). When releasing pressure, indicator should advance 0.005-0.010. as clutch pack relaxes.

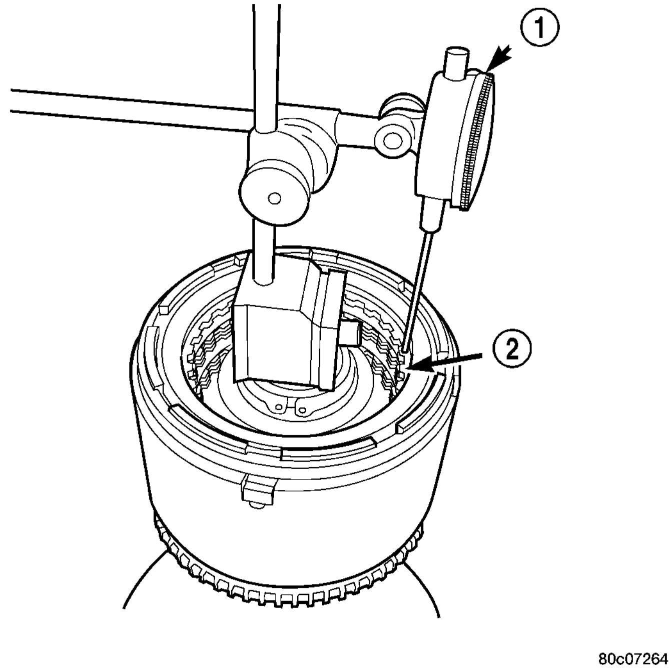


Fig. 229 Measure Reverse Clutch Pack Clearance

1 - DIAL INDICATOR
2 - REVERSE CLUTCH

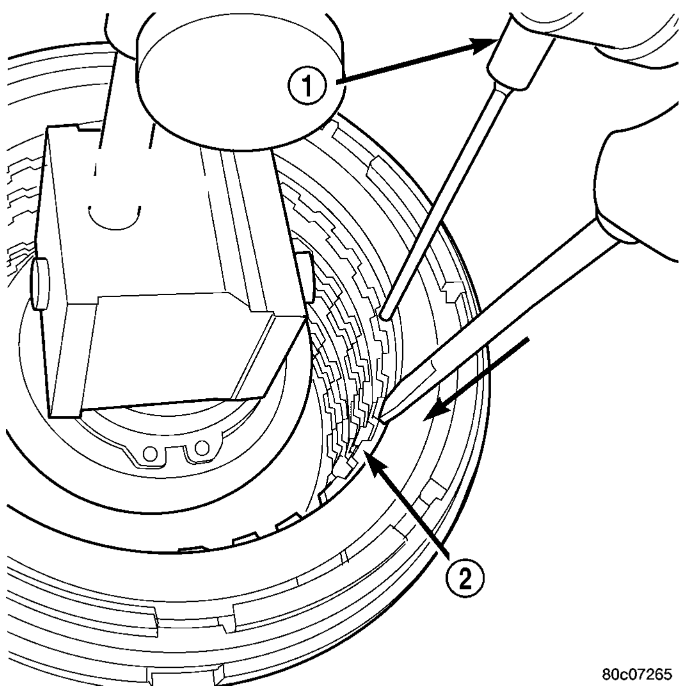


Fig. 230 Press Down on Reverse Clutch and Zero Indicator

1 - DIAL INDICATOR
2 - REVERSE CLUTCH

(34) Apply 30 psi (206 kPa) air pressure to the reverse clutch hose on Tool 8391. Measure and record reverse clutch pack measurement in four (4) places, 90° apart.

INPUT CLUTCH ASSEMBLY (Continued)

(35) Take average of four measurements and compare with reverse clutch pack clearance specification. **The reverse clutch pack clearance is 0.89-1.37 mm (0.035-0.054 in.).** Select the proper reverse clutch snap ring to achieve specifications:

(36) To complete the assembly, reverse clutch and overdrive clutch must be removed.

(37) Install the #2 needle bearing (Fig. 231).

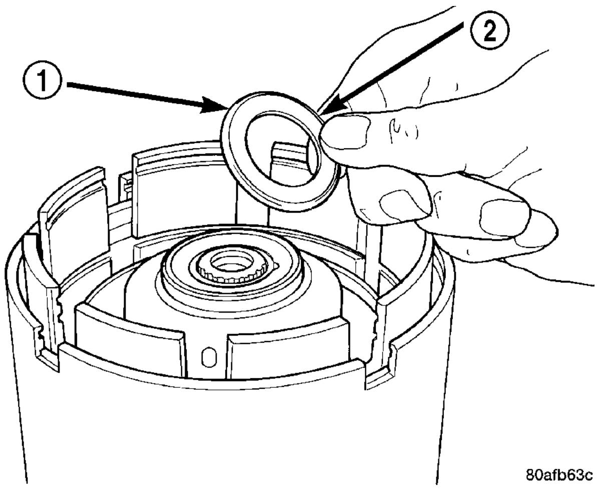


Fig. 231 Install No. 2 Needle Bearing

1 - #2 NEEDLE BEARING (NOTE 3 SMALL TABS)
2 - TABS UP

(38) Install the underdrive shaft assembly (Fig. 232).

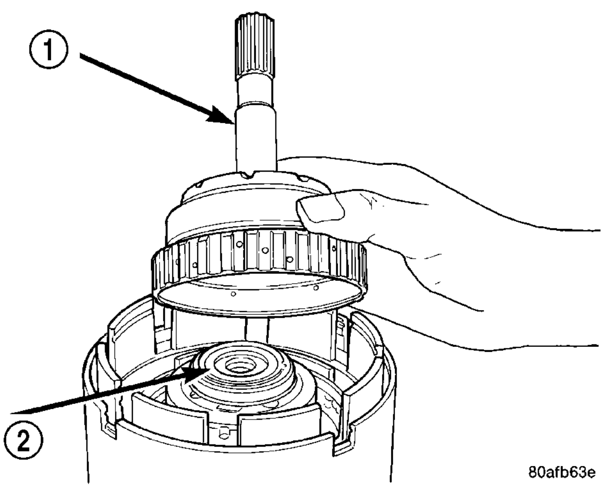


Fig. 232 Install Underdrive Shaft Assembly

1 - UNDERDRIVE SHAFT ASSEMBLY
2 - #2 NEEDLE BEARING

(39) Install the #3 thrust washer to the underdrive shaft assembly. Be sure five tabs are seated properly (Fig. 233).

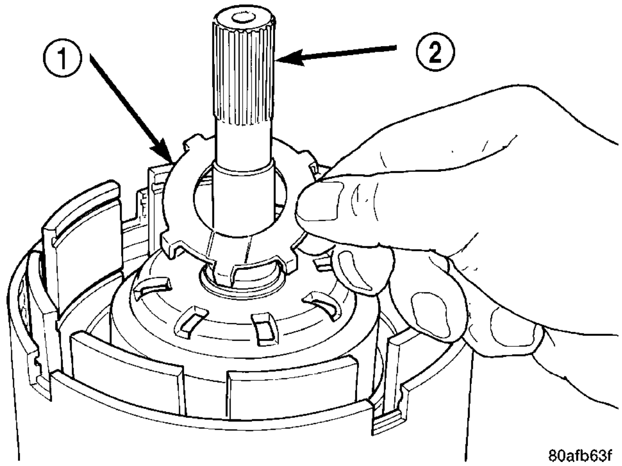


Fig. 233 Install No. 3 Thrust Washer

1 - #3 THRUST WASHER (NOTE 5 TABS)
2 - UNDERDRIVE SHAFT ASSEMBLY

(40) Install the #3 thrust plate to the bottom of the overdrive shaft assembly. Retain with petrolatum or transmission assembly gel (Fig. 234).

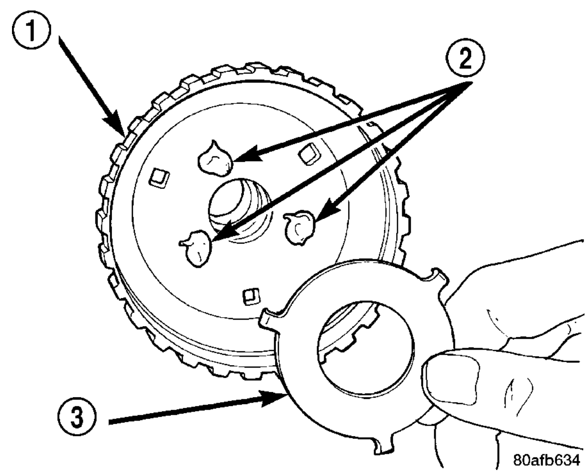


Fig. 234 Install No. 3 Thrust Plate

1 - OVERDRIVE SHAFT ASSEMBLY
2 - DABS OF PETROLATUM (FOR RETENTION)
3 - #3 THRUST PLATE (NOTE 3 TABS)

INPUT CLUTCH ASSEMBLY (Continued)

(41) Install the overdrive shaft assembly (Fig. 235).

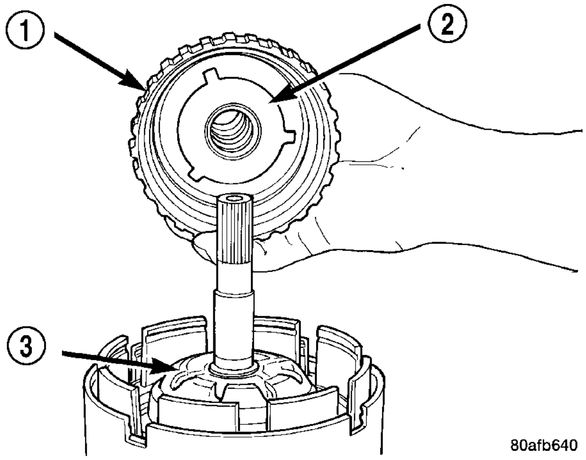


Fig. 235 Install Overdrive Shaft Assembly

1 - OVERDRIVE SHAFT ASSEMBLY
2 - #3 THRUST PLATE
3 - #3 THRUST WASHER

(42) Reinstall overdrive and reverse clutch as shown (Fig. 236). **Rechecking these clutch clearances is not necessary.**

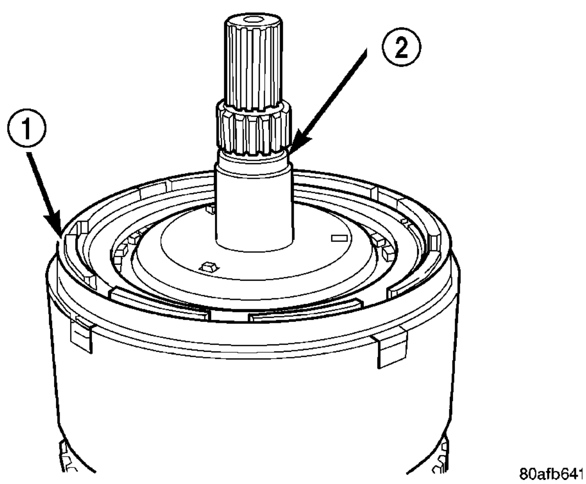


Fig. 236 Input Clutch Assembly

1 - INPUT CLUTCH ASSEMBLY
2 - OVERDRIVE SHAFT ASSEMBLY

INPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors (Fig. 237) are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

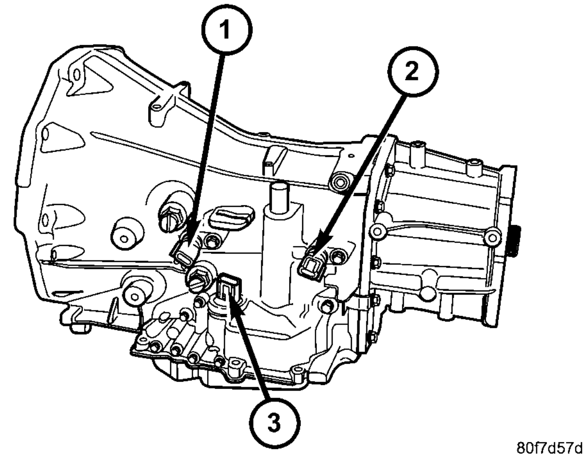


Fig. 237 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

INPUT SPEED SENSOR (Continued)

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the input speed sensor (Fig. 238).

(4) Remove the bolt holding the input speed sensor to the transmission case.

(5) Remove the input speed sensor from the transmission case.

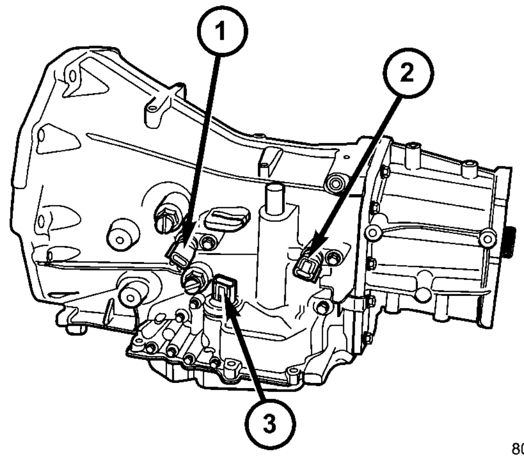


Fig. 238 Input Speed Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

INSTALLATION

(1) Install the input speed sensor into the transmission case.

(2) Install the bolt to hold the input speed sensor into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).

(3) Install the wiring connector onto the input speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

OIL PUMP

DESCRIPTION

The oil pump is located in the pump housing inside the bell housing of the transmission case. The oil pump assembly (Fig. 239) consists of an inner and outer gear, a housing, and a cover that also serves as the reaction shaft support.

OPERATION

As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

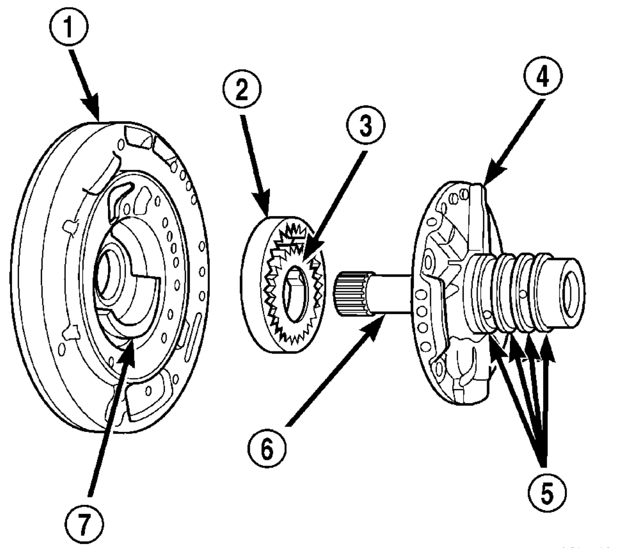


Fig. 239 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

DISASSEMBLY

(1) Remove the reaction shaft support bolts.

(2) Remove reaction shaft support from pump housing (Fig. 240).

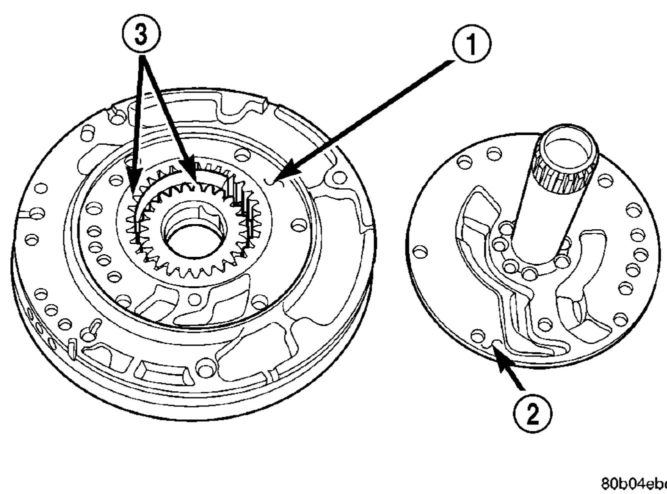


Fig. 240 Reaction Shaft Support

1 - PUMP HOUSING
2 - REACTION SHAFT SUPPORT
3 - PUMP GEARS

OIL PUMP (Continued)

(3) Remove the pump gears (Fig. 241) and check for wear and damage on pump housing and gears.

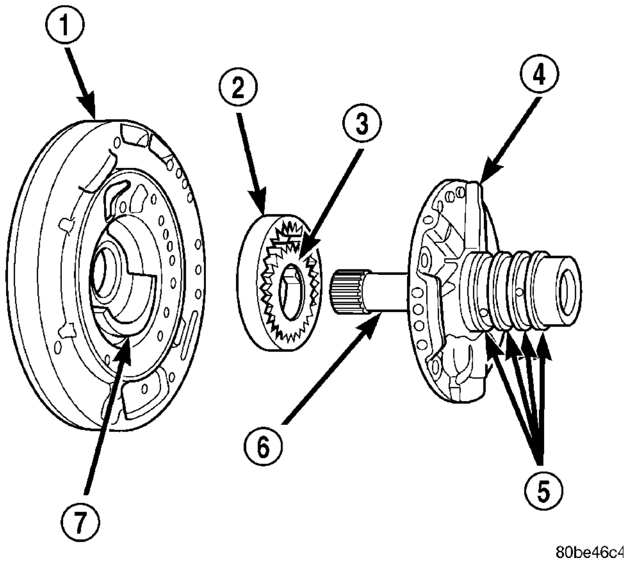


Fig. 241 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

(4) Re-install the gears and check clearances.

(5) Measure the clearance between the outer gear and the pump pocket (Fig. 242). Clearance should be 0.089-0.202 mm (0.0035-0.0079 in.).

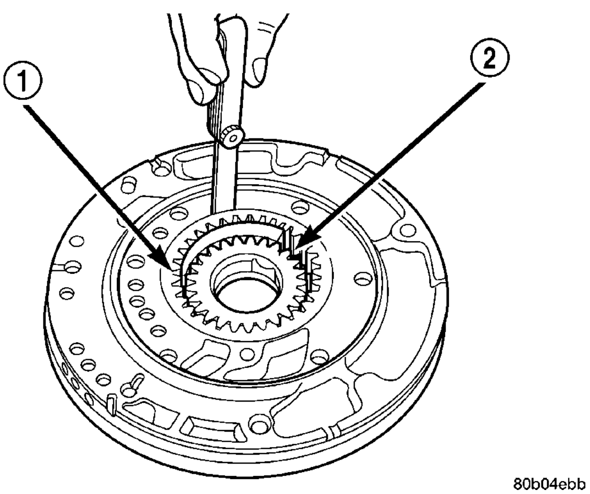


Fig. 242 Measure Outer Gear to Pocket

1 - OUTER GEAR
2 - POCKET

(6) Measure clearance between outer gear and crescent. Clearance should be 0.060-0.298 mm (0.0023-0.0117 in.).

(7) Measure clearance between inner gear and crescent. Clearance should be 0.093-0.385 mm (0.0036-0.0151 in.).

(8) Position an appropriate piece of Plastigage across both pump gears.

(9) Align the Plastigage to a flat area on the reaction shaft support housing.

(10) Install the reaction shaft to the pump housing. Tighten the bolts to 27 N·m (20 ft. lbs.).

(11) Remove bolts and carefully separate the housings. Measure the Plastigage following the instructions supplied.

(12) Clearance between outer gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.). Clearance between inner gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.).

ASSEMBLY

(1) Assemble oil pump as shown in (Fig. 243)

(2) Install and torque reaction shaft support-to-oil pump housing bolts to 28 N·m (20 ft. lbs.) torque.

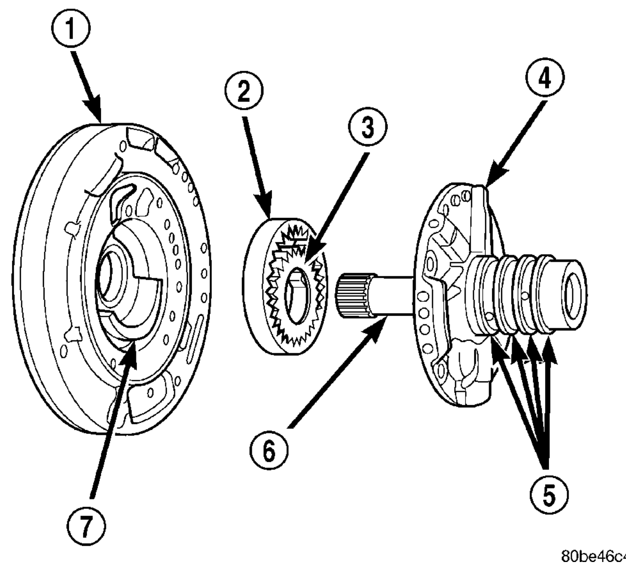


Fig. 243 Oil Pump Assembly

1 - PUMP HOUSING
2 - OUTER PUMP GEAR
3 - INNER PUMP GEAR
4 - REACTION SHAFT SUPPORT
5 - SEAL RINGS (4)
6 - REACTION SHAFT
7 - CRESCENT

OUTPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors (Fig. 244) are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

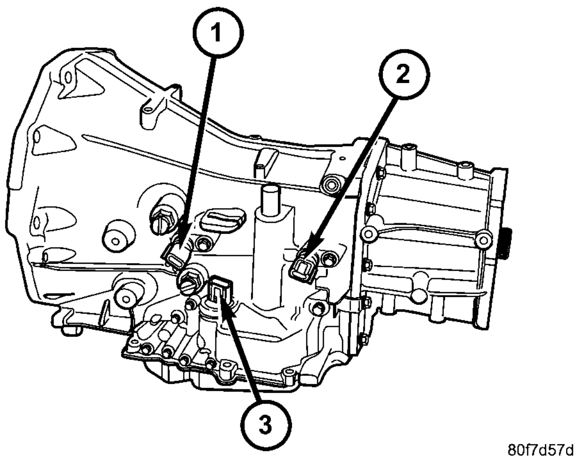


Fig. 244 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the output speed sensor (Fig. 245).

(4) Remove the bolt holding the output speed sensor to the transmission case.

(5) Remove the output speed sensor from the transmission case.

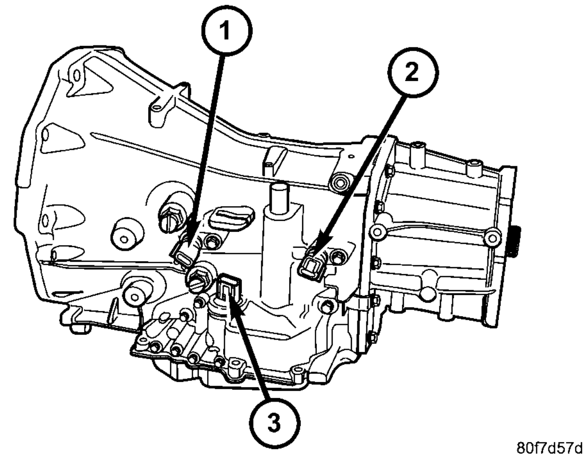


Fig. 245 Input and Output Speed Sensors and Transmission Range Sensor

1 - INPUT SPEED SENSOR
2 - OUTPUT SPEED SENSOR
3 - TRANSMISSION RANGE SENSOR

INSTALLATION

(1) Install the output speed sensor into the transmission case.

(2) Install the bolt to hold the output speed sensor into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).

(3) Install the wiring connector onto the output speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

OVERDRIVE SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, fourth gear operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive

OVERDRIVE SWITCH (Continued)

OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoids and allow upshifts to fourth gear. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

PARK - INTERLOCK CABLE

REMOVAL

(1) Lower the steering column.

(2) With the ignition switch in the “RUN” position depress the park-interlock cable locking tab, located on top of the cable connector (Fig. 246) at the steering column and pull the cable straight out.

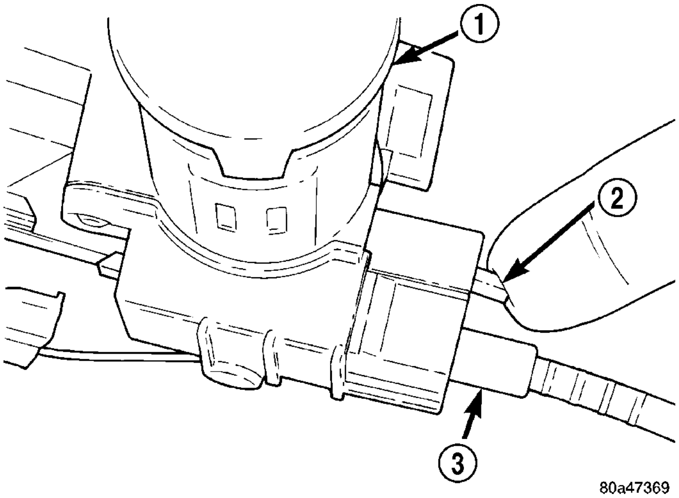


Fig. 246 Park-Interlock Cable

1 - IGNITION LOCK
2 - LOCK TAB
3 - CABLE END

(3) Remove the park-interlock cable from steering column.

(4) Remove the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(5) Disconnect the park-interlock cable from the shift lever assembly and remove the cable from the shifter assembly bracket (Fig. 247).

(6) Release the park-interlock cable from any remaining clips.

(7) Remove park-interlock cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Park-Interlock Cable.

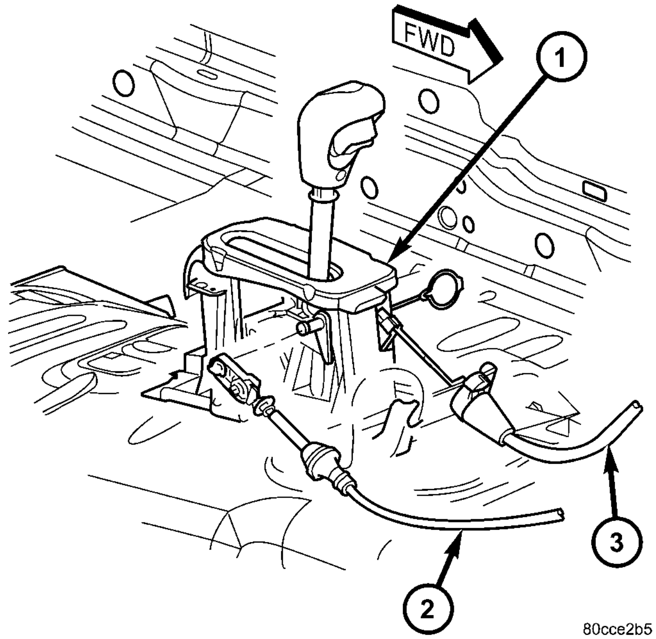


Fig. 247 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(1) Push the park-interlock cable straight into the square mounting hole in the steering column until cable snaps in place (Fig. 248).

(2) Snap park-interlock cable tie strap into hole in steering column tube.

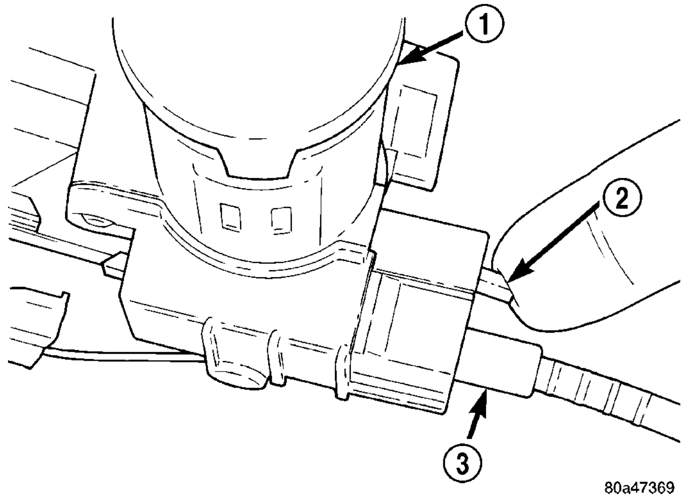


Fig. 248 Brake/Park Interlock Cable

1 - IGNITION LOCK
2 - LOCK TAB
3 - CABLE END

PARK - INTERLOCK CABLE (Continued)

(3) Route cable to the shifter mechanism.

(4) Install the cable end fitting into shifter lever (Fig. 249).

(5) Snap cable adjuster ears into floor shifter bracket.

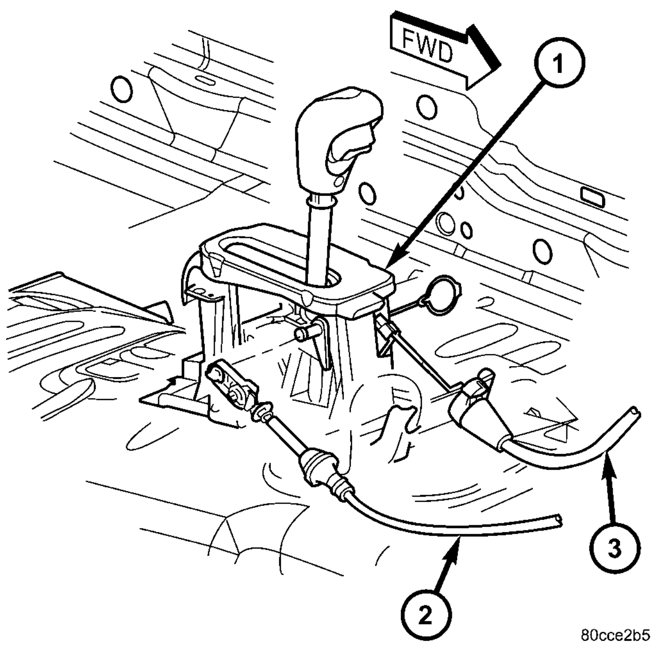


Fig. 249 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(6) Place the ignition key cylinder in the LOCK position.

(7) Push the cable adjuster lock clamp downward to lock it.

(8) Test the park-interlock cable operation.

(9) Install the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

ADJUSTMENTS - PARK-INTERLOCK CABLE

The park-interlock cable is part of the Brake Transmission Shift Interlock (BTSI) system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

(1) Remove floor console as necessary for access to the park-interlock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift the transmission into the PARK position.

(3) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(4) Pull cable lock button up to release cable (Fig. 250).

(5) Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.

(6) Push lock button down until it snaps in place.

(7) Verify proper operation. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK SYSTEM - DIAGNOSIS AND TESTING)

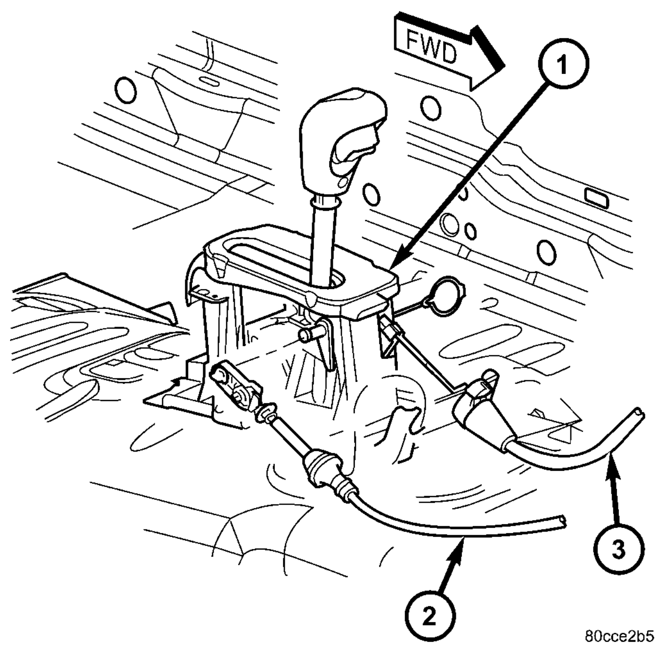


Fig. 250 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

PLANETARY GEARTRAIN

DESCRIPTION

The planetary geartrain is located between the input clutch assembly and the rear of the transmission case. The planetary geartrain consists of two sun gears, two planetary carriers, two annulus (ring) gears, and one output shaft (Fig. 251).

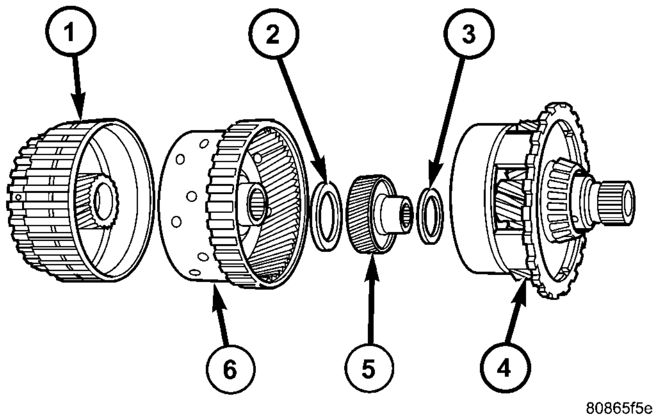


Fig. 251 Planetary Geartrain

1 - FRONT SUN GEAR ASSEMBLY
2 - #6 THRUST BEARING
3 - #7 THRUST BEARING
4 - REAR CARRIER FRONT ANNULUS ASSEMBLY
5 - REAR SUN GEAR
6 - FRONT CARRIER REAR ANNULUS ASSEMBLY

OPERATION

The planetary geartrain utilizes two planetary gear sets that connect the transmission input shaft to the output shaft. Input and holding clutches drive or lock different planetary members to change output ratio or direction.

SEAL - OIL PUMP

REMOVAL

(1) Remove the transmission from the vehicle (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - REMOVAL).

(2) Remove the torque converter from the transmission bellhousing.

(3) Use special tool C-3981B to remove oil pump seal.

INSTALLATION

(1) Clean and inspect oil pump seal seat. Then install seal using special tool C-4193-A.

(2) Clean and inspect torque converter hub. If nicks, scratches or hub wear are found, torque converter replacement will be required.

CAUTION: If the torque converter is being replaced, apply a light coating of grease to the crankshaft pilot hole. Also inspect the engine drive plate for cracks. If any cracks are found replace the drive plate. Do not attempt to repair a cracked drive plate. Always use new torque converter to drive plate bolts.

(3) Apply a light film of transmission oil to the torque converter hub and oil seal lips. Then install torque converter into transmission. Be sure that the hub lugs mesh with the front pump lugs when installing.

(4) Reinstall the transmission into the vehicle.

SHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides first gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides first and second gear only.

DRIVE range provides FIRST, SECOND THIRD and OVERDRIVE FOURTH gear ranges. The shift into OVERDRIVE FOURTH gear range occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The FOURTH gear upshift occurs automatically when the overdrive selector switch is in the ON position. No upshift to FOURTH gear will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to THIRD is not yet complete.
- Vehicle speed is too low for the 3-4 shift to occur.

Upshifts into FOURTH will be delayed when the transmission fluid temperature is below 4.5° C (40° F) or above 115.5° C (240° F).

SHIFT MECHANISM (Continued)

REMOVAL

(1) Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift transmission into PARK.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 252).

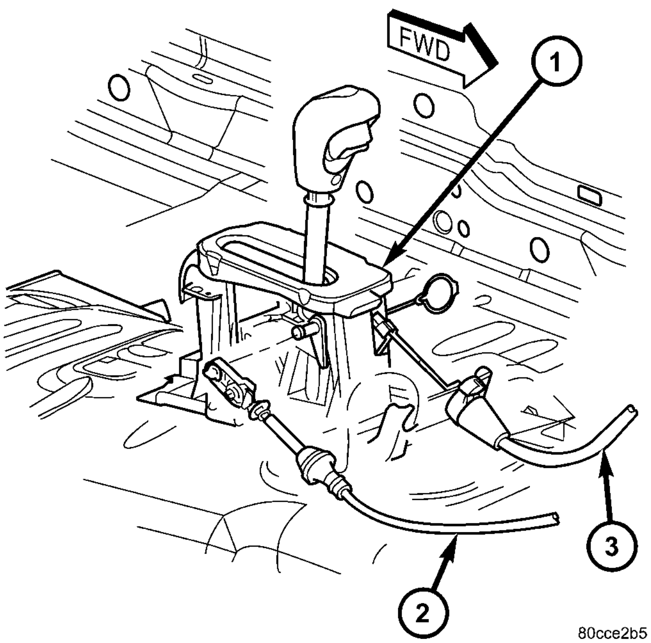


Fig. 252 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(4) Disconnect the park-interlock cable from the shifter lever and the shifter assembly bracket.

(5) Disengage all wiring connectors from the shifter assembly.

(6) Remove all nuts holding the shifter assembly to the floor pan (Fig. 253).

(7) Remove the shifter assembly from the vehicle.

INSTALLATION

(1) Install shifter assembly onto the shifter assembly studs on the floor pan.

(2) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in.lbs.).

(3) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.

(4) Install the park-interlock cable into the shifter assembly bracket and into the shifter lever.

(5) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

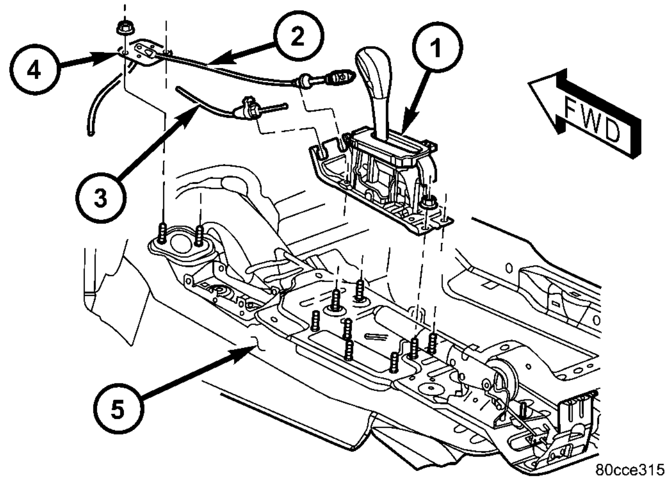


Fig. 253 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

(6) Place the floor shifter lever in park position.

(7) Loosen the adjustment screw on the shift cable.

(8) Snap the shift cable onto the shift lever pin.

(9) Verify that the shift lever is in the PARK position.

(10) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct shifter operation.

(12) Verify proper BTSI operation.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK SYSTEM - DIAGNOSIS AND TESTING) Adjust the park-interlock cable as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK CABLE - ADJUSTMENTS)

(13) Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

SOLENOID

DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

SOLENOID (Continued)

The solenoids used in transmission applications are attached to valves which can be classified as **normally open (Fig. 254)** or **normally closed (Fig. 255)**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.

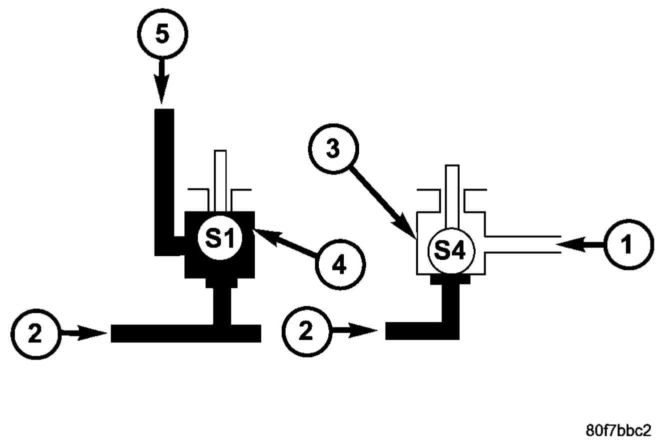


Fig. 254 2/4 - Low Reverse and Underdrive Solenoids

1 - MANUAL VALVE
2 - LINE PRESSURE
3 - 2/4 - LOW REVERSE SOLENOID ENERGIZED
4 - UNDERDRIVE SOLENOID DE-ENERGIZED
5 - UNDERDRIVE CLUTCH

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

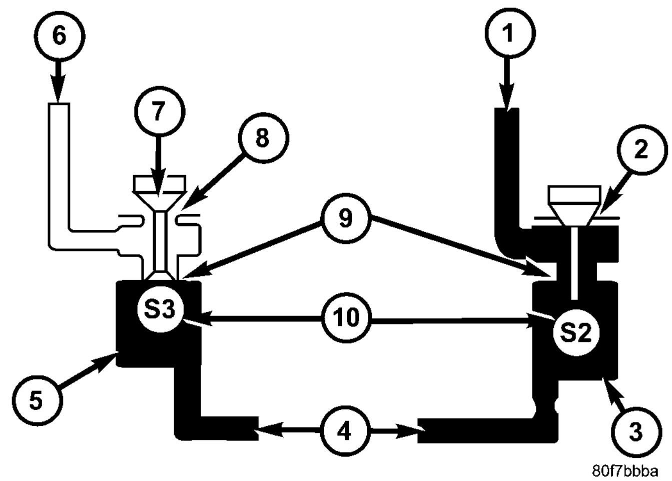


Fig. 255 Low Reverse/Converter Clutch and Overdrive Solenoids

1 - OVERDRIVE CLUTCH
2 - NO VENT
3 - OVERDRIVE SOLENOID ENERGIZED
4 - MANUAL VALVE
5 - LOW REVERSE/CONVERTER CLUTCH SOLENOID DE-ENERGIZED
6 - SOLENOID SWITCH VALVE
7 - TAPER
8 - VENT TO SUMP
9 - ORIFICE
10 - CHECK BALL

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.

OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

SOLENOID/PRESSURE SWITCH ASSY

DESCRIPTION

The Solenoid/Pressure Switch Assembly (Fig. 256) is inside the transmission and mounted to the valve body assembly. The assembly consists of four solenoids that control hydraulic pressure to the L/R, 2/4, OD, and UD friction elements (transmission clutches), and the torque converter clutch. The reverse clutch is controlled by line pressure from the manual valve in the valve body. The solenoids are contained within the Solenoid/Pressure Switch Assembly, and can only be serviced by replacing the assembly.

The solenoid assembly also contains pressure switches that monitor and send hydraulic circuit information to the PCM. Likewise, the pressure switches can only be service by replacing the assembly.

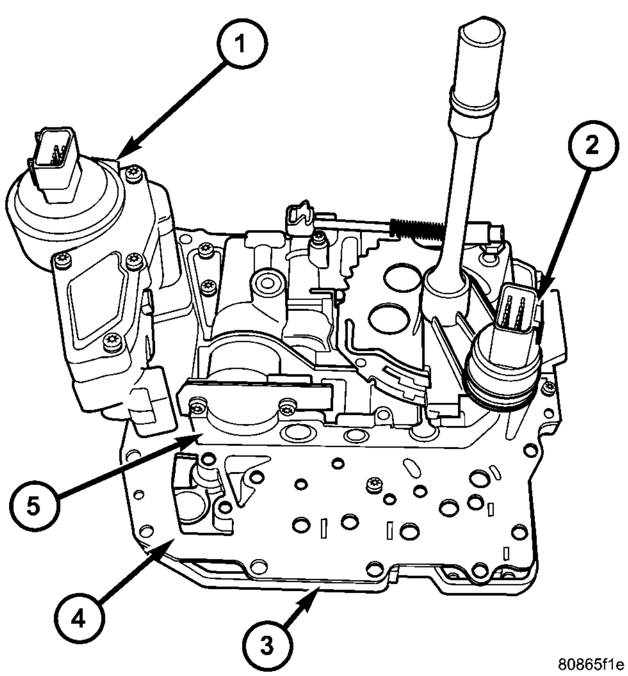


Fig. 256 Valve Body Assembly

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - TRS
3 - TRANSFER PLATE
4 - SEPARATOR PLATE
5 - VALVE BODY

OPERATION

SOLENOIDS

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The PCM energizes or operates the solenoids individually by grounding the return wire of the solenoid needed. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The 2/4 and UD solenoids are normally applied, which allows fluid to pass through in their relaxed or “off” state. By design, this allows transmission limp-in (P,R,N,2) in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the pcm during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The PCM relies on three pressure switches to monitor fluid pressure in the L/R, 2/4, and OD hydraulic circuits. The primary purpose of these switches is to help the PCM detect when clutch circuit hydraulic failures occur. The range for the pressure switch closing and opening points is 11-23 psi. Typically the switch opening point will be approximately one psi lower than the closing point. For example, a switch may close at 18 psi and open at 17 psi. The switches are continuously monitored by the PCM for the correct states (open or closed) in each gear as shown in the following chart:

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

A Diagnostic Trouble Code (DTC) will set if the PCM senses any switch open or closed at the wrong time in a given gear.

SOLENOID/PRESSURE SWITCH ASSY (Continued)

The PCM also tests the 2/4 and OD pressure switches when they are normally off (OD and 2/4 are tested in 1st gear, OD in 2nd gear, and 2/4 in 3rd gear). The test simply verifies that they are operational, by looking for a closed state when the corresponding element is applied. Immediately after a shift into 1st, 2nd, or 3rd gear with the engine speed above 1000 rpm, the PCM momentarily turns on element pressure to the 2/4 and/or OD clutch circuits to identify that the appropriate switch has closed. If it doesn't close, it is tested again. If the switch fails to close the second time, the appropriate Diagnostic Trouble Code (DTC) will set.

REMOVAL

NOTE: If the Solenoid/Pressure Switch Assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Raise vehicle on hoist.

(2) Remove valve body assembly from transmission. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - REMOVAL)

(3) Remove Solenoid/Pressure Switch Assembly retaining screws from solenoid (Fig. 257).

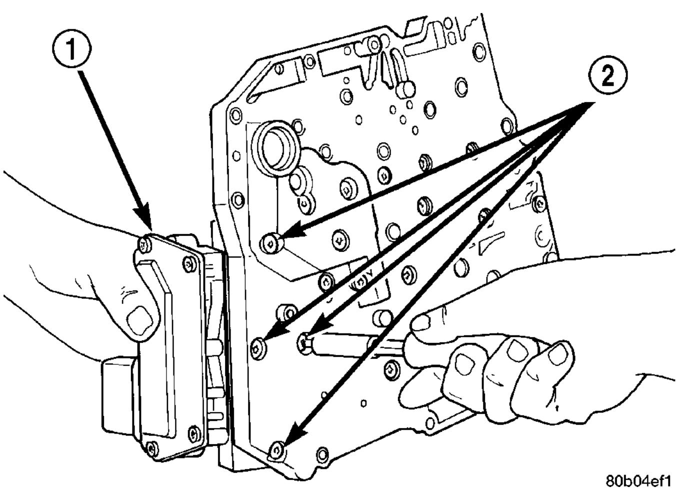


Fig. 257 Solenoid Retaining Screws

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - RETAINING SCREWS

(4) Remove Solenoid/Pressure Switch Assembly and screen from valve body (Fig. 258).

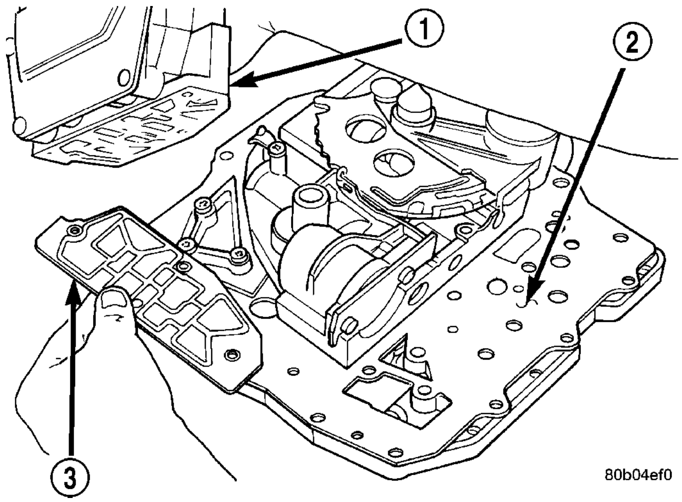


Fig. 258 Solenoid/Pressure Switch Assembly and Screen

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - VALVE BODY
3 - SCREEN

INSTALLATION

NOTE: If the Solenoid/Pressure Switch assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install Solenoid/Pressure Switch Assembly and screen to the separator and transfer plates.

(2) Install and tighten retaining screws to 5.5 N·m (50 in. lbs.) torque.

(3) Install valve body. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 259) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.

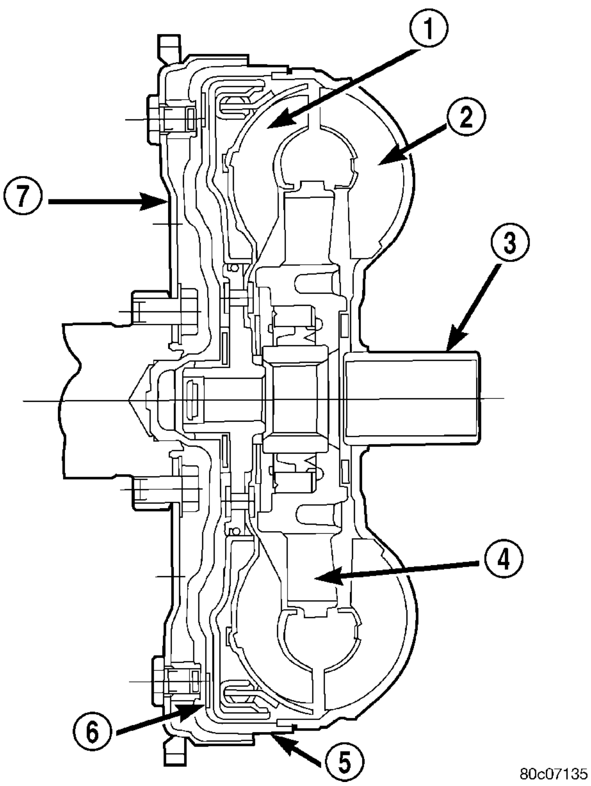


Fig. 259 Torque Converter Assembly

TORQUE CONVERTER (Continued)

IMPELLER

The impeller (Fig. 260) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

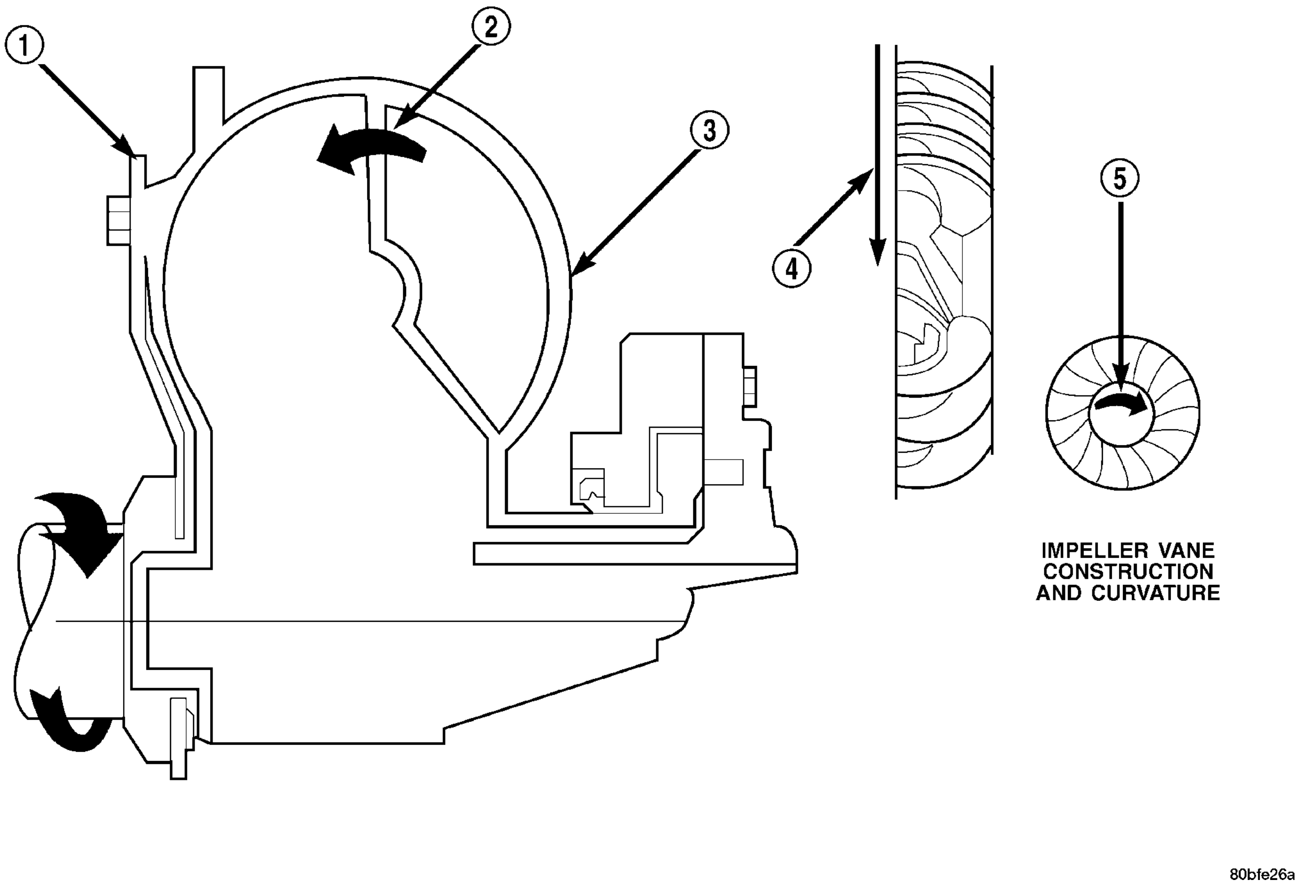


Fig. 260 Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

TORQUE CONVERTER (Continued)

TURBINE

The turbine (Fig. 261) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

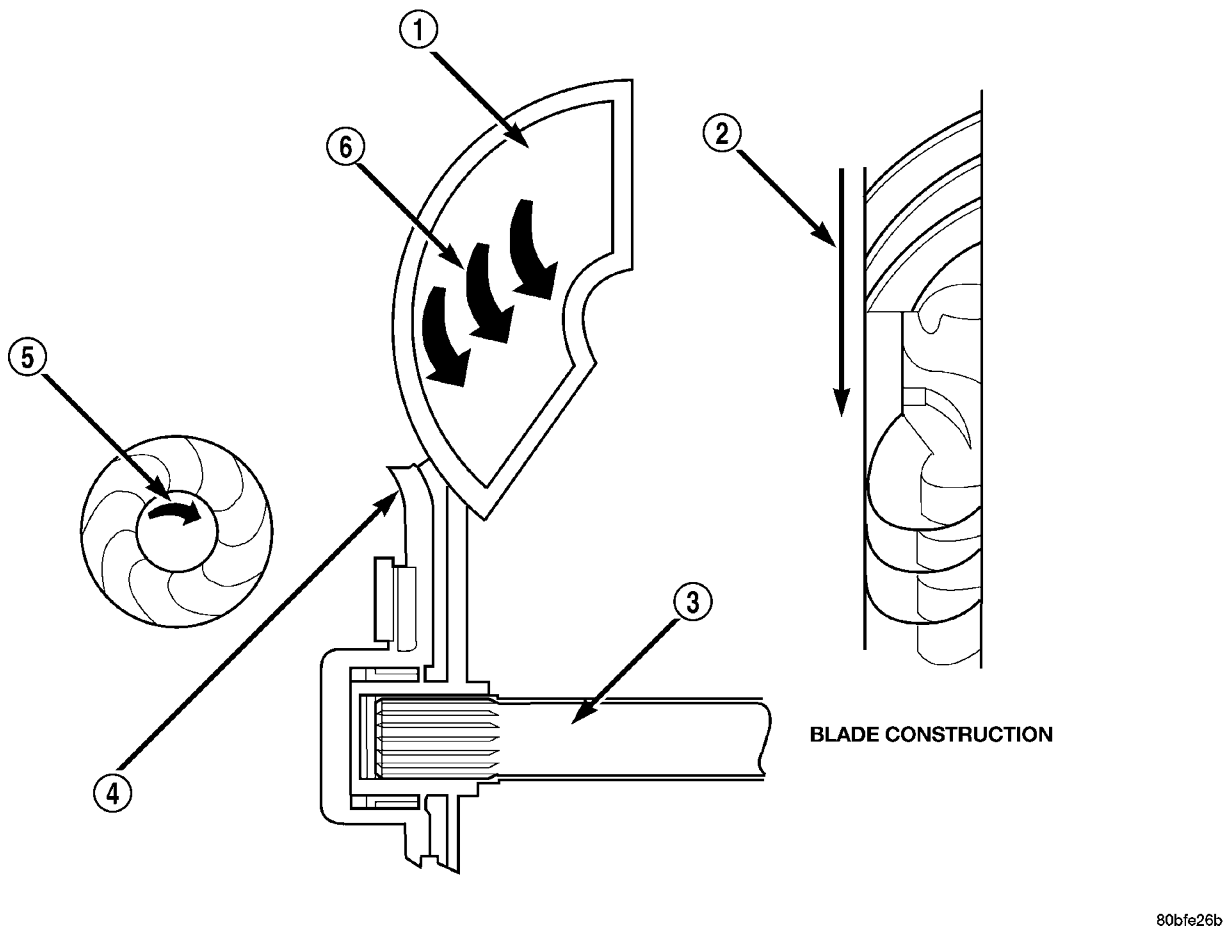


Fig. 261 Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

TORQUE CONVERTER (Continued)

STATOR

The stator assembly (Fig. 262) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 263). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

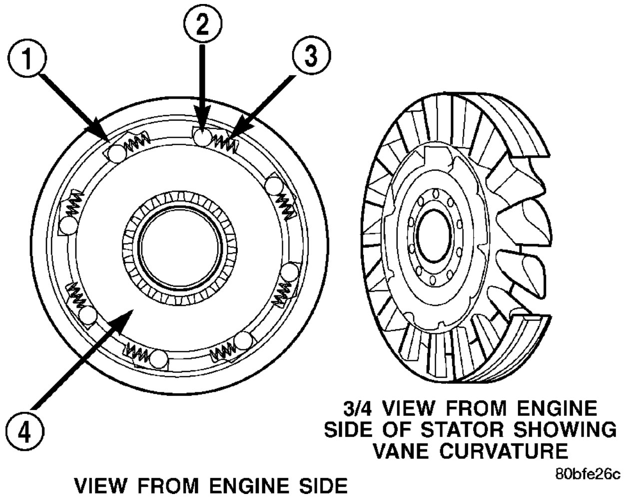


Fig. 262 Stator Components

1 - CAM (OUTER RACE)
2 - ROLLER
3 - SPRING
4 - INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 264) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston was added to the turbine, and a friction material was added to the inside of the front cover to provide this mechanical lock-up.

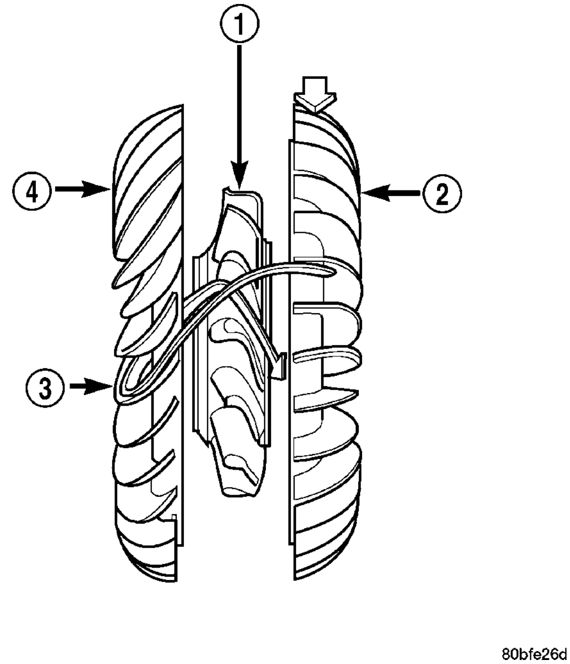


Fig. 263 Stator Location

1 - STATOR
2 - IMPELLER
3 - FLUID FLOW
4 - TURBINE

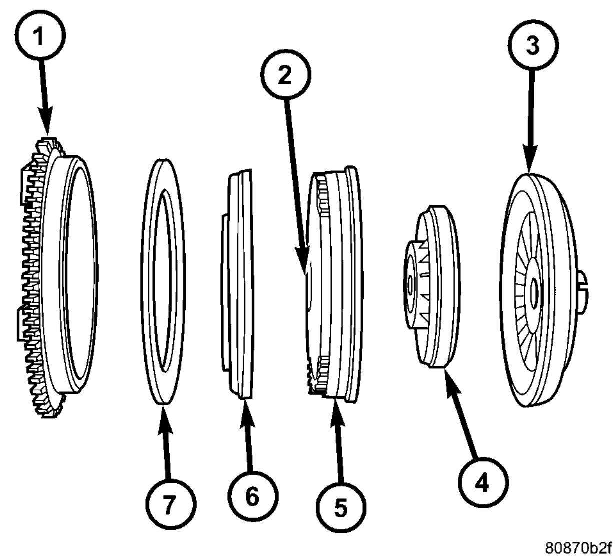


Fig. 264 Torque Converter Clutch (TCC)

1 - IMPELLER FRONT COVER
2 - THRUST WASHER ASSEMBLY
3 - IMPELLER
4 - STATOR
5 - TURBINE
6 - PISTON
7 - FRICTION DISC

TORQUE CONVERTER (Continued)

OPERATION

The converter impeller (Fig. 265) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

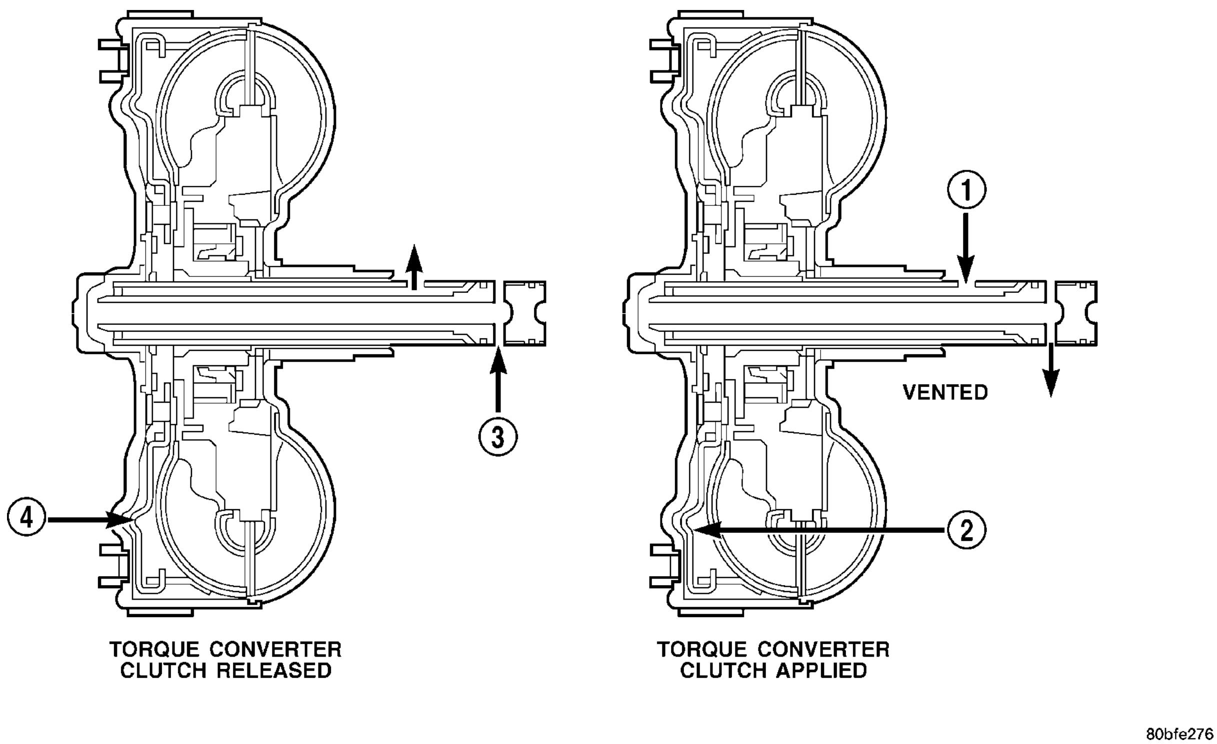


Fig. 265 Torque Converter Fluid Operation

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TORQUE CONVERTER (Continued)

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 266). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counter-clockwise direction. When this happens the overrunning clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

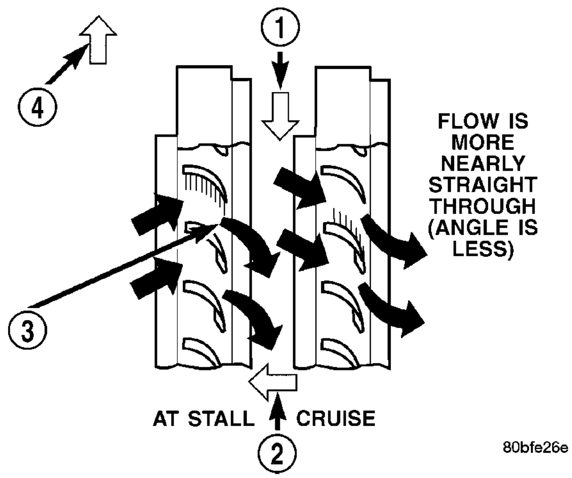


Fig. 266 Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

TORQUE CONVERTER CLUTCH (TCC)

The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in fourth gear, and in third gear under various conditions, such as when the O/D switch is OFF, when the vehicle is cruising on a level surface after the vehicle has warmed up. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased.

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 267). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

TORQUE CONVERTER (Continued)

(9) Fill the transmission with the recommended fluid.

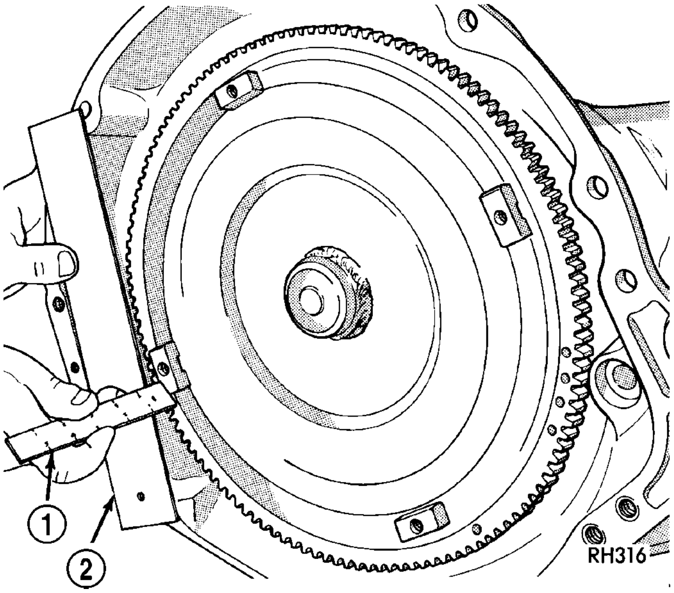


Fig. 267 Checking Torque Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

TRANSMISSION CONTROL RELAY

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

TRANSMISSION RANGE SENSOR

DESCRIPTION

The Transmission Range Sensor (TRS) is mounted to the top of the valve body inside the transmission and can only be serviced by removing the valve body assembly. The electrical connector extends through the transmission case (Fig. 268).

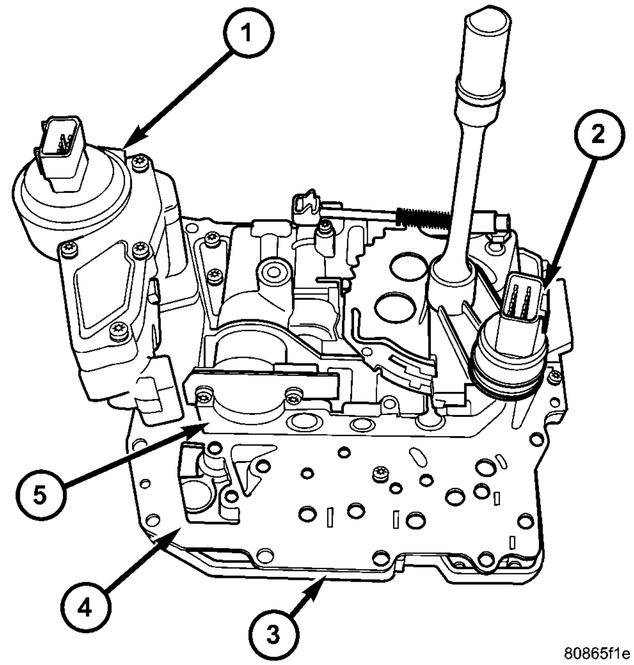


Fig. 268 Valve Body Assembly

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - TRS
3 - TRANSFER PLATE
4 - SEPARATOR PLATE
5 - VALVE BODY

The Transmission Range Sensor (TRS) has four switch contacts that monitor shift lever position and send the information to the PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position (SLP) to the PCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the PCM receives from four sense circuits. The PCM interprets this information and determines the appropriate transmission gear position and shift schedule.

Since there are four switches, there are 16 possible combinations of open and closed switches (codes). Seven of these codes are related to gear position and three are recognized as “between gear” codes. This results in six codes which should never occur. These are called “invalid” codes. An invalid code will result in a DTC, and the PCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

TRANSMISSION RANGE SENSOR (Continued)

TRS SWITCH STATES

SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
D	OP	OP	OP	CL
2	OP	OP	CL	OP
1	CL	OP	CL	CL

REMOVAL

(1) Disconnect the TRS connector.
(2) Remove valve body assembly from vehicle.
(3) Remove the manual shaft seal (Fig. 269).

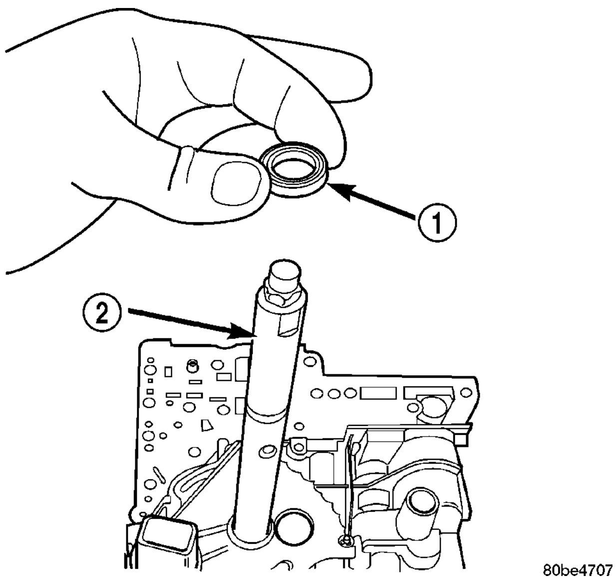


Fig. 269 Manual Shaft Seal - Typical

1 - SEAL
2 - MANUAL SHAFT

(4) Remove manual shaft/TRS retaining screw (Fig. 270).
(5) Slide TRS off of manual valve shaft.

INSTALLATION

(1) Install the TRS to the manual shaft. Make sure TRS locating pin rests in manual valve bore slot.
(2) Install the TRS/manual shaft retaining screw and torque to 5 N·m (45 in. lbs.) torque.
(3) Install the manual shaft seal.
(4) Install valve body to the transmission.

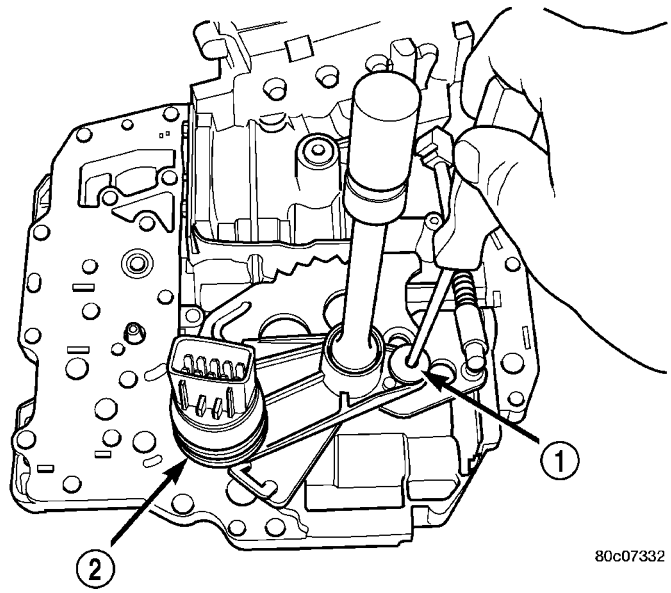


Fig. 270 Manual Shaft Retaining Screw

1 - SCREW
2 - TRS

TRANSMISSION TEMPERATURE SENSOR

DESCRIPTION

The transmission temperature sensor (Fig. 271) is located in the transmission range sensor and communicates transmission sump temperature to the PCM.

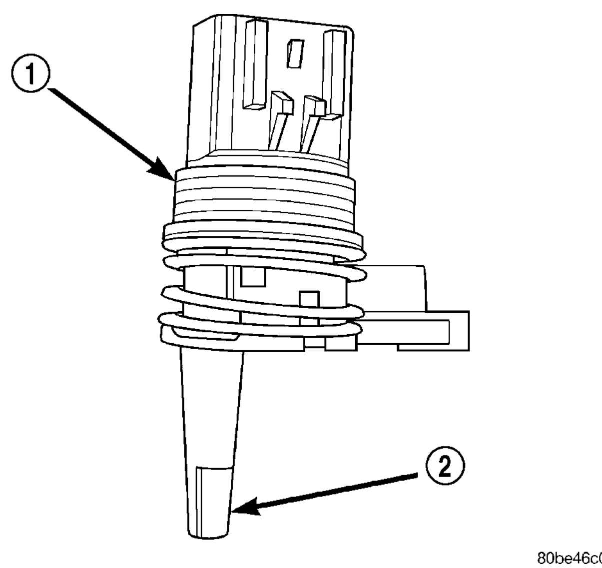


Fig. 271 Transmission Temperature Sensor

1 - TRANSMISSION RANGE SENSOR
2 - TEMPERATURE SENSOR

TRANSMISSION TEMPERATURE SENSOR (Continued)

OPERATION

The TRS has an integrated thermistor that the PCM uses to monitor the transmission's sump temperature. Since fluid temperature can affect transmission shift quality and convertor lock up, the PCM requires this information to determine which shift schedule to operate in. The PCM also monitors this temperature data so it can energize the vehicle cooling fan(s) when a transmission "overheat" condition exists. If the thermistor circuit fails, the PCM will revert to calculated oil temperature usage.

CALCULATED TEMPERATURE

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

VALVE BODY

DESCRIPTION

The valve body assembly (Fig. 272) consists of a cast aluminum valve body, a separator plate, and transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, solenoid/pressure switch assembly, and frictional clutches.

Also mounted to the valve body assembly are the solenoid/pressure switch assembly and the transmission range sensor (Fig. 272).

The valves contained within the valve body include the following (Fig. 273):

- Regulator valve
- Solenoid switch valve
- Manual valve
- Converter clutch switch valve
- Converter clutch control valve
- Torque converter regulator valve
- Low/Reverse switch valve

In addition, the valve body also contains the thermal valve, #2, 3, 4 & 5 check balls and the 2/4 accumulator assembly.

OPERATION

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS) for a visual aid in determining valve location, operation and design.

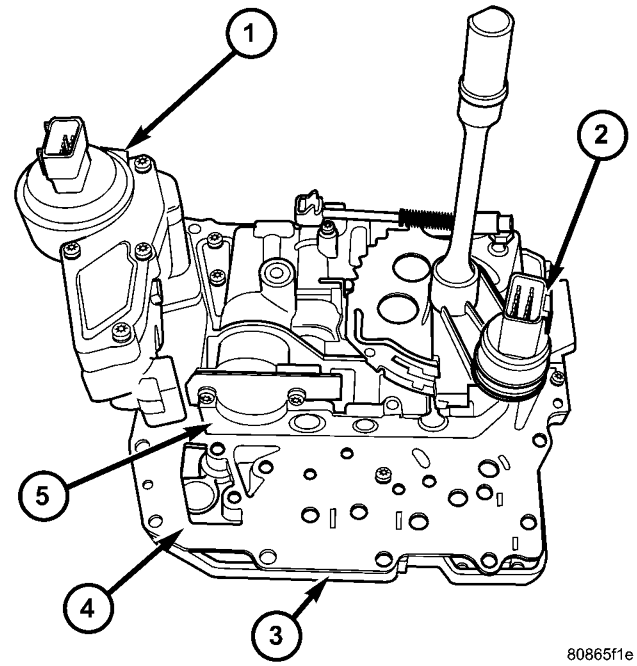


Fig. 272 Valve Body Assembly

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - TRS
3 - TRANSFER PLATE
4 - SEPARATOR PLATE
5 - VALVE BODY

THERMAL VALVE

The thermal valve is a bi-metallic shudder valve that helps control the venting rate of oil pressure in the underdrive clutch passage during release of the clutch (Fig. 274). When the oil temperature is approximately 20 degrees Fahrenheit or less, the valve is fully open to assist in venting oil past the U1 orifice. At temperatures above 20 degrees, the valve starts to close and becomes fully closed at approximately 140 degrees. The thermal valve is located in the transfer plate of the valve body.

REGULATOR VALVE

The regulator valve (Fig. 275) controls hydraulic pressure in the transmission. It receives unregulated pressure from the pump, which works against spring tension to maintain oil at specific pressures. A system of sleeves and ports allows the regulator valve to work at one of three predetermined pressure levels. Regulated oil pressure is also referred to as "line pressure."

VALVE BODY (Continued)

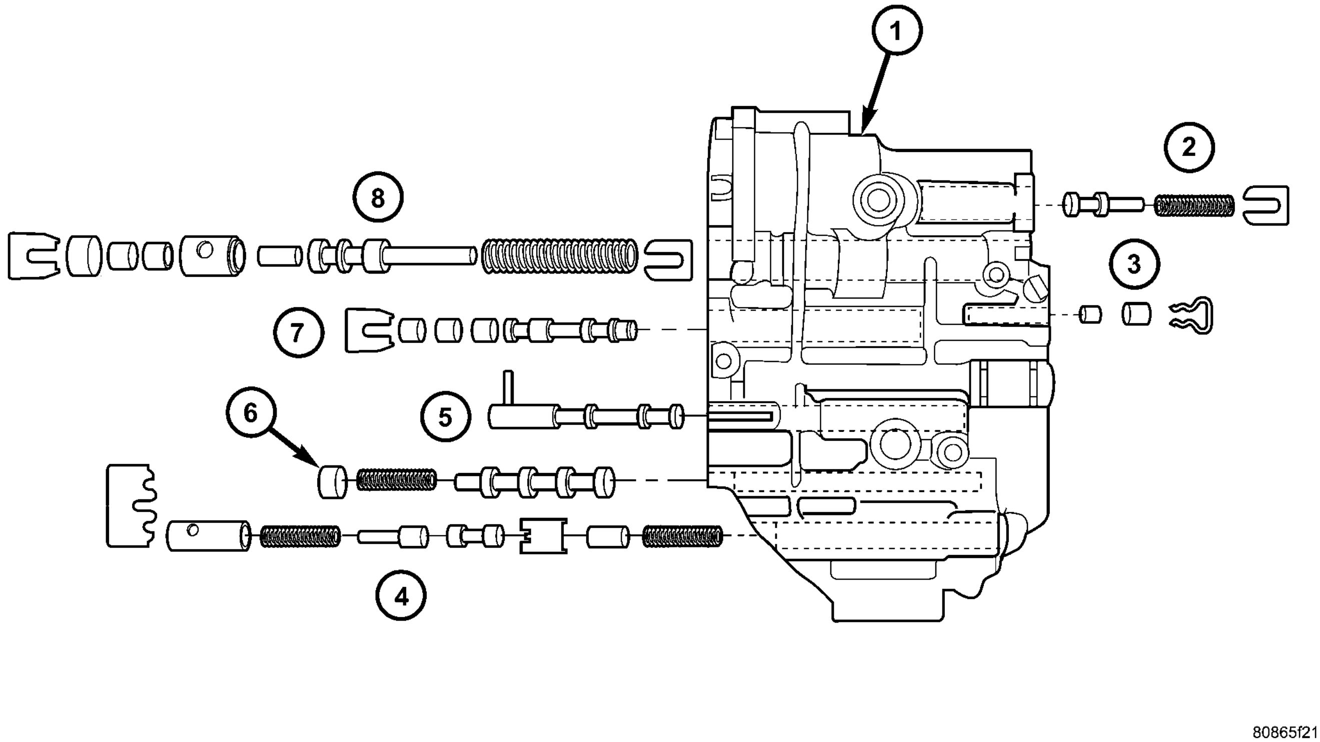


Fig. 273 Valve Body - Exploded

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

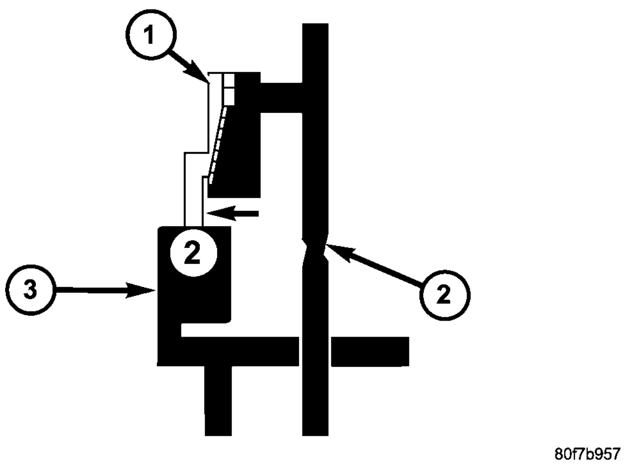


Fig. 274 Thermal Valve

1 - THERMAL VALVE
2 - U1 ORIFICE
3 - NUMBER 2 CHECK BALL

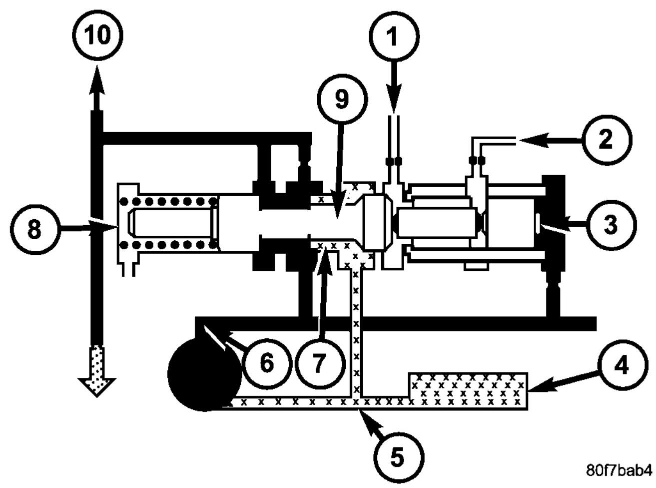


Fig. 275 Regulator Valve

1 - FROM OVERDRIVE CLUTCH CIRCUIT
2 - FROM MANUAL VALVE
3 - HYDRAULIC PRESSURE
4 - FILTER
5 - PUMP INLET
6 - PUMP OUTLET
7 - OIL PRESSURE REGULATED AT THIS POINT
8 - SPRING TENSION
9 - REGULATOR VALVE
10 - TORQUE CONVERTER CONTROL VALVE

VALVE BODY (Continued)

SOLENOID SWITCH VALVE

The solenoid switch valve (Fig. 276) controls line pressure from the LR/CC solenoid. In one position, it allows the low/reverse clutch to be pressurized. In the other, it directs line pressure to the converter control and converter clutch valves.

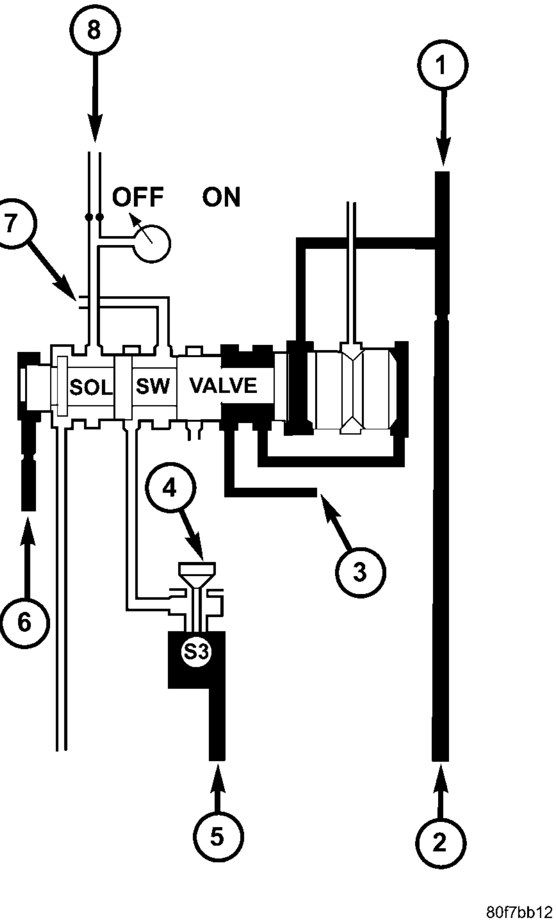


Fig. 276 Solenoid Switch Valve De-Energized

1 - 2/4 CLUTCH
2 - MANUAL VALVE
3 - UD CLUTCH
4 - LR/CC SOLENOID DE-ENERGIZED
5 - MANUAL VALVE
6 - LINE PRESSURE
7 - CONVERTER CLUTCH SWITCH AND CONTROL VALVES
8 - LR CLUTCH

MANUAL VALVE

The manual valve (Fig. 277) is operated by the mechanical shift linkage. Its primary responsibility is to send line pressure to the appropriate hydraulic circuits and solenoids. The valve has three operating ranges or positions.

CONVERTER CLUTCH SWITCH VALVE

The main responsibility of the converter clutch switch valve (Fig. 278) is to control hydraulic pressure applied to the front (off) side of the converter clutch piston. Line pressure from the regulator valve is fed to the torque converter regulator valve. The pressure is then directed to the converter clutch switch valve and to the front side of the converter clutch piston. This pressure pushes the piston back and disengages the converter clutch.

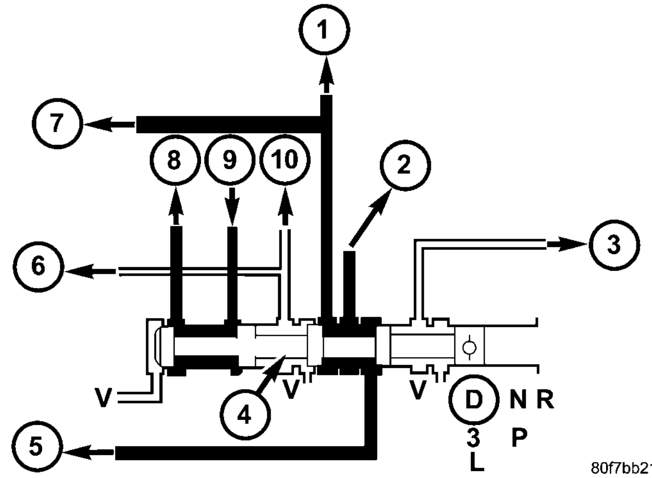


Fig. 277 Manual Valve

1 - UD CLUTCH
2 - LR/CC CLUTCH
3 - REVERSE CLUTCH
4 - MANUAL VALVE
5 - REGULATOR VALVE
6 - REGULATOR VALVE
7 - CONVERTER CLUTCH CONTROL VALVE
8 - 2/4 CLUTCH
9 - 2/4 - L/R SOLENOID
10 - L/R CLUTCH

CONVERTER CLUTCH CONTROL VALVE

The converter clutch control valve (Fig. 279) controls the back (on) side of the torque converter clutch. When the controller energizes or modulates the LR/CC solenoid to apply the converter clutch piston, both the converter clutch control valve and the converter control valve move, allowing pressure to be applied to the back side of the clutch.

T/C REGULATOR VALVE

The torque converter regulator valve slightly regulates the flow of fluid to the torque converter.

LOW/REVERSE SWITCH VALVE

The low/reverse clutch is applied from different sources, depending on whether low (1st) gear or reverse is selected. The low/reverse switch valve alternates positions depending on from which direction fluid pressure is applied. By design, when the valve is shifted by fluid pressure from one channel, the opposing channel is blocked. The switch valve alienates the possibility of a sticking ball check, thus

VALVE BODY (Continued)

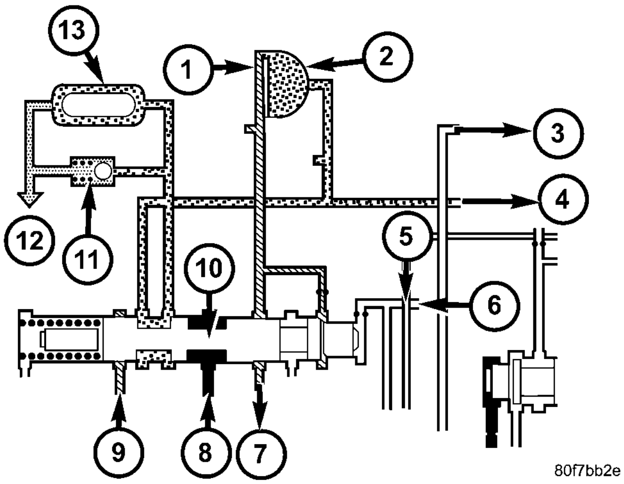


Fig. 278 Converter Clutch Switch Valve

1 - CONVERTER CLUTCH
2 - TORQUE CONVERTER
3 - LR CLUTCH
4 - DRIBBLERS
5 - REGULATOR VALVE
6 - SOLENOID SWITCH VALVE
7 - CONVERTER CLUTCH CONTROL VALVE
8 - REGULATOR VALVE
9 - CONVERTER CLUTCH CONTROL VALVE
10 - CONVERTER CLUTCH SWITCH VALVE
11 - BYPASS VALVE
12 - LUBE
13 - COOLER

providing consistent application of the low/reverse clutch under these operating conditions.

REMOVAL

NOTE: If valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Disconnect the TRS and solenoid wiring connectors.

(2) Disconnect the shift cable from the shift lever (at the transmission).

(3) Move the manual shift lever clockwise as far as it will go. This should be one position past the L position. Then remove the manual shift lever.

(4) Remove transmission pan bolts (Fig. 280).

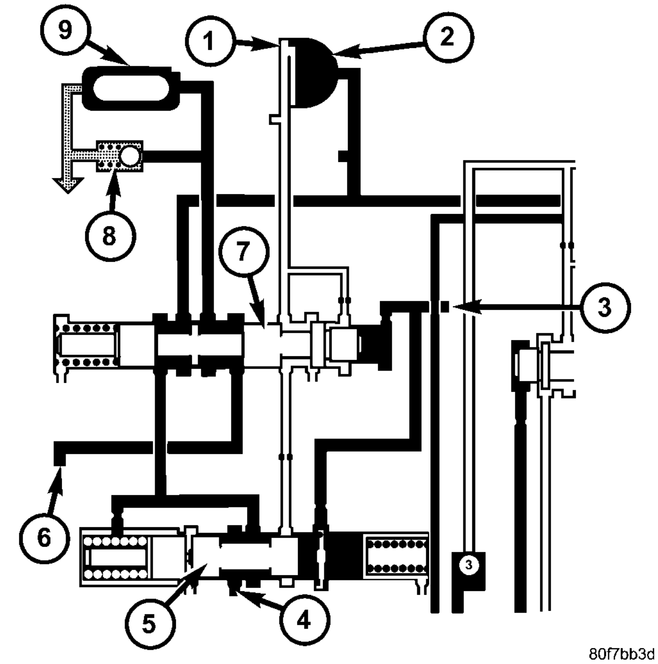


Fig. 279 Converter Clutch Control Valve

1 - CONVERTER CLUTCH
2 - TORQUE CONVERTER
3 - LR/CC SOLENOID
4 - FROM MANUAL VALVE
5 - CONVERTER CLUTCH CONTROL VALVE
6 - TORQUE CONVERTER REGULATOR VALVE
7 - CONVERTER CLUTCH SWITCH VALVE
8 - BYPASS VALVE
9 - COOLER

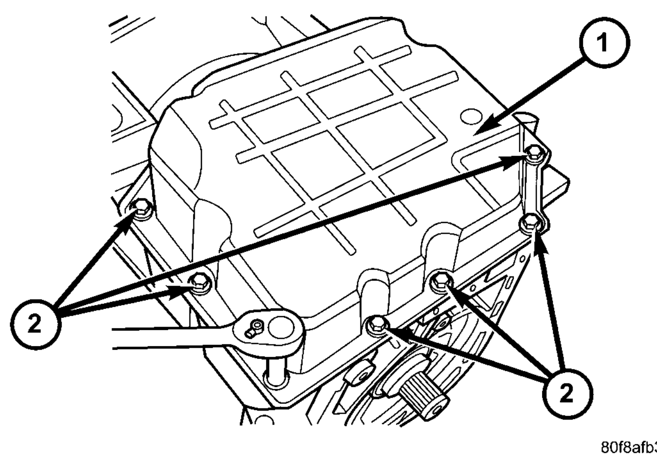


Fig. 280 Remove Transmission Oil Pan Bolts

1 - TRANSMISSION OIL PAN
2 - BOLTS

VALVE BODY (Continued)

(5) Remove transmission oil pan (Fig. 281).

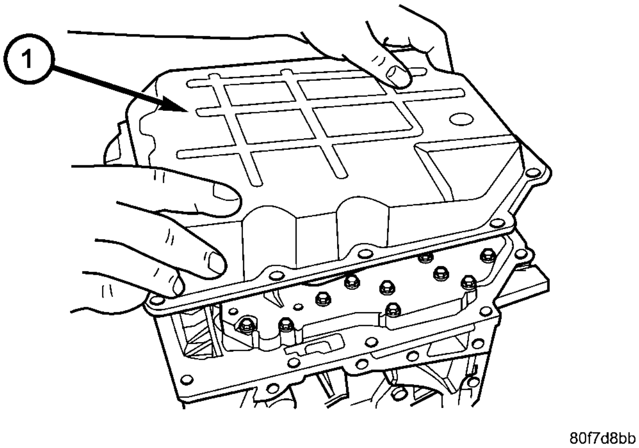


Fig. 281 Remove Transmission Oil Pan

1 - TRANSMISSION OIL PAN

(6) Remove oil filter from valve body (Fig. 282). It is held in place by two screws.

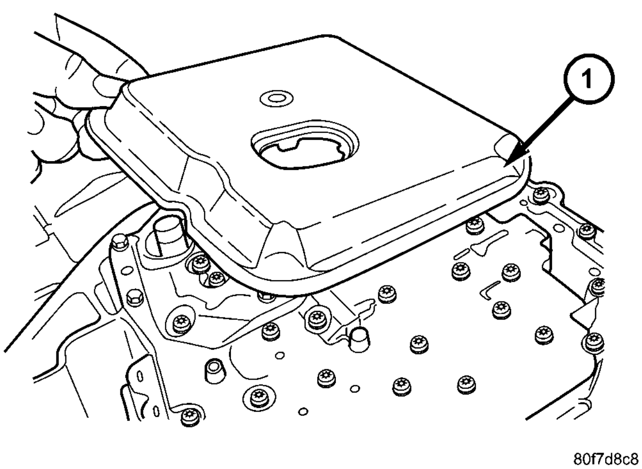


Fig. 282 Remove Transmission Filter

1 - TRANSMISSION FILTER

(7) Remove valve body bolts-to-case (Fig. 283).

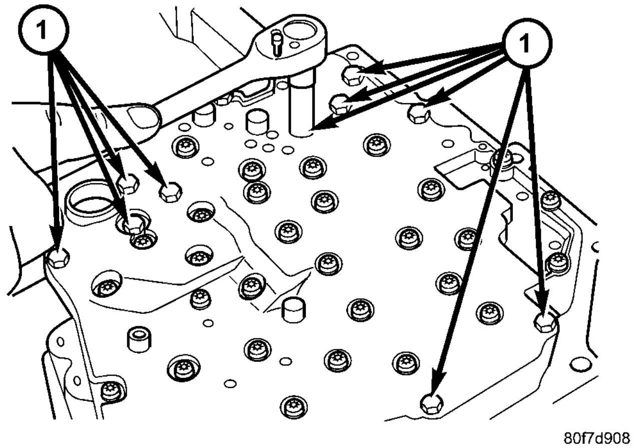


Fig. 283 Remove Valve Body Bolts

1 - BOLTS

(8) Carefully remove valve body assembly from transmission (Fig. 284).

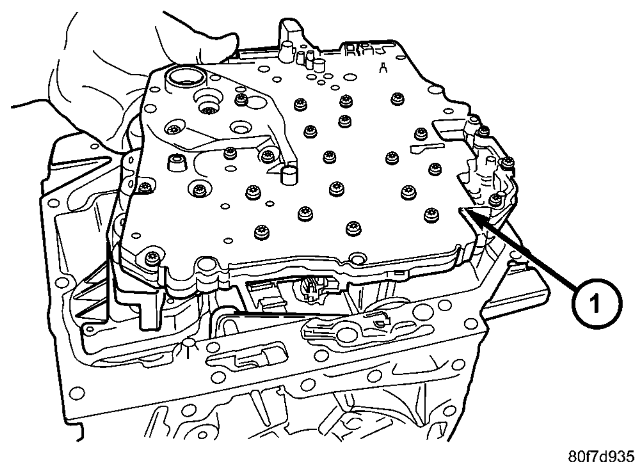


Fig. 284 Remove Valve Body From Transmission

1 - VALVE BODY

VALVE BODY (Continued)

CAUTION: The overdrive and underdrive accumulators and springs may fall out when removing the valve body (Fig. 285) (Fig. 286) (Fig. 287).

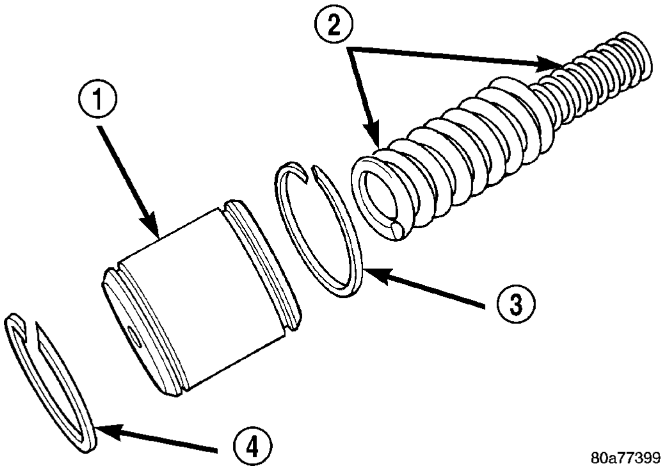


Fig. 285 Accumulator Assembly - Typical

1 - ACCUMULATOR PISTON (UNDERDRIVE)
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

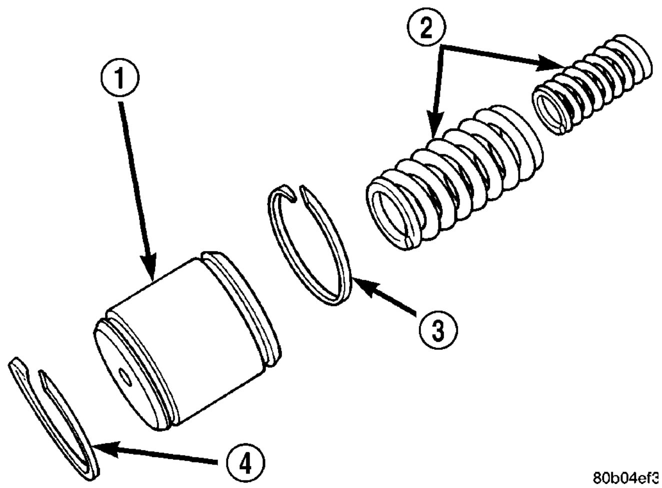


Fig. 286 Overdrive Accumulator and Springs

1 - OVERDRIVE ACCUMULATOR PISTON
2 - RETURN SPRINGS
3 - SEAL RING
4 - SEAL RING

DISASSEMBLY

NOTE: If the valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the DRBIII® Scan Tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

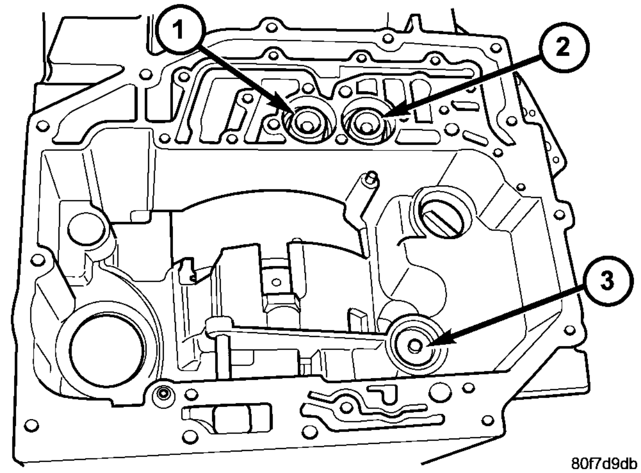


Fig. 287 Accumulator Location

1 - OVERDRIVE ACCUMULATOR LOCATION
2 - UNDERDRIVE ACCUMULATOR LOCATION
3 - LOW/REVERSE ACCUMULATOR

(1) Remove manual shaft seal.
(2) Remove manual shaft screw (Fig. 288).

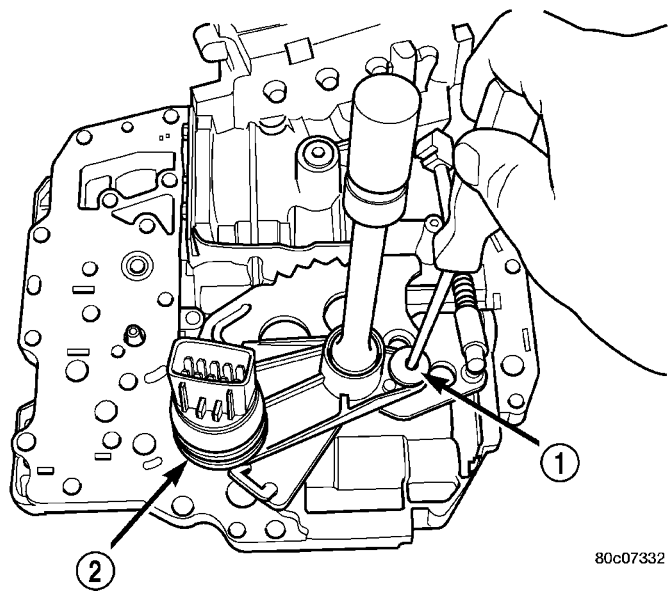


Fig. 288 Manual Shaft Retaining Screw

1 - SCREW
2 - TRS

VALVE BODY (Continued)

(3) Remove Transmission Range Sensor (TRS) and manual shaft (Fig. 289).

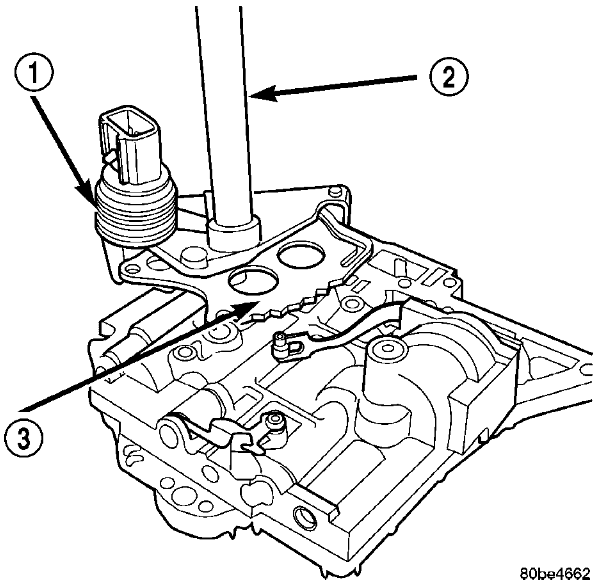


Fig. 289 Manual Shaft/Rooster Comb and Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL SHAFT
3 - ROOSTER COMB

(4) Remove Solenoid/Pressure Switch Assembly from valve body (Fig. 290).

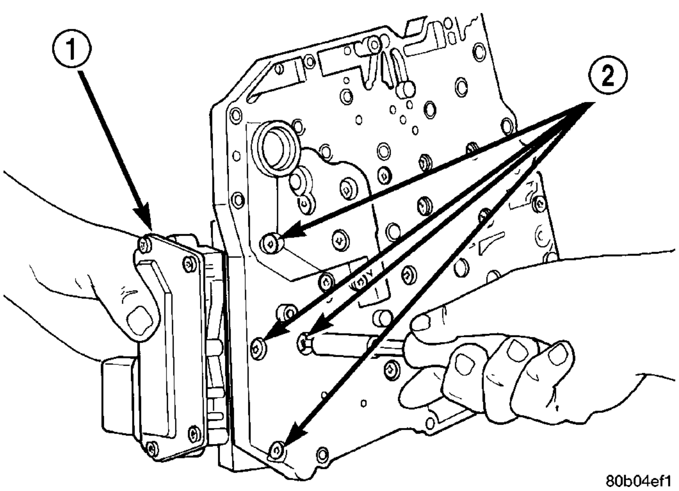


Fig. 290 Solenoid Retaining Screws

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - RETAINING SCREWS

(5) Remove valve body stiffener plate (Fig. 291).

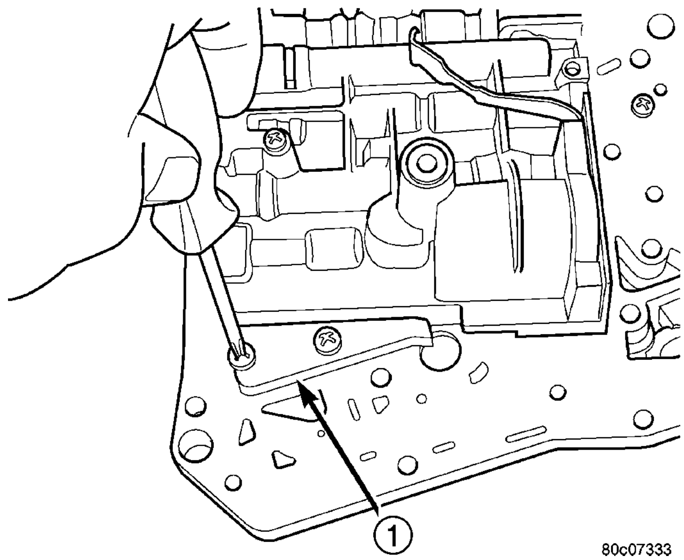


Fig. 291 Remove Stiffener Plate

1 - STIFFENER PLATE

(6) Invert valve body assembly and remove transfer plate-to-valve body screws (Fig. 292).

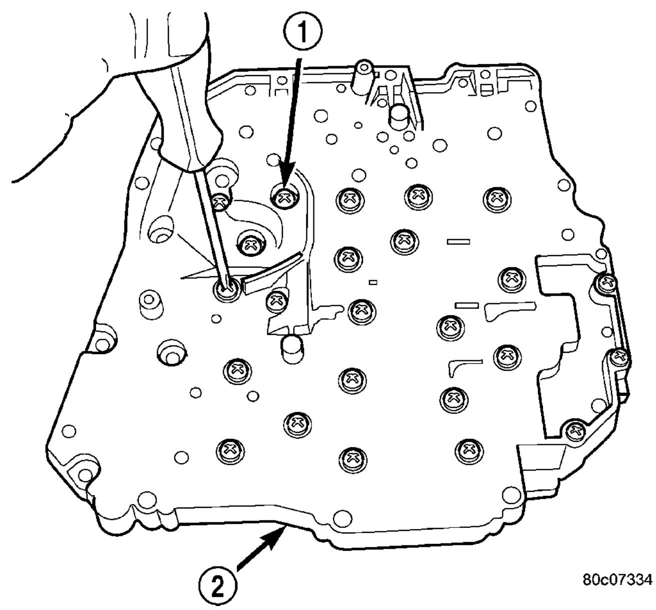


Fig. 292 Remove Transfer Plate-to-Valve Body Screws

1 - SCREW (24)
2 - TRANSFER PLATE

VALVE BODY (Continued)

(7) Remove transfer/separator plate from valve body (Fig. 293)

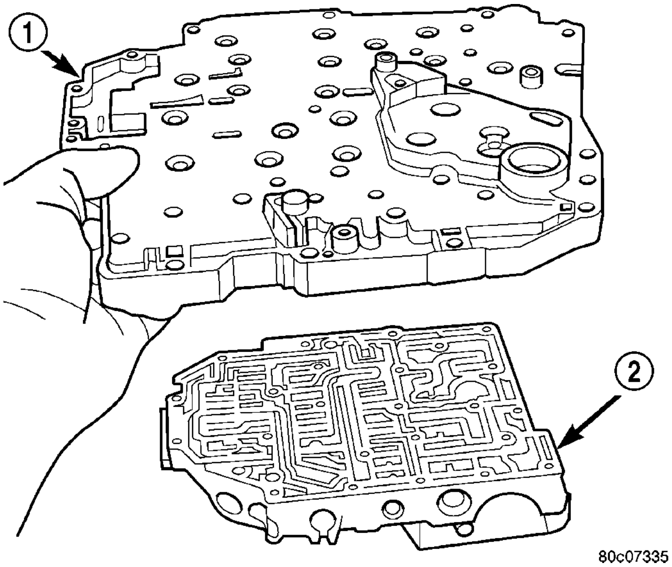


Fig. 293 Remove Transfer Plate to Valve Body

1 - TRANSFER PLATE
2 - VALVE BODY

(8) Remove separator plate-to-transfer plate screws (Fig. 294).

(9) Remove separator plate from transfer plate (Fig. 295).

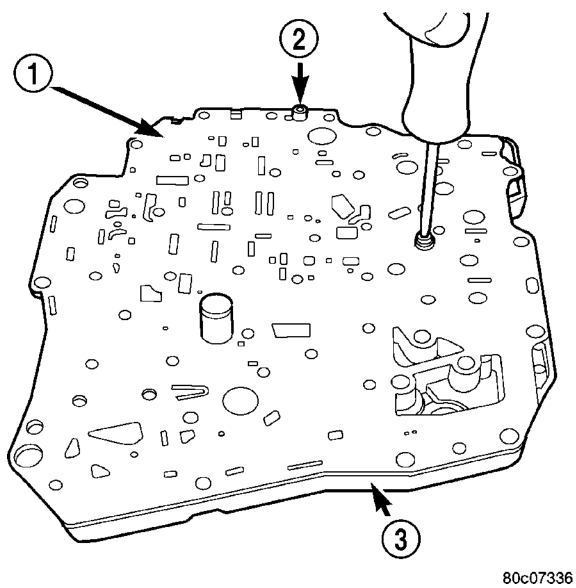


Fig. 294 Remove Separator Plate-to-Transfer Plate Screws

1 - SEPARATOR PLATE
2 - SCREW (2)
3 - TRANSFER PLATE

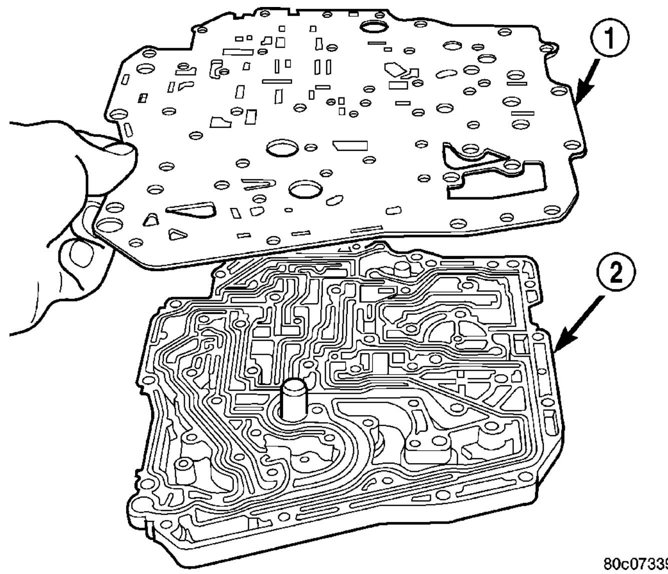


Fig. 295 Remove Separator Plate to Transfer Plate

1 - SEPARATOR PLATE
2 - TRANSFER PLATE

(10) Remove the oil screen from the transfer plate (Fig. 296).

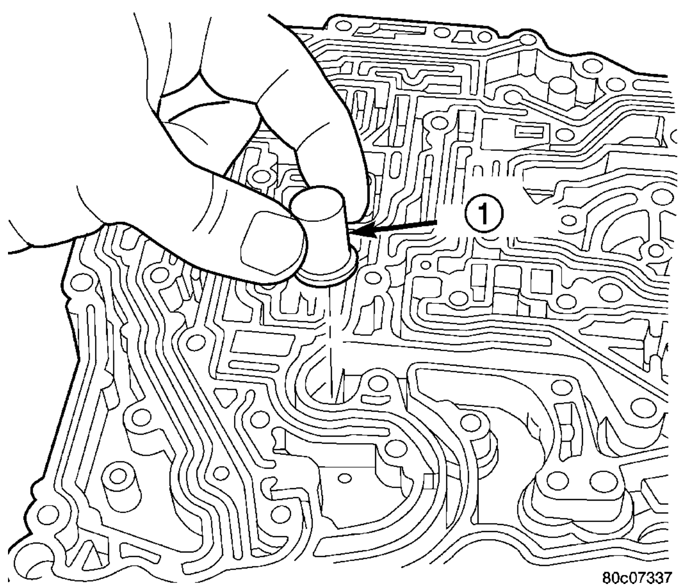


Fig. 296 Remove Oil Screen to Transfer Plate

1 - OIL SCREEN

VALVE BODY (Continued)

(11) Remove thermal valve (Fig. 297) from transfer plate.

(12) Remove valve body check balls. Note their location for assembly ease (Fig. 298).

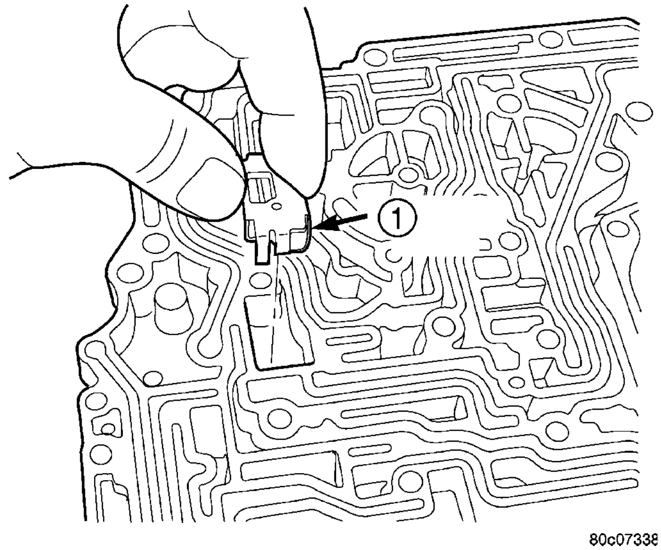


Fig. 297 Remove Thermal Valve to Transfer Plate

1 - THERMAL VALVE

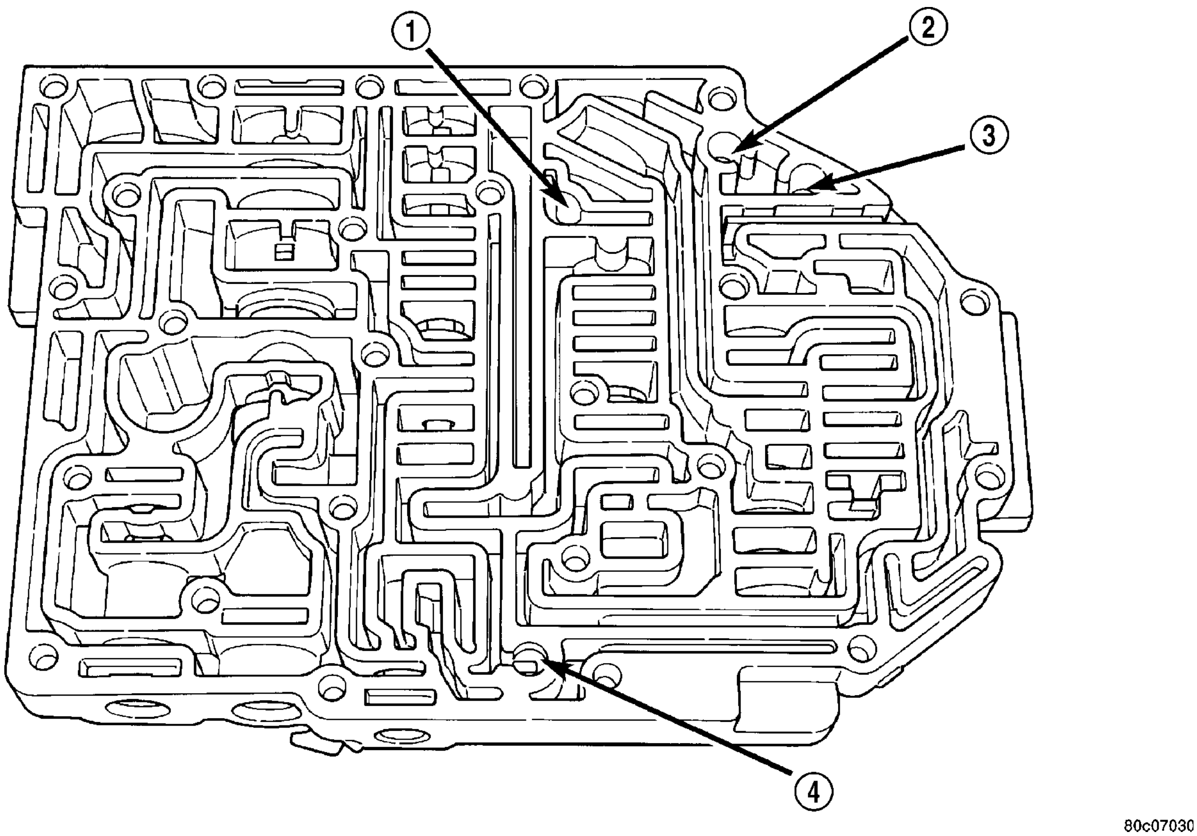


Fig. 298 Ball Check Location

1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - (#5) BALL CHECK LOCATION
4 - (#3) BALL CHECK LOCATION

VALVE BODY (Continued)

(13) Remove 2/4 accumulator assembly as shown in (Fig. 299).

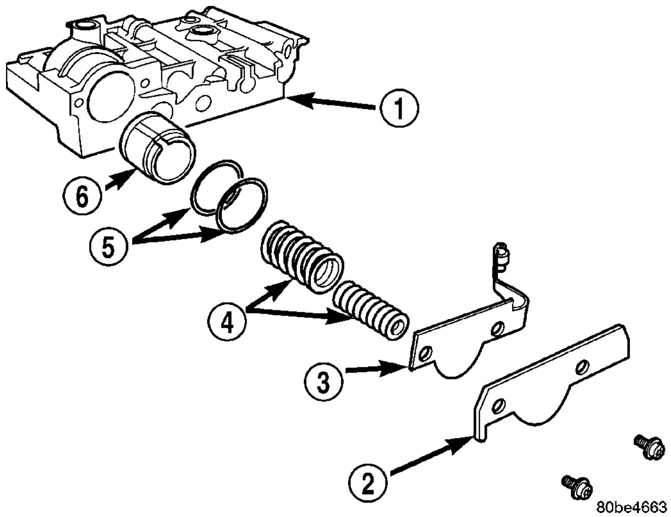


Fig. 299 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - SPRINGS
5 - SEALS
6 - PISTON

(14) Remove dual retainer plate from valve body. Use special tool 6301 to remove plate (Fig. 300).

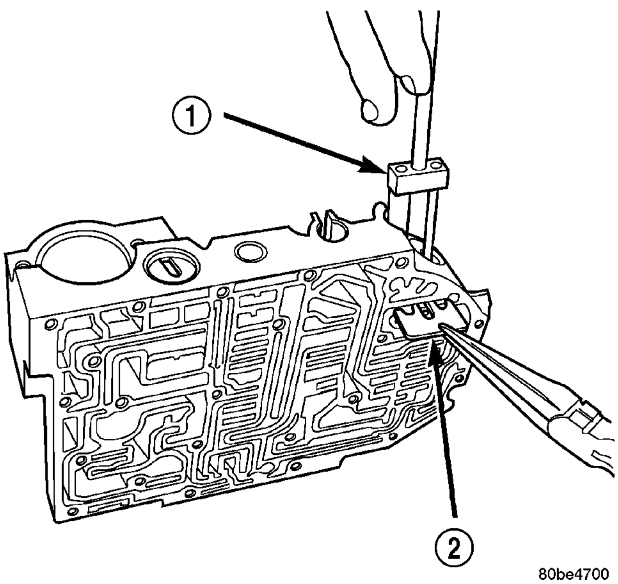


Fig. 300 Remove Dual Retainer Plate using Tool 6301

1 - TOOL 6301
2 - RETAINER

(15) Remove regulator valve spring retainer (Fig. 301).

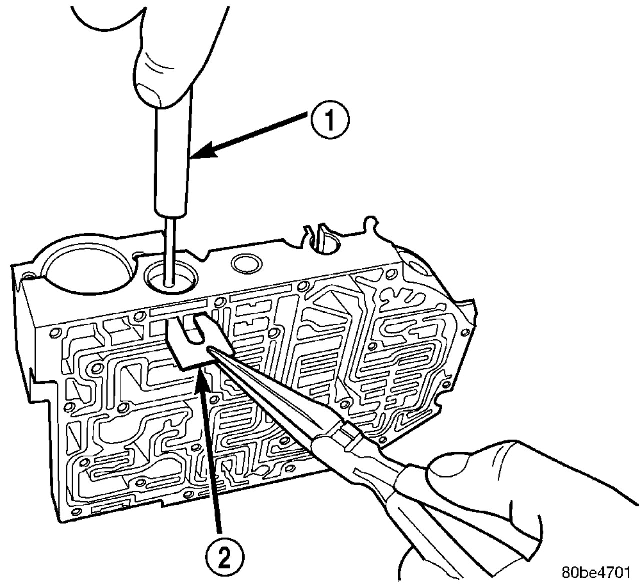


Fig. 301 Remove Regulator Valve Spring Retainer using Tool 6302

1 - TOOL 6302
2 - RETAINER

(16) Remove remaining retainers as shown in (Fig. 302).

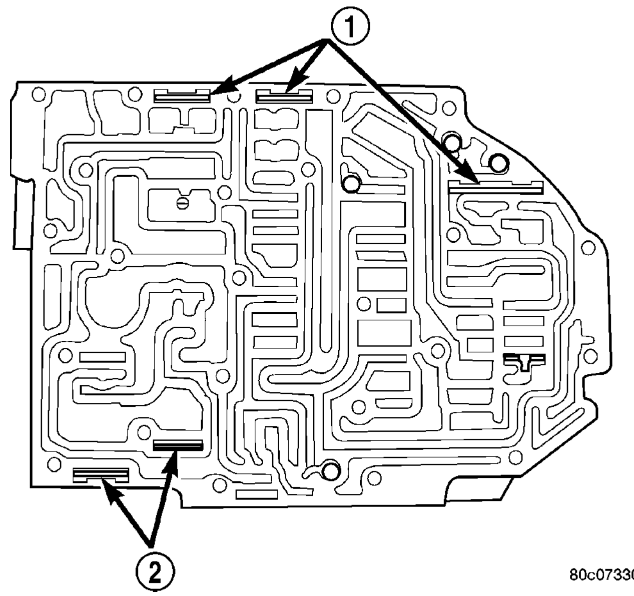


Fig. 302 Valve Retainer Location

1 - RETAINER
2 - RETAINER

VALVE BODY (Continued)

(17) Remove valves and springs as shown in (Fig. 303).

(18) Cleanliness through entire disassembly and assembly of the valve body cannot be overemphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe parts with shop towels.** All mating surfaces in the valve body are accurately machined; therefore, careful handling of all parts must be exercised to avoid nicks or burrs.

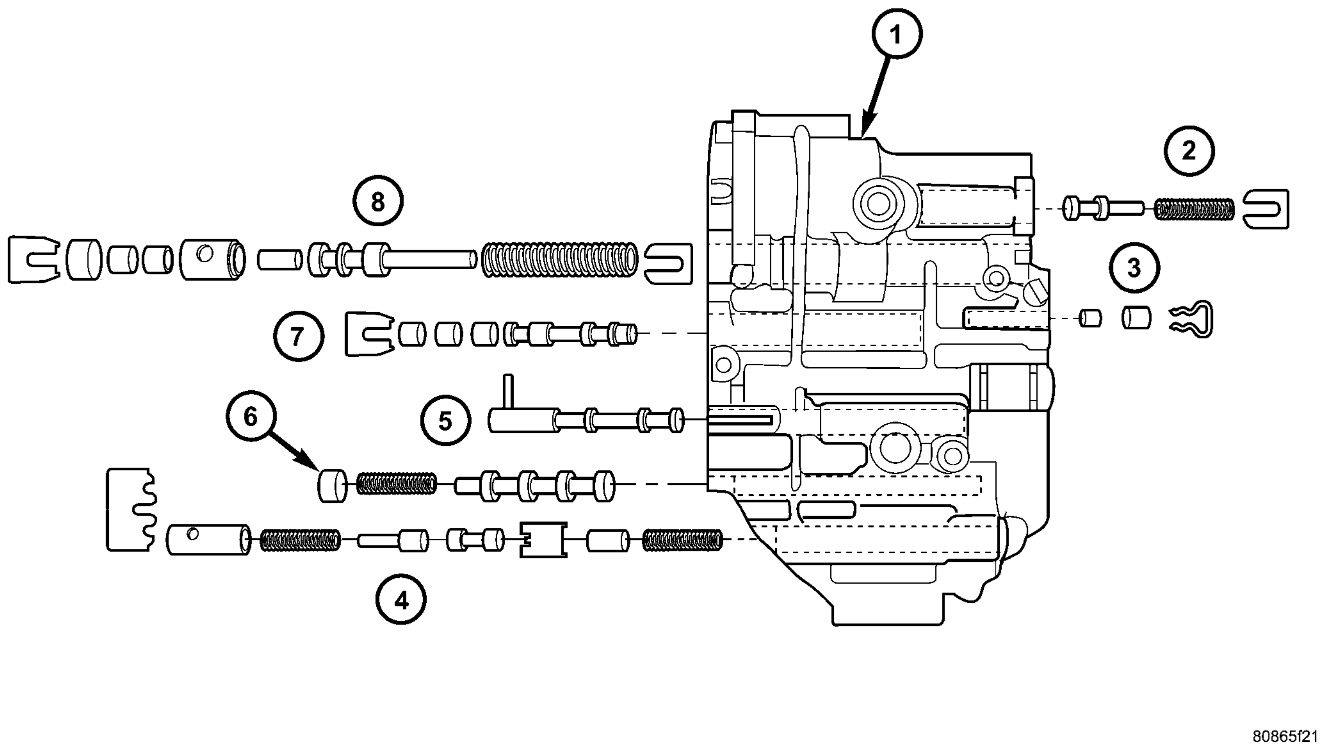


Fig. 303 Valve Body Assembly

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

VALVE BODY (Continued)

ASSEMBLY

NOTE: If the valve body assembly is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the DRBIII® Scan Tool. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

(1) Install valves and springs as shown in (Fig. 304).

(2) Install regulator valve spring retainer (Fig. 305).

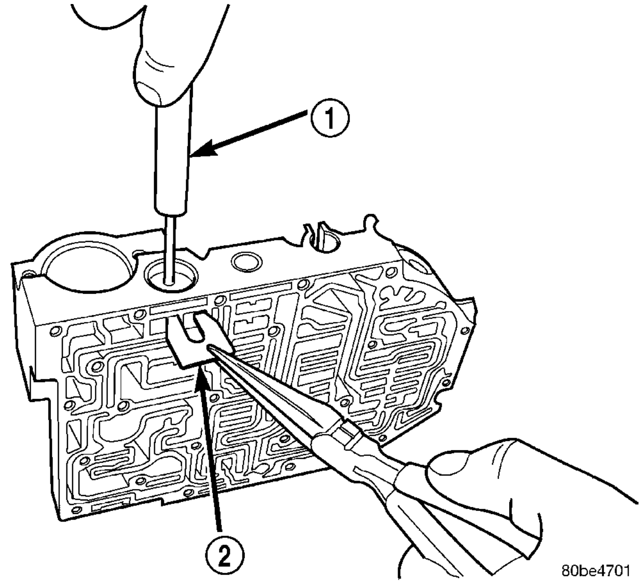


Fig. 305 Install Regulator Valve Spring Retainer using Tool 6302

1 - TOOL 6302
2 - RETAINER

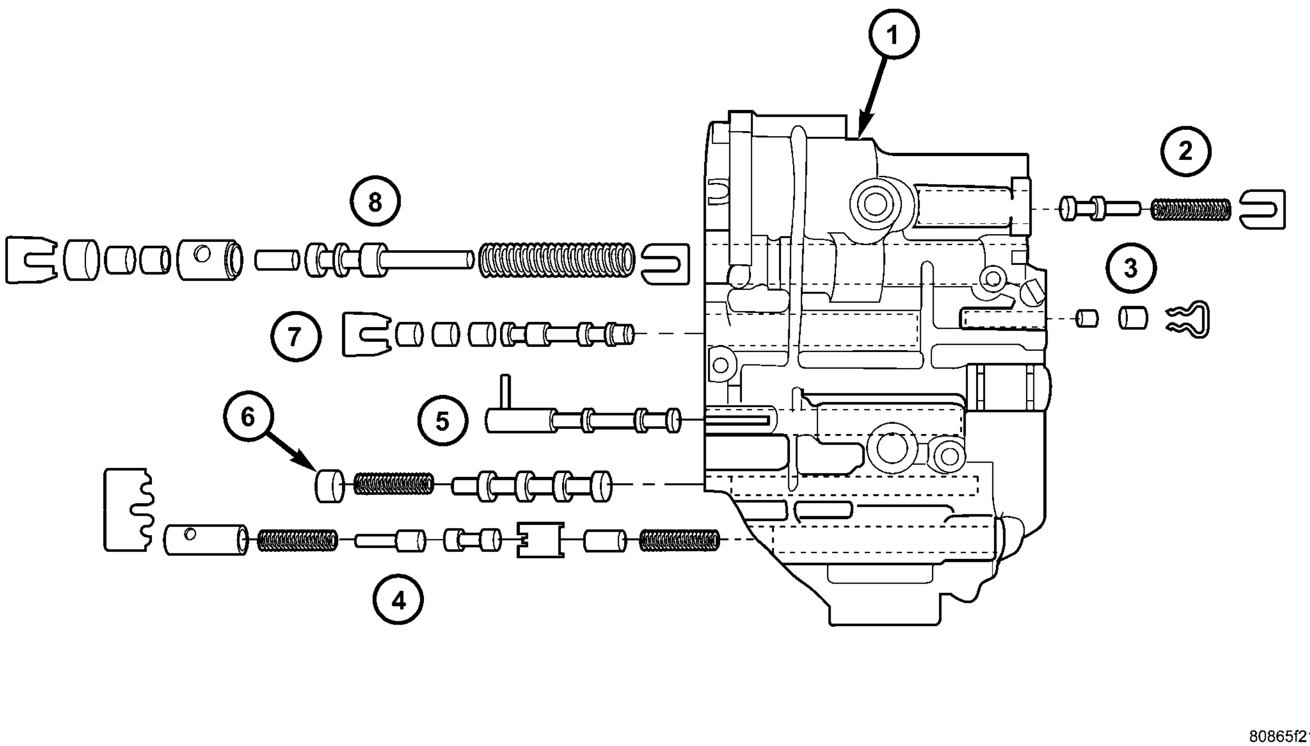


Fig. 304 Valve Body Assembly

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

VALVE BODY (Continued)

(3) Install dual retainer plate using Tool 6301 (Fig. 306).

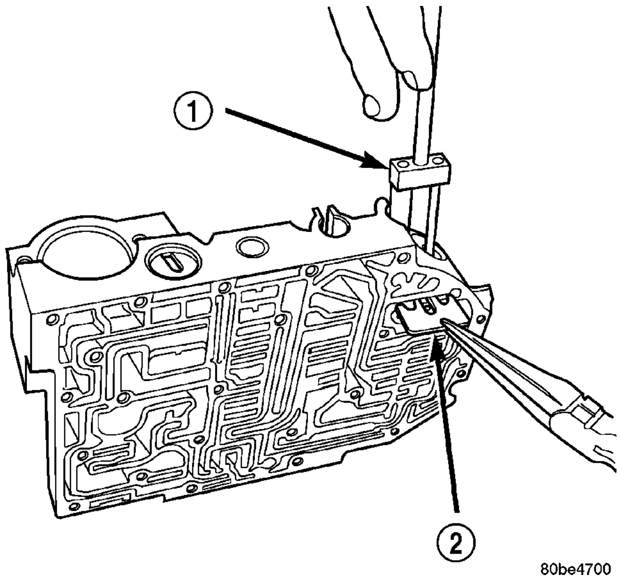


Fig. 306 Install Dual Retainer Plate using Tool 6301

1 - TOOL 6301
2 - RETAINER

(4) Verify that all retainers are installed as shown in (Fig. 307). Retainers should be flush or below valve body surface.

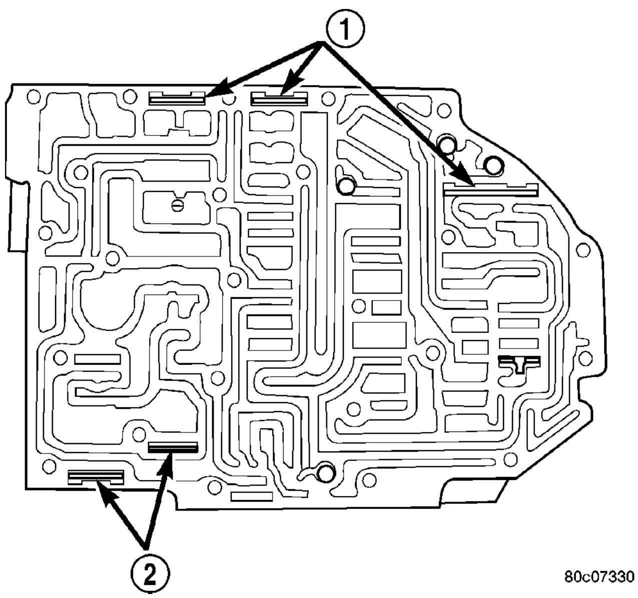


Fig. 307 Valve Retainer Location

1 - RETAINER
2 - RETAINER

(5) Install 2/4 Accumulator components as shown in (Fig. 308). Torque 2/4 Accumulator retainer plate to 5 N·m (45 in. lbs.).

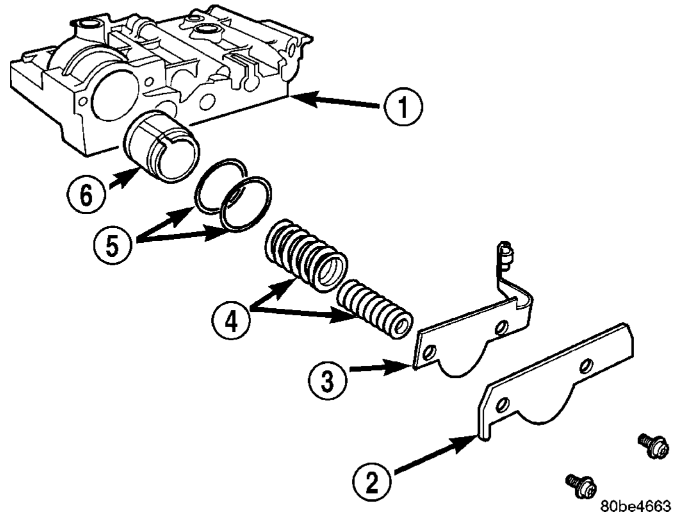


Fig. 308 2/4 Accumulator Assembly

1 - VALVE BODY
2 - RETAINER PLATE
3 - DETENT SPRING
4 - SPRINGS
5 - SEALS
6 - PISTON

(6) Install check balls into position as shown in (Fig. 309). If necessary, secure them with petrolatum or transmission assembly gel for assembly ease.

(7) Install thermal valve to the transfer plate (Fig. 310).

(8) Install the oil screen to the transfer plate (Fig. 311).

VALVE BODY (Continued)

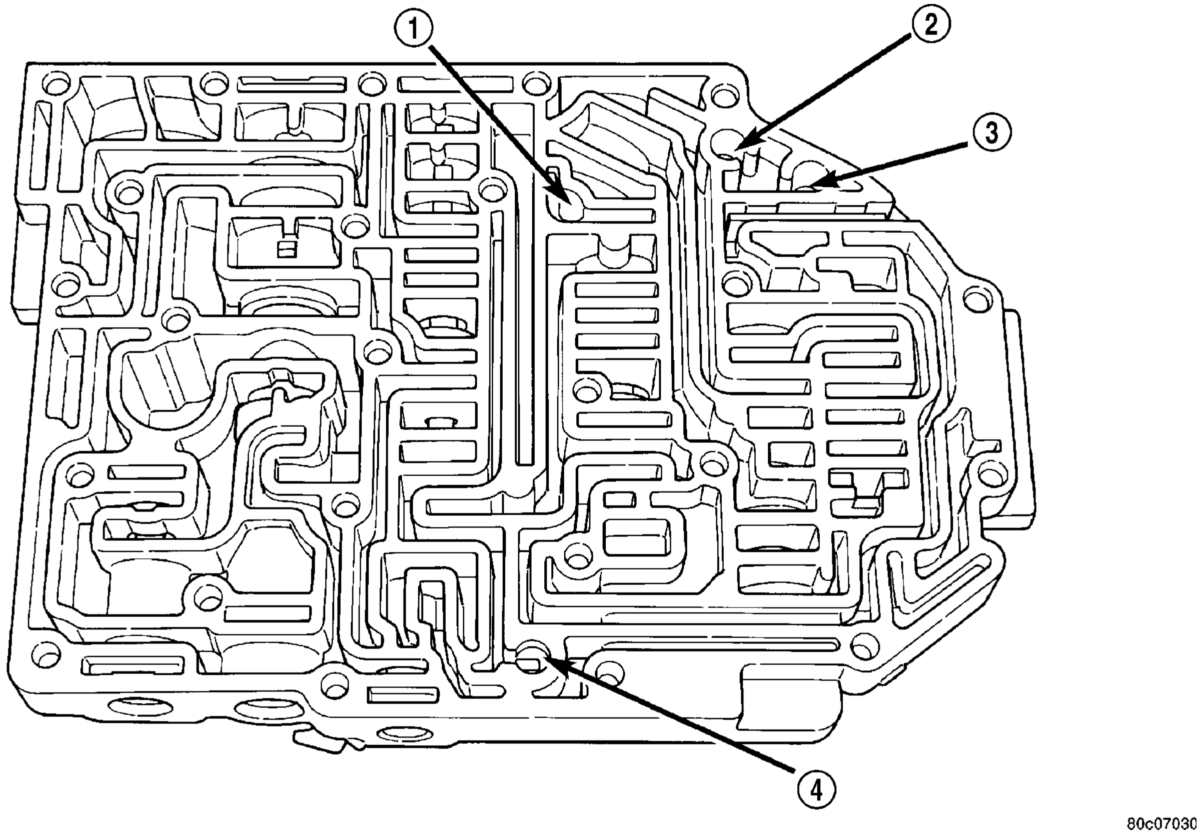


Fig. 309 Ball Check Location

1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - (#5) BALL CHECK LOCATION
4 - (#3) BALL CHECK LOCATION

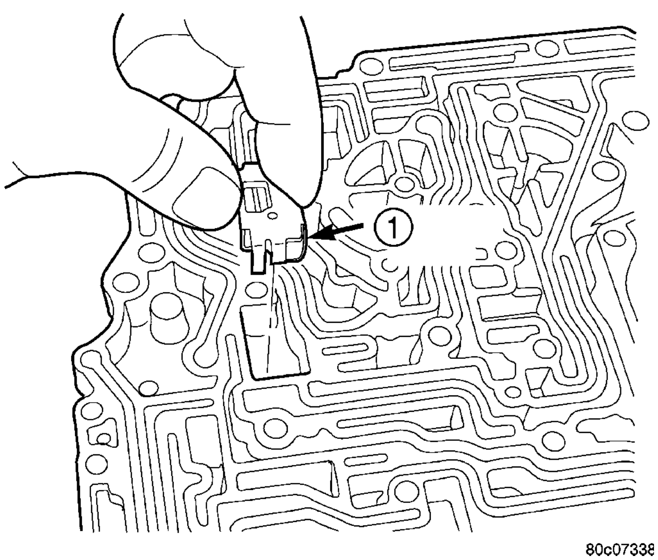


Fig. 310 Install Thermal Valve to Transfer Plate

1 - THERMAL VALVE

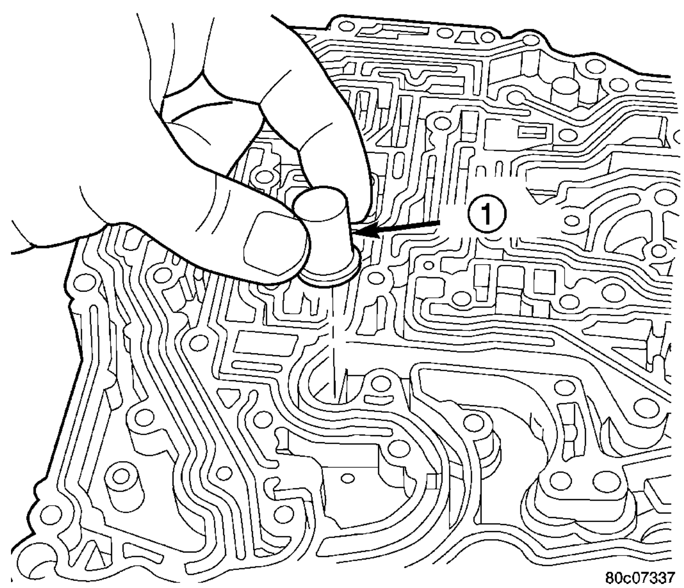


Fig. 311 Install Oil Screen to Transfer Plate

1 - OIL SCREEN

VALVE BODY (Continued)

(9) Install separator plate to transfer plate (Fig. 312).

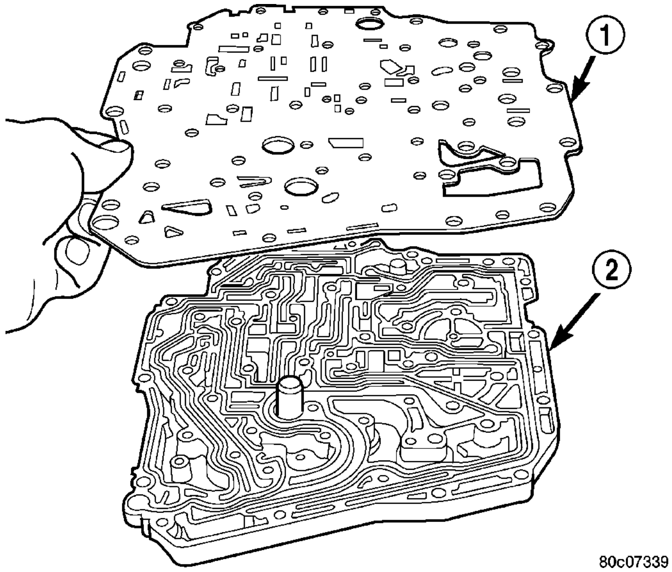


Fig. 312 Install Separator Plate to Transfer Plate

1 - SEPARATOR PLATE
2 - TRANSFER PLATE

(10) Install the two separator plate-to-transfer plate screws (Fig. 313).

(11) Install the transfer plate to the valve body (Fig. 314).

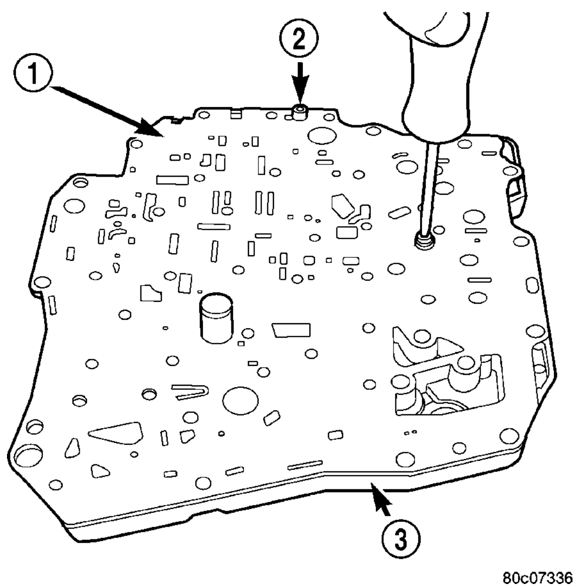


Fig. 313 Install Separator Plate-to-Transfer Plate Screws

1 - SEPARATOR PLATE
2 - SCREW (2)
3 - TRANSFER PLATE

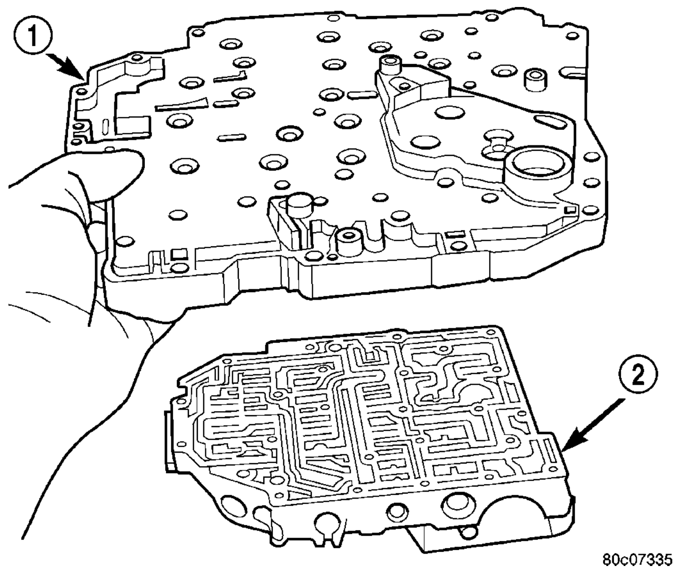


Fig. 314 Install Transfer Plate to Valve Body

1 - TRANSFER PLATE
2 - VALVE BODY

(12) Install the transfer plate-to-valve body screws (Fig. 315) and torque to 5 N·m (45 in. lbs.).

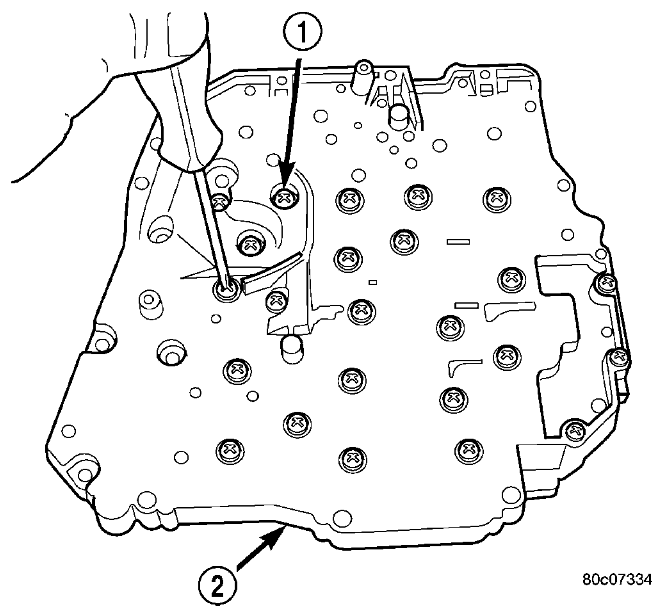


Fig. 315 Install Transfer Plate-to-Valve Body Screws

1 - SCREW (24)
2 - TRANSFER PLATE

VALVE BODY (Continued)

(13) Install the stiffener plate (Fig. 316).

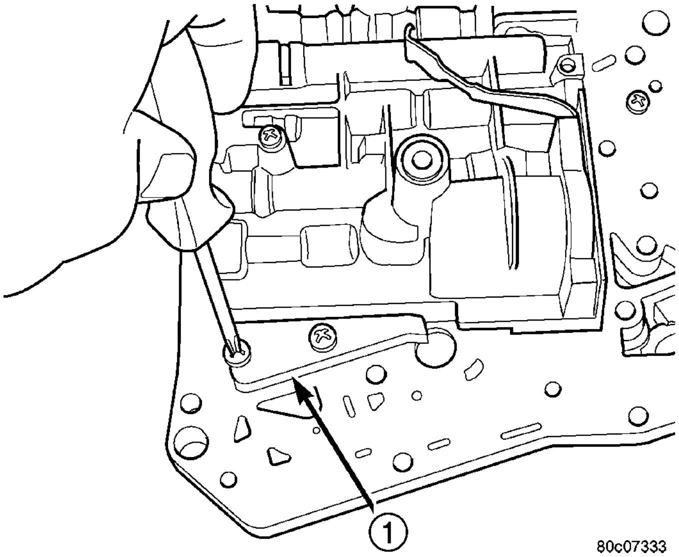


Fig. 316 Install Stiffener Plate

1 - STIFFENER PLATE

(14) Install the solenoid/pressure switch assembly and to the transfer plate (Fig. 317) and torque to 5.5 N·m (50 in. lbs.).

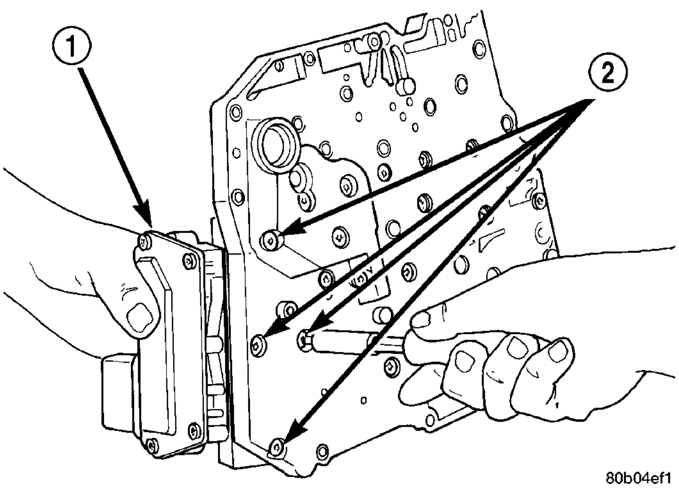


Fig. 317 Solenoid Retaining Screws

1 - SOLENOID/PRESSURE SWITCH ASSEMBLY
2 - RETAINING SCREWS

(15) Install the manual shaft/rooster comb and transmission range sensor to the valve body (Fig. 318).

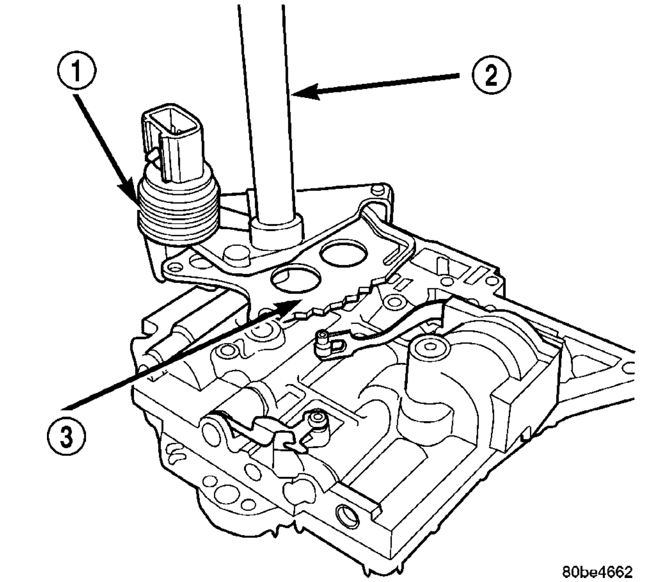


Fig. 318 Manual Shaft/Rooster Comb and Transmission Range Sensor

1 - TRANSMISSION RANGE SENSOR
2 - MANUAL SHAFT
3 - ROOSTER COMB

(16) Install the TRS/manual shaft retaining screw (Fig. 319) and torque to 5 N·m (45 in. lbs.).

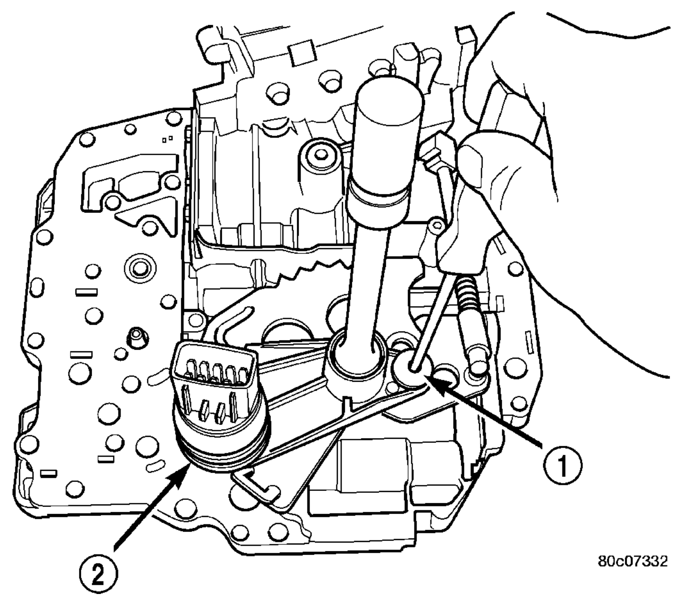


Fig. 319 Manual Shaft Retaining Screw

1 - SCREW
2 - TRS

(17) Install manual shaft seal.

VALVE BODY (Continued)

INSTALLATION

(1) Install valve body into position and start bolts. Torque valve body to transmission case bolts (Fig. 320) to 12 N·m (105 in. lbs.) torque.

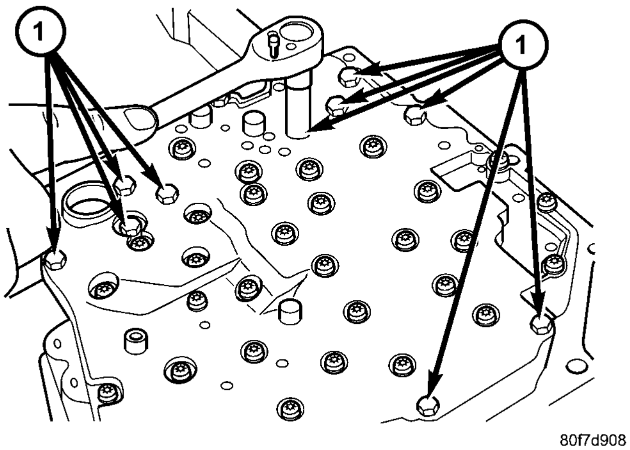


Fig. 320 Install Valve Body Bolts

1 - BOLTS

(2) Install transmission oil filter (Fig. 321).

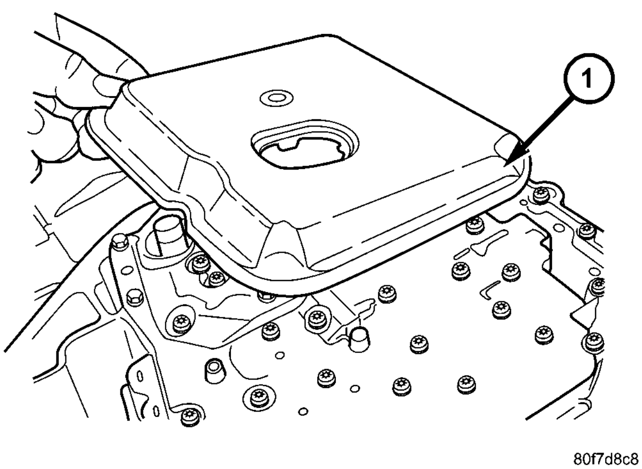


Fig. 321 Install Transmission Filter

1 - TRANSMISSION FILTER

(3) Make sure oil pan and case rail are clean and dry. Install an 1/8" bead of RTV to the transmission oil pan and install to case. Tighten bolts (Fig. 322) to 20 N·m (14.5 ft. lbs.).

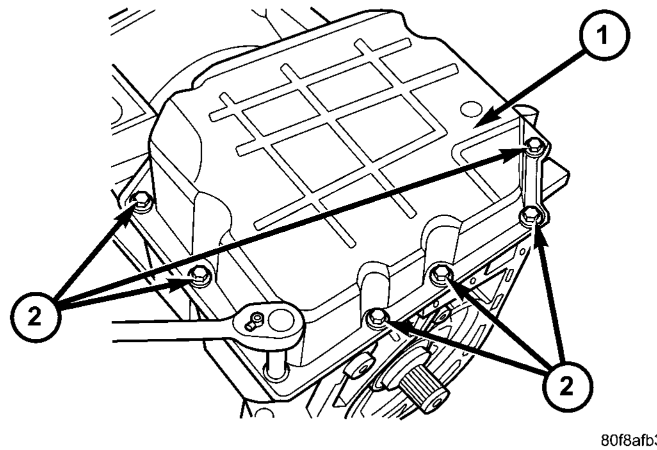


Fig. 322 Install Transmission Oil Pan Bolts

1 - TRANSMISSION OIL PAN
2 - BOLTS

(4) Lower vehicle and connect the TRS connector.

(5) Connect solenoid/pressure switch assembly connector.

(6) Lower vehicle.

(7) Fill transmission with ATF+4, Automatic Transmission Fluid. Verify proper fluid level. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/ FLUID - STANDARD PROCEDURE)

NOTE: If the valve body has been reconditioned or replaced, it is necessary to perform the Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

AUTOMATIC TRANSMISSION - 45RFE

TABLE OF CONTENTS

AUTOMATIC TRANSMISSION - 45RFE

DESCRIPTION

The 45RFE automatic transmission is a sophisticated, multi-range, electronically controlled transmission which combines optimized gear ratios for responsive performance, state of the art efficiency features and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum driveability. The three planetary gear sets also make available a unique alternate second gear ratio. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2prime) allows smoother 4-2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual Stage Hydraulic oil pump
- Valve body
- Solenoid pack

The TCM is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

AUTOMATIC TRANSMISSION - 45RFE (Continued)

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan sealing surface (Fig. 1). Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information which may also be necessary for identification purposes.

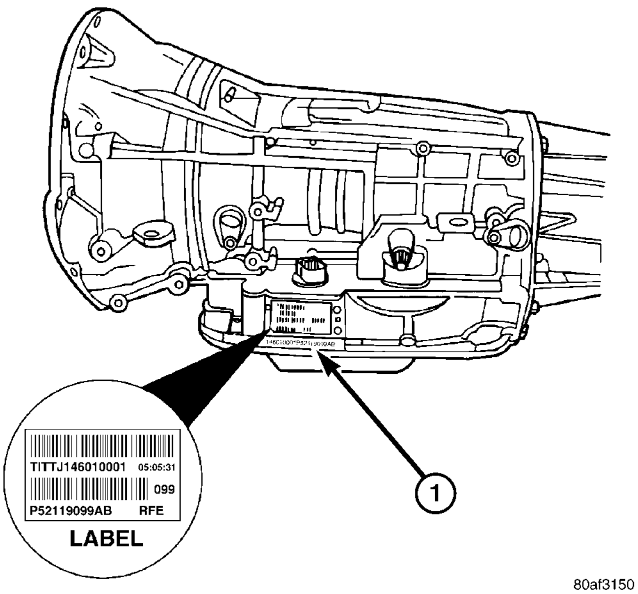


Fig. 1 Transmission Part And Serial Number Location

1 - IDENTIFICATION NUMBERS (STAMPED)

GEAR RATIOS

The 45RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
Reverse	3.00:1

OPERATION

The 45RFE offers full electronic control of all automatic up and downshifts, and features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmission includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output pressure greatly exceeds that which is needed to keep the clutches applied. The 45RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

A high-travel torque converter damper assembly allows earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 45RFE is packaged in a one-piece die-cast aluminum case. To reduce NVH, the case has high lateral, vertical and torsional stiffness. It is also designed to maximize the benefit of the structural dust cover that connects the bottom of the bell housing to the engine bedplate, enhancing overall power train stiffness. Dual filters protect the pump and other components. A pump return filter is added to the customary main sump filter. Independent lubrication and cooler circuits assure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

The hydraulic control system design (without electronic assist) provides the transmission with PARK, REVERSE, NEUTRAL, SECOND, and THIRD gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in “limp-in” mode) in the event of a electronic control system failure, or a situation that the Transmission Control Module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC’s, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB® scan tool.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on a RFE automatic transmission, check for Diagnostic Trouble Codes with the DRB® scan tool.

Transmission malfunctions may be caused by these general conditions:
- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions

AUTOMATIC TRANSMISSION - 45RFE (Continued)

- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

DIAGNOSIS AND TESTING - PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

(1) Check for transmission fault codes using DRB® scan tool.

(2) Check fluid level and condition.

(3) Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform hydraulic pressure test if shift problems were noted during road test.

(6) Perform air-pressure test to check clutch operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift cable.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

DIAGNOSIS AND TESTING - ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, overrunning clutch, or line pressure problems.

A slipping clutch can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch Application chart provides a basis for analyzing road test results.

CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D–OVERDRIVE FIRST	ON					ON*	ON
SECOND	ON			ON			
SECOND PRIME	ON				ON		
THIRD	ON	ON					
FOURTH		ON			ON		
LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
SECOND	ON			ON			
LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

*L/R clutch is on only with the output shaft speed below 150 rpm.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

DIAGNOSIS AND TESTING - HYDRAULIC PRESSURE TEST

An accurate tachometer and pressure test gauges are required. Test Gauge C-3293-SP has a 300 psi range and is used at all locations where pressures exceed 100 psi.

Pressure Test Port Locations

Only two pressure ports are supplied on the transmission case. The torque converter clutch apply and release ports are located on the right side of the transmission case (Fig. 2).

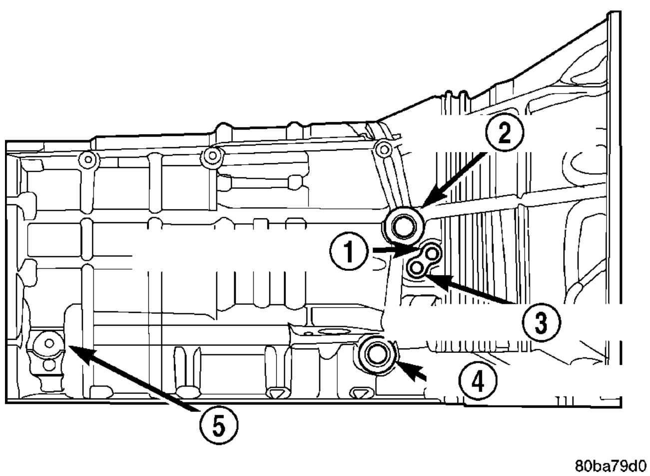


Fig. 2 Torque Converter Pressure Locations

1 - TCC RELEASE
2 - TO COOLER
3 - TCC APPLY
4 - FROM COOLER
5 - LINE PRESSURE SENSOR

To determine the line pressure, there are two available methods. The DRB® scan tool can be used to read line pressure from the line pressure sensor. The second method is to install Line Pressure Adapter 8259 (Fig. 4) into the transmission case and then install the pressure gauge and the original sensor into the adapter. This will allow a comparison of the DRB® readings and the gauge reading to determine the accuracy of the line pressure sensor. The DRB® line pressure reading should match the gauge reading within ±10 psi.

In order to access any other pressure tap locations, the transmission oil pan must be removed, the pressure port plugs removed and Valve Body Pressure Tap Adapter 8258-A (Fig. 5) installed. The extensions supplied with Adapter 8258-A will allow the installation of pressure gauges to the valve body. Refer to (Fig. 3) for correct pressure tap location identification.

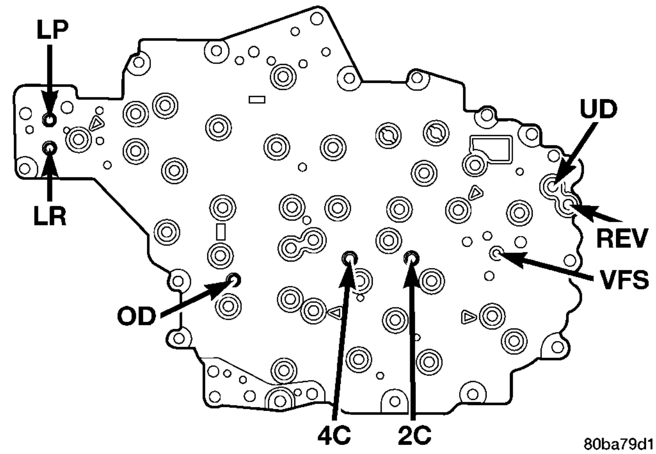


Fig. 3 Pressure Tap Locations

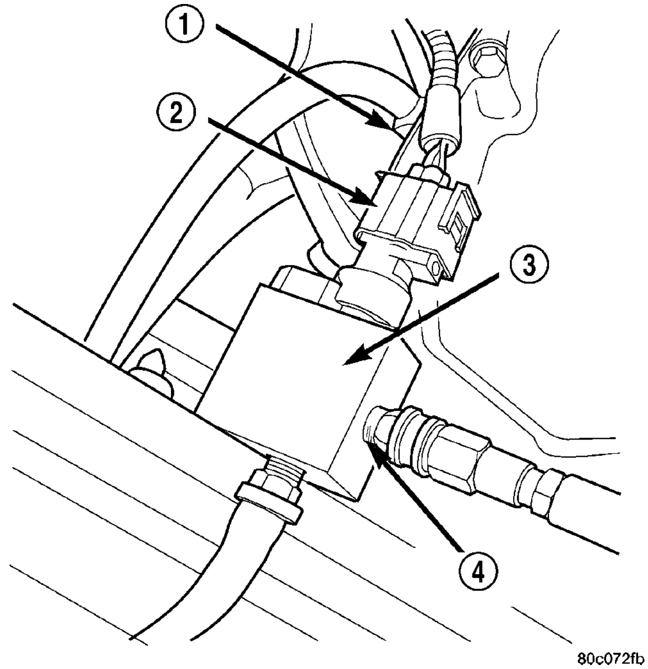


Fig. 4 Line Pressure Adapter 8259

1 - LINE PRESSURE SENSOR PORT
2 - LINE PRESSURE SENSOR
3 - TOOL 8259
4 - PRESSURE TAP

TEST PROCEDURE

All pressure readings should be taken with the transmission fluid level full, transmission oil at the normal operating temperature, and the engine at 1500 rpm. Check the transmission for proper operation in each gear position that is in question or if a specific element is in question, check the pressure readings in at least two gear positions that employ that element. Refer to the Hydraulic Schematics at the rear of this section to determine the correct pressures for each element in a given gear position.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

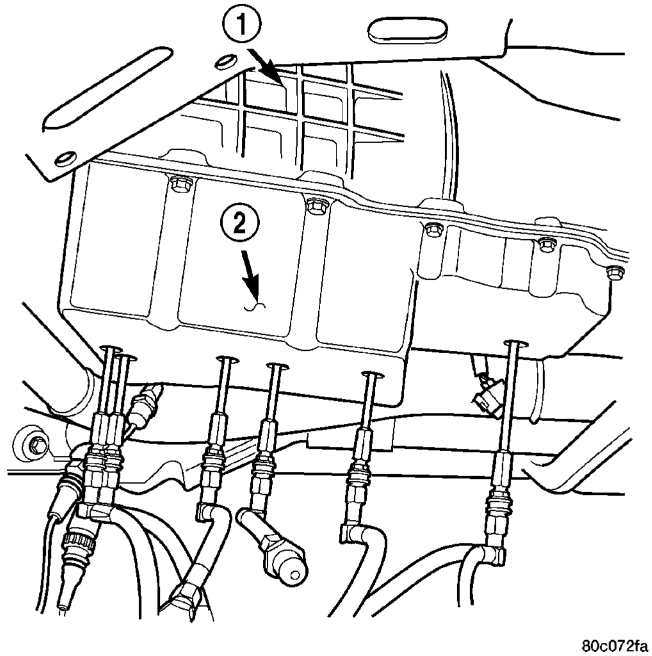


Fig. 5 Valve Body Pressure Tap Adapter 8258-A

1 - RFE TRANSMISSION
2 - TOOL 8258-A

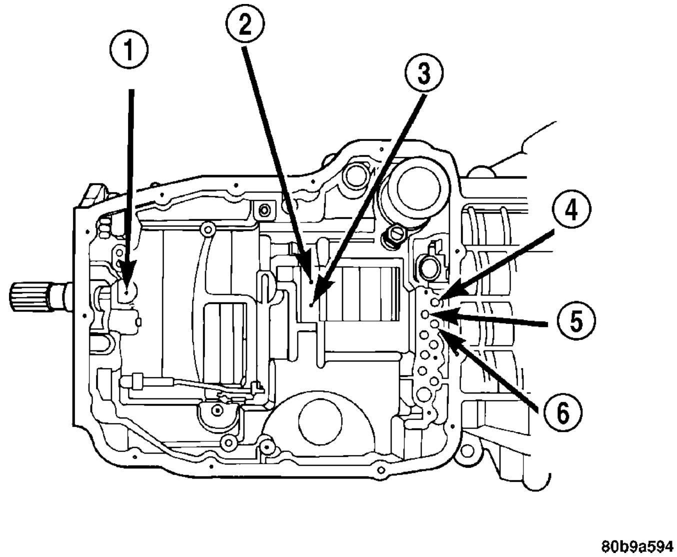


Fig. 6 Air Pressure Test Passages

1 - LOW REVERSE CLUTCH
2 - 4TH CLUTCH
3 - 2ND CLUTCH
4 - OVERDRIVE CLUTCH
5 - UNDERDRIVE CLUTCH
6 - REVERSE CLUTCH

NOTE: The RFE utilizes closed loop control of pump line pressure. The pressure readings may therefore vary greatly but should always follow line pressure.

Some common pressures that can be measured to evaluate pump and clutch performance are the upshift/downshift pressures and the garage shift pressures. The upshift/downshift pressure for all shifts is 120 psi. The garage shift pressure when performing a N-R shift is 220 psi. The garage shift pressure for the R-N shift is 120 psi and 135 psi for N-1 shifts.

DIAGNOSIS AND TESTING - AIR CHECKING TRANSMISSION CLUTCH OPERATION

Air-pressure testing can be used to check transmission clutch operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The clutch apply passages are shown (Fig. 6).

NOTE: The air supply which is used must be free of moisture and dirt. Use a pressure of 30 psi to test clutch operation.

Apply air pressure at each port. If the clutch is functioning, a soft thump will be heard as the clutch is applied. The clutch application can also be felt by touching the appropriate element while applying air pressure. As the air pressure is released, the clutch should also release.

DIAGNOSIS AND TESTING - CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.

(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Torque converter seal leaks tend to move along the drive hub and onto the rear of the converter. Pump cover seal tend to run down the cover and the inside surface of the bellhousing.

Some leaks, or suspected leaks, may be particularly difficult to locate. If necessary, a Mopar® approved dye may be used to locate a leak.

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 7).

(2) Leaks at the converter hub weld (Fig. 7).

AUTOMATIC TRANSMISSION - 45RFE (Continued)

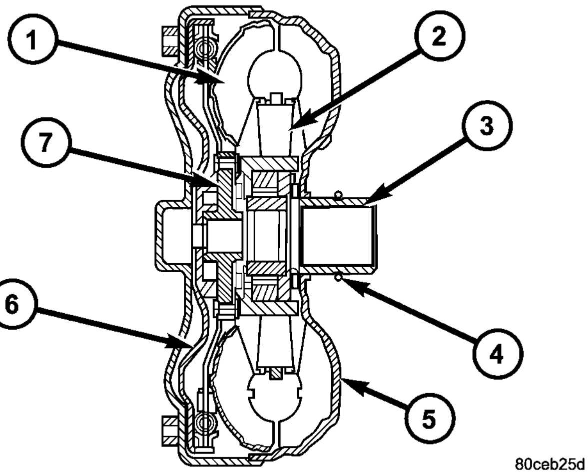


Fig. 7 Torque Converter Assembly

1 - TURBINE ASSEMBLY
2 - STATOR
3 - CONVERTER HUB
4 - O-RING
5 - IMPELLER ASSEMBLY
6 - CONVERTER CLUTCH PISTON
7 - TURBINE HUB

STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

(1) Disconnect the negative battery cable.

(2) Raise and support the vehicle

(3) Remove any necessary skid plates (Fig. 8). (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)

(4) Mark propeller shaft and axle companion flanges for assembly alignment.

(5) Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(6) Remove the front propeller shaft, if necessary.(Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(7) Disengage the output speed sensor connector from the output speed sensor (Fig. 9).

(8) Disengage the input speed sensor connector from the input speed sensor (Fig. 10).

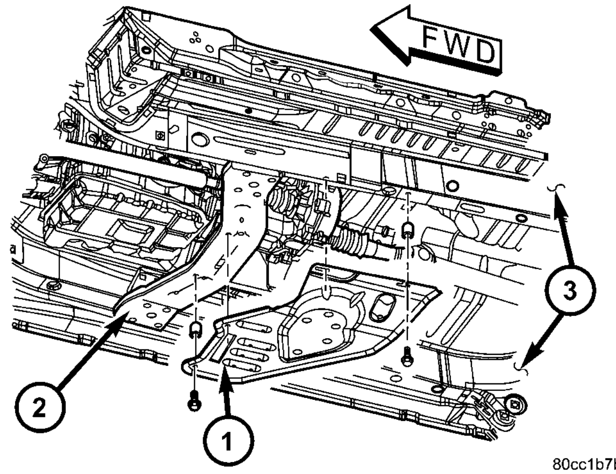


Fig. 8 Remove Skid Plate

1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

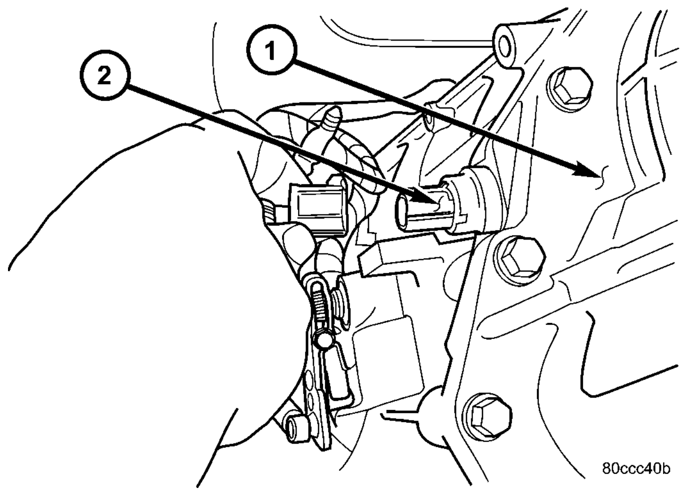


Fig. 9 Disconnect Output Speed Sensor

1 - TRANSMISSION
2 - OUTPUT SPEED SENSOR

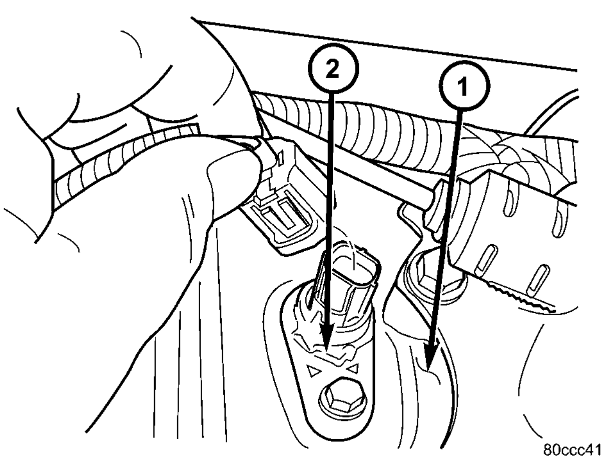


Fig. 10 Disconnect Input Speed Sensor

1 - TRANSMISSION
2 - INPUT SPEED SENSOR

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(9) Disengage the transmission solenoid/TRS assembly connector from the transmission solenoid/ TRS assembly (Fig. 11).

(10) Disengage the line pressure sensor connector from the line pressure sensor (Fig. 12).

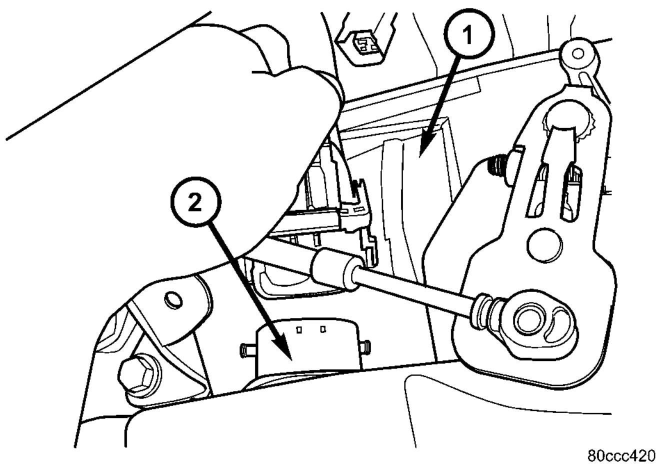


Fig. 11 Disconnect Transmission Solenoid/TRS Assembly

1 - TRANSMISSION
2 - TRANSMISSION SOLENOID/TRS ASSEMBLY

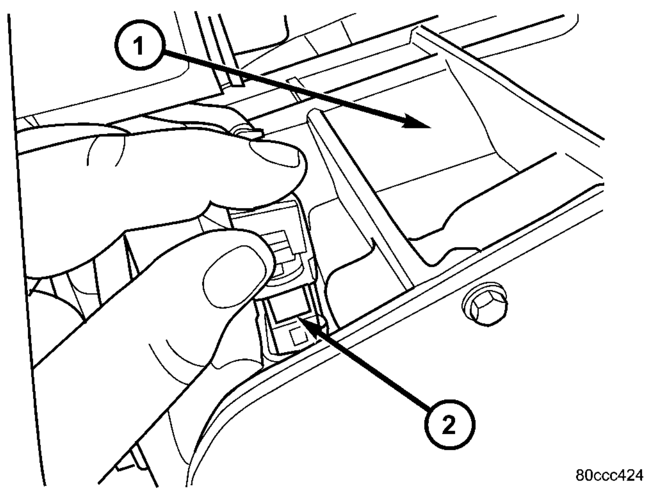


Fig. 12 Disconnect Line Pressure Sensor

1 - TRANSMISSION
2 - LINE PRESSURE SENSOR

(11) Remove the bolts holding the exhaust cross-over pipe to the pre-catalytic converter pipe flanges (Fig. 13).

(12) Remove the bolts holding the exhaust cross-over pipe to the catalytic converter flange.

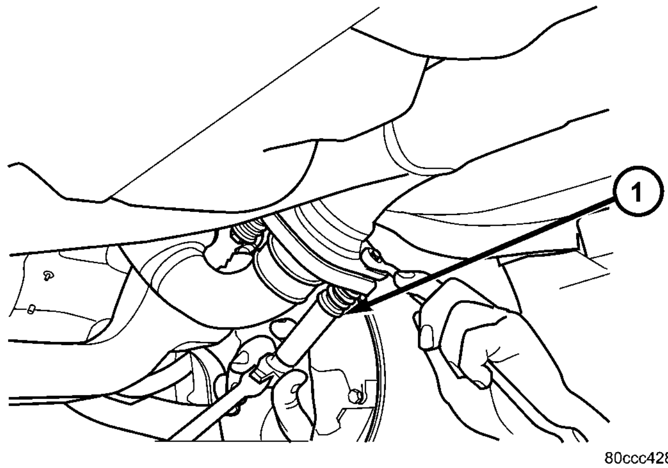


Fig. 13 Remove Exhaust Flange Bolts

1 - EXHAUST FLANGE BOLTS

(13) Disconnect gearshift cable from transmission manual valve lever (Fig. 14).

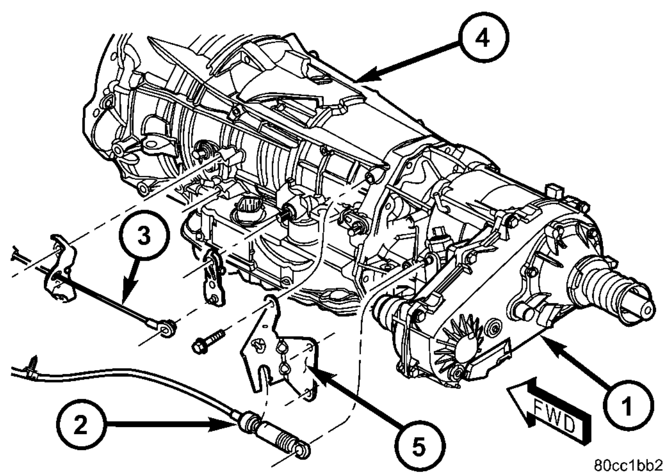


Fig. 14 Remove Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(14) Disengage the shift cable from the cable support bracket.

(15) Remove the starter motor.

(16) Remove the engine to transmission collar (Fig. 15).

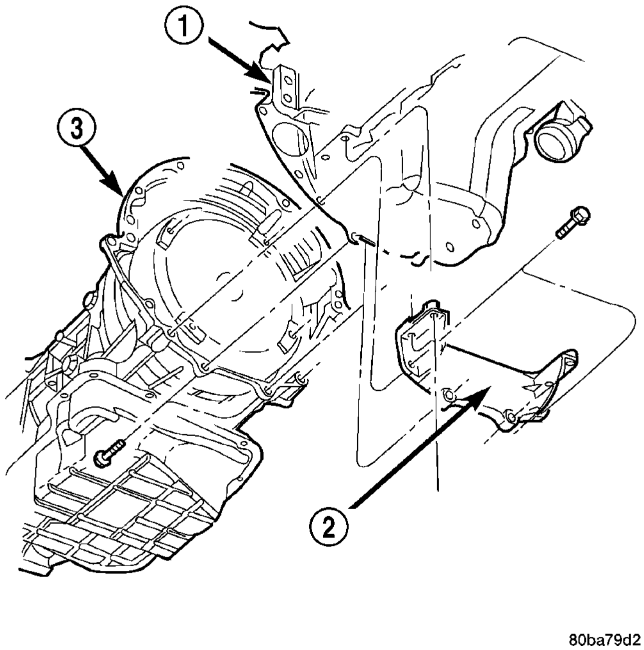


Fig. 15 Transmission Collar

1 - ENGINE
2 - ENGINE TO TRANSMISSION COLLAR
3 - TRANSMISSION

(17) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(18) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(19) Disconnect the transmission vent hose from the transmission.

(20) Remove transfer case.

(21) Support rear of engine with safety stand or jack.

(22) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(23) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 16).

(24) Remove bolts attaching crossmember to frame and remove crossmember.

(25) Remove all remaining converter housing bolts.

(26) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(27) Hold torque converter in place during transmission removal.

(28) Lower transmission and remove assembly from under the vehicle (Fig. 17).

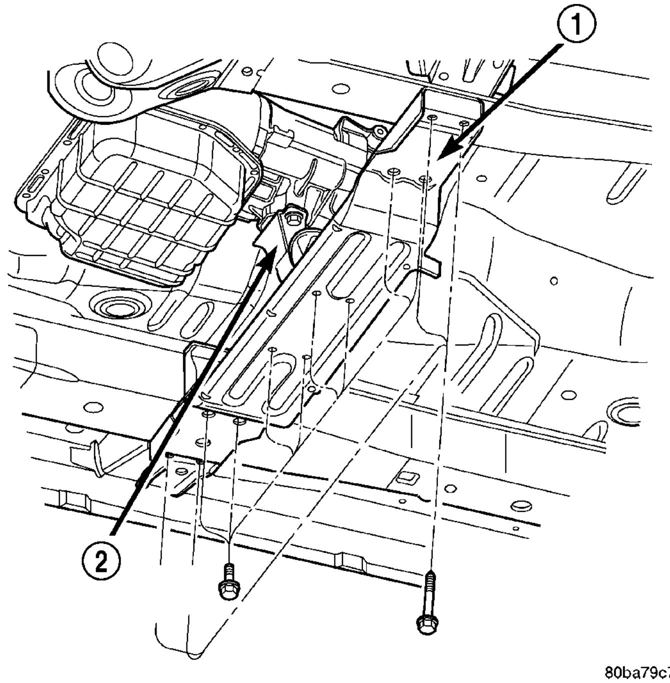


Fig. 16 Rear Transmission Crossmember

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

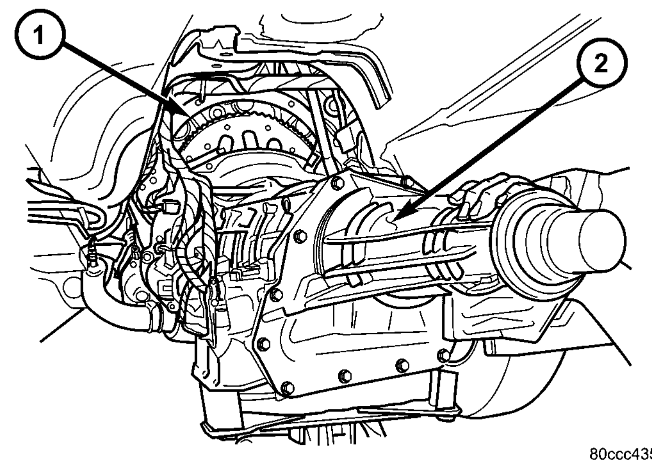


Fig. 17 Remove Transmission

1 - ENGINE
2 - TRANSMISSION

(29) To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY

(1) Drain fluid from transmission.

(2) Clean exterior of transmission with suitable solvent or pressure washer.

(3) Remove the torque converter from the transmission.

(4) Remove the manual shift lever from the transmission.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(5) Remove the input, output, and line pressure sensors from the transmission case (Fig. 18).

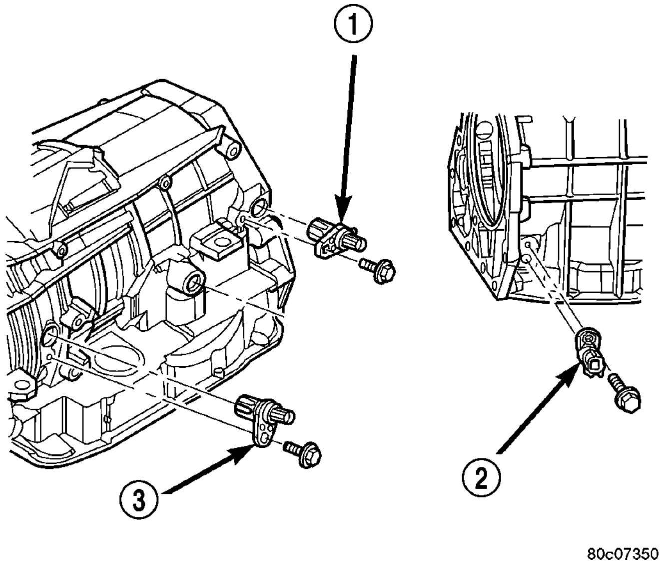


Fig. 18 Remove Input, Output, and Line Pressure Sensors

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

(6) Inspect the ends of the sensors for debris, which may indicate the nature of the transmission failure.

(7) Install Support Stand 8257 onto the transmission case (Fig. 19).

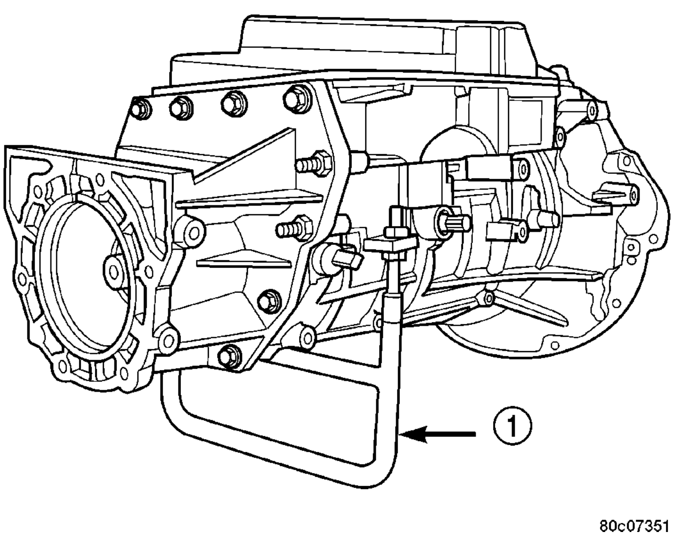


Fig. 19 Install Support Stand - Tool 8257

1 - TOOL 8257

(8) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 20).

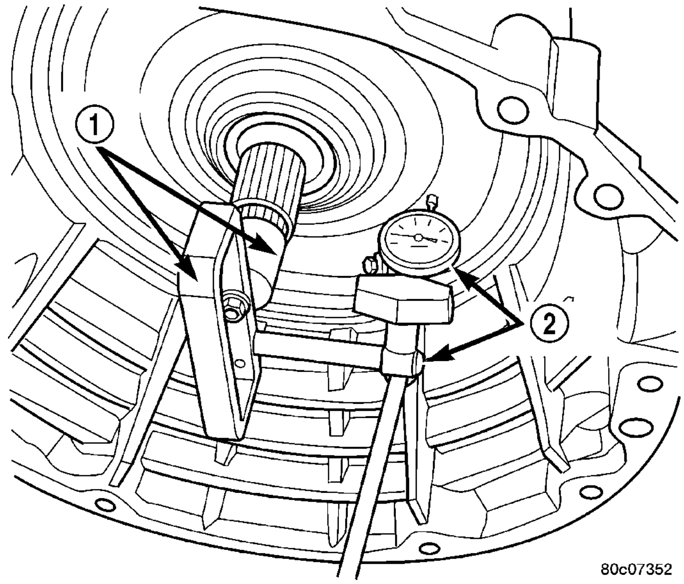


Fig. 20 Measure Input Shaft End Play

1 - TOOL 8266
2 - TOOL C-3339

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(9) Remove the bolts holding the transmission extension/adapter housing to the transmission case.

(10) Remove the extension/adapter housing from the transmission case.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(11) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 21).

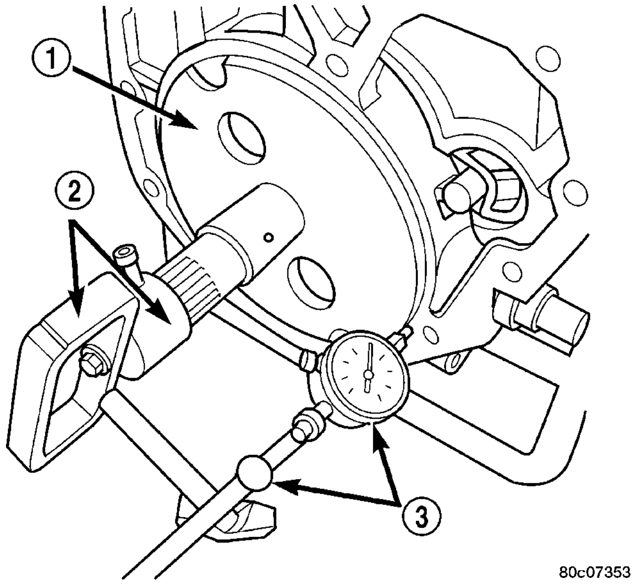


Fig. 21 Measure Output Shaft End Play

1 - TOOL 8261
2 - TOOL 8266
3 - TOOL C-3339

(12) Remove the bolts holding the transmission oil pan to the transmission case.

(13) Remove the transmission oil pan from the transmission case.

(14) Remove the primary oil filter and the oil cooler return filter (Fig. 22).

(15) Remove the cooler return filter bypass valve.

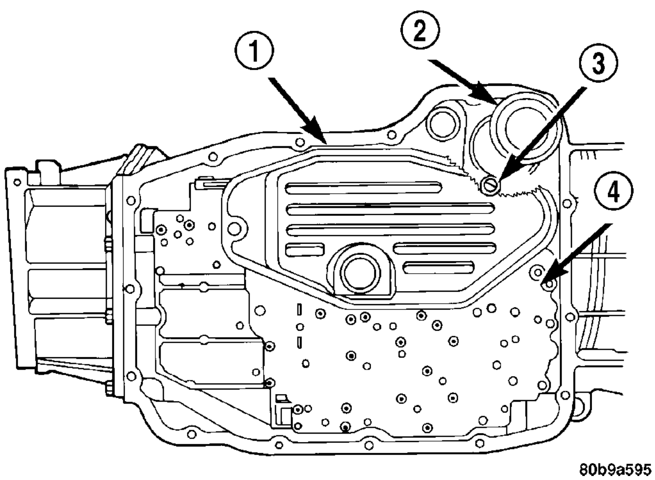


Fig. 22 Remove Primary Oil and Cooler Filters

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

(16) Remove the bolts holding the valve body to the transmission case (Fig. 23).

(17) Remove the valve body from the transmission case.

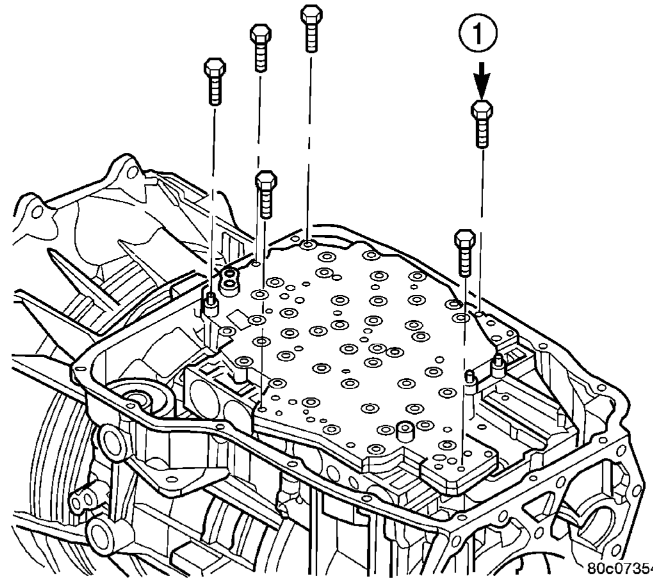


Fig. 23 Remove Valve Body Assembly

1 - VALVE BODY TO CASE BOLT (6)

(18) Remove the outer snap-ring securing the transmission front cover into the transmission case (Fig. 24).

(19) Remove the inner snap-ring securing the transmission front cover to the oil pump (Fig. 24).

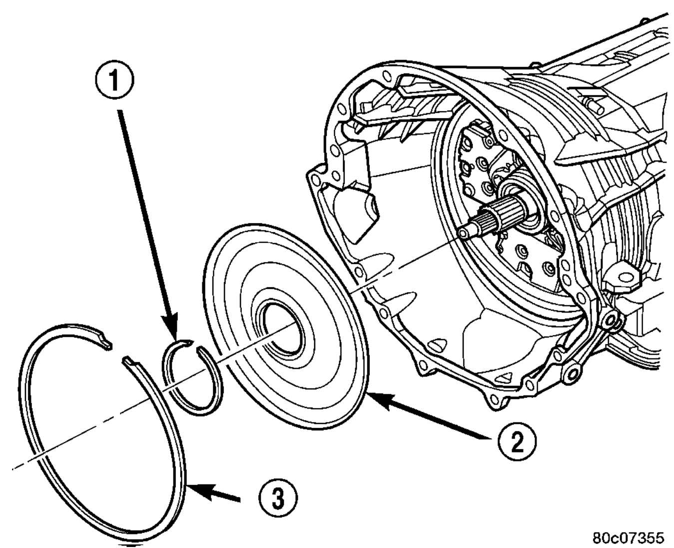


Fig. 24 Remove Transmission Front Cover

1 - INNER SNAP-RING
2 - TRANSMISSION COVER
3 - OUTER SNAP-RING

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(20) Reaching through a case opening in the valve body area with a long blunted tool, remove the transmission front cover from the transmission case.

(21) Remove the bolts holding the oil pump into the transmission case (Fig. 25).

(22) Remove the oil pump. Hold inward on the input shaft to prevent pulling the input clutch assembly with the oil pump (Fig. 25).

NOTE: If the input shaft is not held during oil pump removal, the input clutch assembly will attempt to move forward with the oil pump and the numbers 2, 3, or 4 bearings inside the input clutch assembly may become dislodged.

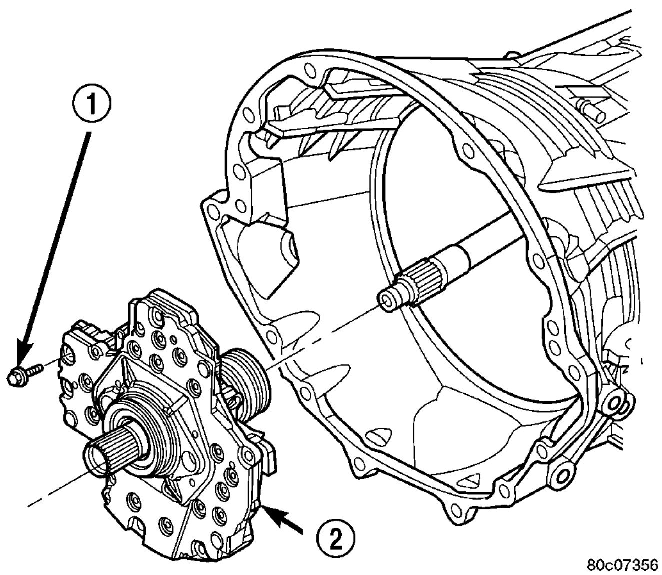


Fig. 25 Remove Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

(23) Remove the number 1 bearing from the input clutch assembly (Fig. 26).

(24) Remove the input clutch assembly from the transmission case (Fig. 26).

(25) Remove the number 5 bearing and selective thrust plate from the input clutch assembly (Fig. 26), or the 4C clutch retainer/bulkhead.

(26) Remove the 4C clutch retainer/bulkhead tapered snap-ring from the transmission case (Fig. 27).

(27) Remove the 4C clutch retainer/bulkhead from the transmission case (Fig. 27).

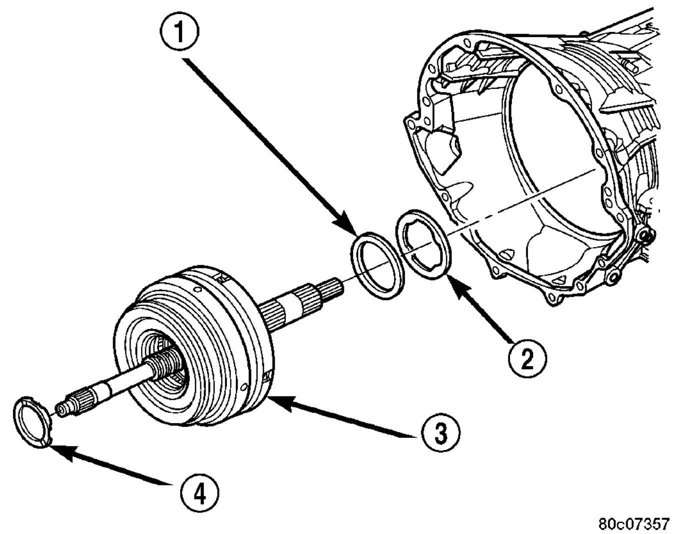


Fig. 26 Remove Input Clutch Assembly

1 - BEARING NUMBER 5
2 - THRUST PLATE (SELECT)
3 - INPUT CLUTCH ASSEMBLY
4 - BEARING NUMBER 1

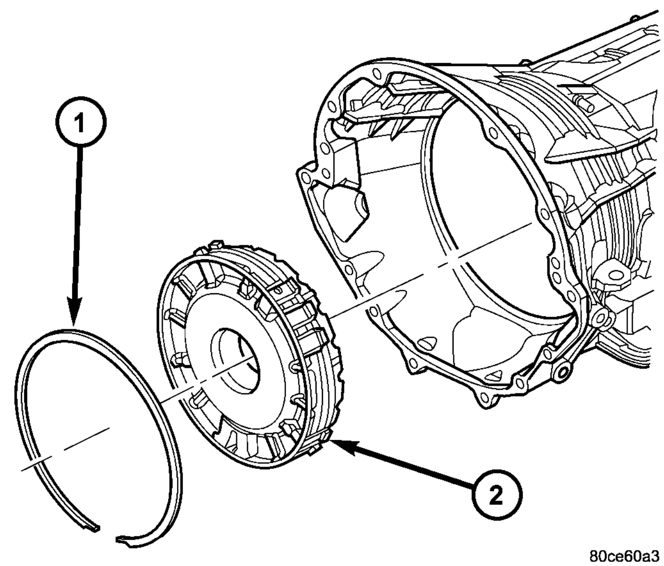


Fig. 27 Remove 4C Clutch Retainer/Bulkhead

1 - SNAP-RING
2 - 4C CLUTCH RETAINER/BULKHEAD

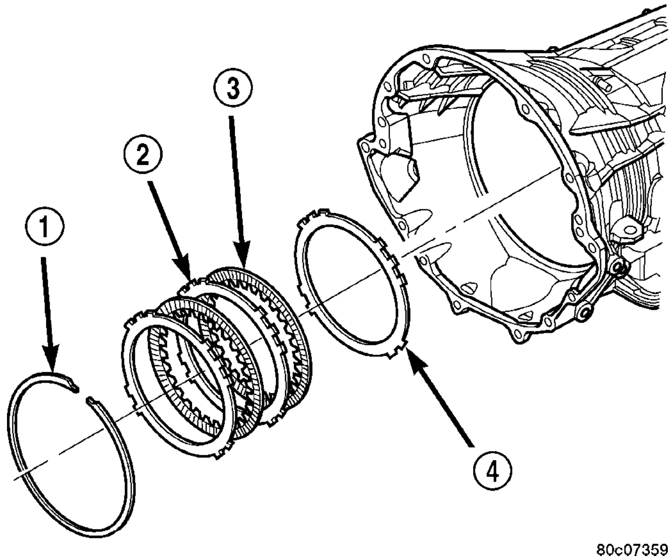


Fig. 28 Remove 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

(28) Remove the front 2C clutch pack snap-ring from the transmission case (Fig. 28).

(29) Remove the 2C clutch pack from the transmission case (Fig. 28).

(30) Remove the rear selective plate and number 6 bearing from the reaction annulus (Fig. 29).

(31) Remove the reaction annulus from the reaction planetary carrier (Fig. 29).

(32) Remove the number 7 bearing (Fig. 29).

(33) Remove the reaction sun gear (Fig. 29).

(34) Remove the number 8 bearing from the reaction planetary carrier (Fig. 29).

(35) Remove the reaction planetary carrier (Fig. 29). Note that this planetary gear set has three pinion gears.

(36) Remove the number 9 bearing from the reverse planetary gear set (Fig. 29).

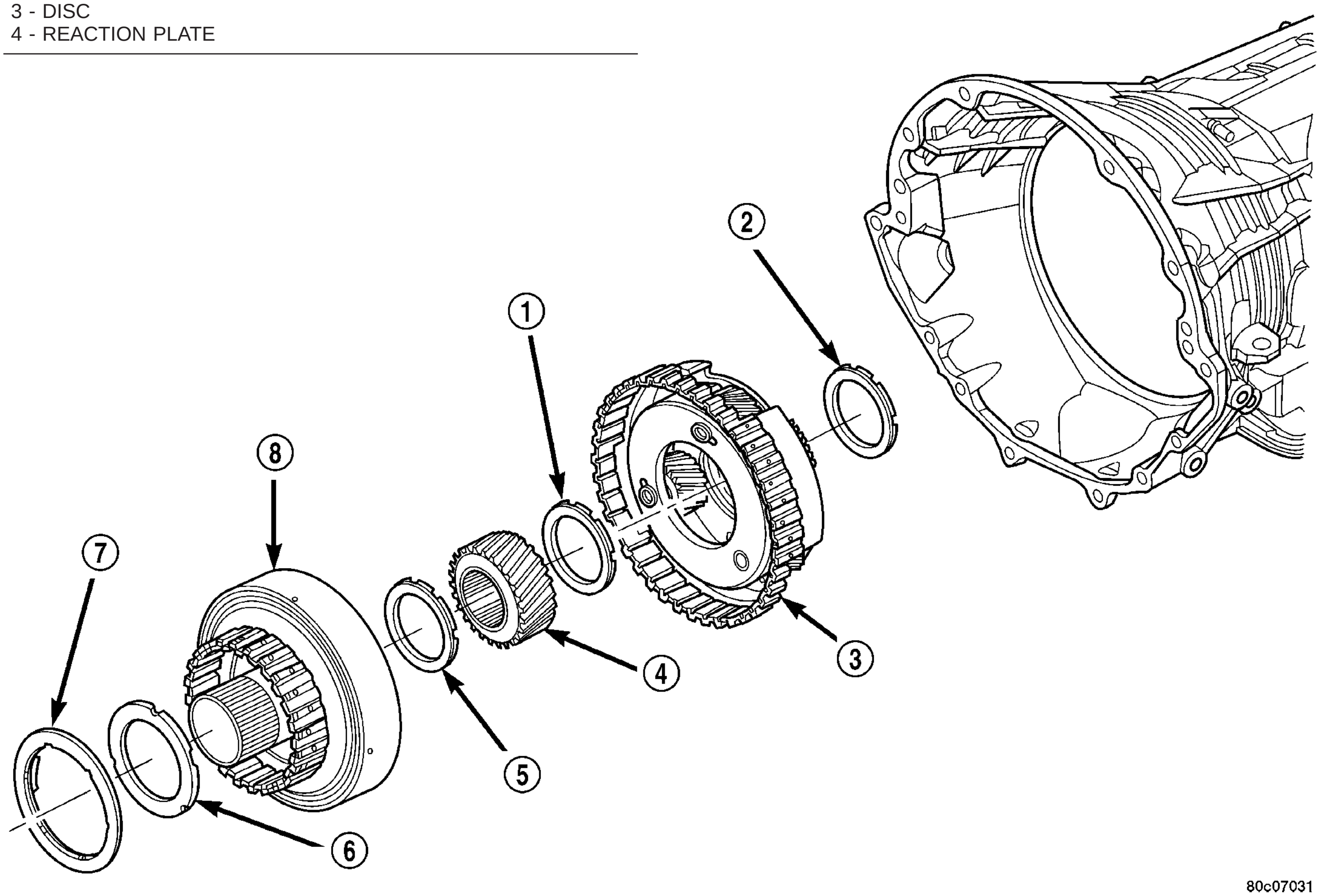


Fig. 29 Remove Reaction Annulus and Carrier

1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(37) Remove the snap-ring holding the park sprag gear onto the output shaft (Fig. 30).

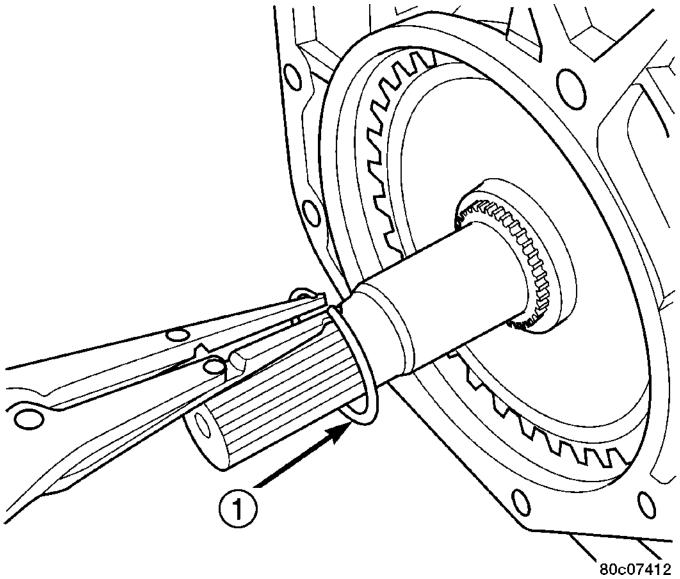


Fig. 30 Remove Park Sprag Snap-Ring

1 - SNAP-RING

(38) Remove the park sprag gear from the output shaft (Fig. 31).

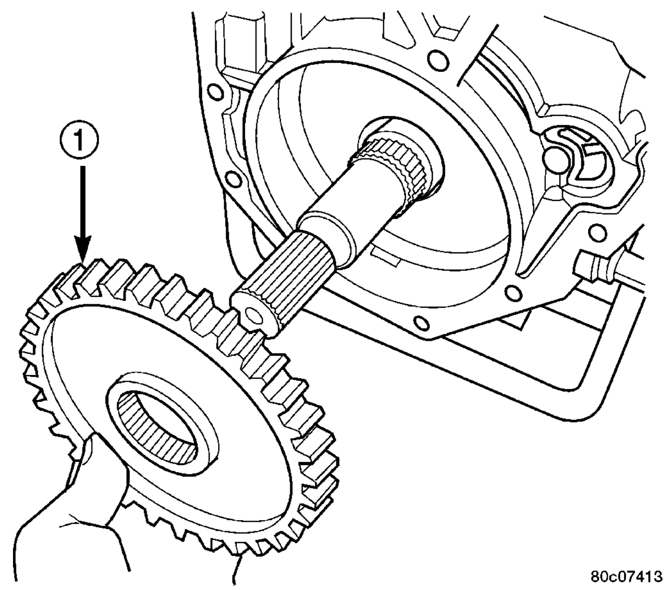


Fig. 31 Remove Park Sprag Gear

1 - PARK SPRAG GEAR

(39) Remove the input/reverse planetary assembly (Fig. 32).

(40) Remove the number 12 bearing from the input/reverse planetary assembly (Fig. 32).

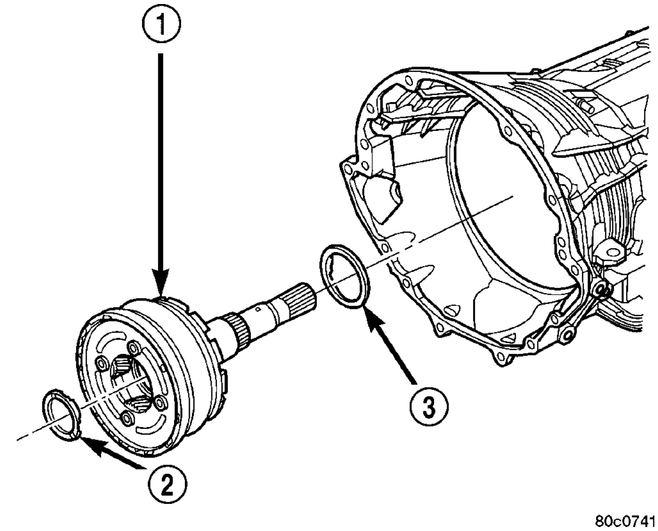


Fig. 32 Remove Input/Reverse Planetary Assembly

1 - INPUT/REVERSE PLANETARY ASSEMBLY
2 - BEARING NUMBER 9
3 - BEARING NUMBER 12

(41) Remove the snap-ring holding the low/reverse clutch retainer into the transmission case (Fig. 33).

(42) Remove the low/reverse clutch retainer from the transmission case (Fig. 33).

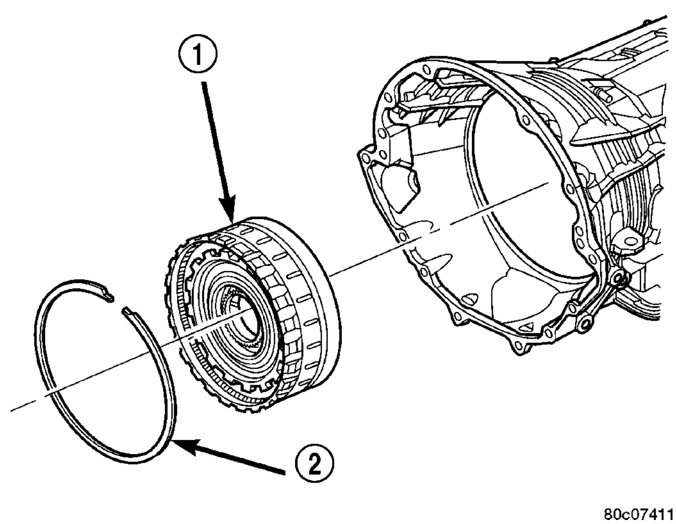


Fig. 33 Remove Low/Reverse Clutch Retainer

1 - LOW/REVERSE OVERRUNNING CLUTCH ASSEMBLY
2 - SNAP-RING

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(43) Remove the park pawl rod and e-clip (Fig. 34).

(44) Remove the park pawl rod guide snap-ring (Fig. 34).

(45) Remove the park pawl rod guide (Fig. 34).

(46) Remove the park pawl pivot shaft, park pawl, and spring (Fig. 34).

(47) Remove the manual selector shaft (Fig. 34).

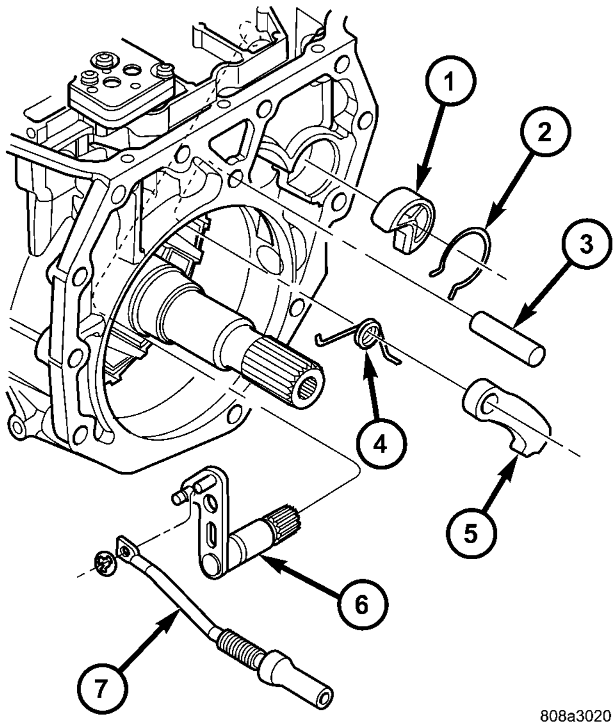


Fig. 34 Manual Shaft/Park Lock Components

1 - GUIDE
2 - SNAP-RING
3 - SHAFT
4 - SPRING
5 - PARK PAWL
6 - MANUAL SHAFT/LEVER
7 - PARK ROD

(48) Remove the manual selector shaft seal.

(49) Remove the dipstick tube seal.

CLEANING

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF +4, Automatic Transmission Fluid, during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install the cooler filter bypass valve.

(3) Torque the bypass valve to specification. The valve uses a tapered pipe thread and excessive torque can damage the transmission case. Tighten the cooler filter bypass valve to 4.5 N·m (40 in.lbs.).

(4) Install a new selector shaft seal using Seal Installer 8253 (Fig. 35).

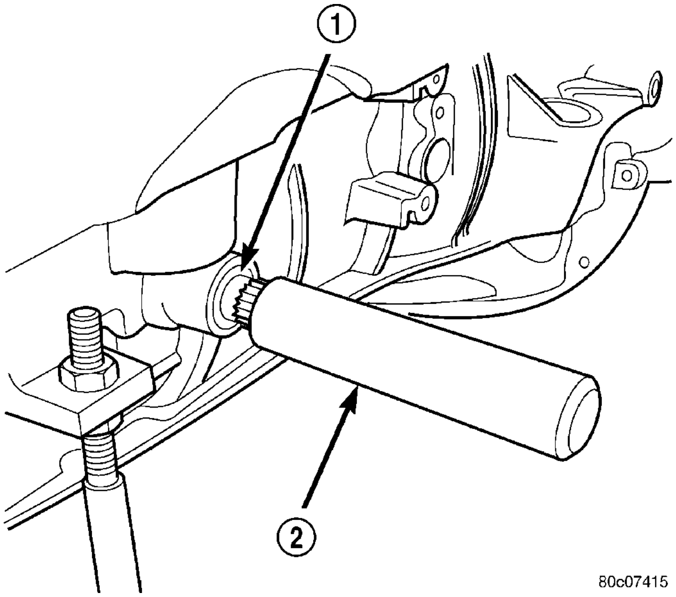


Fig. 35 Install Selector Shaft

1 - SEAL
2 - TOOL 8253

(5) Install the manual selector shaft and retaining screw. Tighten the manual selector shaft retaining screw to 28 N·m (250 in.lbs.).

(6) Install the park pawl, spring, and shaft (Fig. 36).

(7) Install the park rod and e-clip (Fig. 36).

(8) Install the park rod guide and snap-ring (Fig. 36).

(9) Install a new dipstick tube seal using Seal Installer 8254 (Fig. 37).

NOTE: Before final assembly of transmission centerline, the 2C/4C clutch components should be installed into position and measured as follows:

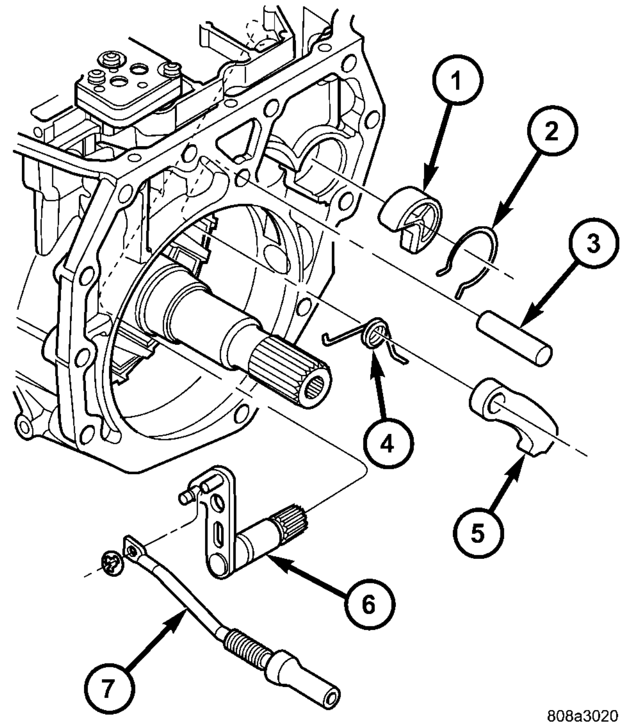


Fig. 36 Manual Shaft/Park Lock Components

1 - GUIDE
2 - SNAP-RING
3 - SHAFT
4 - SPRING
5 - PARK PAWL
6 - MANUAL SHAFT/LEVER
7 - PARK ROD

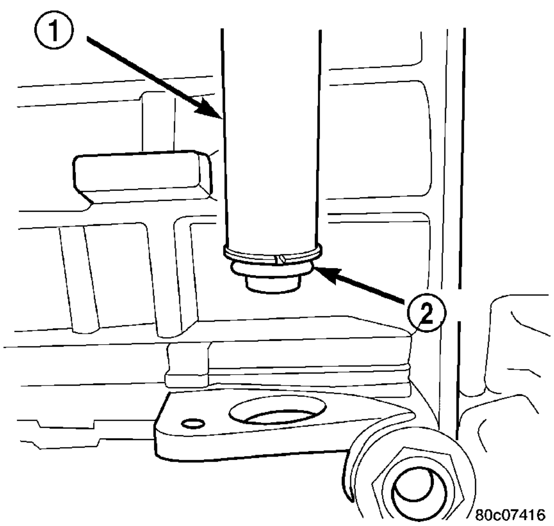


Fig. 37 Install Dipstick Tube Seal Using Tool 8254

1 - TOOL 8254
2 - SEAL

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(10) Install the 2C reaction plate into the transmission case (Fig. 38). The reaction plate is directional. The plate must be installed with the flat side toward the front of the transmission.

(11) Install the 2C clutch pack into the transmission case (Fig. 38).

(12) Install the flat 2C clutch snap-ring into the transmission case (Fig. 38).

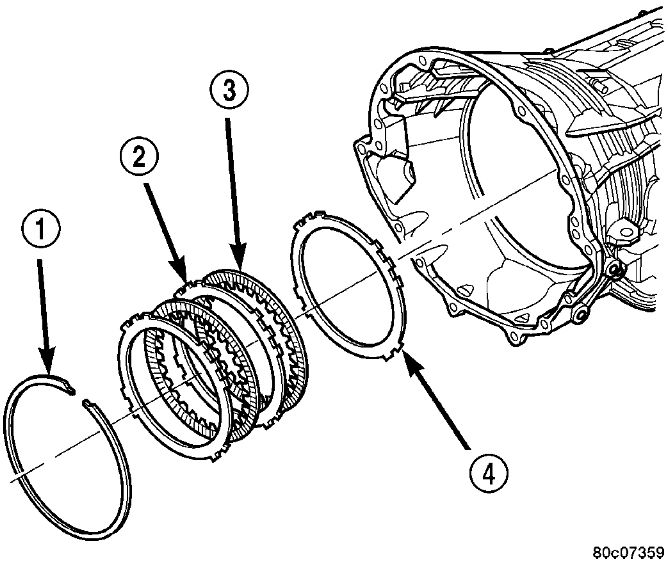


Fig. 38 Install 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

(13) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area.

(14) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

(15) Using a feeler gauge through the opening in the rear of the transmission case, measure the 2C clutch pack clearance between the 2C reaction plate and the transmission case at four different points. The average of these measurements is the 2C clutch pack clearance. The correct clutch clearance is 0.455-1.335 mm (0.018-0.053 in.). The reaction plate is not selective. If the clutch pack clearance is not within specification, the reaction plate, all the friction discs, and steels must be replaced.

(16) Remove the 4C retainer/bulkhead and all of the 2C clutch components from the transmission case.

(17) Install the low/reverse clutch assembly (Fig. 39). Make sure that the oil feed hole points toward the valve body area and that the bleed orifice is aligned with the notch in the rear of the transmission case.

(18) Install the snap-ring to hold the low/reverse clutch retainer into the transmission case (Fig. 39). The snap-ring is tapered and must be installed with the tapered side forward. Once installed, verify that the snap-ring is fully seated in the snap-ring groove.

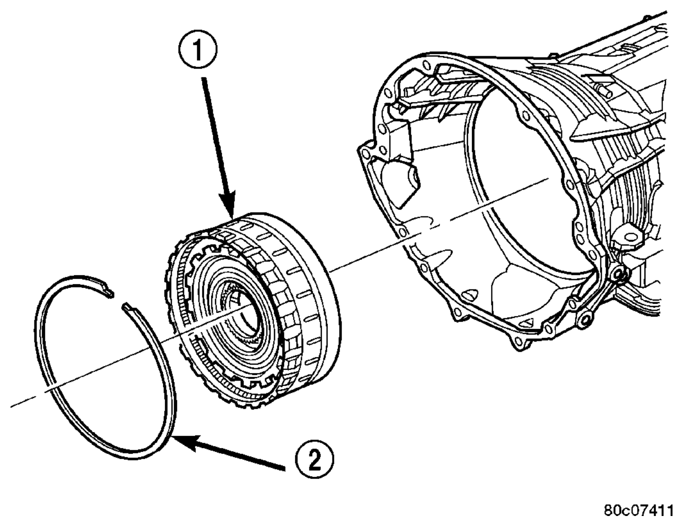


Fig. 39 Install Low/Reverse Clutch Retainer

1 - LOW/REVERSE OVERRUNNING CLUTCH ASSEMBLY
2 - SNAP-RING

(19) Air check the low/reverse clutch and verify correct overrunning clutch operation.

(20) Install the number 12 bearing over the output shaft and against the rear planetary gear set. The flat side of the bearing goes toward the planetary gearset and the raised tabs on the inner race should face the rear of the transmission.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(21) Install the reverse/input planetary assembly through the low/reverse clutch assembly (Fig. 40).

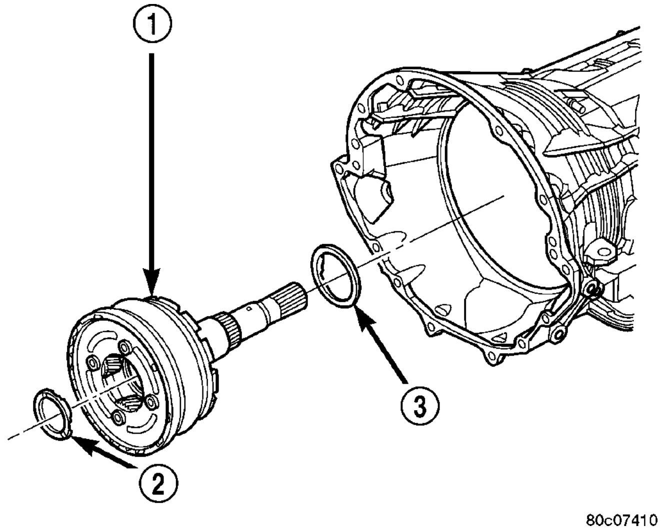


Fig. 40 Install Input/Reverse Planetary Assembly

1 - INPUT/REVERSE PLANETARY ASSEMBLY
2 - BEARING NUMBER 9
3 - BEARING NUMBER 12

(22) Install the park sprag onto the output shaft (Fig. 41).

(23) Install the snap-ring to hold the park sprag onto the output shaft (Fig. 42).

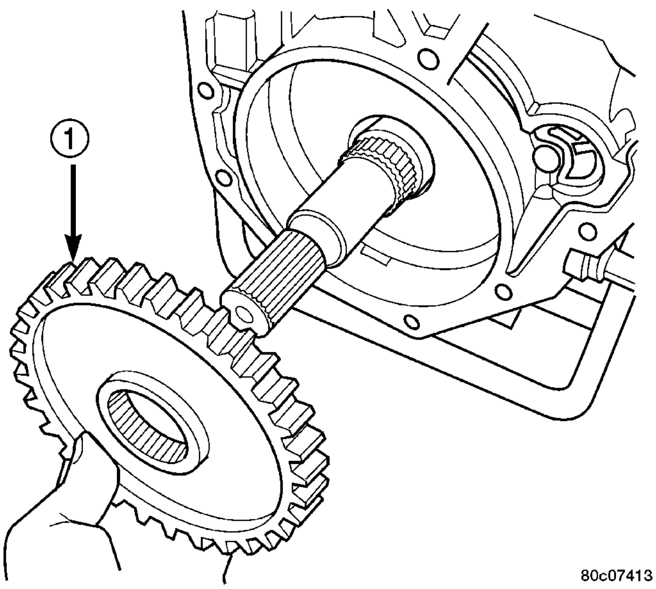


Fig. 41 Install Park Sprag Gear

1 - PARK SPRAG GEAR

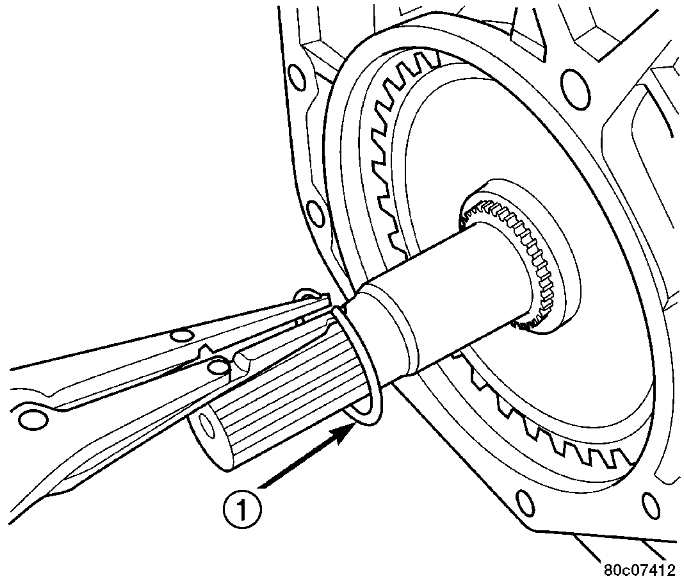


Fig. 42 Install Park Sprag Snap-Ring

1 - SNAP-RING

(24) Install the 2C reaction plate into the transmission case (Fig. 43). The reaction plate is directional. The plate must be installed with the flat side toward the front of the transmission.

(25) Install the 2C clutch pack into the transmission case (Fig. 43).

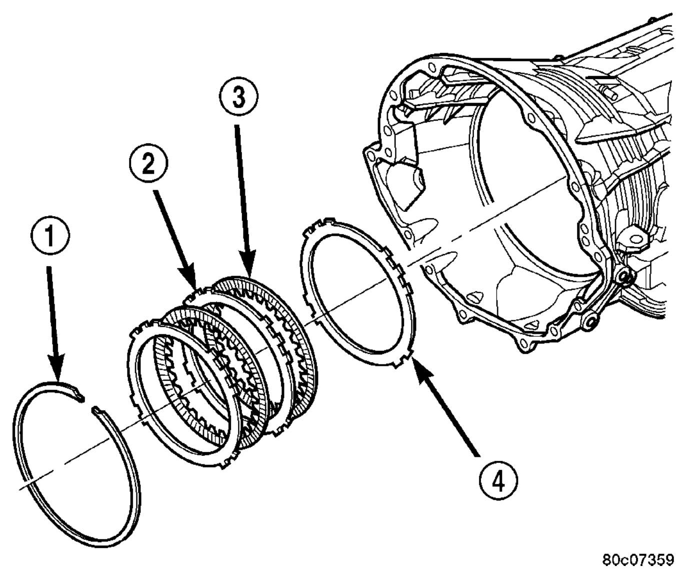


Fig. 43 Install 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(26) Install the number 8 bearing inside the reaction carrier with the outer race against the reaction planetary carrier.

(27) Install the reaction planetary gear set and the number 9 bearing, with the inner race against the reaction planetary carrier, into the transmission case (Fig. 44).

(28) Install the flat 2C clutch snap-ring into the transmission case (Fig. 43).

(29) Install the reaction sun gear into the reaction planetary gear set. **Make sure** the small shoulder is facing the front of the transmission (Fig. 44).

(30) Install the number 7 bearing onto the reaction sun gear with the inner race against the sun gear (Fig. 44).

(31) Install the output shaft selective thrust plate onto the reaction annulus with the oil grooves facing the annulus gear and the tabs and notches aligned as shown in (Fig. 45).

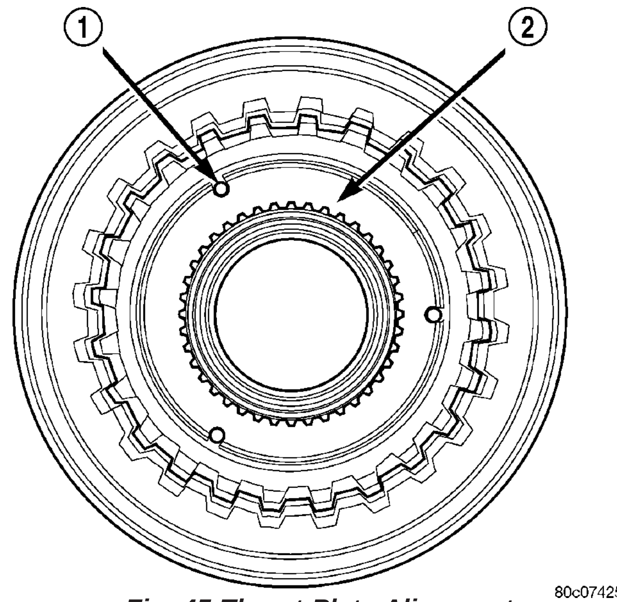


Fig. 45 Thrust Plate Alignment

1 - LOCATING LUG (3)
2 - THRUST PLATE

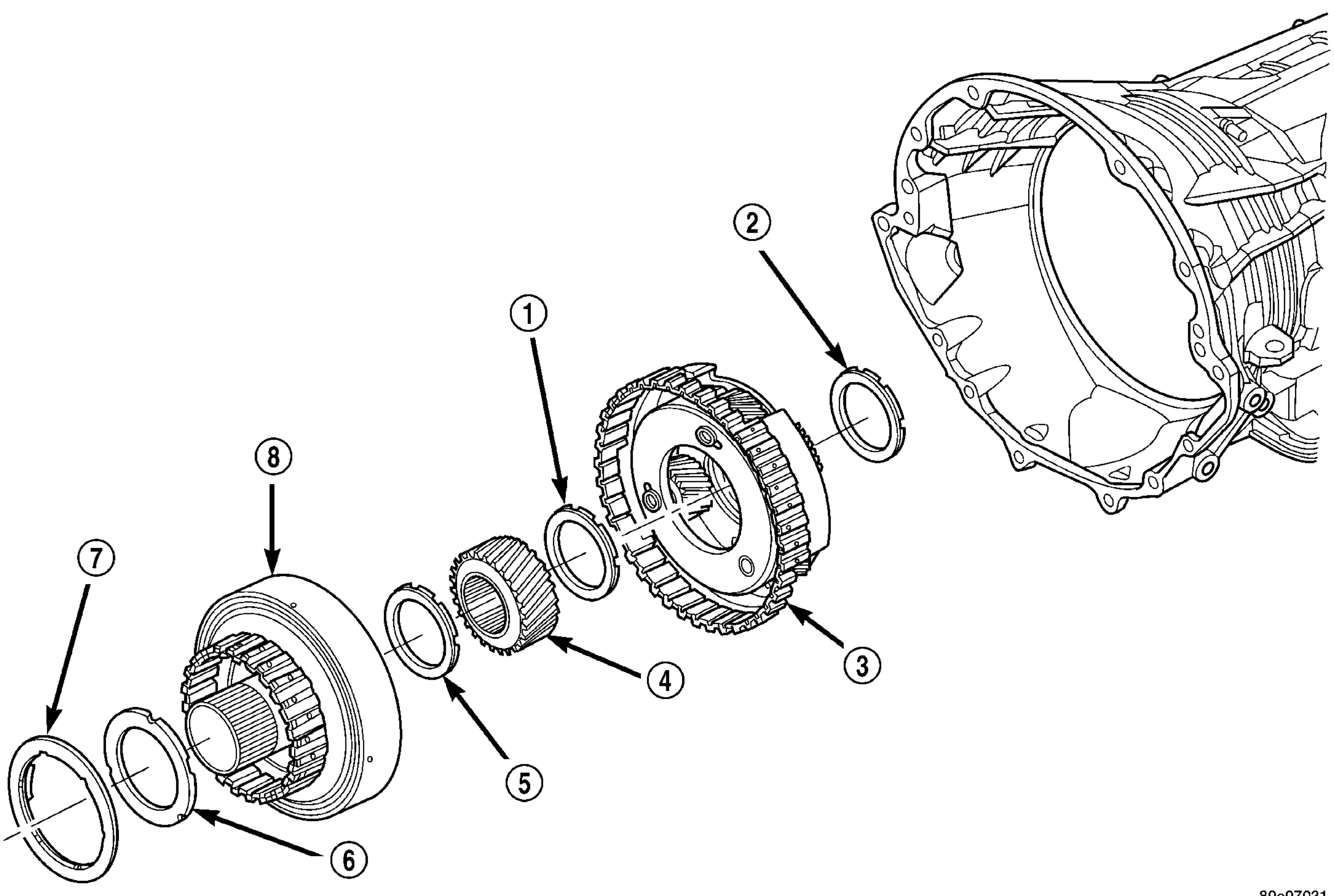


Fig. 44 Install Reaction Annulus and Carrier

1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(32) Install the number 6 bearing against the output shaft selective thrust plate with the flat side against the thrust plate (Fig. 44) and the raised tabs on the inner race facing the front of the transmission.

(33) Install the reaction annulus into the reaction planetary gear set (Fig. 44).

(34) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area. Rotate the reaction annulus during the installation of the 4C retainer/bulkhead to ease installation.

(35) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case (Fig. 46) with the taper toward the front of the case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

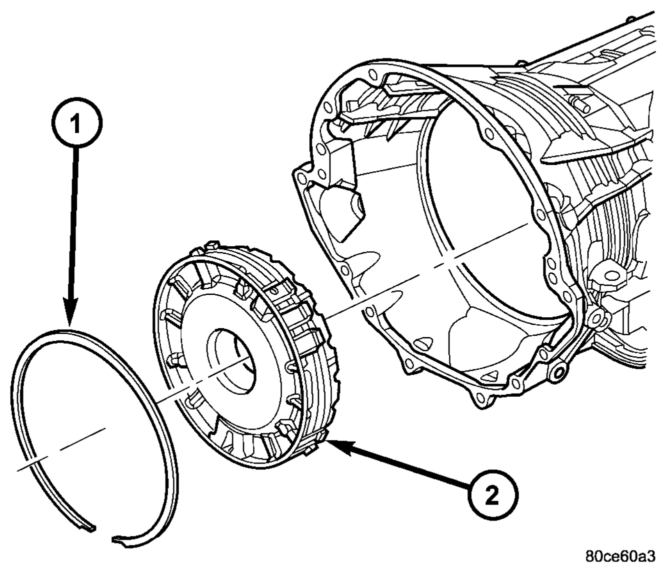


Fig. 46 Install 4C Clutch Retainer/Bulkhead

1 - SNAP-RING
2 - 4C CLUTCH RETAINER/BULKHEAD

(36) Air check the 2C and 4C clutch operation.

(37) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 47). The correct output shaft end-play is 0.22-0.55 mm (0.009-0.021 in.). Adjust as necessary. Install the chosen output shaft selective thrust plate and re-measure end-play to verify selection.

(38) Apply a bead of RTV silicone and install the extension/adapter housing onto the transmission case.

(39) Install and torque the bolts to hold the extension/adapter housing onto the transmission case. The correct torque is 54 N·m (40 ft.lbs.).

(40) Install the number 5 bearing and selective thrust plate onto the 4C retainer/bulkhead (Fig. 48).

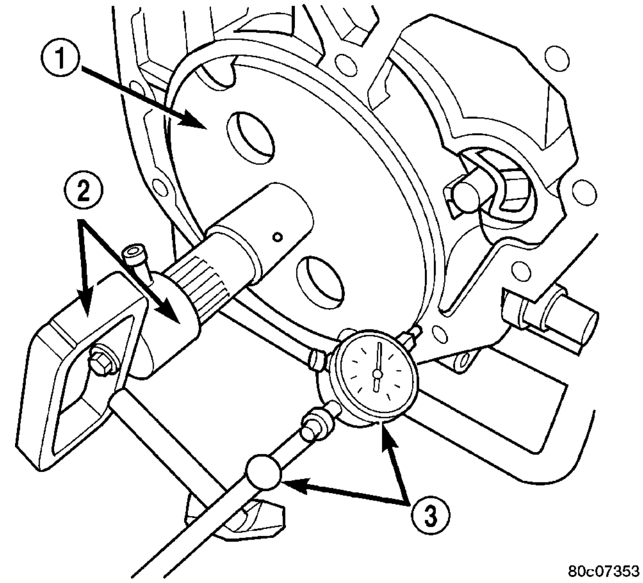


Fig. 47 Measure Output Shaft End Play

1 - TOOL 8261
2 - TOOL 8266
3 - TOOL C-3339

Be sure that the outer race of the bearing is against the thrust plate.

(41) Install the input clutch assembly into the transmission case (Fig. 48). Make sure that the input clutch assembly is fully installed by performing a visual inspection through the input speed sensor hole. If the tone wheel teeth on the input clutch assembly are centered in the hole, the assembly is fully installed.

(42) Install the number 1 bearing with the outer race up in the pocket of the input clutch assembly (Fig. 48).

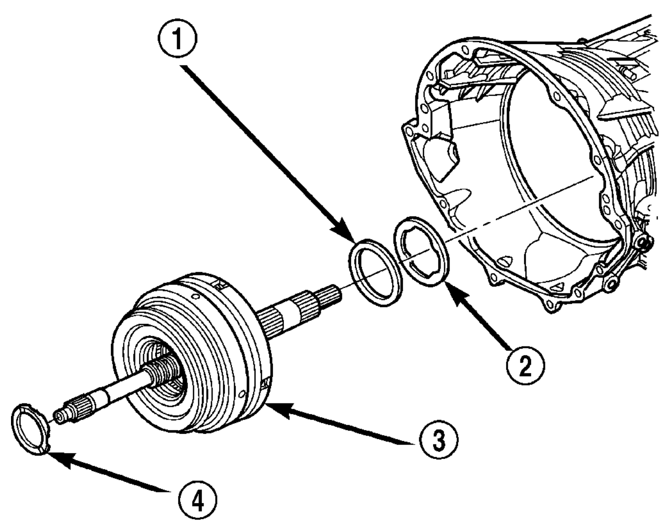


Fig. 48 Install Input Clutch Assembly

1 - BEARING NUMBER 5
2 - THRUST PLATE (SELECT)
3 - INPUT CLUTCH ASSEMBLY
4 - BEARING NUMBER 1

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(43) Install the oil pump into the transmission case (Fig. 49).

(44) Install the bolts to hold the oil pump into the transmission case. Tighten the oil pump bolts to 28 N·m (250 in.lbs.).

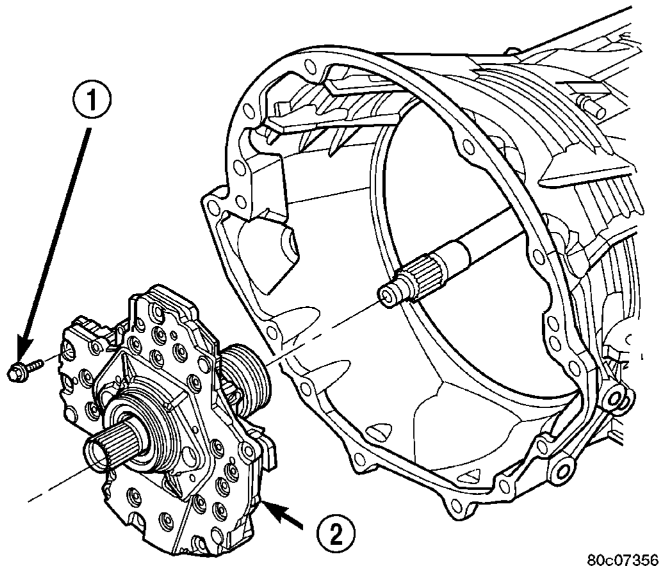


Fig. 49 Install Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

(45) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 50). The correct end-play is 0.46-0.89 mm (0.018-0.035 in.). Adjust as necessary. Install the chosen thrust plate on the number 5 bearing and re-measure end-play to verify selection.

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(46) Install the transmission front cover into the transmission case (Fig. 51).

(47) Install the outer snap-ring to hold the transmission front cover into the transmission case (Fig. 51).

(48) Partially install the inner transmission front cover snap-ring onto the oil pump (Fig. 51).

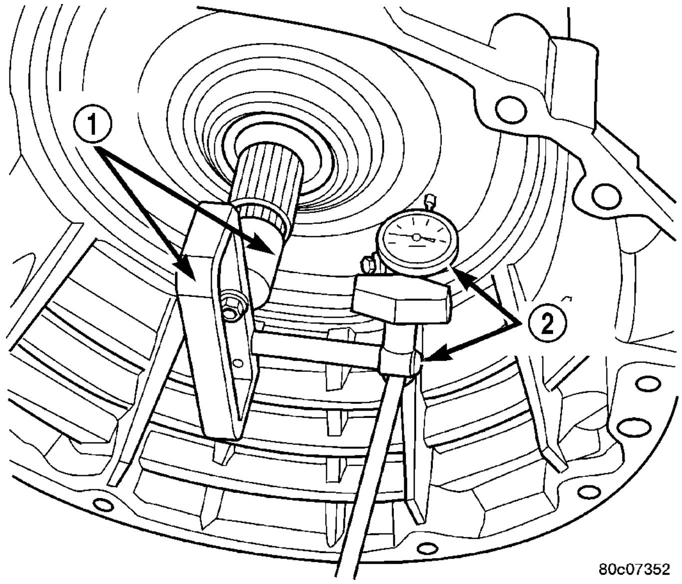


Fig. 50 Measure Input Shaft End Play

1 - TOOL 8266
2 - TOOL C-3339

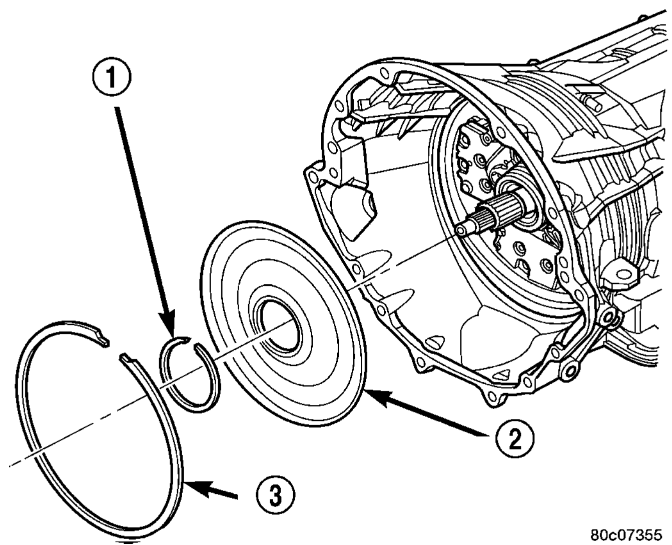


Fig. 51 Install the Transmission Front Cover

1 - INNER SNAP-RING
2 - TRANSMISSION COVER
3 - OUTER SNAP-RING

AUTOMATIC TRANSMISSION - 45RFE (Continued)

(49) Using Installer 8255, install the inner transmission front cover snap-ring the remainder of the way onto the oil pump (Fig. 52).

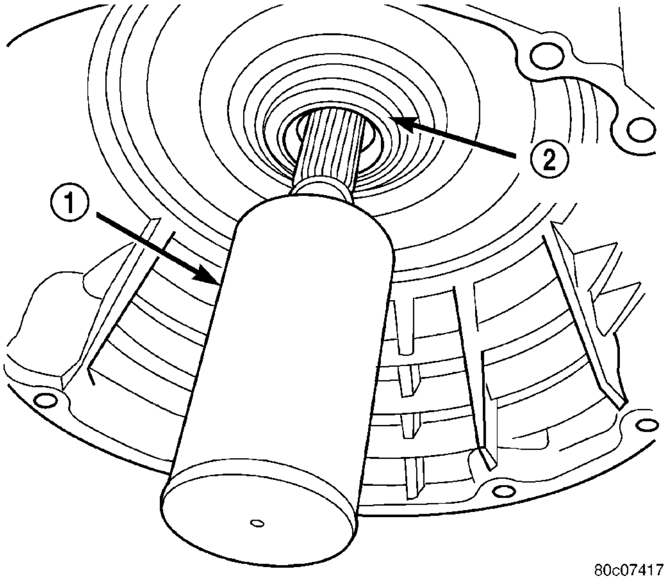


Fig. 52 Seat Snap-Ring Using Tool 8255

1 - TOOL 8255
2 - SNAP-RING

(50) Install the valve body (Fig. 53). Verify that the pin on the manual lever has properly engaged the TRS selector plate. Tighten the valve body to transmission case bolts to 12 N·m (105 in.lbs.).

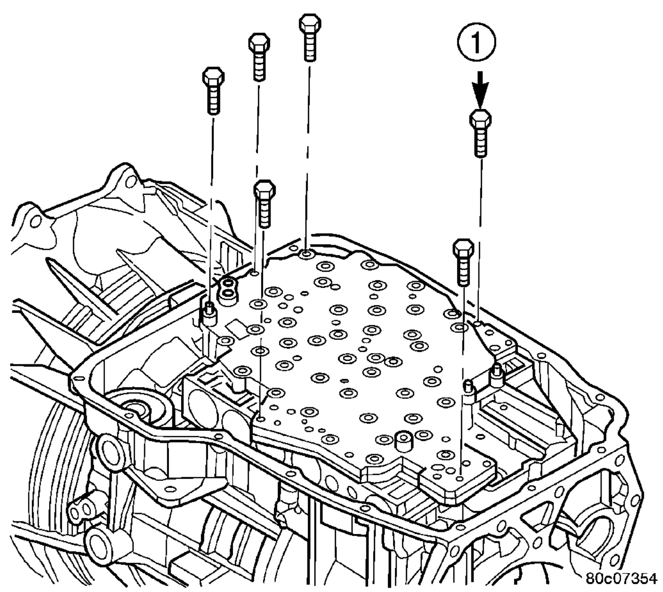


Fig. 53 Install Valve Body Assembly

1 - VALVE BODY TO CASE BOLT (6)

(51) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(52) Install the primary oil filter and the oil cooler return filter (Fig. 54). Tighten the screw to hold the primary oil filter to the valve body to 4.5 N·m (40 in.lbs.). Using Oil Filter Wrench 8321, tighten the cooler return oil filter to the transmission case to 14 N·m (125 in.lbs.).

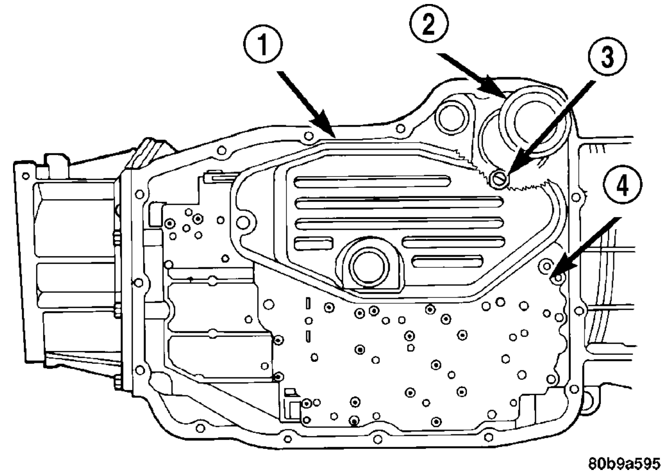


Fig. 54 Install Primary Oil and Cooler Filters

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

(53) Apply RTV silicone to the oil pan and install the transmission oil pan. Tighten the bolts to 12 N·m (105 in.lbs.).

(54) Install the input, output, and line pressure sensors (Fig. 55). Tighten the bolts to 12 N·m (105 in.lbs.).

(55) Install the manual shift lever from the transmission. Torque the retaining cross-bolt to 16 N·m (140 in.lbs.).

INSTALLATION

(1) Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free of any debris. The hub must be smooth to avoid damaging pump seal at installation.

(2) If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.

AUTOMATIC TRANSMISSION - 45RFE (Continued)

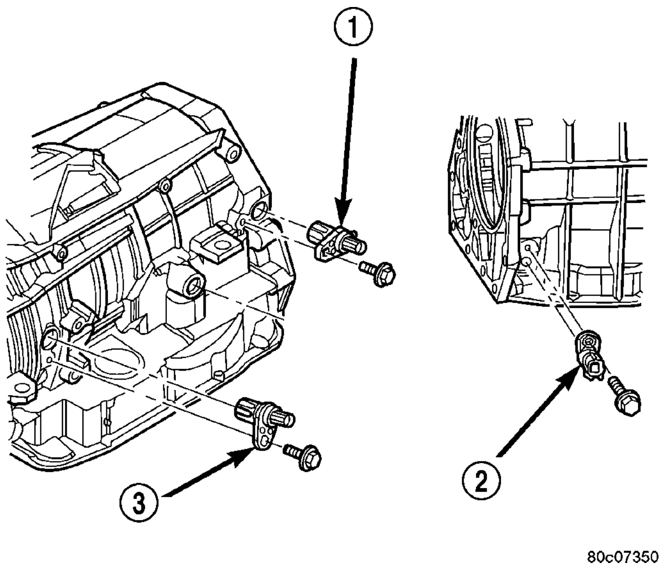


Fig. 55 Install Input, Output, and Line Pressure Sensors

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

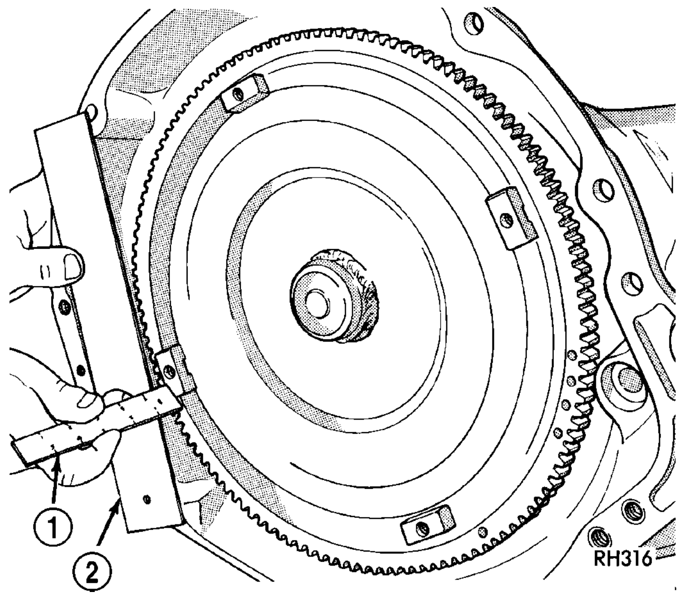


Fig. 56 Checking Torque Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

(3) Lubricate oil pump seal lip with transmission fluid.

(4) Align converter and oil pump.

(5) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(6) Check converter seating with steel scale and straightedge (Fig. 56). Surface of converter lugs should be at least 13mm (1/2 in.) to rear of straightedge when converter is fully seated.

(7) Temporarily secure converter with C-clamp.

(8) Position transmission on jack and secure it with chains.

(9) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

(10) Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.

(11) Raise transmission (Fig. 57) and align the torque converter with the drive plate and transmission converter housing with the engine block.

(12) Move transmission forward. Then raise, lower or tilt transmission to align the converter housing with engine block dowels.

(13) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.

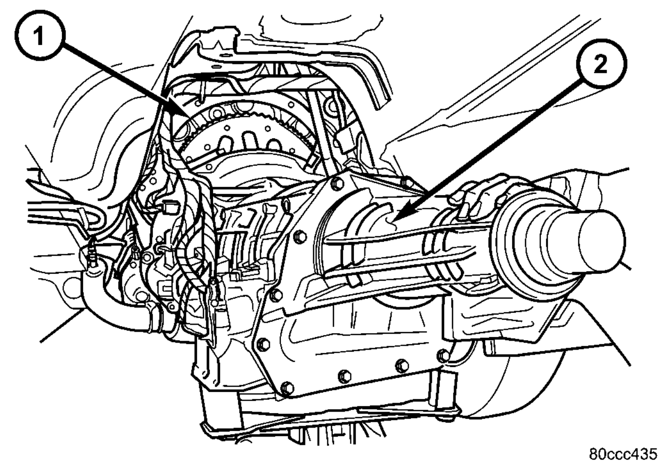


Fig. 57 Install Transmission

1 - ENGINE
2 - TRANSMISSION

(14) Install two bolts to attach the transmission to the engine.

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).

(16) Install transfer case, if equipped. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).

(17) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).

(18) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).

(19) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts

AUTOMATIC TRANSMISSION - 45RFE (Continued)

to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).

(20) Remove engine support fixture.

(21) Connect gearshift cable to support bracket and transmission manual lever (Fig. 58).

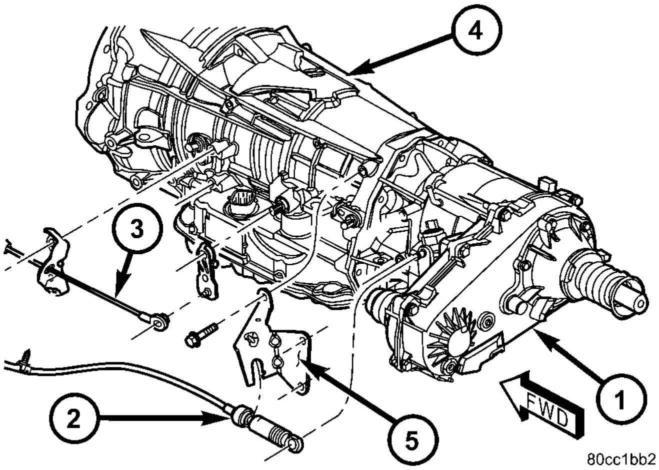


Fig. 58 Install Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

(22) Connect wires to solenoid and pressure switch assembly (Fig. 59) connector, input (Fig. 60) and output (Fig. 61) speed sensors, and line pressure sensor (Fig. 62). Be sure transmission harnesses are properly routed.

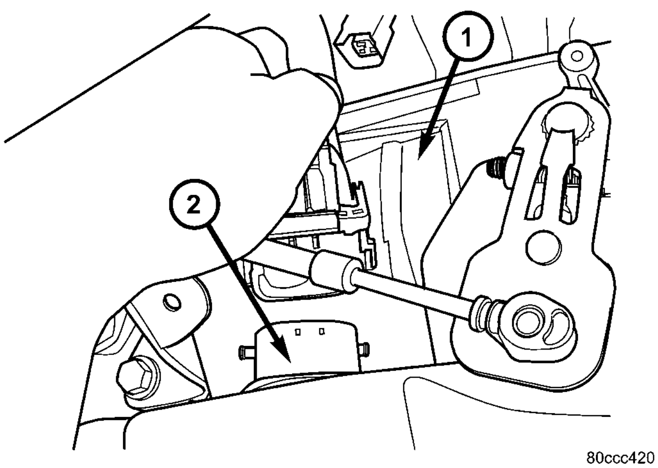


Fig. 59 Connect Transmission Solenoid

1 - TRANSMISSION
2 - TRANSMISSION SOLENOID/TRS ASSEMBLY

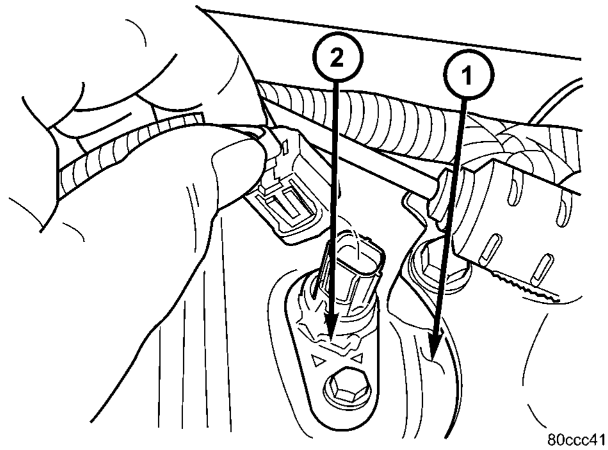


Fig. 60 Connect Input Speed Sensor

1 - TRANSMISSION
2 - INPUT SPEED SENSOR

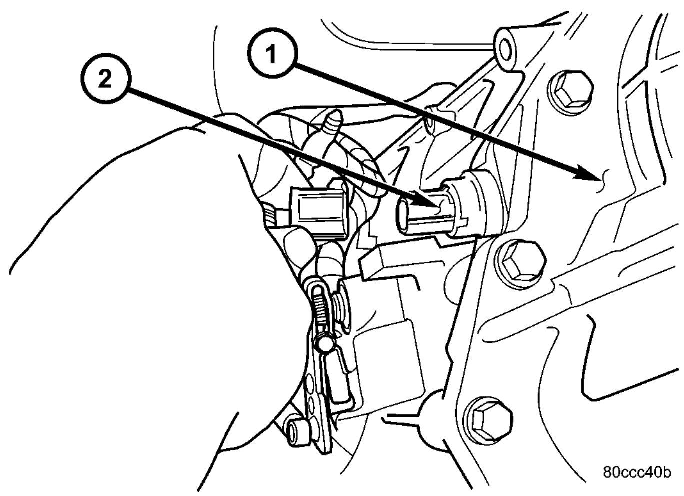


Fig. 61 Connect Output Speed Sensor

1 - TRANSMISSION
2 - OUTPUT SPEED SENSOR

AUTOMATIC TRANSMISSION - 45RFE (Continued)

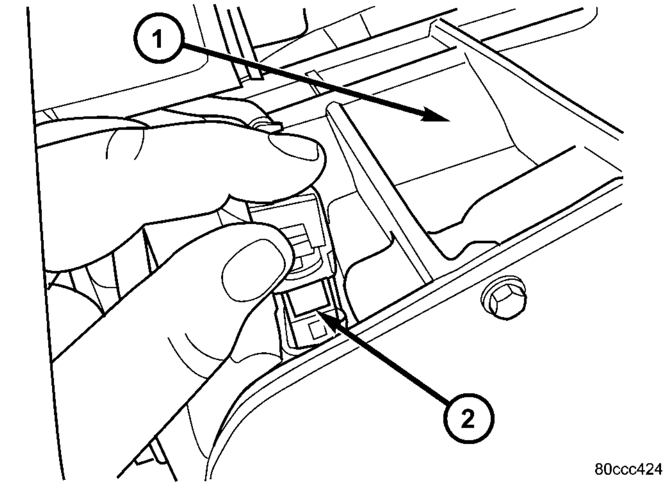


Fig. 62 Connect Line Pressure Sensor

1 - TRANSMISSION
2 - LINE PRESSURE SENSOR

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(23) Install torque converter-to-driveplate bolts. Tighten bolts to 31 N·m (270 in. lbs.).

(24) Install starter motor and cooler line bracket.

(25) Connect cooler lines to transmission.

(26) Install transmission fill tube.

(27) Install exhaust components (Fig. 63).

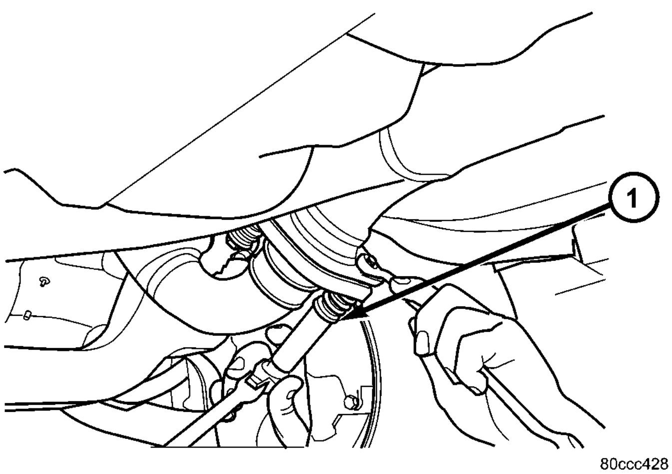


Fig. 63 Install Exhaust Flange Bolts

1 - EXHAUST FLANGE BOLTS

(28) Install the engine collar (Fig. 64) onto the transmission and the engine. Tighten the bolts to 54 N·m (40 ft.lbs.).

(29) Align and connect propeller shaft(s).

(30) Adjust gearshift cable if necessary.

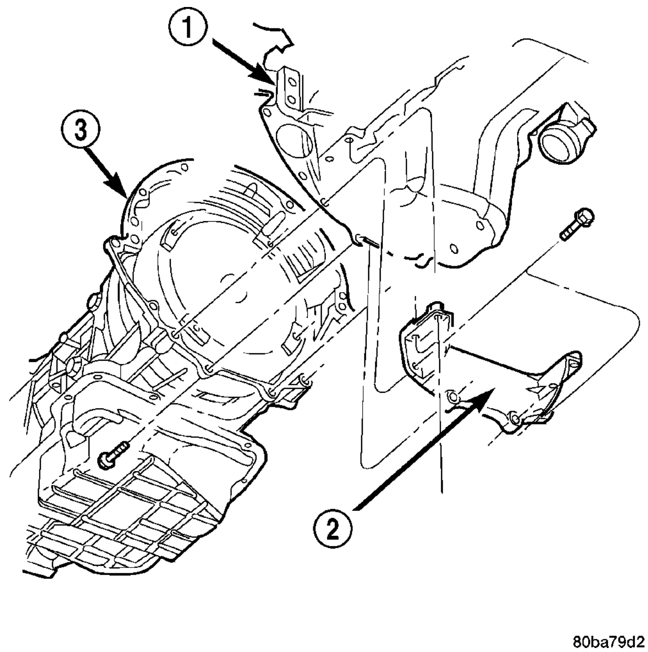


Fig. 64 Transmission Collar

1 - ENGINE
2 - ENGINE TO TRANSMISSION COLLAR
3 - TRANSMISSION

(31) Install any skid plates removed previously (Fig. 65). (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)

(32) Lower vehicle.

(33) Fill transmission with Mopar® ATF +4, type 9602, Automatic Transmission Fluid.

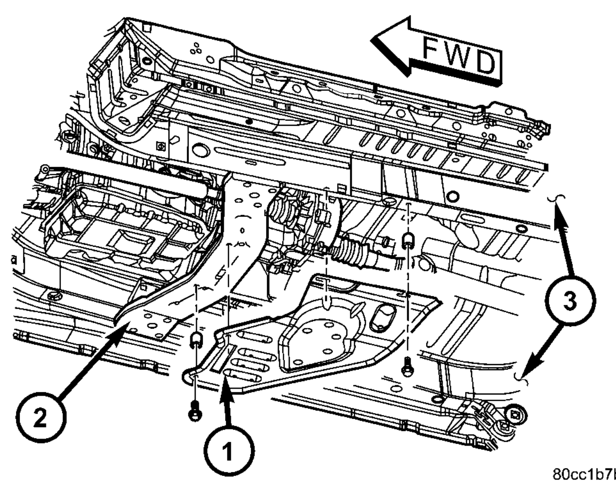


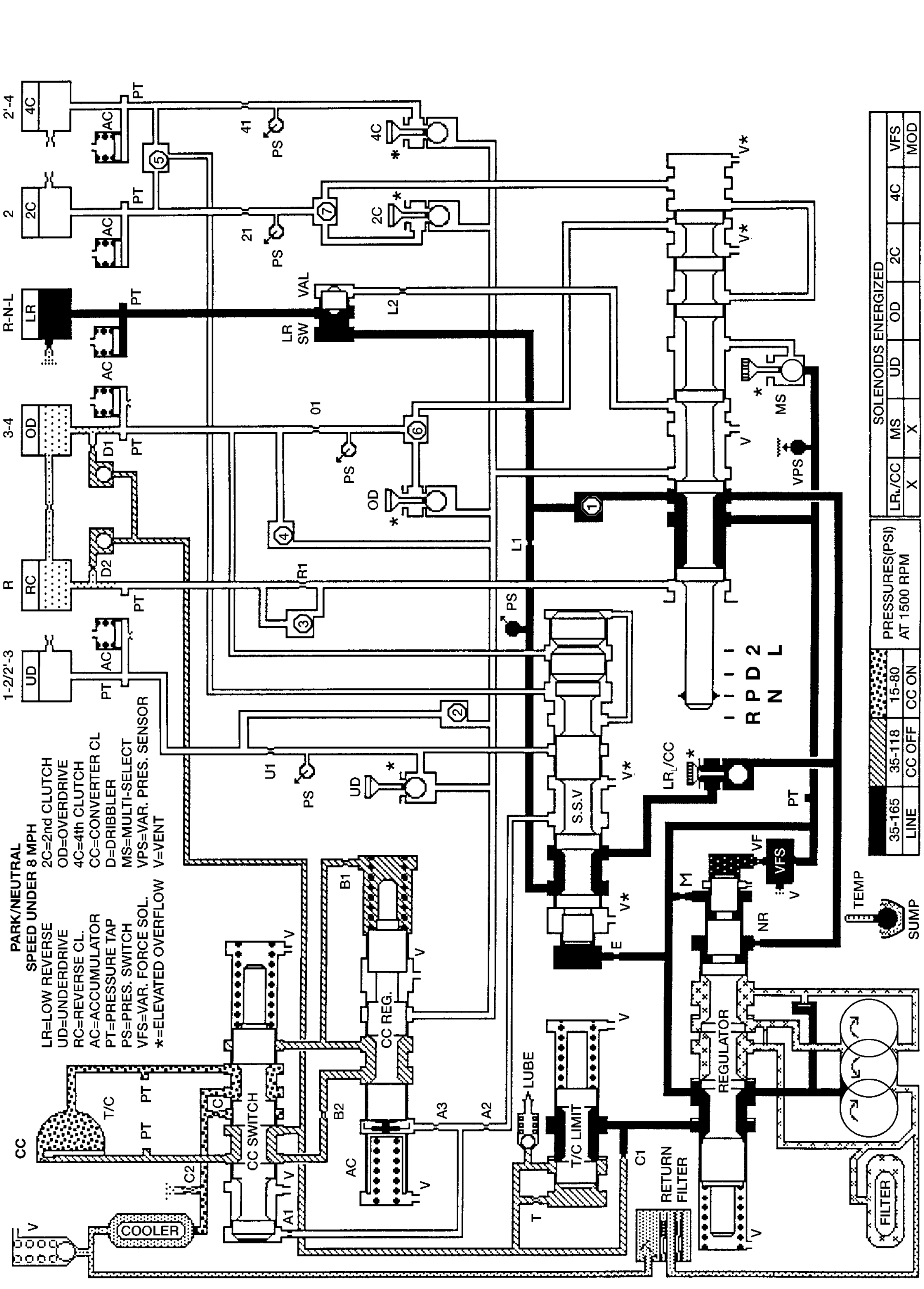
Fig. 65 Install Skid Plate

1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

AUTOMATIC TRANSMISSION - 45RFE (Continued)

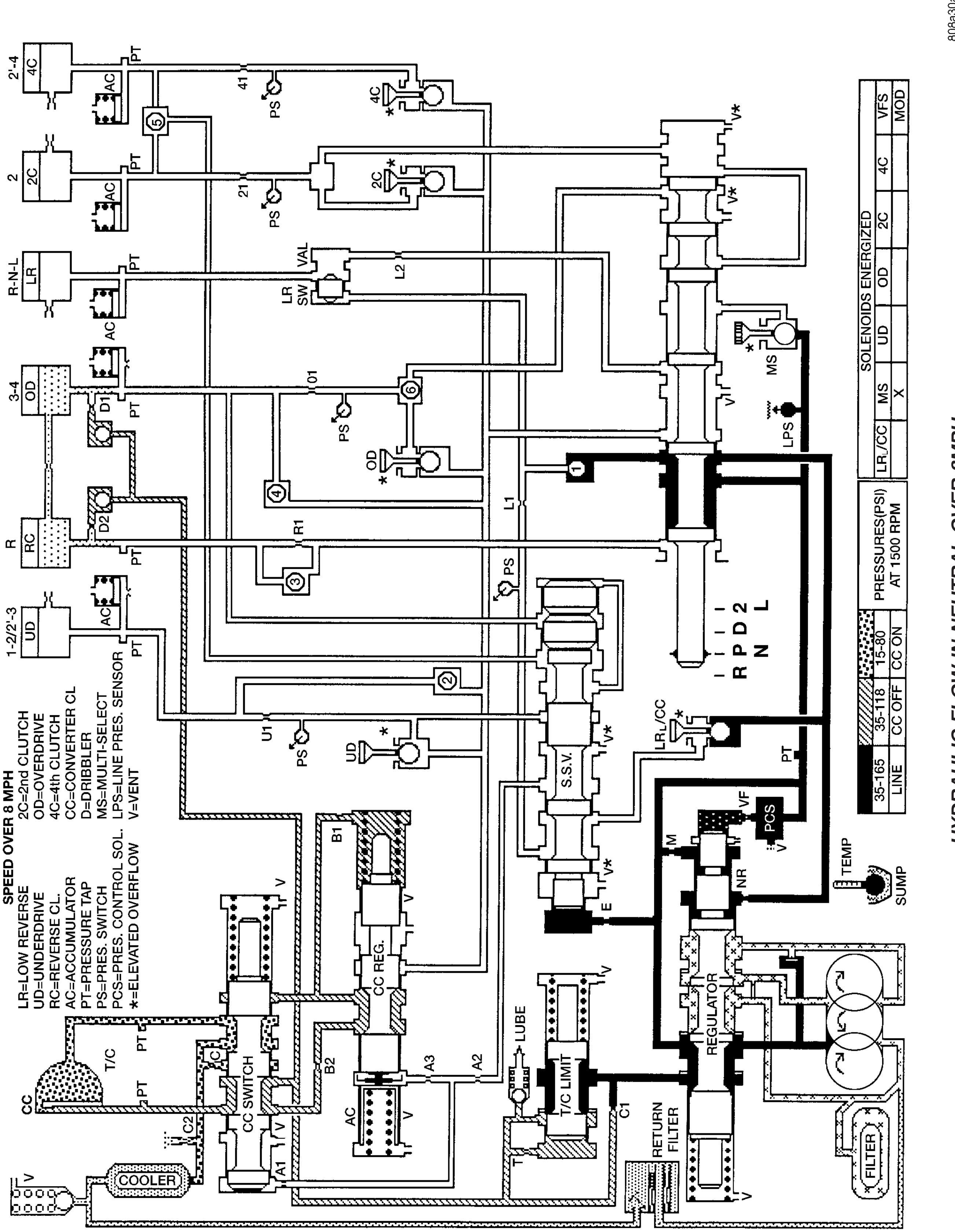
SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS



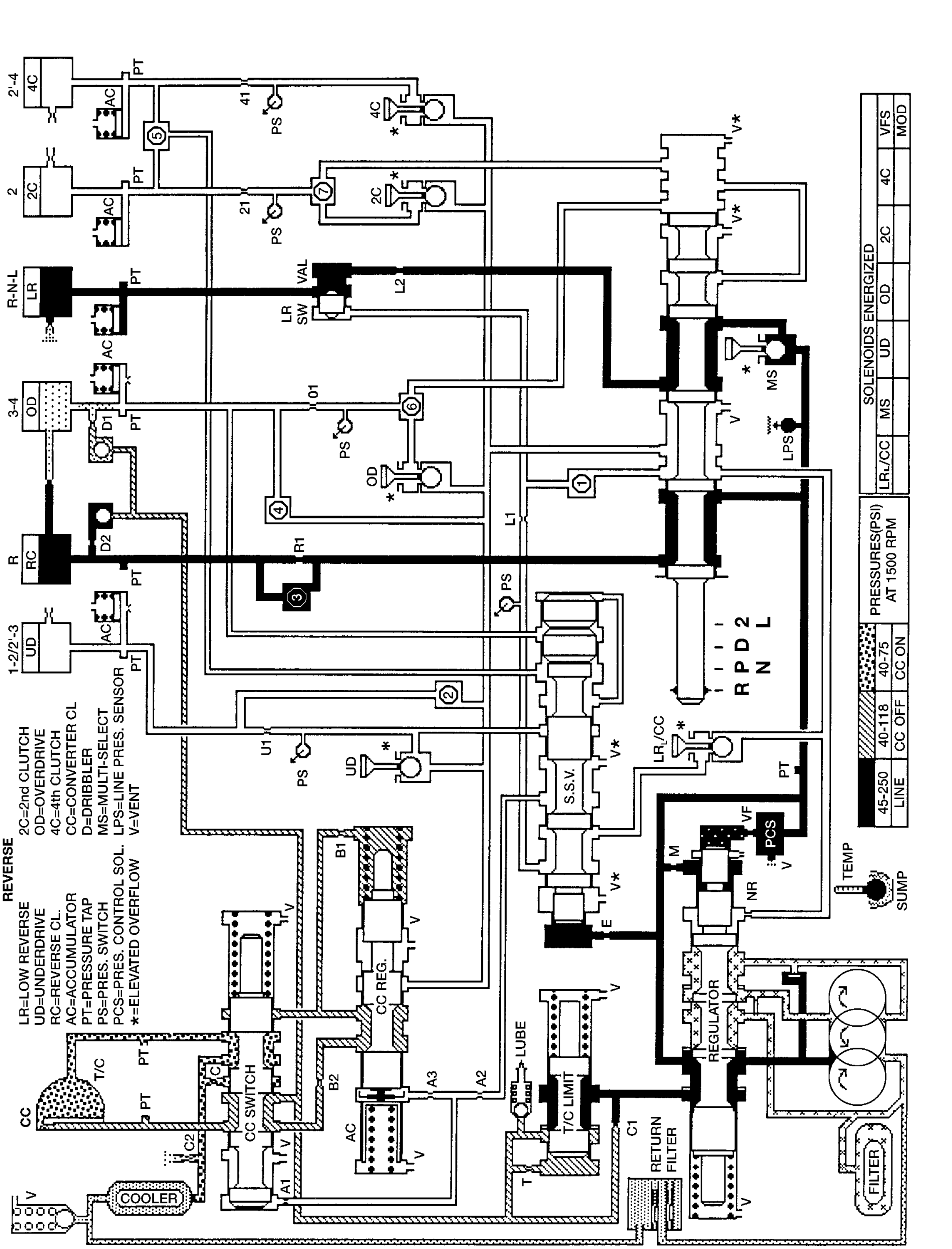
HYDRAULIC FLOW IN PARK/NEUTRAL

AUTOMATIC TRANSMISSION - 45RFE (Continued)



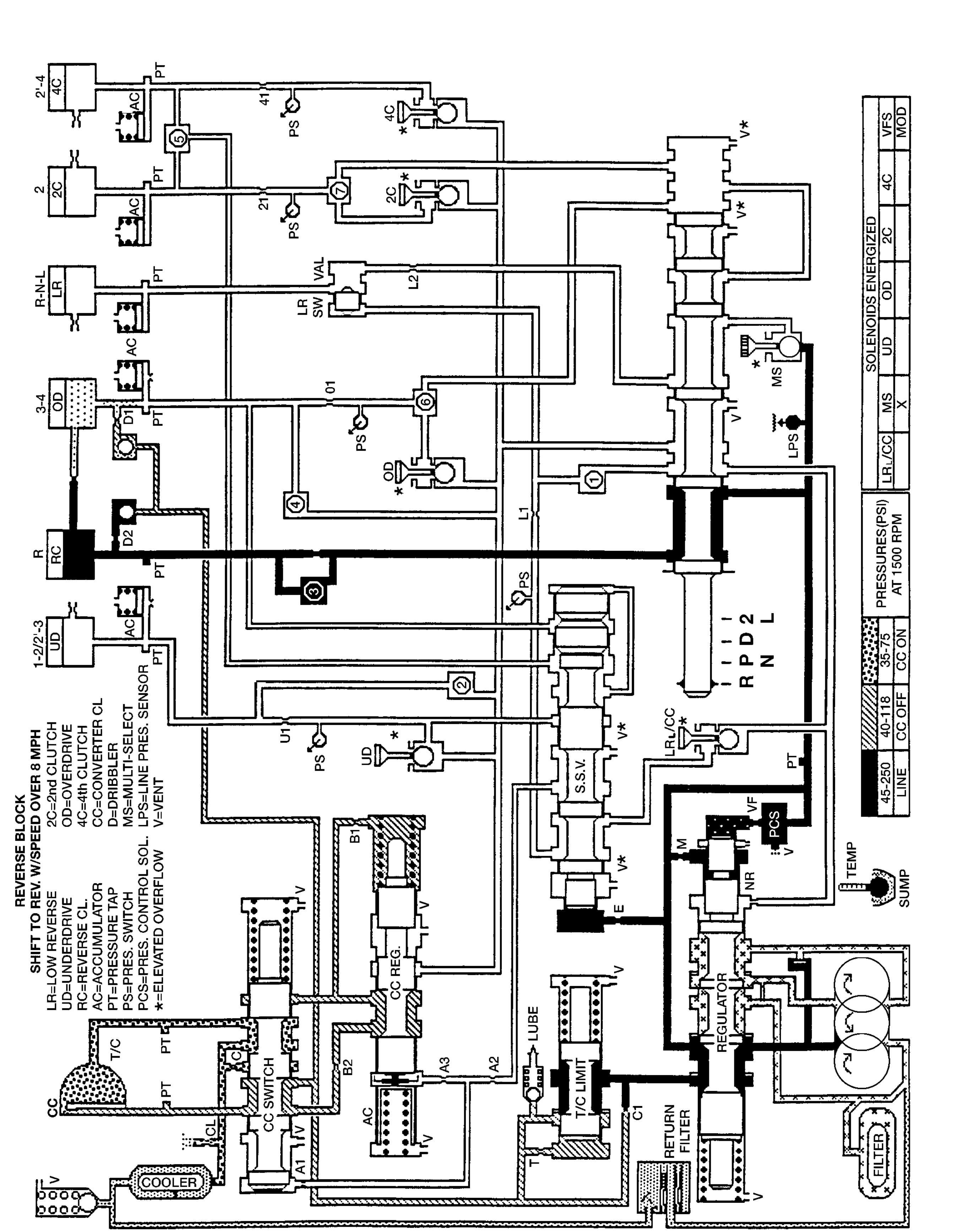
HYDRAULIC FLOW IN NEUTRAL OVER 8MPH

AUTOMATIC TRANSMISSION - 45RFE (Continued)



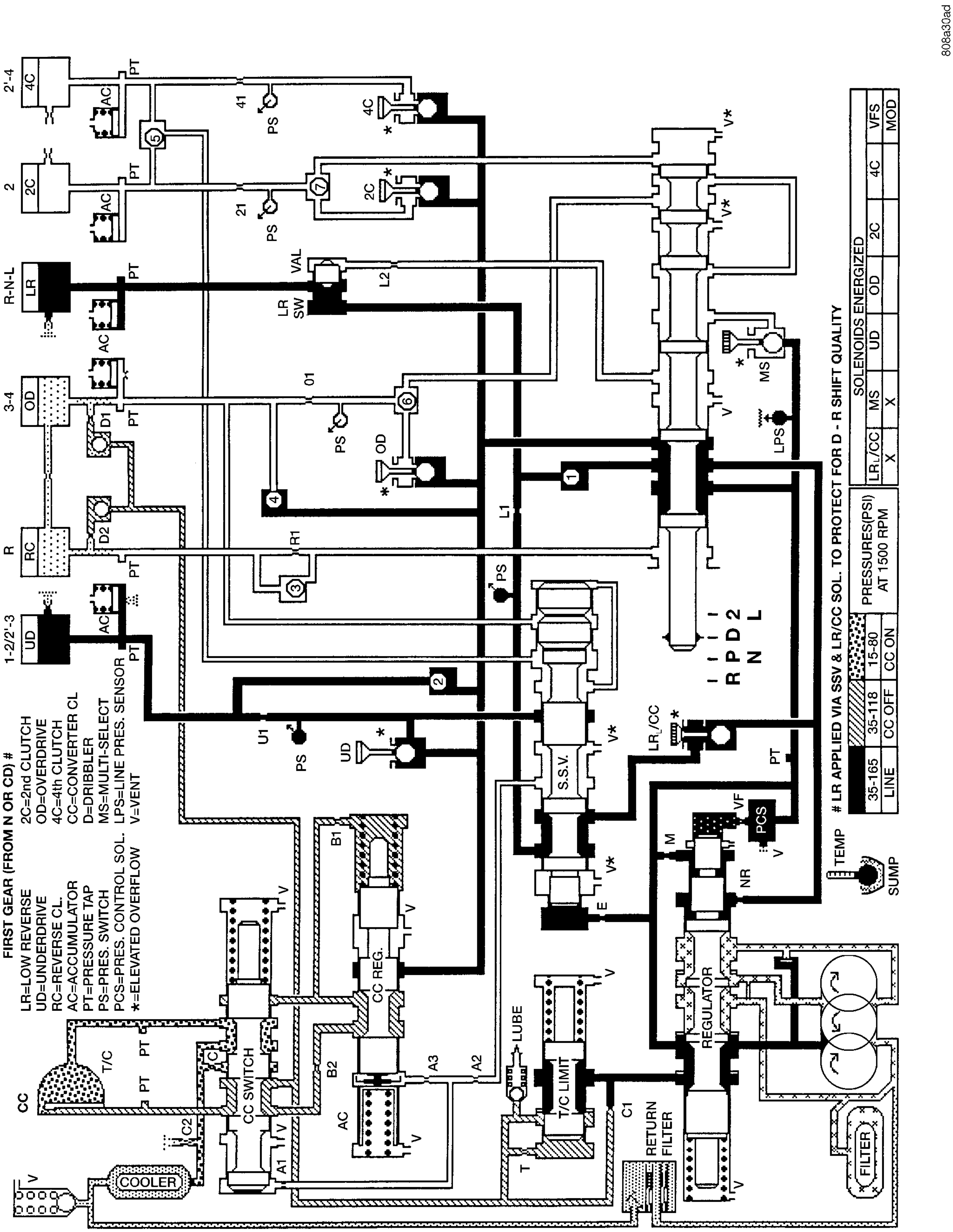
HYDRAULIC FLOW IN REVERSE

AUTOMATIC TRANSMISSION - 45RFE (Continued)



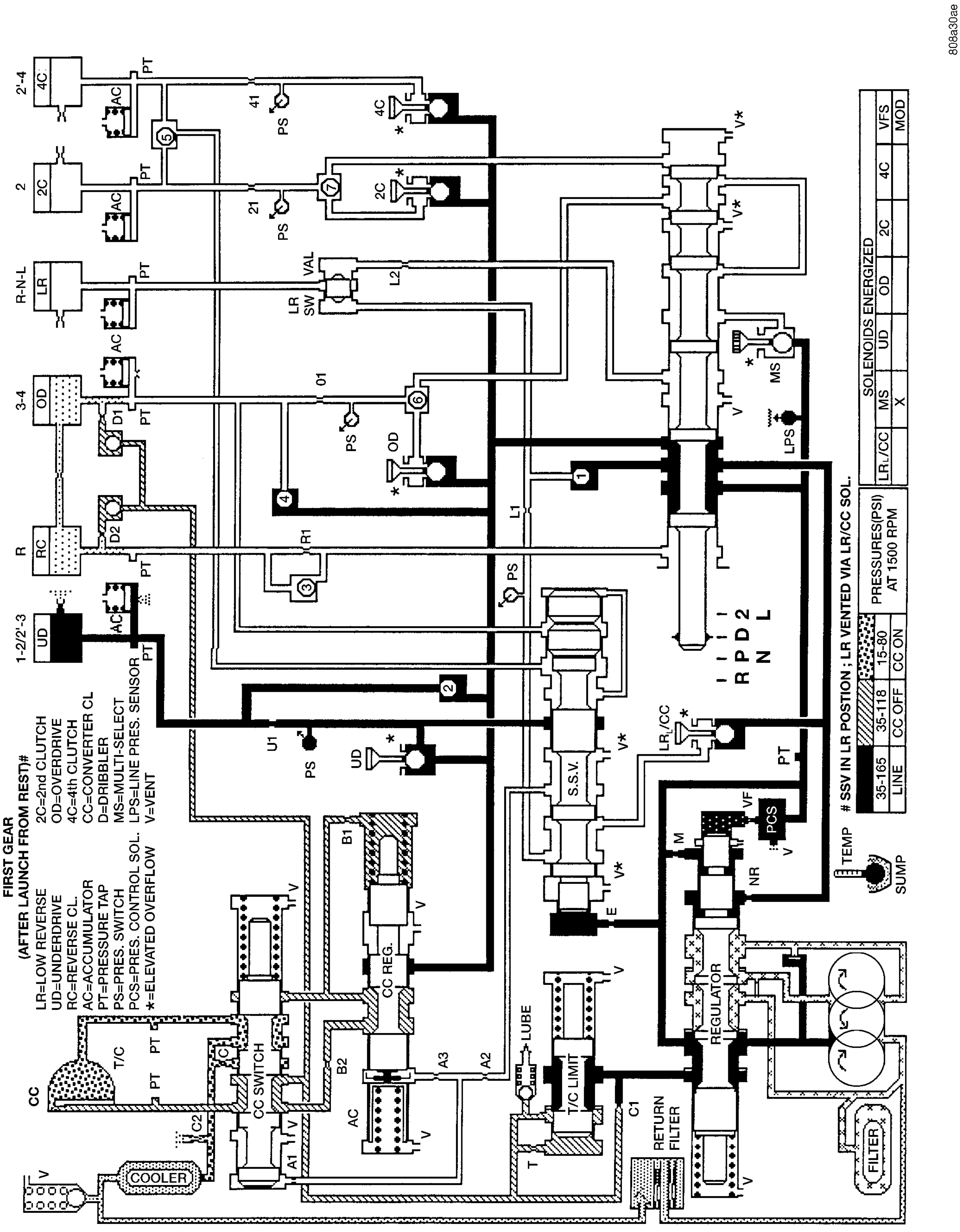
HYDRAULIC FLOW IN REVERSE BLOCK

AUTOMATIC TRANSMISSION - 45RFE (Continued)



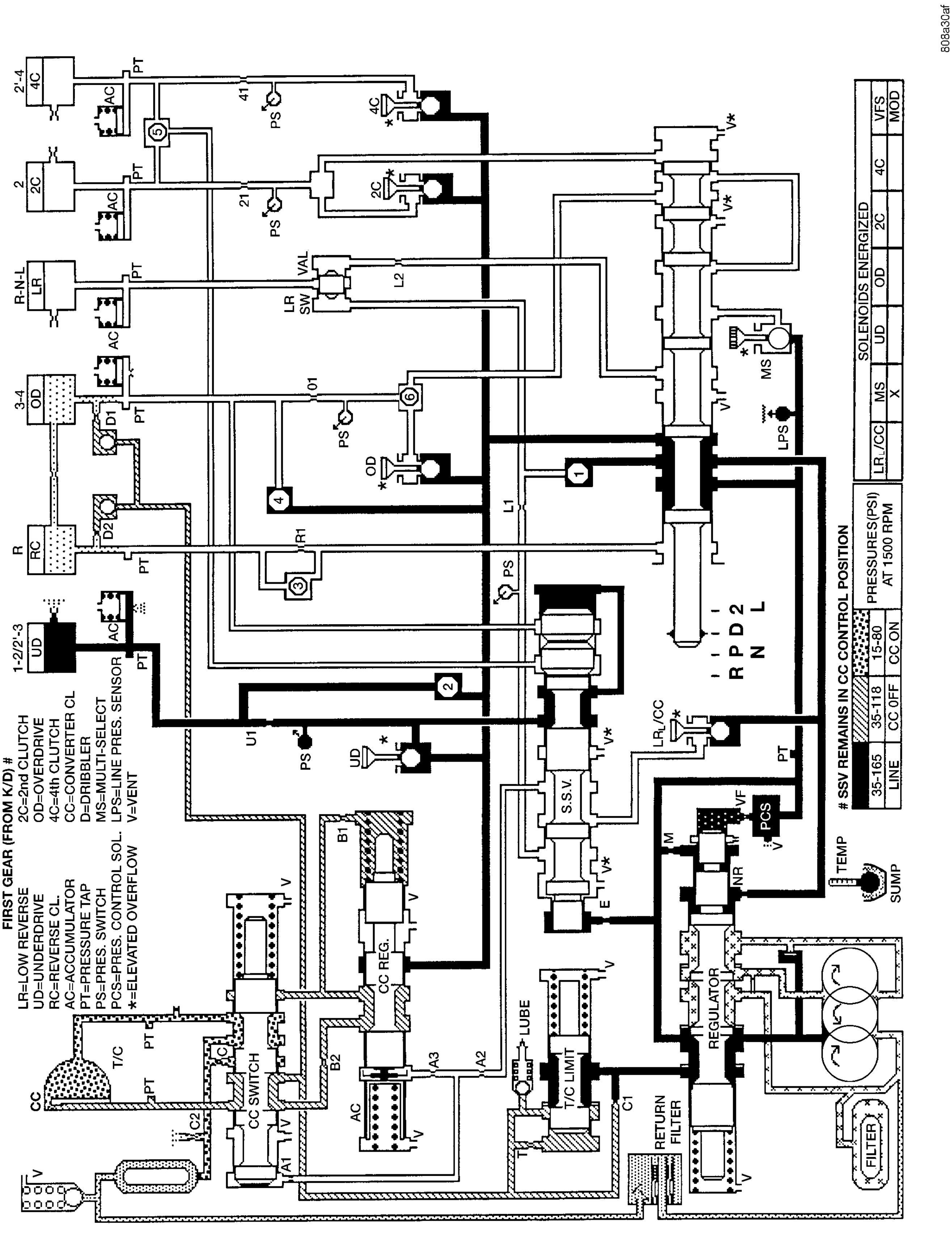
HYDRAULIC FLOW IN FIRST GEAR (FROM N OR OD)

AUTOMATIC TRANSMISSION - 45RFE (Continued)



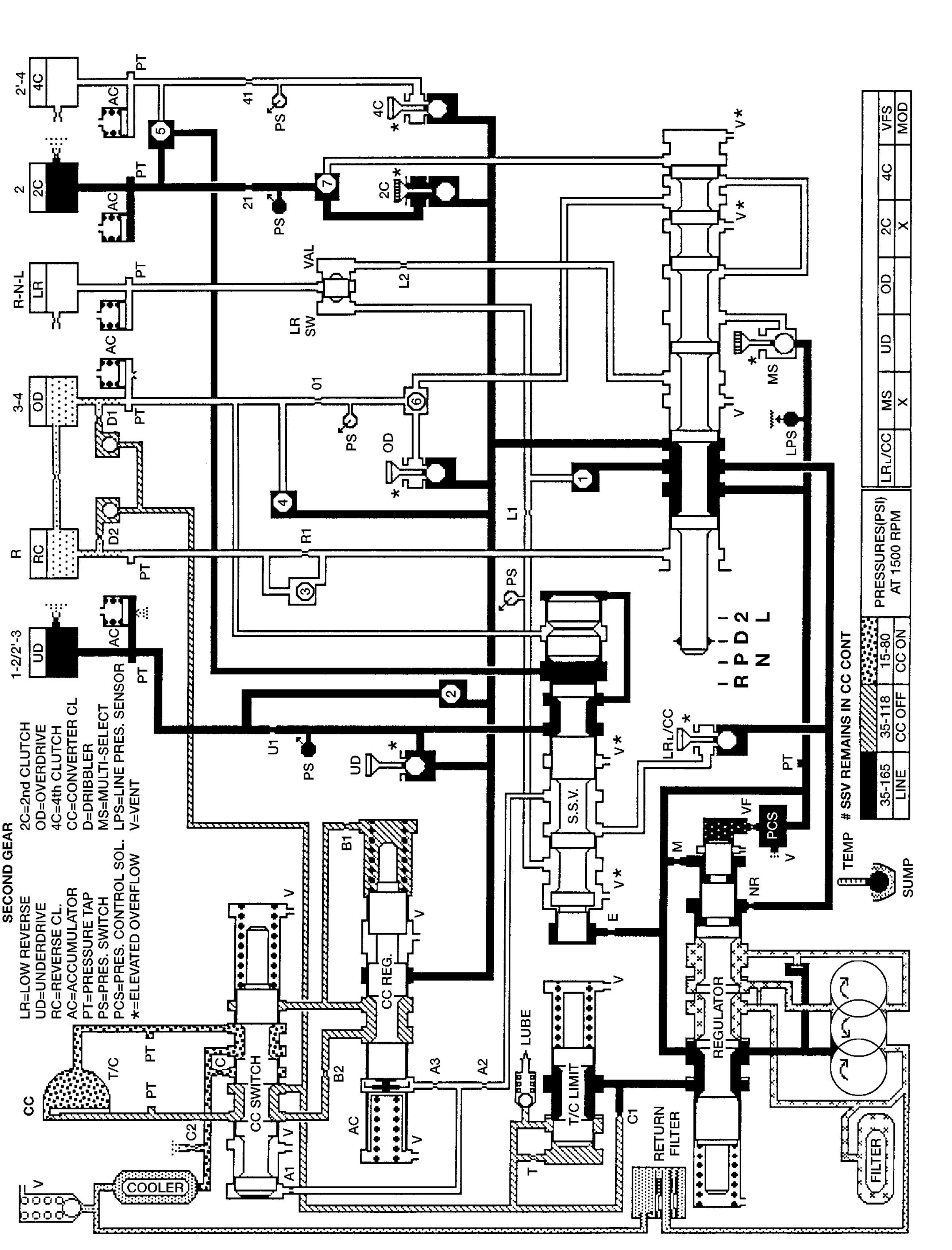
HYDRAULIC FLOW IN FIRST GEAR (AFTER LAUNCH FROM REST)

AUTOMATIC TRANSMISSION - 45RFE (Continued)



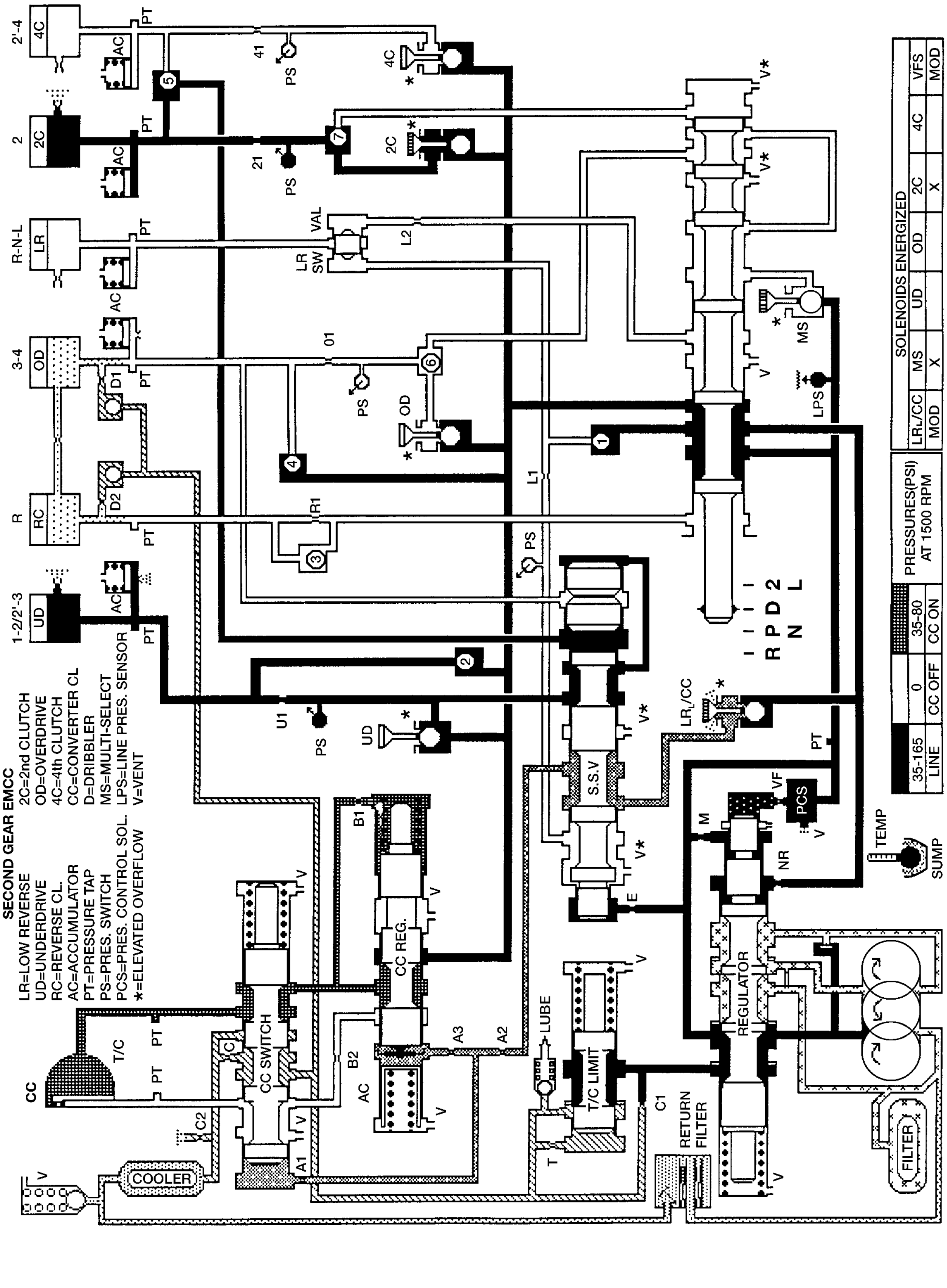
HYDRAULIC FLOW IN FIRST GEAR (FROM K/D)

AUTOMATIC TRANSMISSION - 45RFE (Continued)



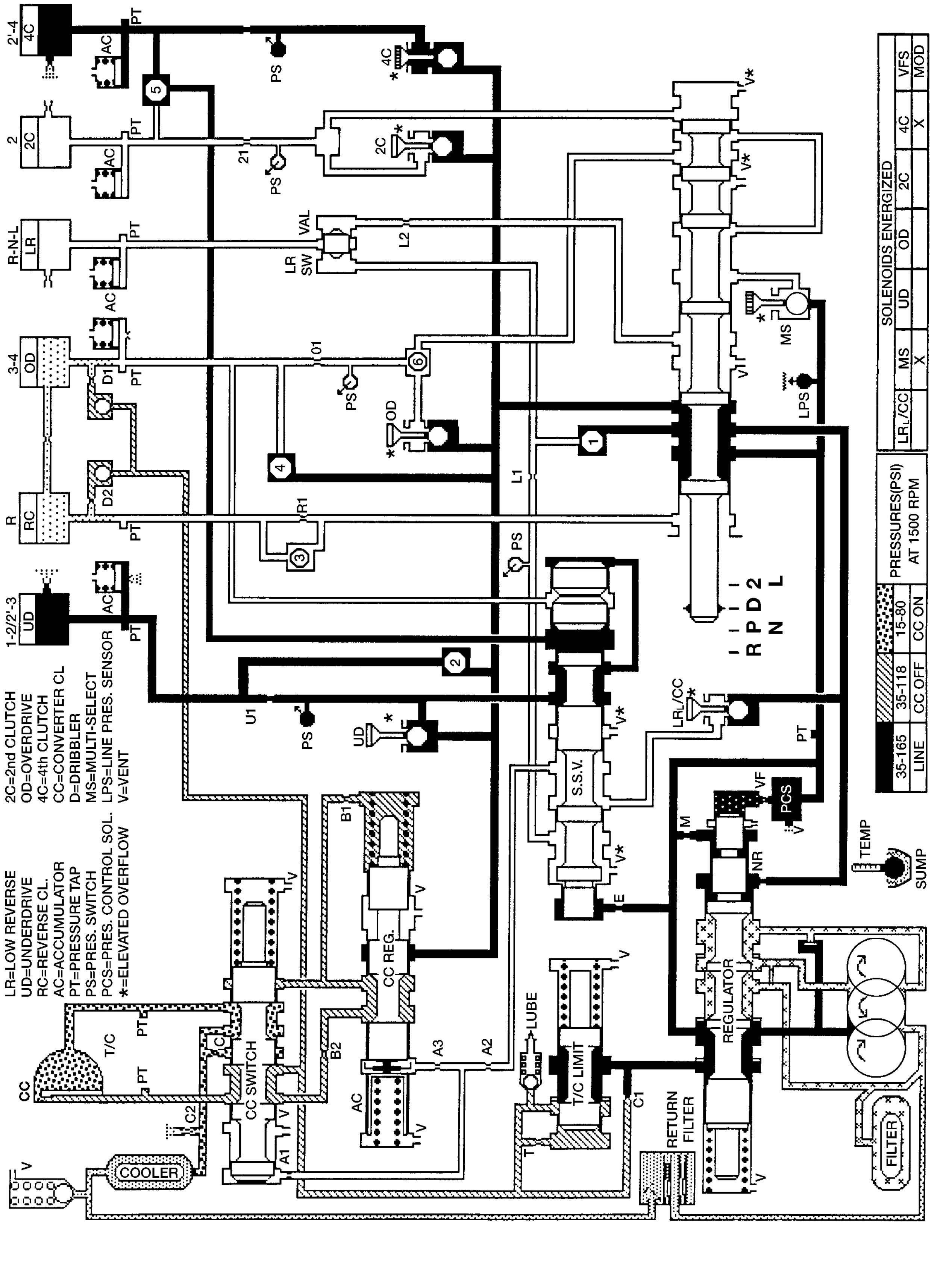
HYDRAULIC FLOW IN SECOND GEAR

AUTOMATIC TRANSMISSION - 45RFE (Continued)



HYDRAULIC FLOW IN SECOND GEAR EMCC

AUTOMATIC TRANSMISSION - 45RFE (Continued)



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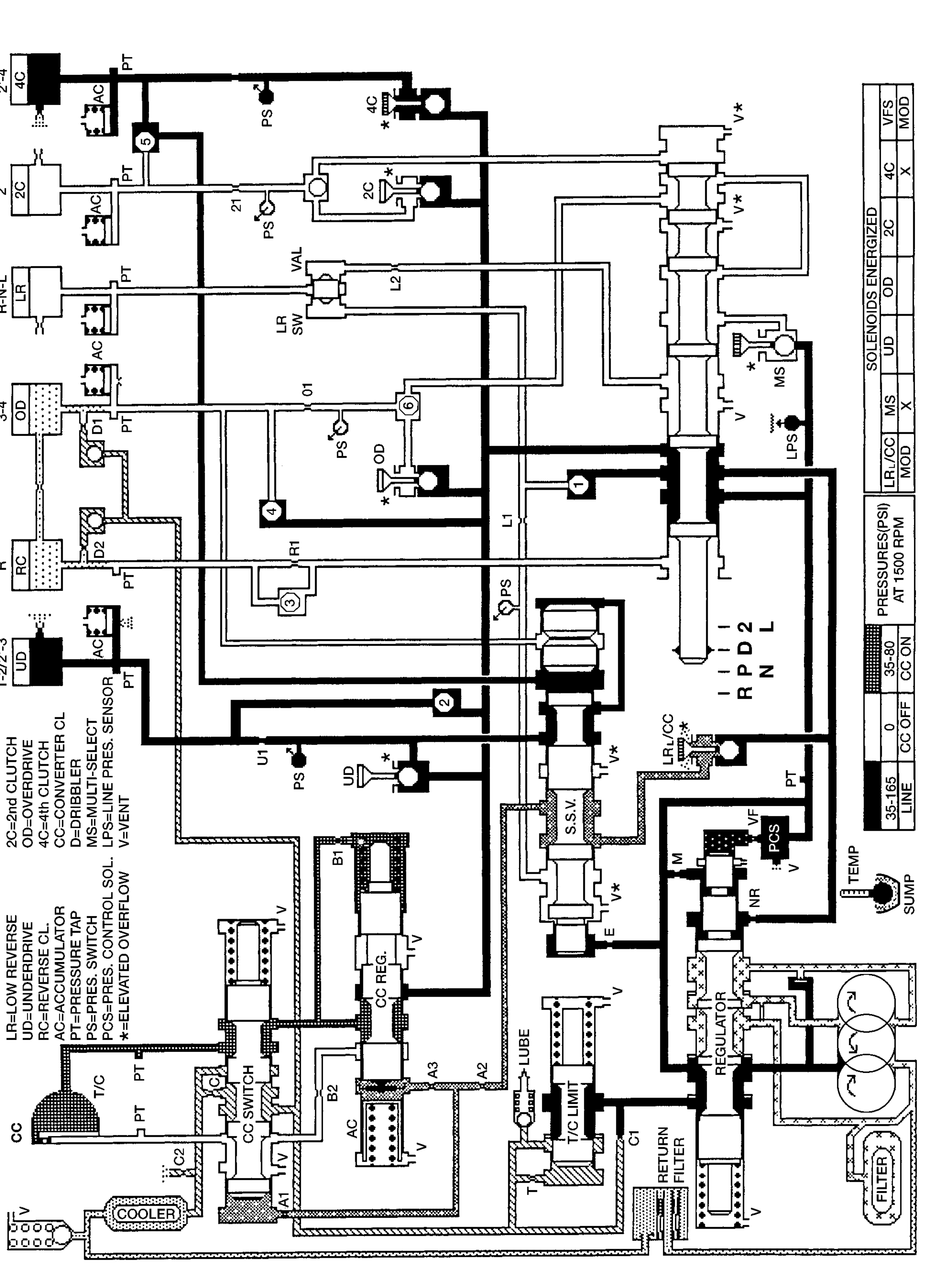
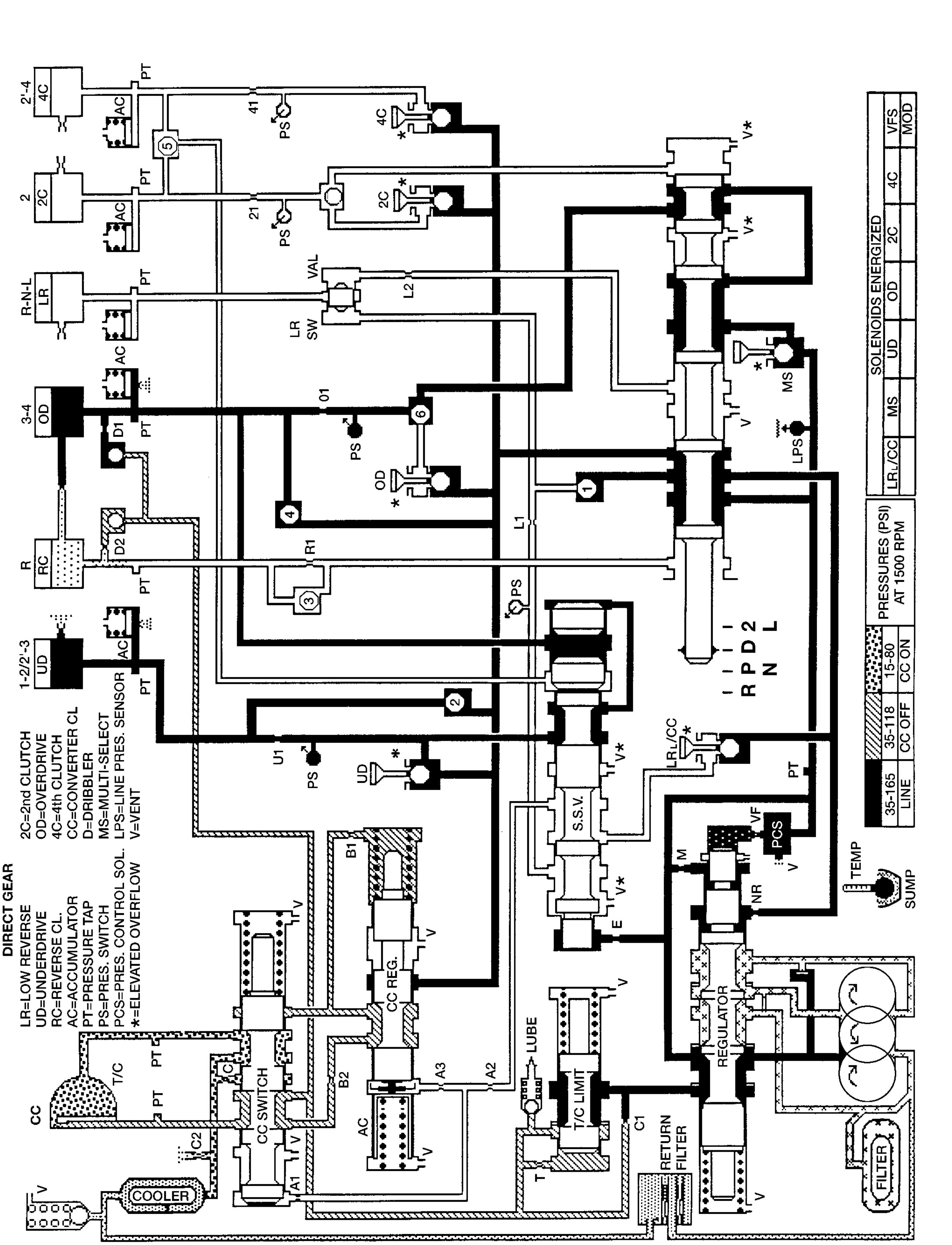
HYDRAULIC FLOW IN SECOND PRIME GEAR

AUTOMATIC TRANSMISSION - 45RFE (Continued)



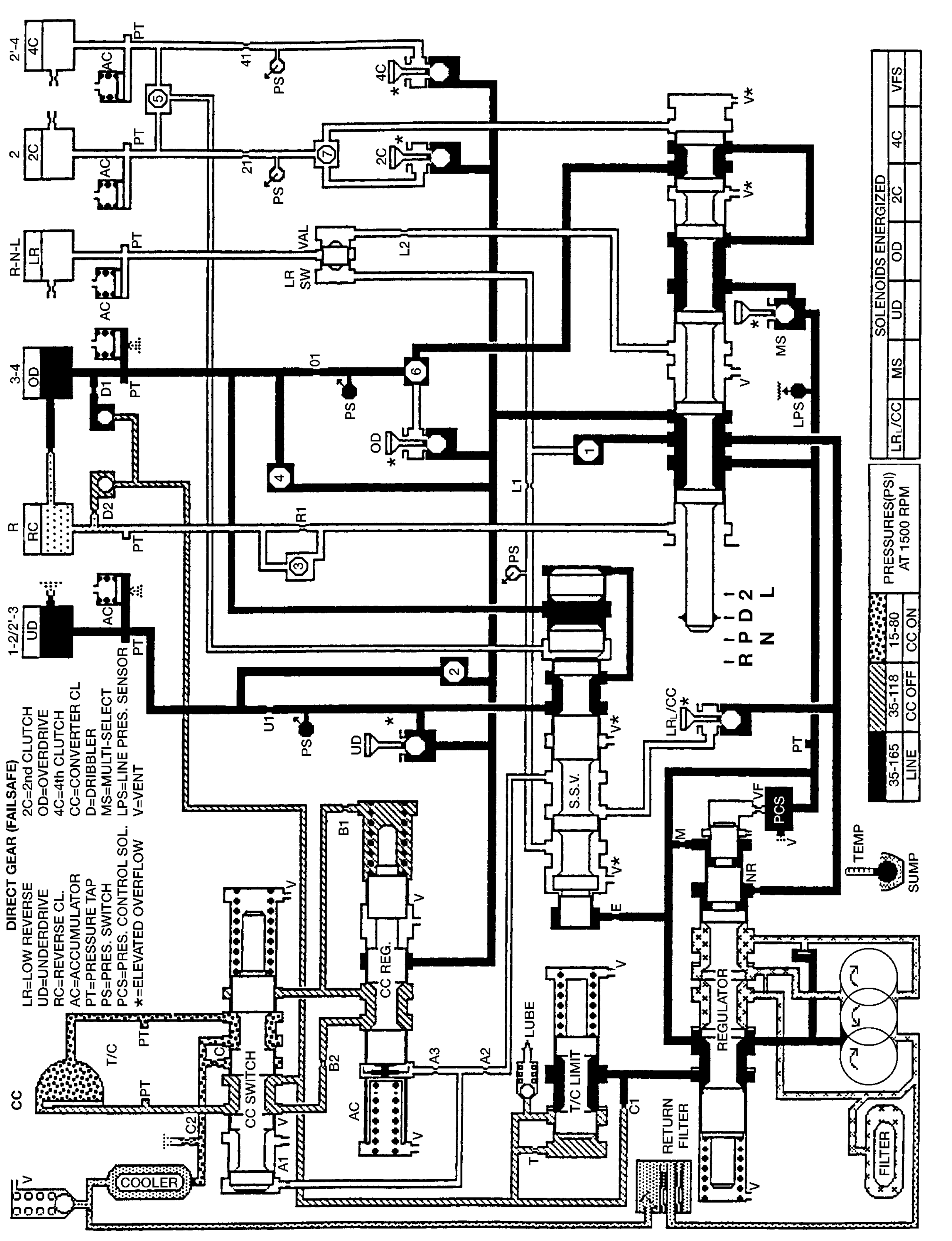
HYDRAULIC FLOW IN SECOND PRIME GEAR EMCC

AUTOMATIC TRANSMISSION - 45RFE (Continued)



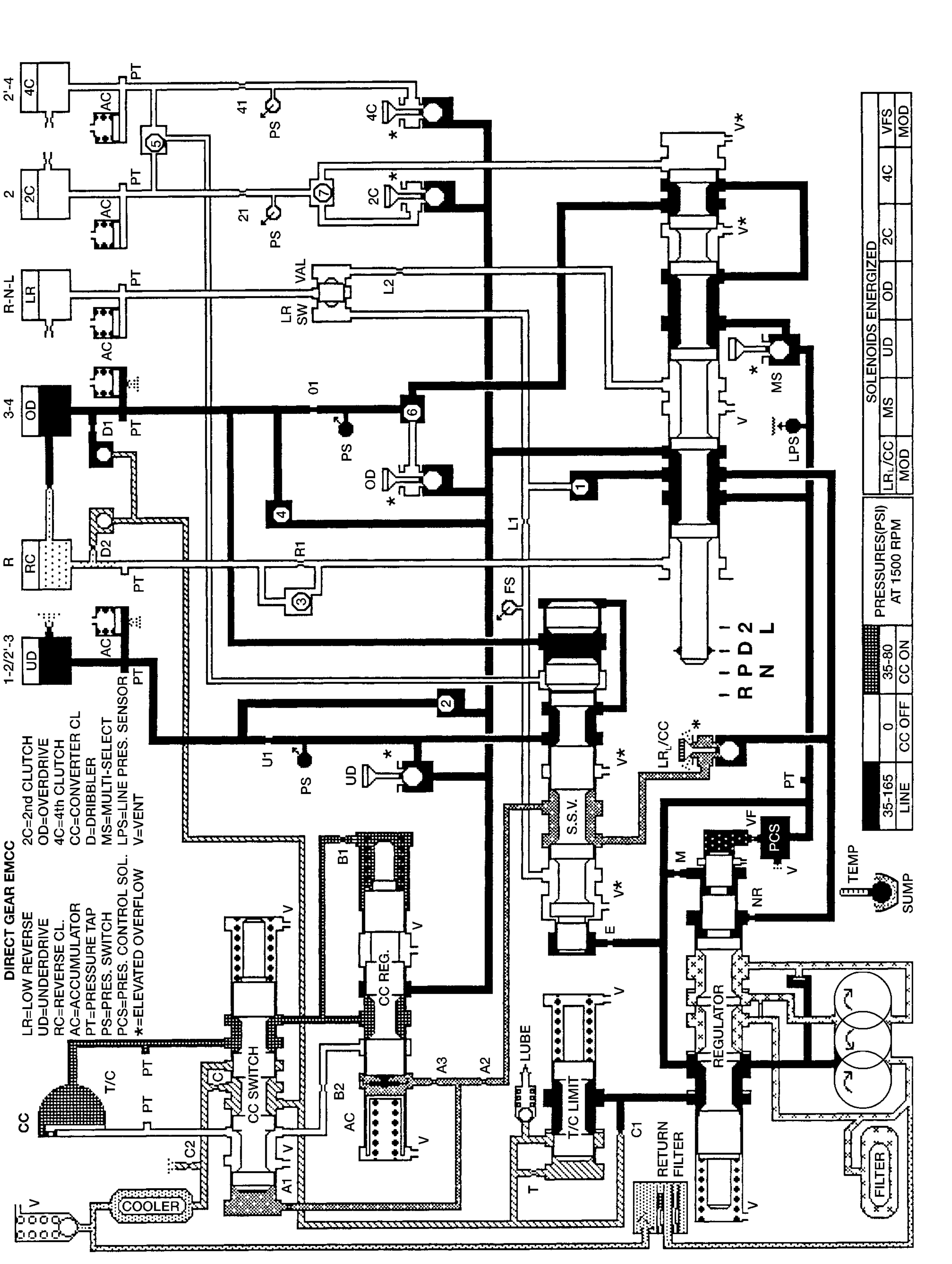
HYDRAULIC FLOW IN DIRECT GEAR

AUTOMATIC TRANSMISSION - 45RFE (Continued)



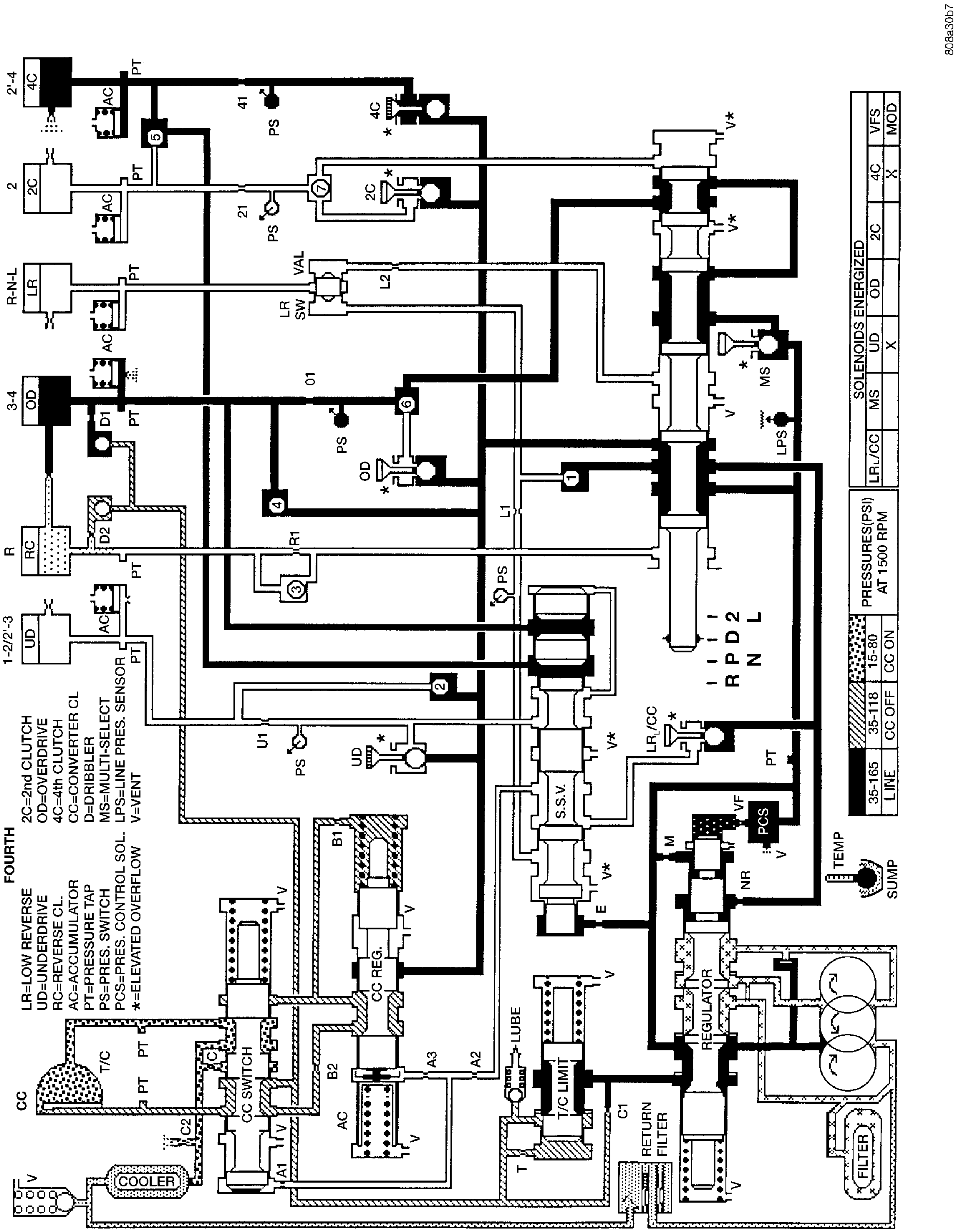
HYDRAULIC FLOW IN DIRECT GEAR (FAILSAFE)

AUTOMATIC TRANSMISSION - 45RFE (Continued)



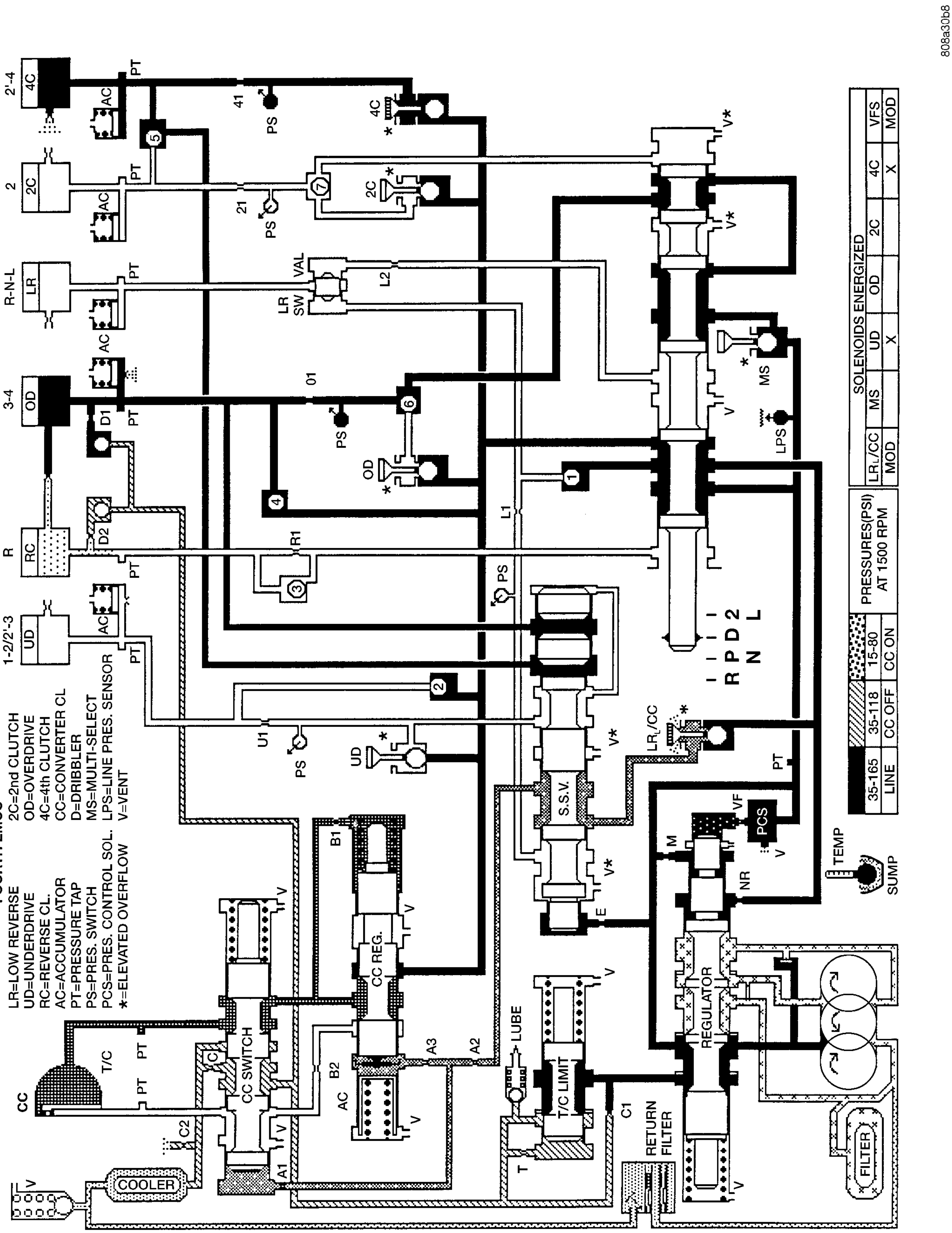
HYDRAULIC FLOW IN DIRECT GEAR EMCC

AUTOMATIC TRANSMISSION - 45RFE (Continued)



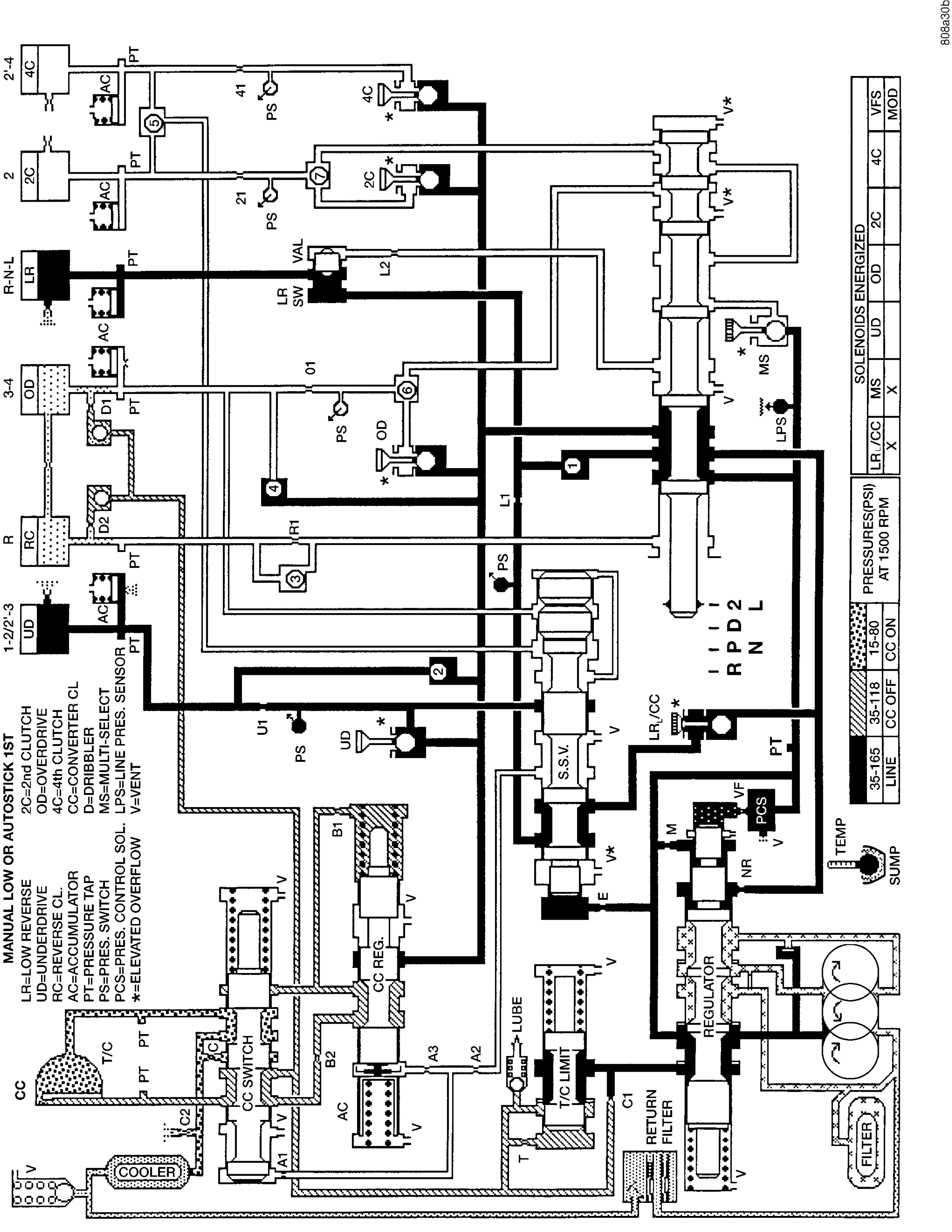
HYDRAULIC FLOW IN FOURTH

AUTOMATIC TRANSMISSION - 45RFE (Continued)



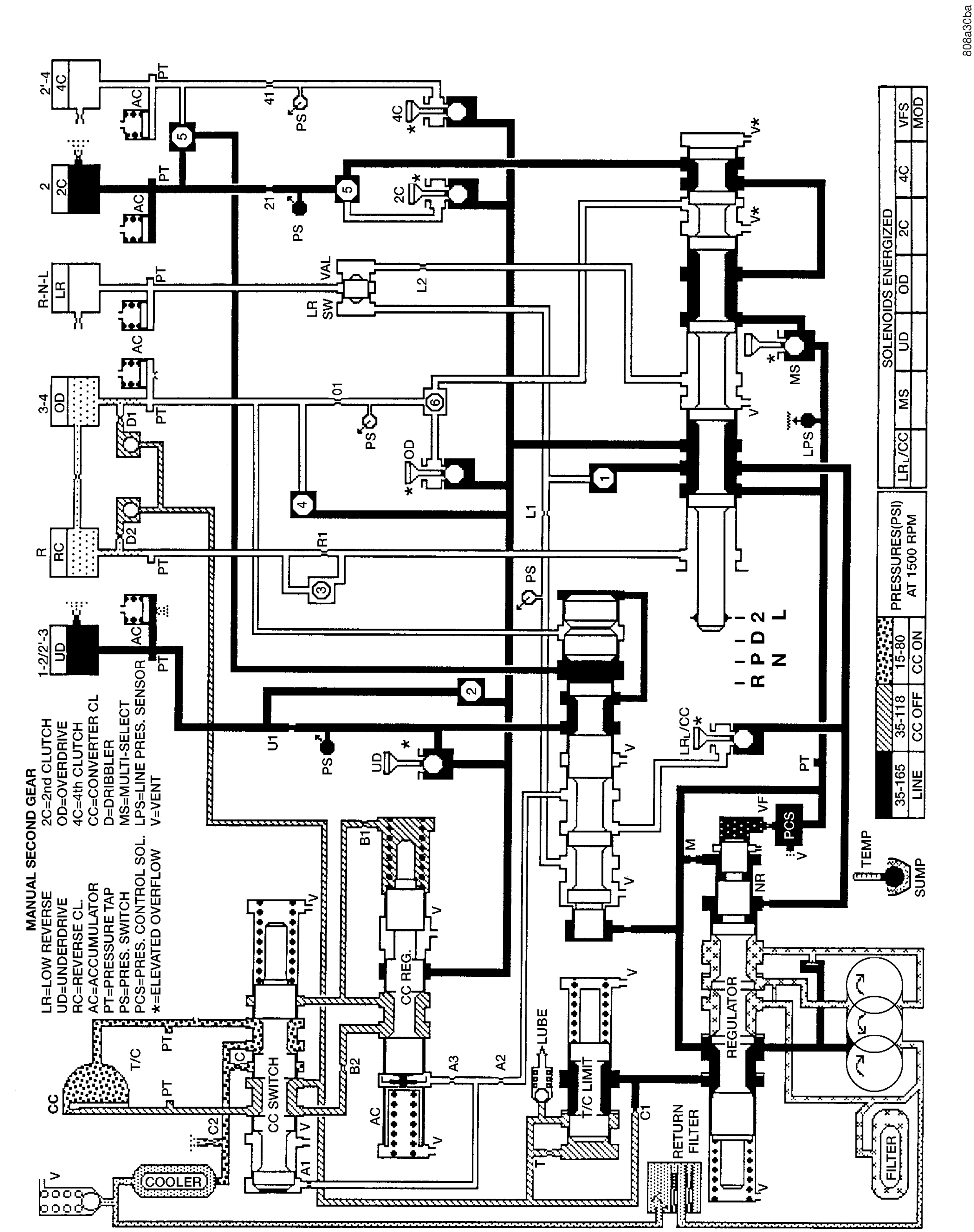
HYDRAULIC FLOW IN FOURTH EMCC

AUTOMATIC TRANSMISSION - 45RFE (Continued)



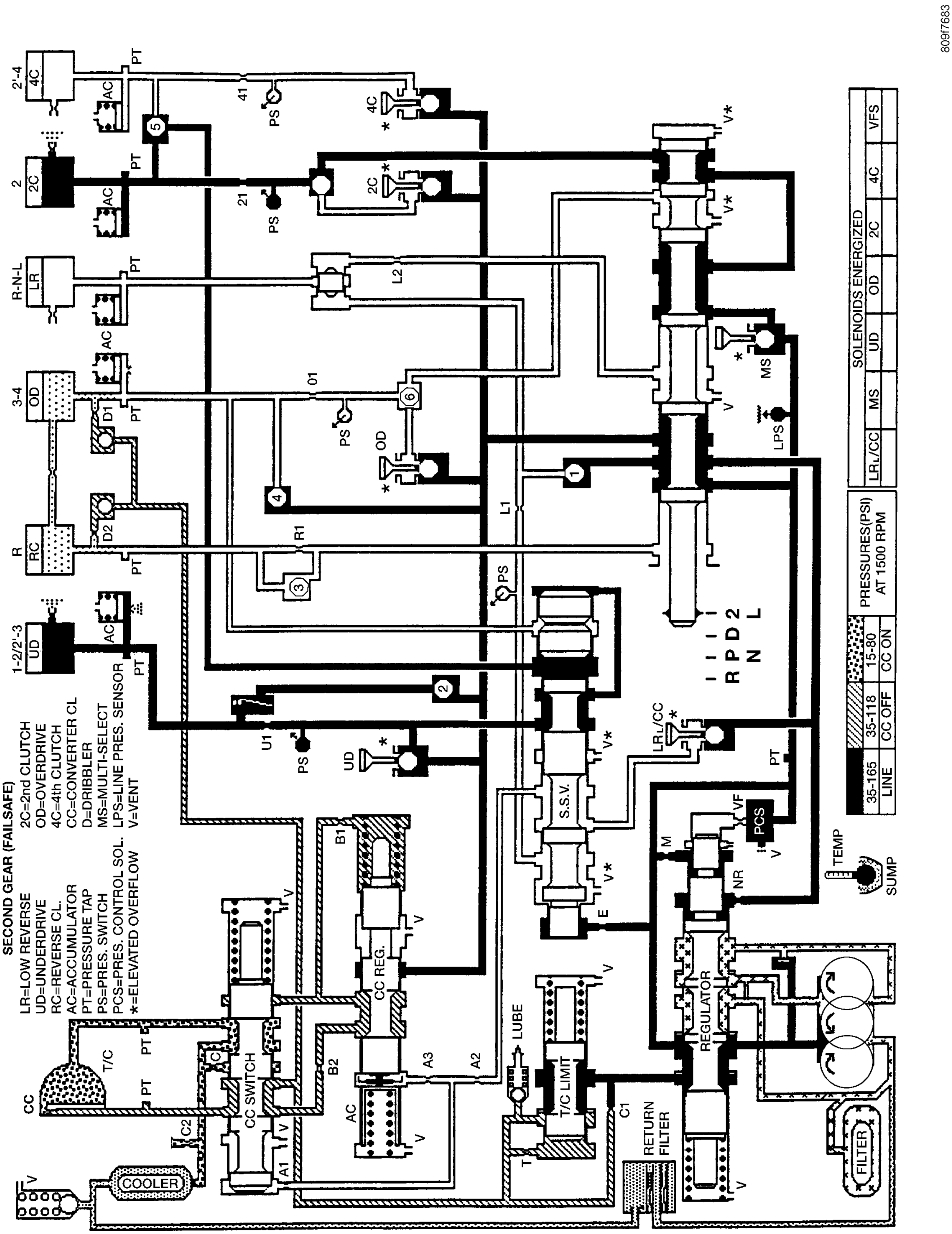
HYDRAULIC FLOW IN MANUAL LOW OR AUTOSTICK 1ST

AUTOMATIC TRANSMISSION - 45RFE (Continued)



HYDRAULIC FLOW IN MANUAL SECOND

AUTOMATIC TRANSMISSION - 45RFE (Continued)



HYDRAULIC FLOW IN MANUAL SECOND (FAILSAFE)

AUTOMATIC TRANSMISSION - 45RFE (Continued)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Output Shaft End Play	0.22-0.55 mm	0.009-0.021 in.
Input Shaft End Play	0.46-0.89 mm	0.018-0.035 in.
2C Clutch Pack Clearance	0.455-1.335 mm	0.018-0.053 in.
4C Clutch Pack Clearance	0.770-1.390 mm	0.030-0.055 in.
L/R Clutch Pack Clearance	1.00-1.74 mm	0.039-0.069 in.
OD Clutch Pack Clearance	1.103-1.856 mm	0.043-0.073 in.
UD Clutch Pack Clearance	0.84-1.54 mm	0.033-0.061 in.
Reverse Clutch Pack Clearance	0.81-1.24 mm	0.032-0.049 in.
Recommended fluid	Mopar® ATF +4, Automatic Transmission Fluid	

GEAR RATIOS

1ST	3.00:1
2ND	1.67:1
2ND Prime	1.50:1
3RD	1.0:1
4TH	0.75:1
REVERSE	3.00:1

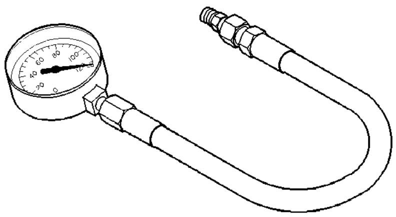
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	17.5	-	155
Bolt, torque convertor	31	23	-
Bolt/nut, crossmember	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Bolt, oil pan	11.8	-	105
Screw, primary fluid filter	4.5	-	40
Bolt, oil pump	28.2	-	250
Bolt, oil pump body to cover	4.5	-	40
Screw, plate to oil pump body	4.5	-	40
Bolt, valve body to case	11.8	-	105
Plug, pressure test port	5.1	-	45
Bolt, reaction shaft support	11.8	-	105
Screw, valve body to transfer plate	5.6	-	50
Screw, solenoid module to transfer plate	5.7	-	50
Screw, accumulator cover	4.5	-	40
Screw, detent spring	4.5	-	40
Bolt, input speed sensor	11.8	-	105
Bolt, output speed sensor	11.8	-	105
Bolt, line pressure sensor	11.8	-	105
Bolt, extension housing	54	40	-
Valve, cooler return filter bypass	4.5	-	40
Screw, manual valve cam retaining	4.5	-	40
Bolt, manual lever	28.2	-	250

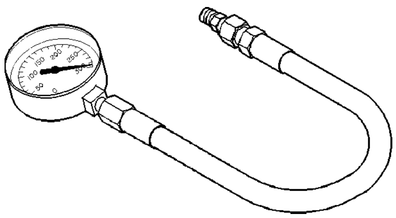
AUTOMATIC TRANSMISSION - 45RFE (Continued)

SPECIAL TOOLS

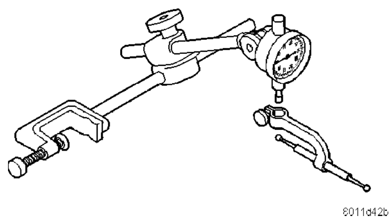
RFE TRANSMISSION



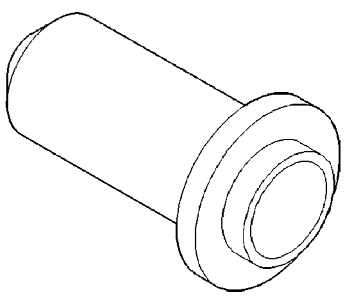
Gauge, Oil Pressure - C-3292



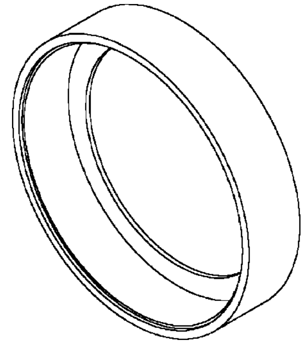
Gauge, Oil Pressure - C-3293SP



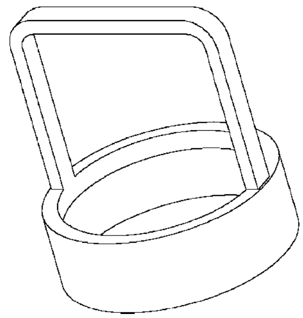
Dial Indicator - C-3339



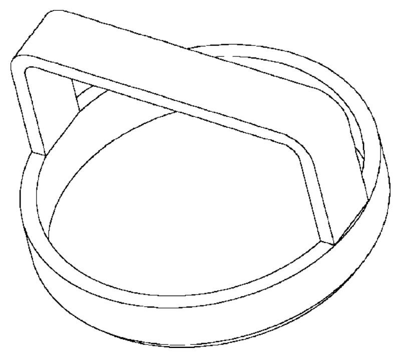
Installer, Seal - C-3860-A



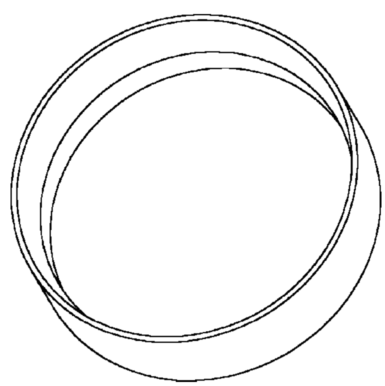
Compressor, Spring - 8249



Compressor, Spring - 8250

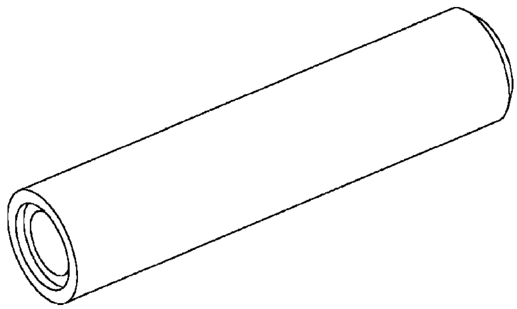


Compressor, Spring - 8251

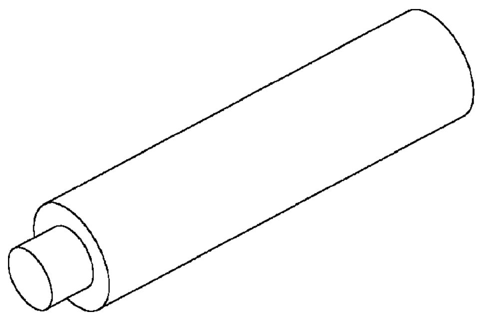


Installer, Piston - 8252

AUTOMATIC TRANSMISSION - 45RFE (Continued)



Installer, Seal - 8253



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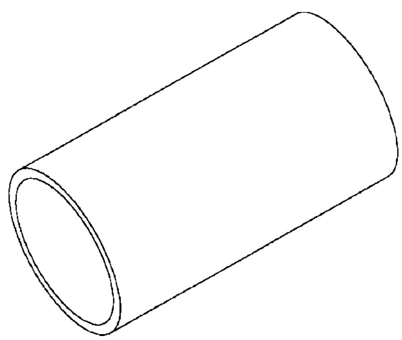
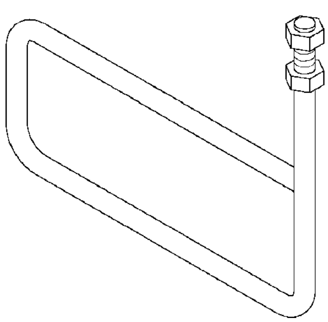
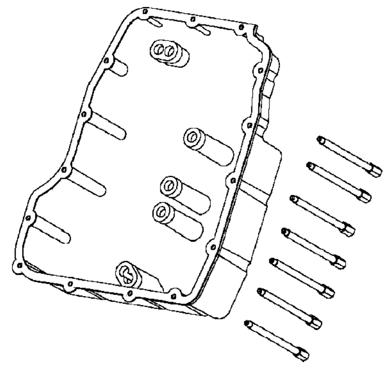


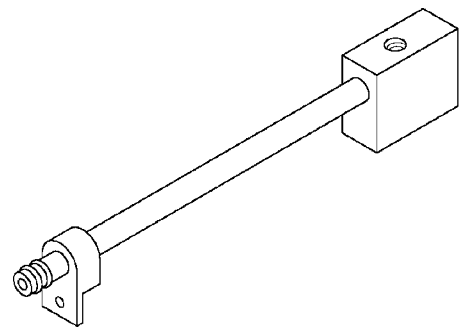
Installer, Snap-ring - 8255



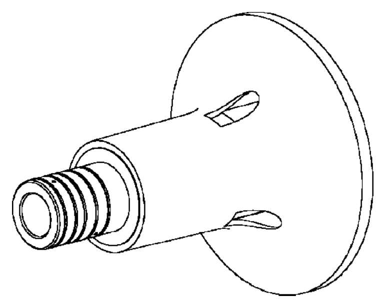
Stand, Support - 8257



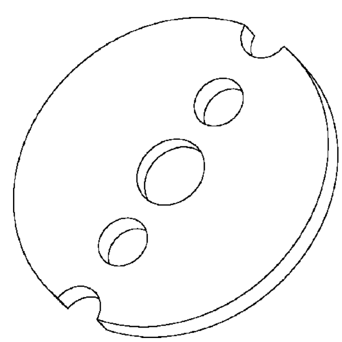
Adapter, Pressure Tap - 8258-A



Adapter, Line Pressure - 8259

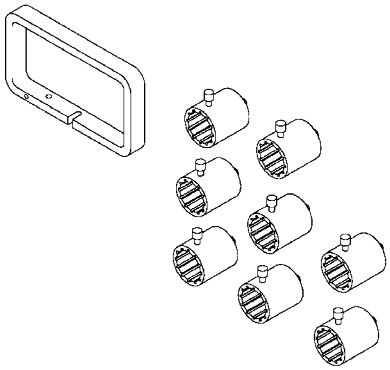


Fixture, Input Clutch Pressure - 8260

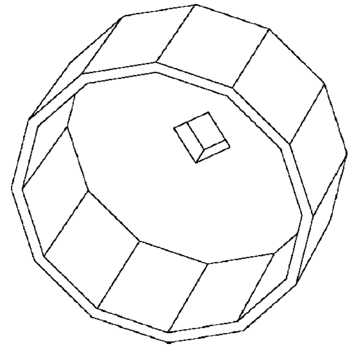


Plate, Alignment - 8261

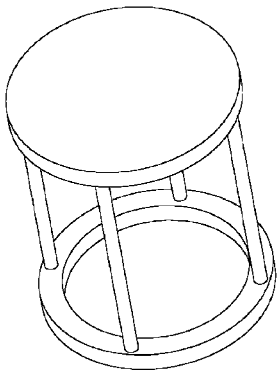
AUTOMATIC TRANSMISSION - 45RFE (Continued)



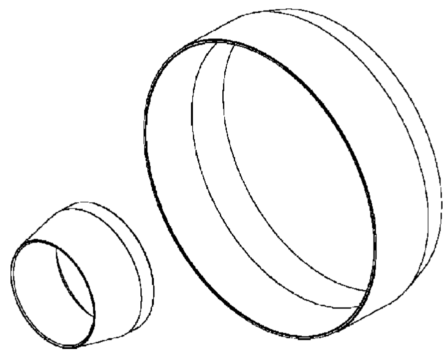
End Play Set - 8266



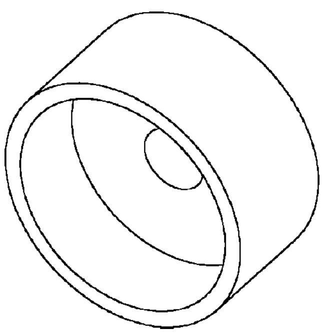
Wrench, Filter - 8321



Compressor, Spring - 8285



Installer, Piston - 8504



Installer, Bearing - 8320

4C RETAINER/BULKHEAD

DISASSEMBLY

(1) Remove the 2C piston belleville spring snap-ring from the 4C retainer /bulkhead (Fig. 66).

(2) Remove the 2C piston Belleville spring from the retainer/bulkhead (Fig. 66).

(3) Remove the 2C piston from the retainer/bulkhead. Use 20 psi of air pressure to remove the piston if necessary.

(4) Remove the 4C clutch snap-ring from the retainer/bulkhead (Fig. 66).

(5) Remove the 4C clutch pack from the retainer/bulkhead (Fig. 66).

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and remove the snap-ring (Fig. 66).

(7) Remove the 4C piston return spring and piston from the retainer/bulkhead (Fig. 66). Use 20 psi of air pressure to remove the piston if necessary.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install new seals on the 2C and 4C pistons (Fig. 66).

(3) Lubricate all seals with Mopar® ATF +4 prior to installation.

(4) Install the 4C piston into the 4C retainer/bulkhead (Fig. 66).

(5) Position the 4C piston return spring onto the 4C piston.

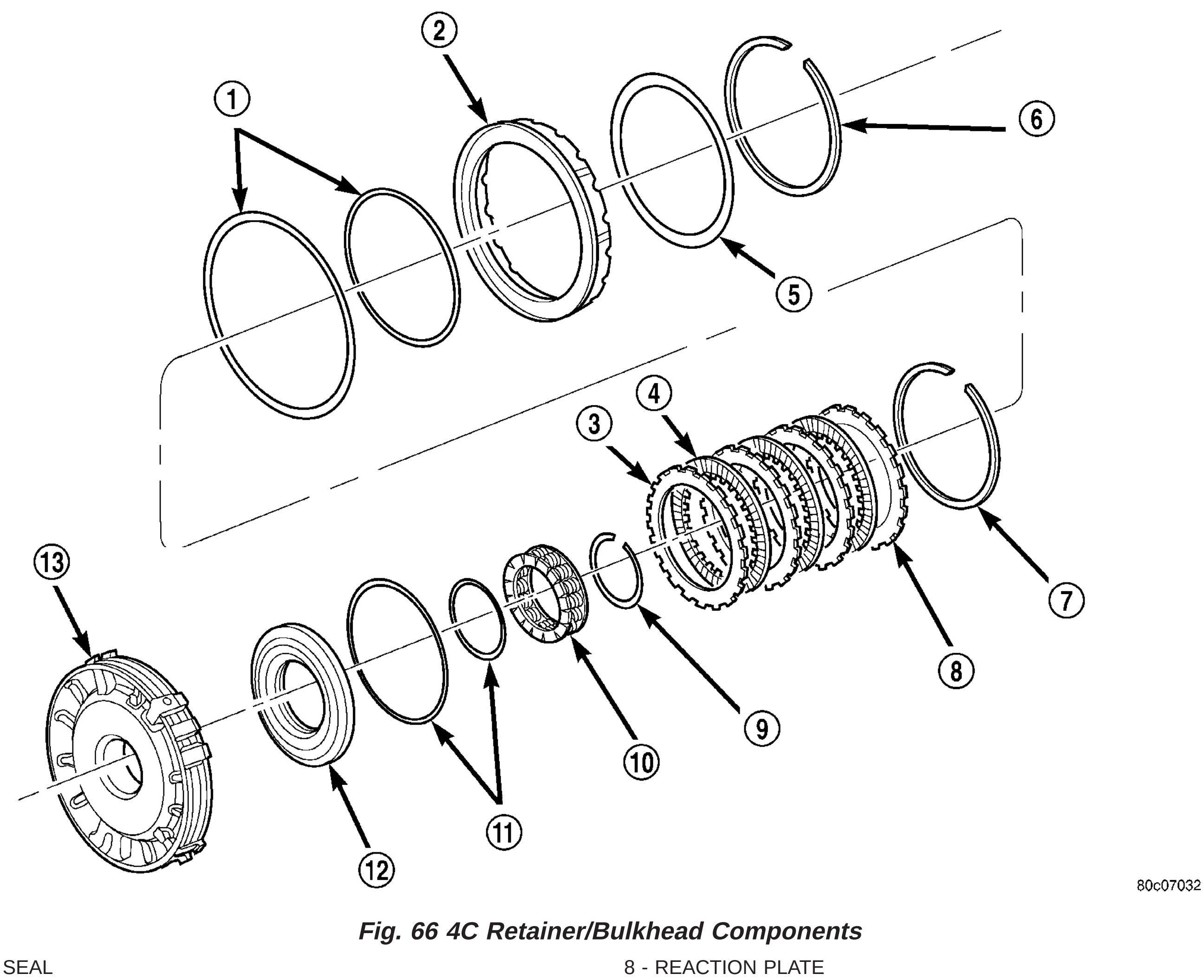


Fig. 66 4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

4C RETAINER/BULKHEAD (Continued)

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and install the snap-ring (Fig. 67).

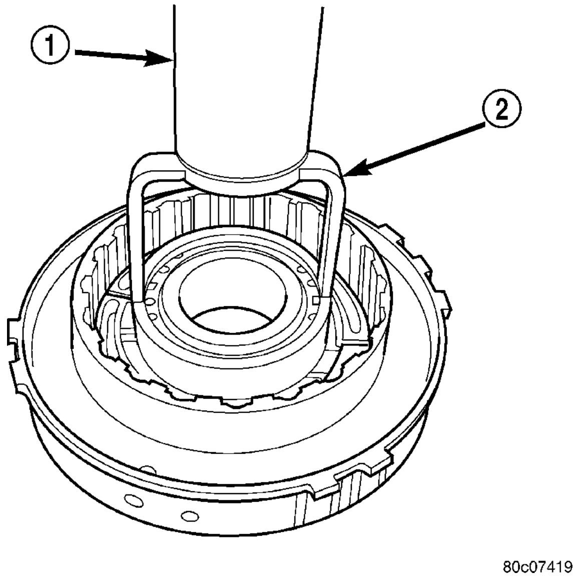


Fig. 67 Compress 4C Piston Return Spring Using Tool 8250

1 - PRESS
2 - TOOL 8250

(7) Assemble and install the 4C clutch pack into the retainer/bulkhead (Fig. 66) with the steel separator plate against the piston.

(8) Install the 4C reaction plate and snap-ring into the retainer/bulkhead (Fig. 66). The 4C reaction plate is non-directional.

(9) Measure the 4C clutch clearance. The correct clutch clearance is 0.77-1.39 mm (0.030-0.055 in.). The snap-ring is selectable. Install the chosen snap-ring and re-measure to verify the selection.

(10) Install the 2C piston into the retainer/bulkhead (Fig. 66).

(11) Position the 2C Belleville spring onto the 2C piston.

(12) Position the 2C Belleville spring snap-ring onto the 2C Belleville spring (Fig. 66).

(13) Using Spring Compressor 8249 and a suitable shop press (Fig. 68), compress the belleville spring until the snap-ring is engaged with the snap-ring groove in the retainer/bulkhead.

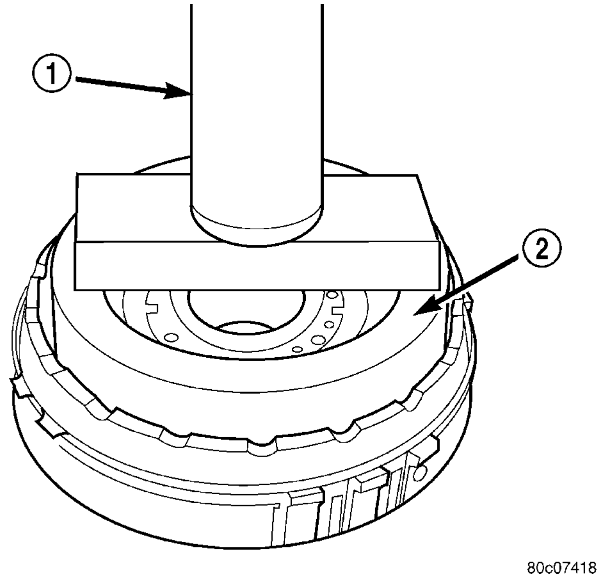


Fig. 68 Compress 2C Belleville Spring Using Tool 8249

1 - PRESS
2 - TOOL 8249

ADAPTER HOUSING SEAL

REMOVAL

(1) Remove the transfer case from the transmission.

(2) Using a screw mounted on a slide hammer, remove the adapter housing seal.

INSTALLATION

(1) Clean the adapter seal bore in the adapter housing of any residue or particles remaining from the original seal.

(2) Install new oil seal in the adapter housing using Seal Installer C-3860-A (Fig. 69). A properly installed seal is flush to the face of the seal bore.

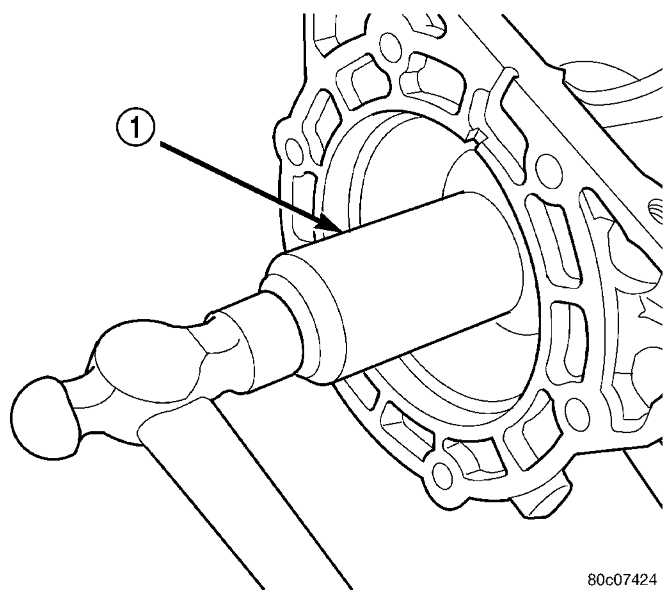


Fig. 69 Adapter Housing Seal Installation

1 - TOOL C-3860-A

(3) Install the transfer case onto the transmission.

BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM

DESCRIPTION

The Brake Transmission Shift Interlock Sytem (BTSI), consists of a Park-Interlock cable and a solenoid mounted in the shift lever assembly. The Park-Interlock cable connects the automatic transmission floor mounted shifter to the steering column ignition switch.

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in the shift lever assembly is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

FLUID AND FILTER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

DIAGNOSIS AND TESTING - CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

(1) Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.

(2) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(3) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

DIAGNOSIS AND TESTING - FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

FLUID AND FILTER (Continued)

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

STANDARD PROCEDURE - FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P (PARK) and N (NEUTRAL) positions. Place the selector lever in P (PARK) to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 70° F fluid temperature.

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.

(2) Shift the transmission into DRIVE for approximately 2 seconds.

(3) Shift the transmission into REVERSE for approximately 2 seconds.

(4) Shift the transmission into PARK.

(5) Hook up DRB® scan tool and select transmission.

(6) Select sensors.

(7) Read the transmission temperature value.

(8) Compare the fluid temperature value with the chart. (Fig. 70)

(9) Adjust transmission fluid level shown on the dipstick according to the chart.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

(10) Check transmission for leaks.

STANDARD PROCEDURE - FLUID AND FILTER REPLACEMENT

For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Place a large diameter shallow drain pan beneath the transmission pan.

(3) Remove bolts holding front and sides of pan to transmission.

(4) Loosen bolts holding rear of pan to transmission.

(5) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.

(6) Hold up pan and remove remaining bolts holding pan to transmission.

(7) While holding pan level, lower pan away from transmission.

(8) Pour remaining fluid in pan into drain pan.

(9) Remove screw holding filter to valve body (Fig. 71).

(10) Separate filter from valve body and oil pump and pour fluid in filter into drain pan.

(11) Remove and discard the oil filter seal from the bottom of the oil pump.

FLUID AND FILTER (Continued)

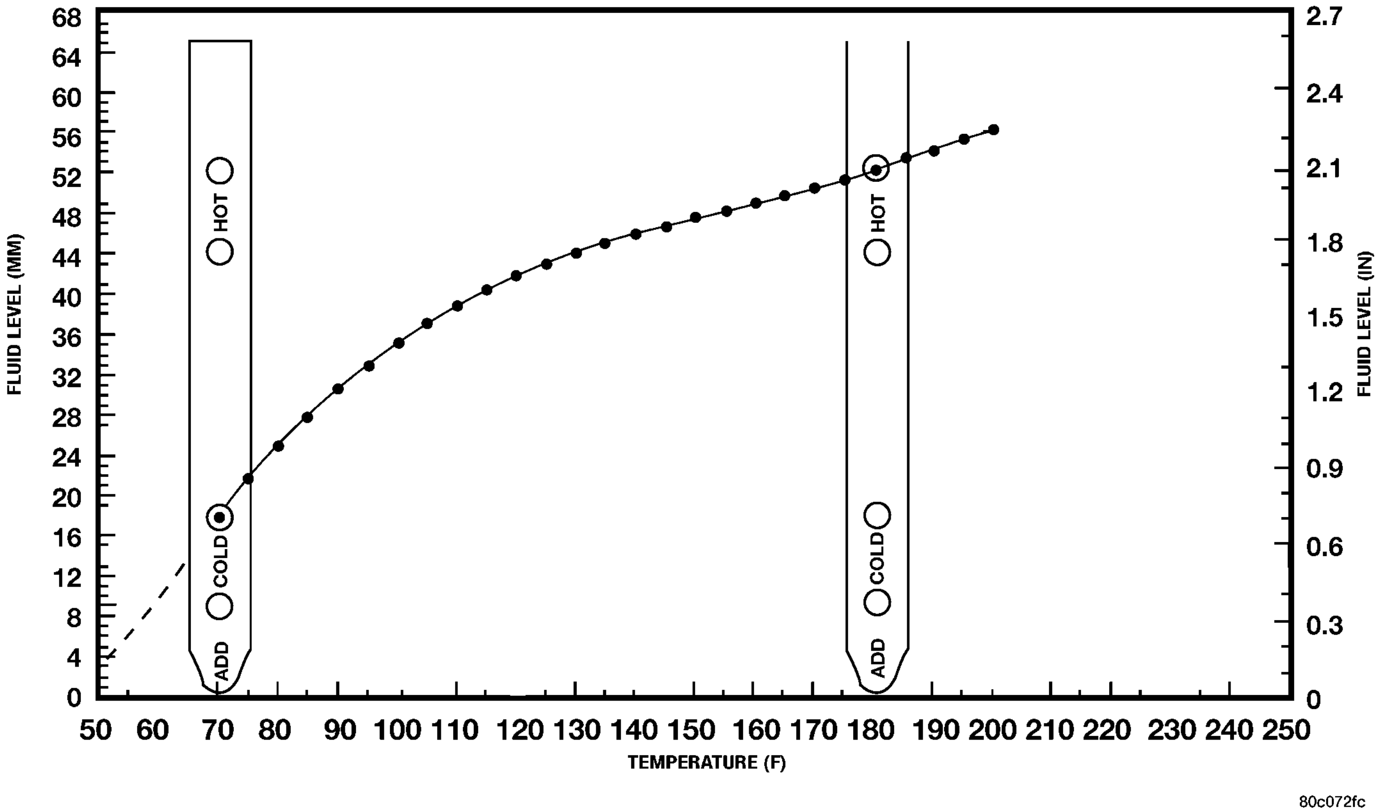


Fig. 70 Transmission Fluid Temperature Chart

(12) If replacing the cooler return filter, use Oil Filter Wrench 8321 to remove the filter from the transmission.

(13) Dispose of used trans fluid and filter(s) properly.

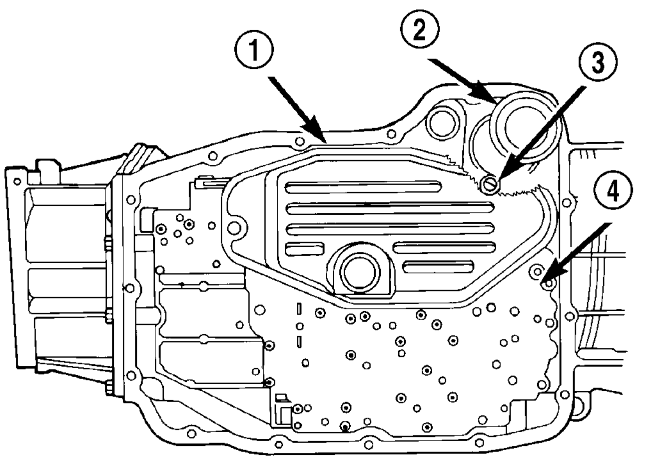


Fig. 71 Transmission Filters - 4X4 Shown

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal. A light coating of clutch material on the bottom of the pan does not indicate a problem unless accompanied by a slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts of debris, refer to the diagnosis section of this group.

CLEANING

(1) Using a suitable solvent, clean pan and magnet.

(2) Using a suitable gasket scraper, clean original sealing material from surface of transmission case and the transmission pan.

FLUID AND FILTER (Continued)

INSTALLATION

(1) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(2) Place replacement filter in position on valve body and into the oil pump.

(3) Install screw to hold filter to valve body (Fig. 71). Tighten screw to 4.5 N·m (40 in. lbs.) torque.

(4) Install new cooler return filter onto the transmission, if necessary. Torque the filter to 14.12 N·m (125 in.lbs.).

(5) Place bead of Mopar® RTV sealant onto the transmission case sealing surface.

(6) Place pan in position on transmission.

(7) Install bolts to hold pan to transmission. Tighten bolts to 11.8 N·m (105 in. lbs.) torque.

(8) Lower vehicle and fill transmission with Mopar® ATF +4.

STANDARD PROCEDURE - TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF +4 to transmission:

(a) If only fluid and filter were changed, add **10 pints (5 quarts)** of ATF +4 to transmission.

(b) If transmission was completely overhauled and the torque converter was replaced or drained, add **24 pints (12 quarts)** of ATF +4 to transmission.

(3) Check the transmission fluid (Refer to 21 - TRANSMISSION/AUTOMATIC - RFE/FLUID - STANDARD PROCEDURE) and adjust as required.

GEARSHIFT CABLE

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position - Normal position. Engine starts must be possible.

(d) NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

REMOVAL

(1) Shift transmission into PARK.

(2) Raise vehicle.

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 72).

(4) Remove shift cable from the cable support bracket.

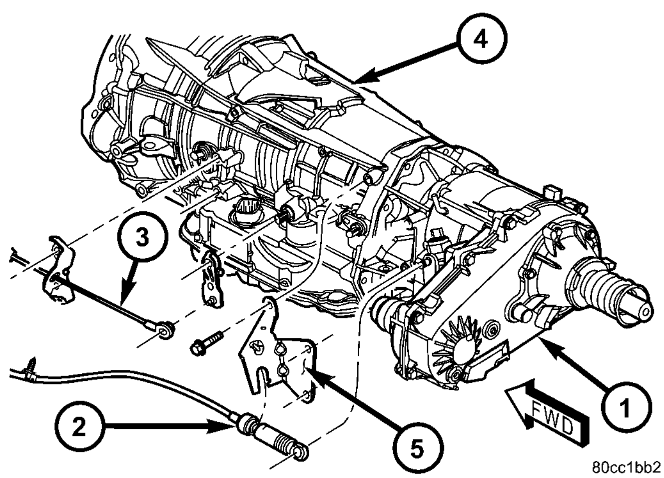


Fig. 72 Remove Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

(5) Lower vehicle.

(6) Remove necessary console parts for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

GEARSHIFT CABLE (Continued)

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 73).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 74).

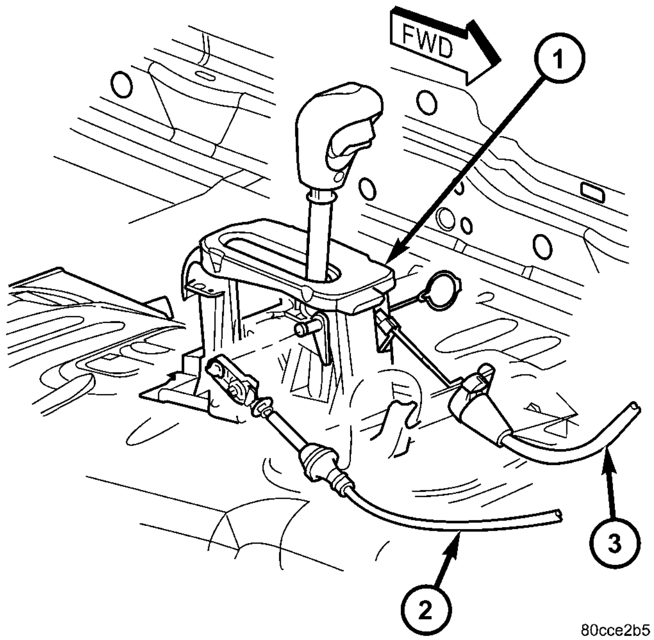


Fig. 73 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

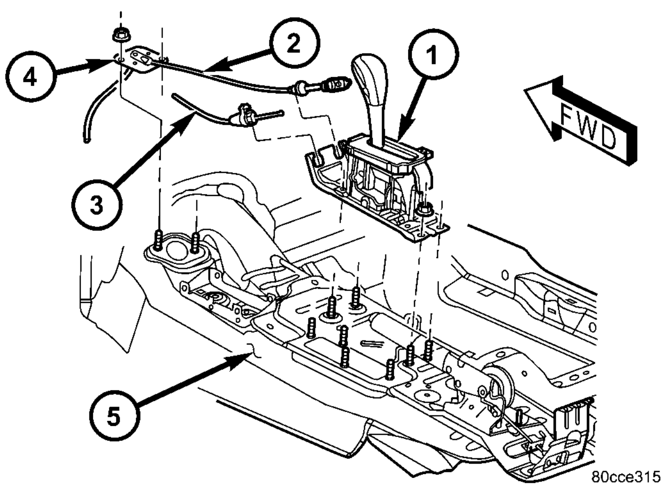


Fig. 74 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

(9) Pull cable through floor panel opening.

(10) Remove shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan (Fig. 75).

(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in.lbs.).

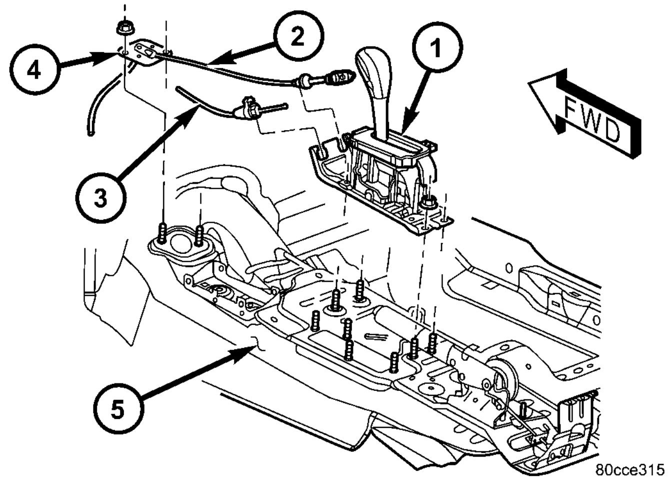


Fig. 75 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

(4) Install the shift cable to the shifter assembly bracket (Fig. 76). Push cable into the bracket until secure.

(5) Place the floor shifter lever in PARK position.

(6) Loosen the adjustment screw on the shift cable.

(7) Snap the shift cable onto the shift lever pin.

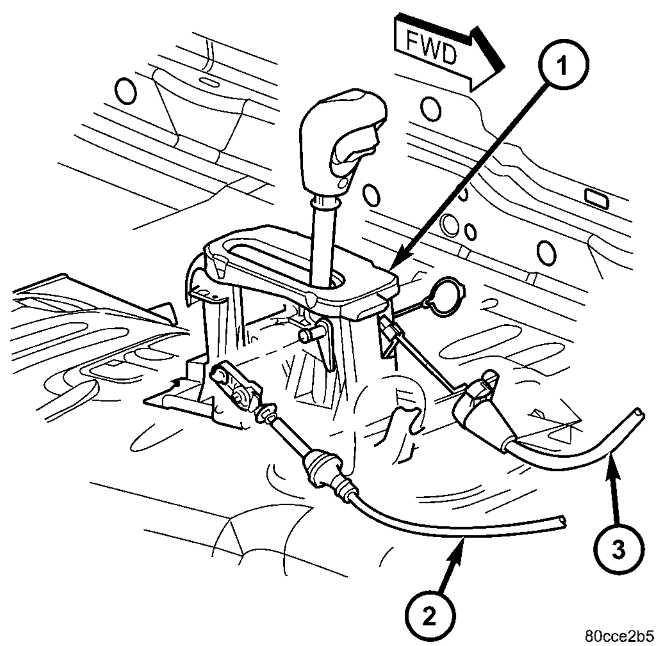


Fig. 76 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(8) Raise the vehicle.

GEARSHIFT CABLE (Continued)

(9) Install the shift cable to the shift cable support bracket (Fig. 77).

(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.

(11) Snap the shift cable onto the transmission manual shift lever.

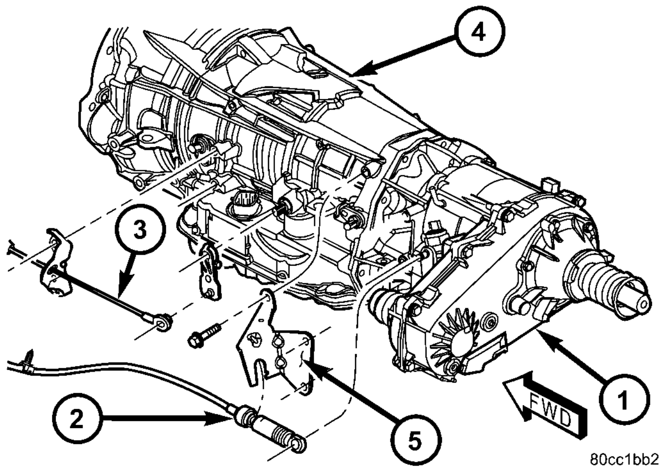


Fig. 77 Install Shift Cable

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

(12) Lower vehicle.

(13) Verify that the shift lever is in the PARK position.

(14) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(15) Verify correct shifter operation.

(16) Install any console parts removed for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the TRS may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into PARK.

(2) Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(3) Loosen the shift cable adjustment screw (Fig. 78).

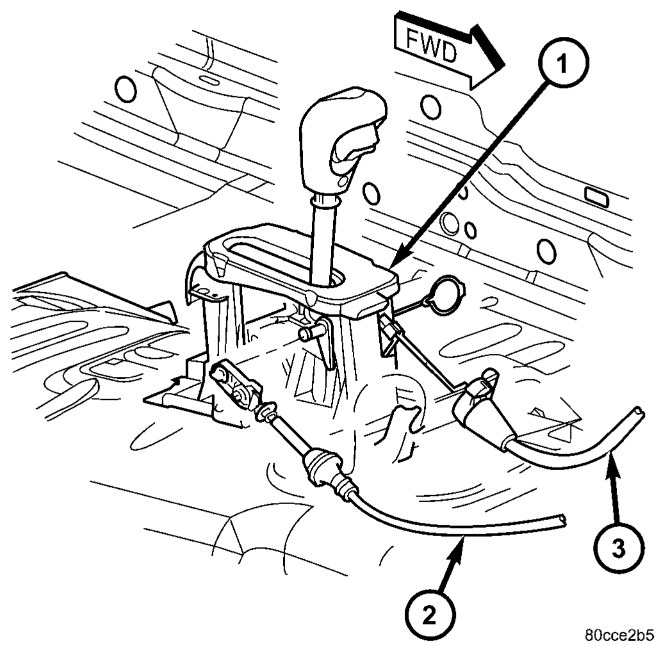


Fig. 78 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(4) Raise vehicle.

(5) Unsnap cable eyelet from transmission shift lever.

(6) Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Snap cable eyelet onto transmission shift lever.

(9) Lower vehicle

(10) Tighten the shift cable adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct operation.

(12) Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

HOLDING CLUTCHES

DESCRIPTION

Three hydraulically applied multi-disc clutches are used to hold some planetary geartrain components stationary while the input clutches drive others. The 2C, 4C, and Low/Reverse clutches are considered holding clutches. The 2C and 4C clutches are located in the 4C retainer/bulkhead (Fig. 79), while the Low/Reverse clutch is located at the rear of the transmission case (Fig. 80).

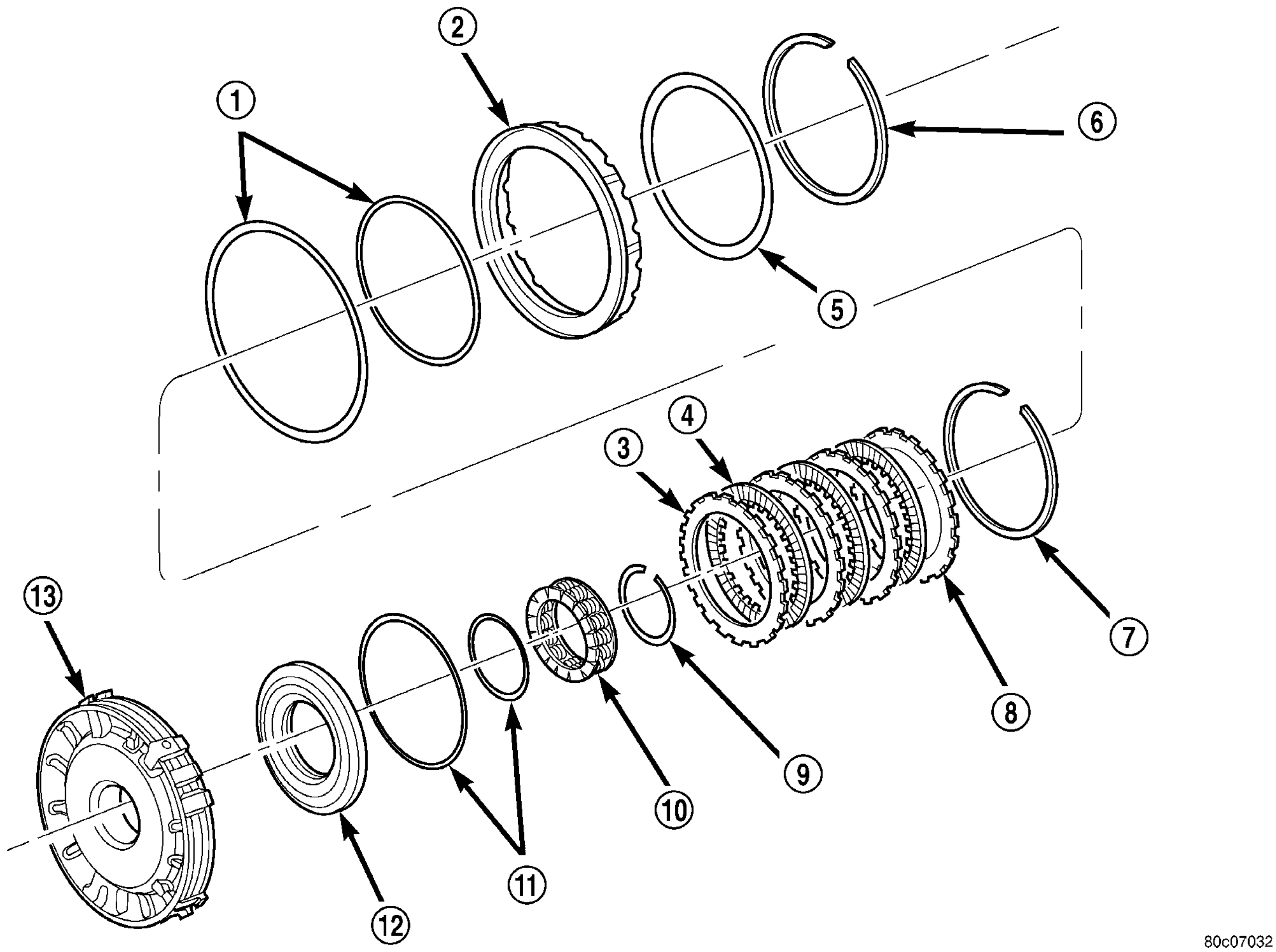


Fig. 79 2C and 4C Clutches

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

HOLDING CLUTCHES (Continued)

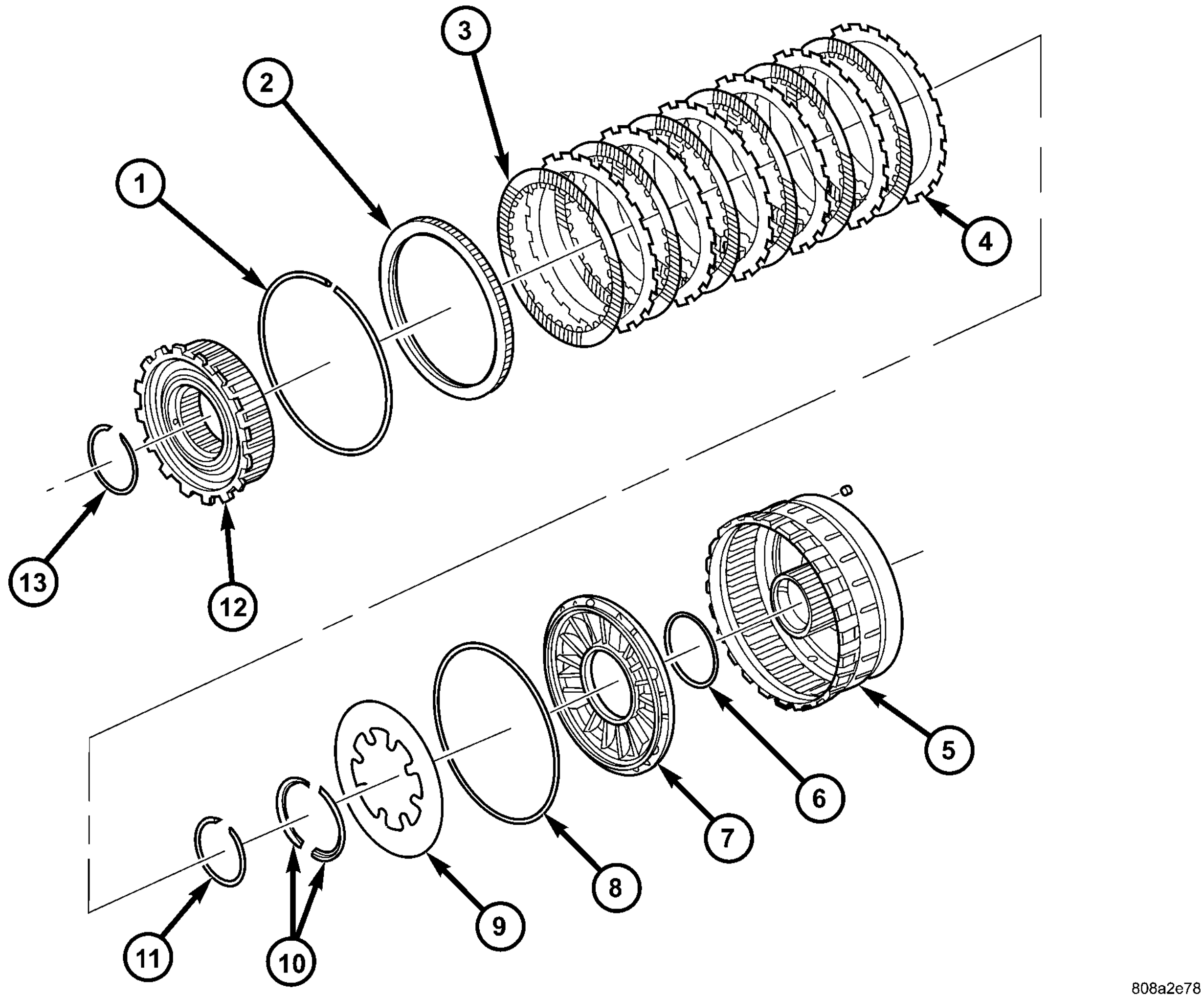


Fig. 80 Low/Reverse Clutch

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

OPERATION

2C CLUTCH

The 2C clutch is hydraulically applied in second gear by pressurized fluid against the 2C piston. When the 2C clutch is applied, the reverse sun gear assembly is held or grounded to the transmission case by holding the reaction planetary carrier.

4C CLUTCH

The 4C clutch is hydraulically applied in second prime and fourth gear by pressurized fluid against the 4C clutch piston. When the 4C clutch is applied, the reaction annulus gear is held or grounded to the transmission case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gear, only at low speeds, by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the input annulus assembly is held or grounded to the transmission case.

INPUT CLUTCH ASSEMBLY

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly (Fig. 81) and (Fig. 82). The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, second prime, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the input sun gear.

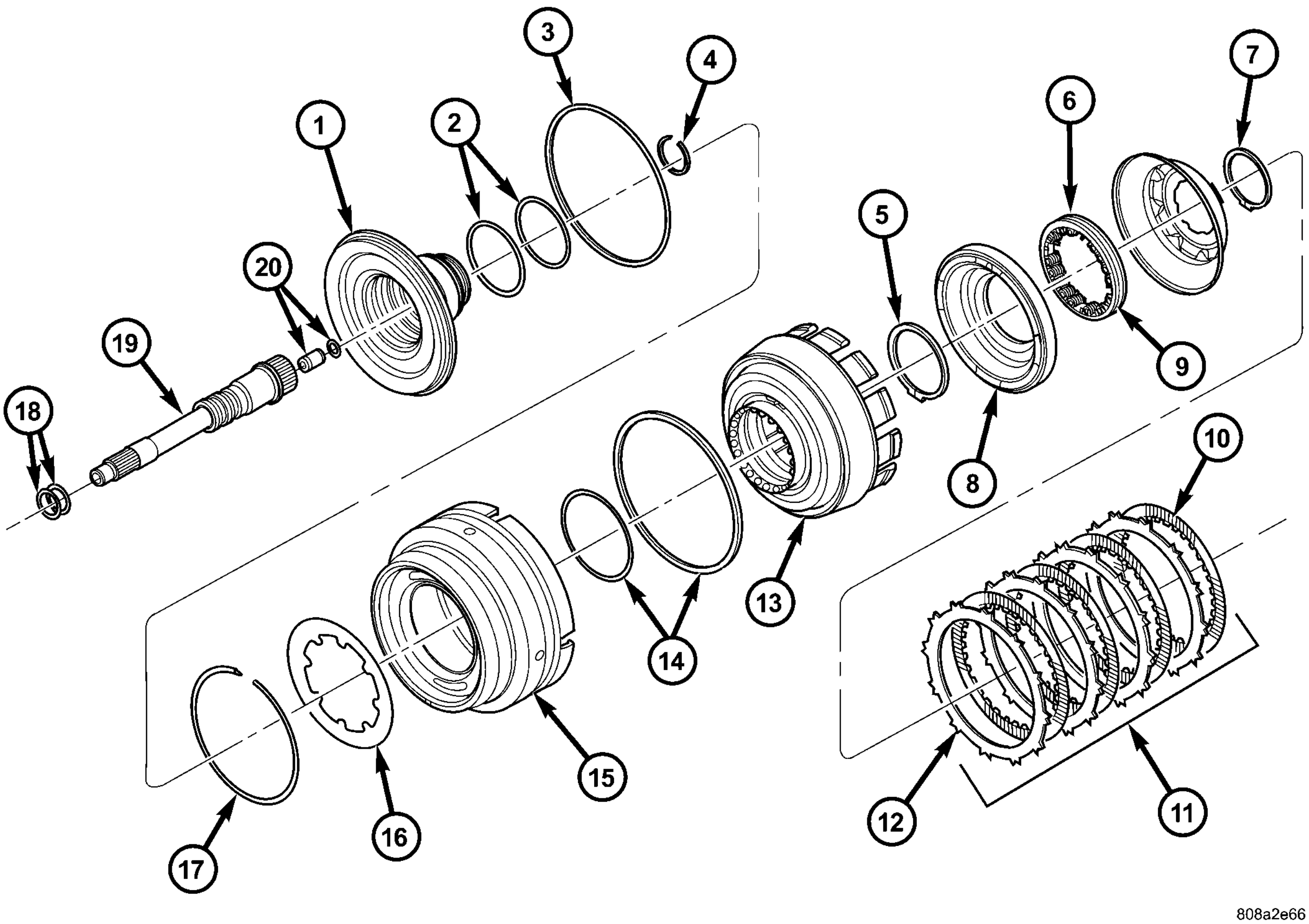


Fig. 81 Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

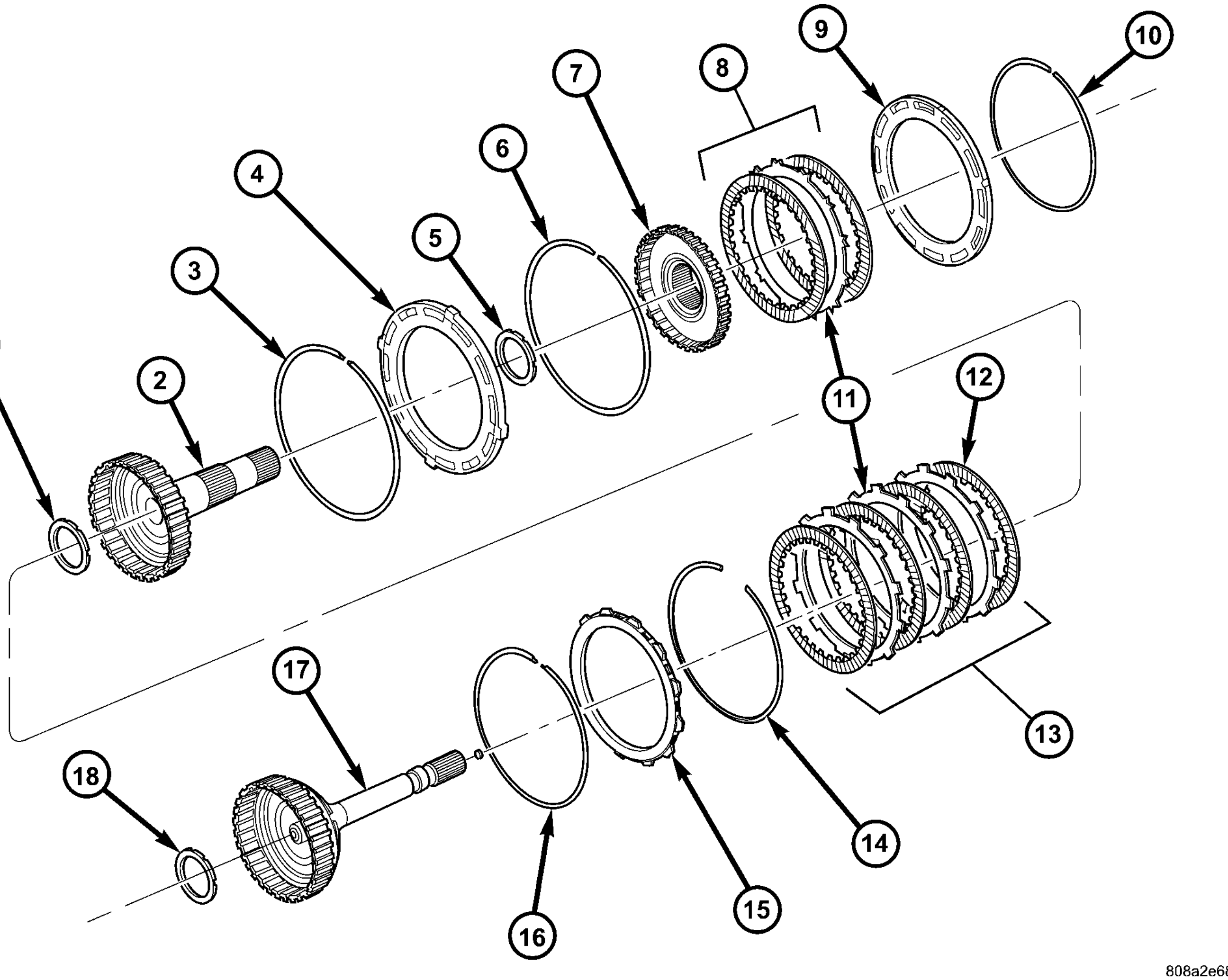


Fig. 82 Input Clutch Assembly - Part 2

1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and fourth gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the reverse carrier/input annulus assembly.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the reaction annulus gear is driven.

DISASSEMBLY

(1) Remove the reverse reaction plate selective snap-ring from the input clutch retainer (Fig. 83).

(2) Remove the reverse reaction plate from the input clutch retainer.

(3) Remove the reverse hub and reverse clutch pack from the input clutch retainer.

(4) Remove the number 4 bearing from the overdrive hub.

(5) Remove the overdrive hub from the input clutch retainer (Fig. 83).

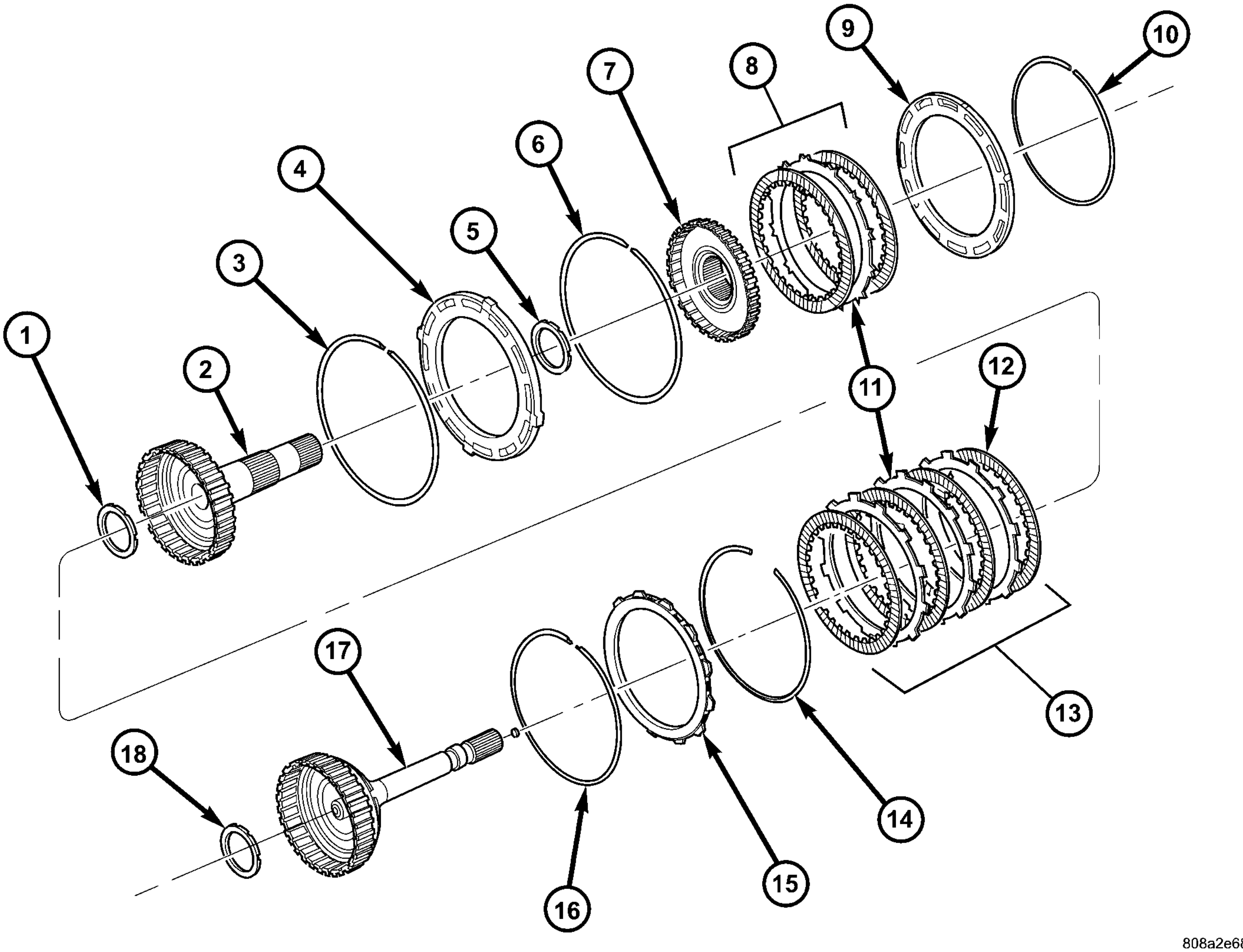


Fig. 83 Input Clutch Assembly - Part 2

1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

(6) Remove the number 3 bearing from the underdrive hub.

(7) Remove the OD/reverse reaction plate snap-ring from the input clutch retainer.

(8) Remove the underdrive hub, overdrive clutch, and overdrive reaction plate from the input clutch retainer (Fig. 83).

NOTE: The overdrive friction discs and steel discs are thicker than the matching components in the underdrive and reverse clutches.

(9) Remove the number 2 bearing from the input clutch hub.

(10) Remove the overdrive clutch wave snap-ring from the input clutch retainer.

(11) Remove the UD/OD reaction plate tapered snap-ring from the input clutch retainer.

(12) Remove the UD/OD reaction plate from the input clutch retainer.

(13) Remove the UD/OD reaction plate flat snap-ring from the input clutch retainer (Fig. 83).

(14) Remove the underdrive clutch pack from the input clutch retainer (Fig. 85).

(15) Using Spring Compressor 8251, compress the UD/OD balance piston and remove the snap-ring from the input clutch hub (Fig. 84).

(16) Remove the UD/OD balance piston and piston return spring from the input clutch retainer (Fig. 85).

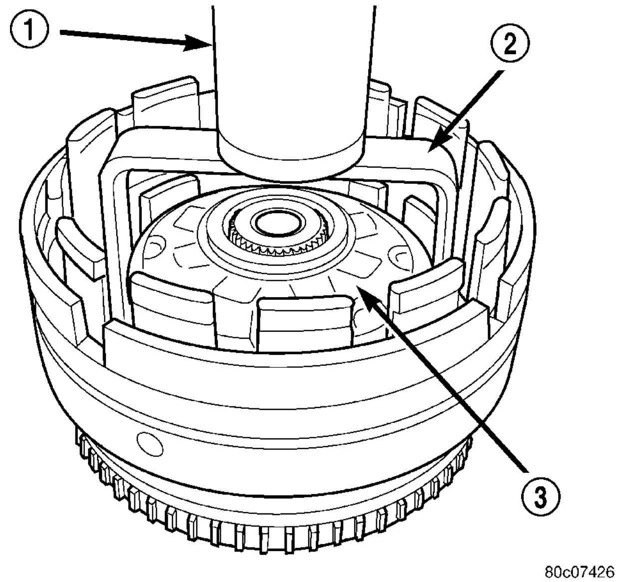


Fig. 84 Compressing UD/OD Balance Piston Using Tool 8251

1 - PRESS
2 - TOOL 8251
3 - BALANCE PISTON

INPUT CLUTCH ASSEMBLY (Continued)

(17) Remove the underdrive piston from the input clutch retainer (Fig. 85).

NOTE: Both the UD/OD balance piston and the underdrive piston have seals molded onto them. If the seal is damaged, do not attempt to install a new seal onto the piston. The piston/seal must be replaced as an assembly.

(18) Remove the input clutch retainer tapered snap-ring.

(19) Separate input clutch retainer from input clutch hub.

(20) Separate OD/reverse piston from input clutch hub retainer (Fig. 85).

(21) Remove all seals and o-rings from the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to make note of which o-ring belongs in which location.

ASSEMBLY

(1) Install all new seals and o-rings onto the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to install the correct o-ring in the correct location.

(2) Check the transmission lubrication check valve located in the input shaft using shop air. The valve should only allow air flow in one direction. If the valve allows no air flow, or air flow in both directions, the valve will need to be replaced.

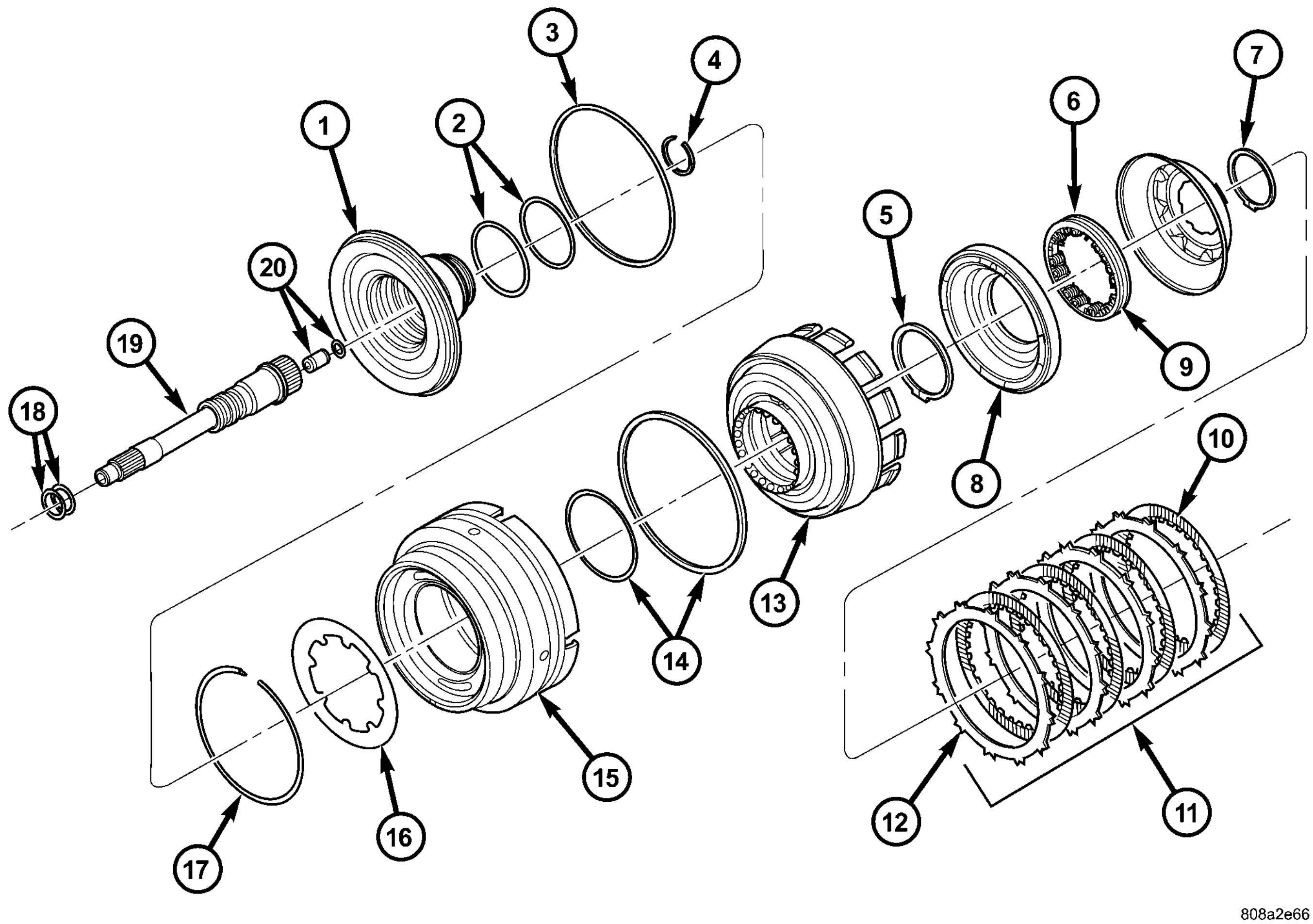


Fig. 85 Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

(3) Lubricate all seals with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.

(4) Assemble the OD/reverse piston onto the input clutch hub (Fig. 86).

(5) Assemble the input clutch retainer onto the input clutch hub.

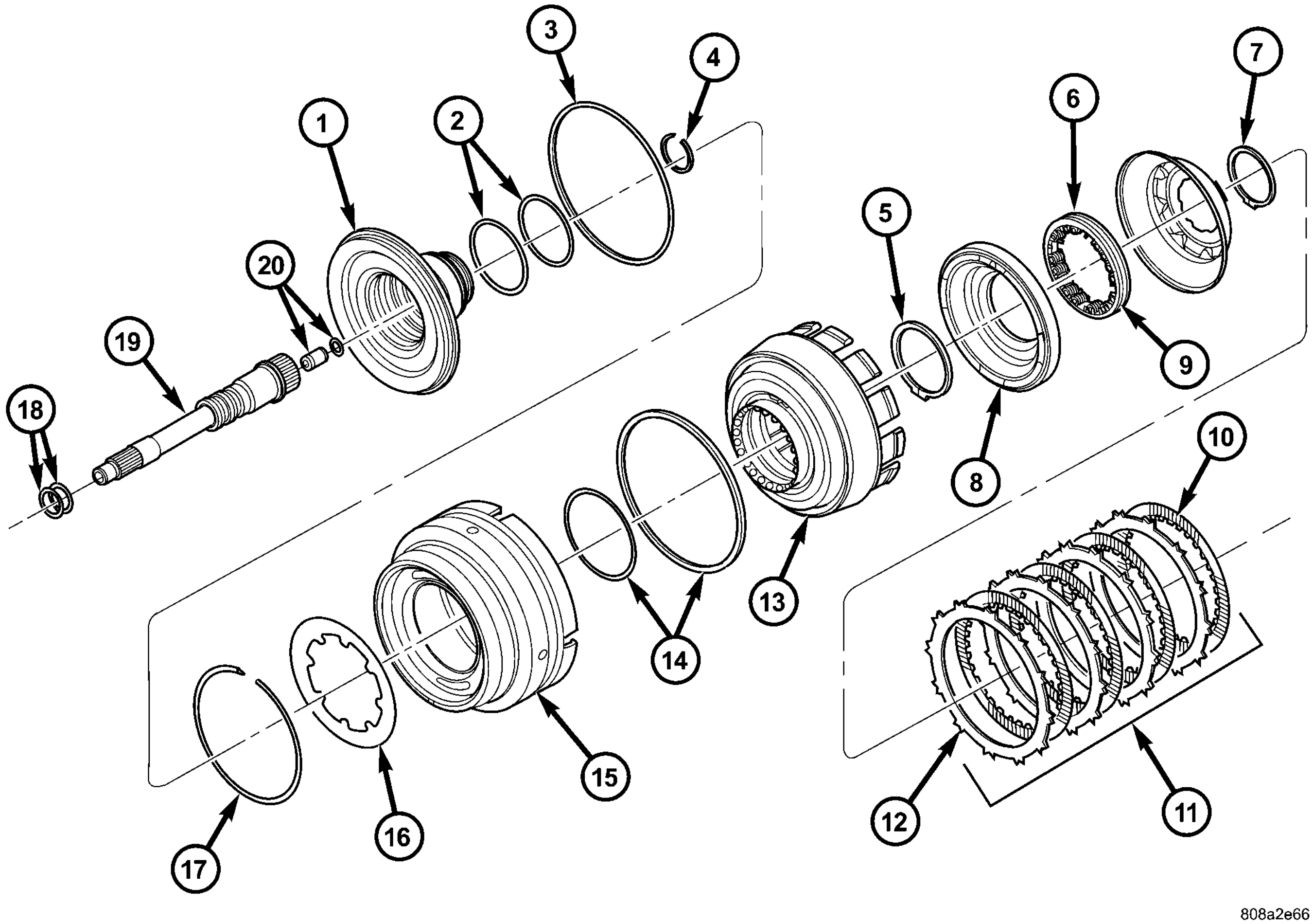


Fig. 86 Input Clutch Assembly - Part I

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

(6) Install the input clutch retainer tapered snap-ring with tapered side up onto the input clutch hub.

(7) Install Piston Guides 8504 into the input clutch retainer (Fig. 87) and onto the input clutch hub to guide the inner and outer underdrive piston seals into position.

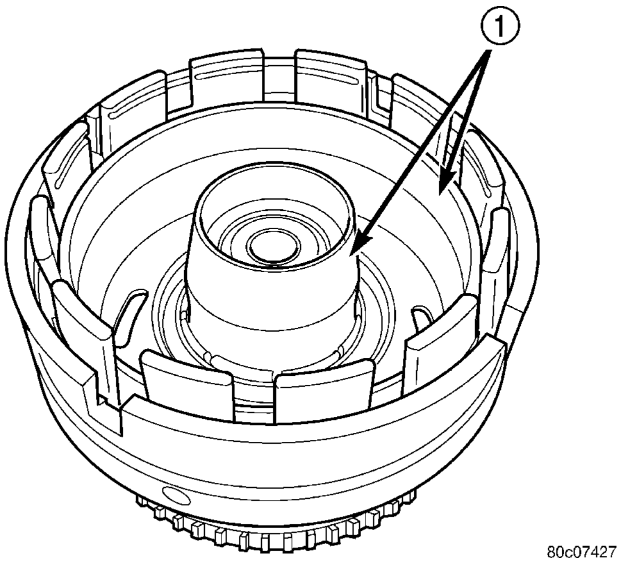


Fig. 87 Install Underdrive Piston Using Tool 8504

1 - TOOL 8504

(8) Install the underdrive piston into the input clutch retainer and over the input clutch hub (Fig. 86).

(9) Install the UD/OD balance piston return spring pack into the input clutch retainer.

(10) Install Piston Guide 8252 into the input clutch retainer (Fig. 88) to guide the UD/OD balance piston seal into position inside the underdrive piston.

(11) Install the UD/OD balance piston into the input clutch retainer and the underdrive piston.

(12) Using Spring Compressor 8251, compress the UD/OD return spring pack and secure the piston in place with the snap-ring (Fig. 89).

(13) Install the underdrive clutch pack into the input clutch retainer (Fig. 86).

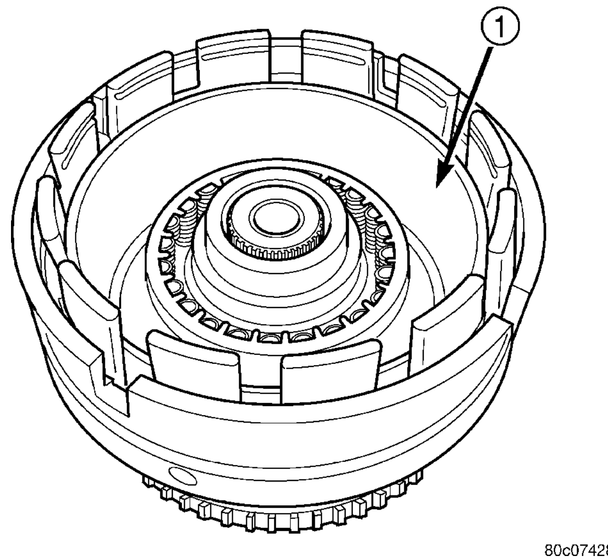


Fig. 88 Install Balance Piston Using Tool 8252

1 - TOOL 8252

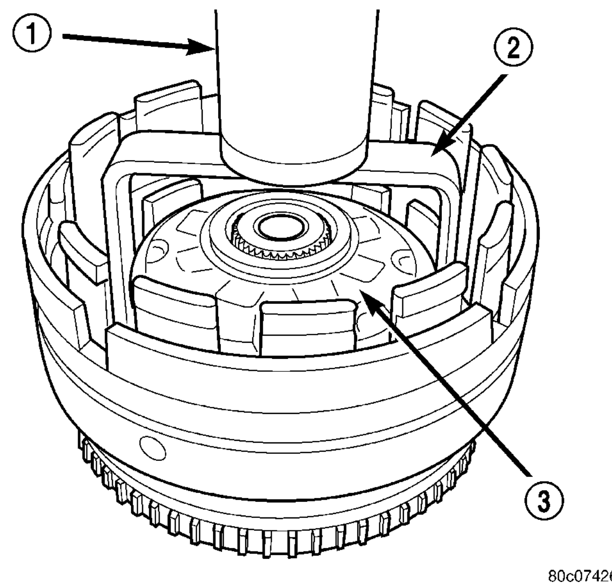


Fig. 89 Compressing UD/OD Balance Piston Using Tool 8251

1 - PRESS
2 - TOOL 8251
3 - BALANCE PISTON

INPUT CLUTCH ASSEMBLY (Continued)

(14) Install the UD/OD reaction plate lower flat snap-ring (Fig. 90). The correct snap-ring can be identified by the two tabbed ears.

(15) Install the UD/OD reaction plate into the input clutch retainer. The reaction plate is to be installed with the big step down.

(16) Install the UD/OD reaction plate upper tapered snap-ring with tapered side up.

(17) Install the input clutch assembly into Input Clutch Pressure Fixture 8260 (Fig. 91). Mount a dial indicator to the assembly, push down on the clutch discs and zero the indicator against the underdrive clutch discs (Fig. 92). Apply 20 psi of air pressure to the underdrive clutch and record the dial indicator reading. Measure and record UD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with UD clutch pack clearance specification. The correct clutch clearance is 0.84-1.54 mm (0.033-0.061 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.

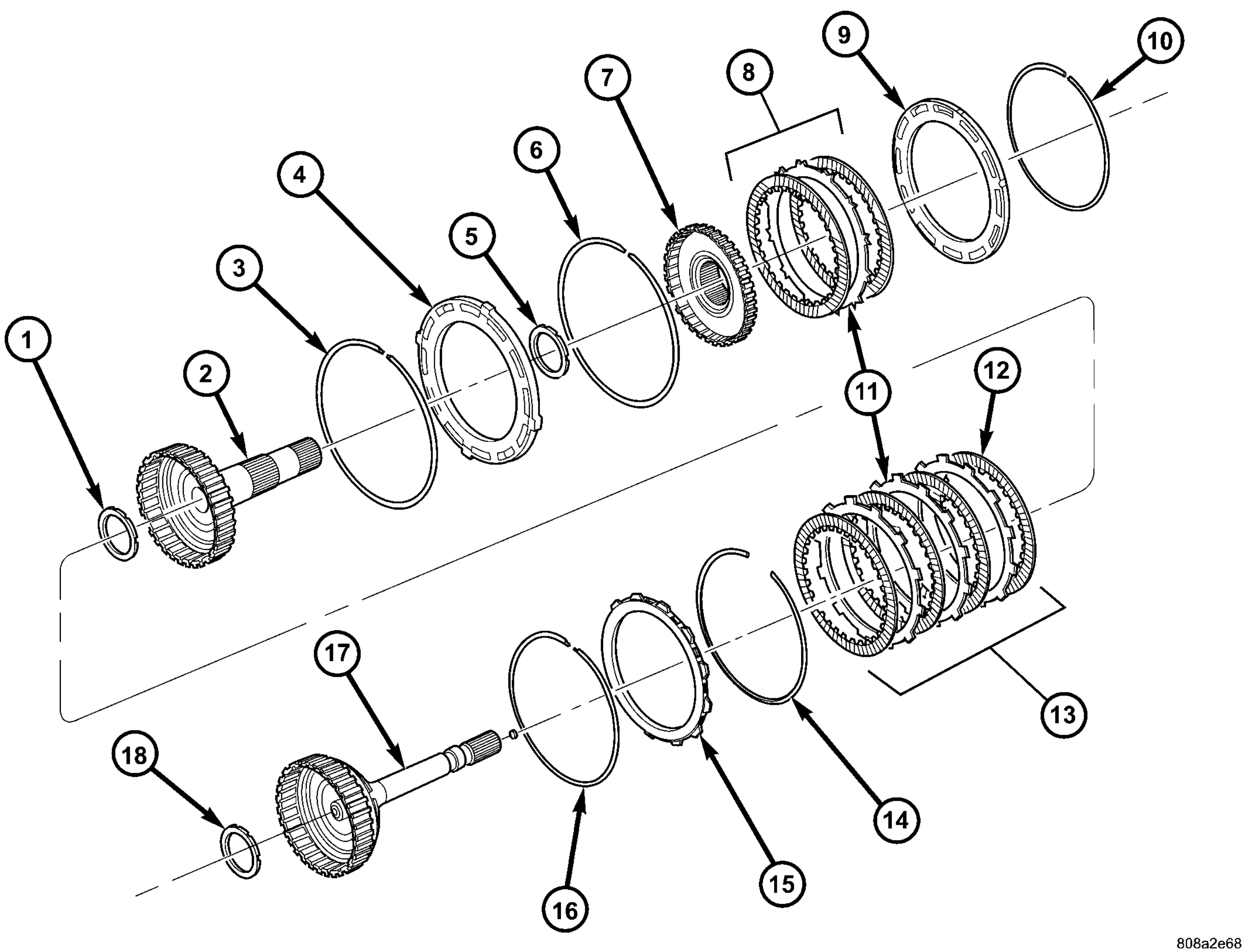


Fig. 90 Input Clutch Assembly - Part II

1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

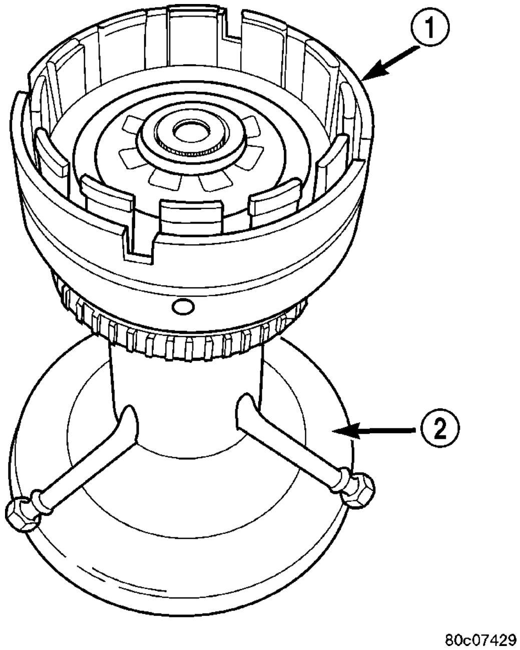


Fig. 91 Input Clutch Assembly Mounted on Tool 8260

1 - INPUT CLUTCH ASSEMBLY
2 - TOOL 8260

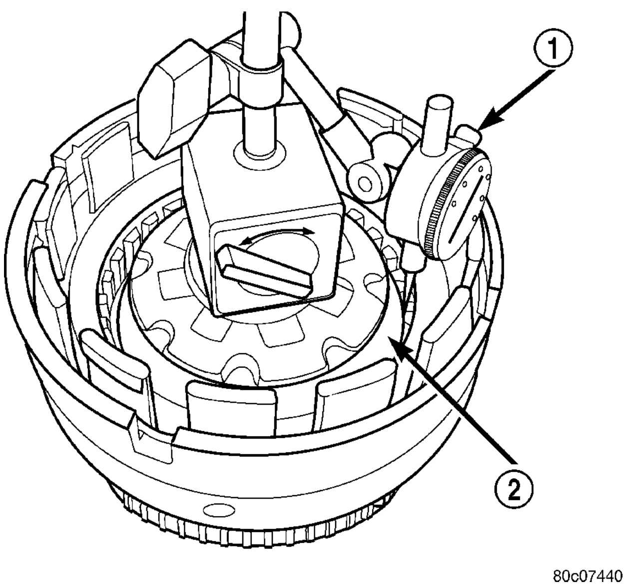


Fig. 92 Measuring UD Clutch Clearance

1 - TOOL C-3339
2 - UNDERDRIVE CLUTCH PACK

(18) Install the overdrive clutch pack into the input clutch retainer (Fig. 90). The overdrive steel separator plates can be identified by the lack of the half-moon cuts in the locating tabs.

(19) Install the overdrive clutch wavy snap-ring with the two tabbed ears into the input clutch retainer.

(20) Install the OD/reverse reaction plate into the input clutch retainer. The reaction plate is non-directional (Fig. 90).

(21) Install the OD/reverse reaction plate flat snap-ring into the input clutch retainer.

(22) Mount a dial indicator to the assembly and zero the indicator against the OD/reverse reaction plate (Fig. 93). Apply 20 psi of air pressure to the overdrive clutch and record the dial indicator reading. Measure and record OD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with OD clutch pack clearance specification.Verify that the clutch clearance is 1.103-1.856 mm (0.043-0.073 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.

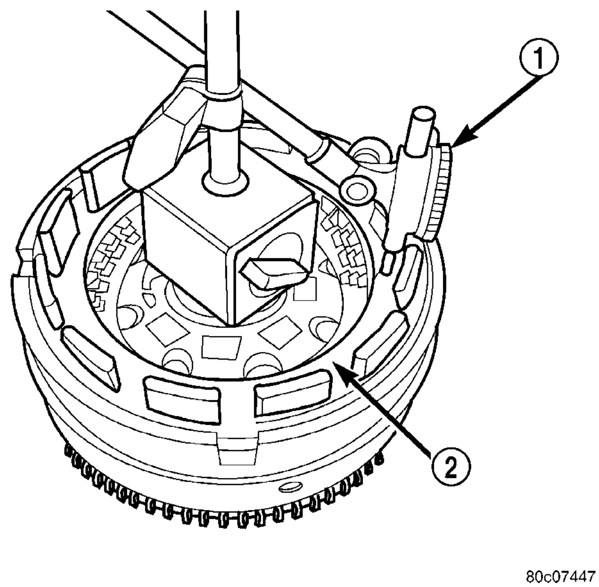


Fig. 93 Measuring OD Clutch Clearance

1 - TOOL C-3339
2 - OD/REV REACTION PLATE

(23) Install the reverse clutch pack into the input clutch retainer (Fig. 90).

(24) Install the reverse reaction plate into the input clutch retainer.

(25) Install the reverse reaction plate selective snap-ring into the input clutch retainer.

(26) Mount a dial indicator to the assembly, push down on the clutch discs, pull up on the reaction plate to ensure the plate is properly seated and zero the indicator against the reverse clutch discs (Fig. 94). Apply 20 psi of air pressure to the reverse clutch and record the dial indicator reading. Measure and record Reverse clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with Reverse clutch pack clearance specification. The correct clutch clearance is 0.58-1.47

INPUT CLUTCH ASSEMBLY (Continued)

mm (0.023-0.058 in.). Adjust as necessary. Install the chosen snap-ring and re-measure to verify selection.

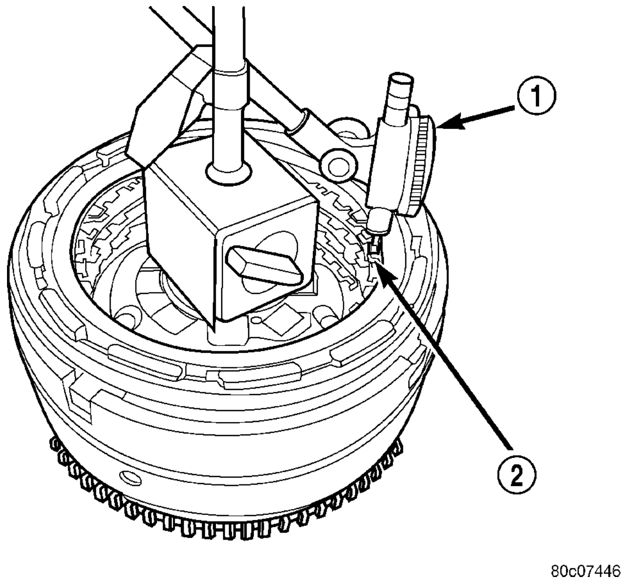


Fig. 94 Measuring Reverse Clutch Clearance

1 - TOOL C-3339
2 - REVERSE CLUTCH PACK

(27) Remove the reverse clutch pack from the input clutch retainer.

(28) Install the number 2 bearing onto the underdrive hub with outer race against the hub with petroleum jelly.

(29) Install the underdrive hub into the input clutch retainer.

(30) Install the number 3 bearing into the overdrive hub with the outer race against the hub with petroleum jelly.

(31) Install the overdrive hub into the input clutch retainer.

(32) Install the number 4 bearing into the reverse hub with outer race against the hub with petroleum jelly.

(33) Install the reverse hub into the input clutch retainer.

(34) Install the complete reverse clutch pack.

(35) Install the reverse reaction plate and snap-ring.

(36) Push up on reaction plate to allow reverse clutch to move freely.

INPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the input speed sensor (Fig. 95).

(4) Remove the bolt holding the input speed sensor to the transmission case.

(5) Remove the input speed sensor from the transmission case.

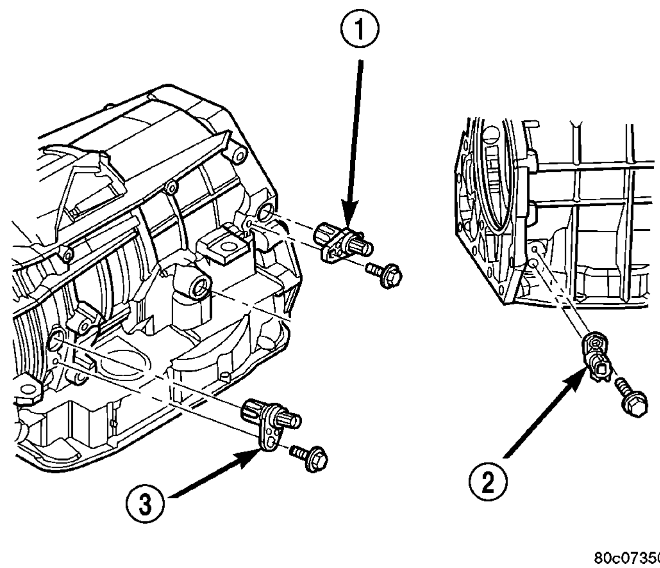


Fig. 95 Input Speed Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

INPUT SPEED SENSOR (Continued)

INSTALLATION

(1) Install the input speed sensor into the transmission case.

(2) Install the bolt to hold the input speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

(3) Install the wiring connector onto the input speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

LINE PRESSURE (LP) SENSOR

DESCRIPTION

The TCM utilizes a closed-loop system to control transmission line pressure. The system contains a variable force style solenoid, the Pressure Control Solenoid, mounted on the side of the solenoid and pressure switch assembly. The solenoid is duty cycle controlled by the TCM to vent the unnecessary line pressure supplied by the oil pump back to the sump. The system also contains a variable pressure style sensor, the Line Pressure Sensor, which is a direct input to the TCM. The line pressure solenoid monitors the transmission line pressure and completes the feedback loop to the TCM. The TCM uses this information to adjust its control of the pressure control solenoid to achieve the desired line pressure.

OPERATION

The TCM calculates the desired line pressure based upon inputs from the transmission and engine. The TCM calculates the torque input to the transmission and uses that information as the primary input to the calculation. The line pressure is set to a predetermined value during shifts and when the transmission is in the PARK and NEUTRAL positions. This is done to ensure consistent shift quality. During all other operation, the actual line pressure is compared to the desired line pressure and adjustments are made to the pressure control solenoid duty cycle.

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the line pressure sensor (Fig. 96).

(4) Remove the bolt holding the line pressure sensor to the transmission case.

(5) Remove the line pressure sensor from the transmission case.

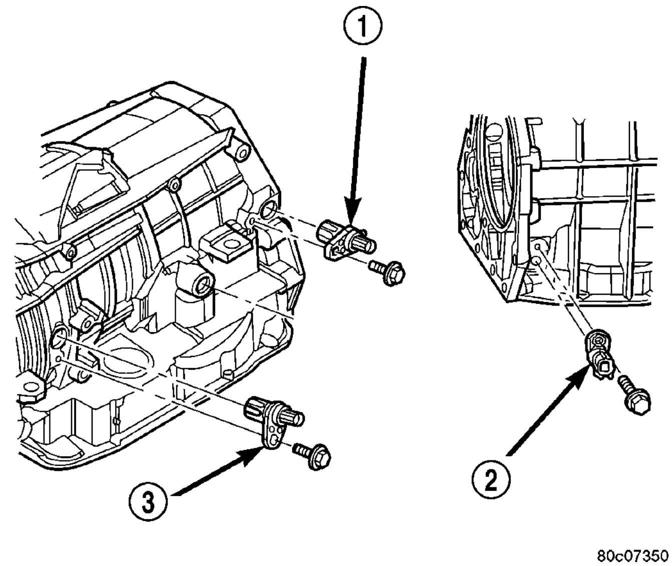


Fig. 96 Line Pressure Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

INSTALLATION

(1) Install the line pressure sensor into the transmission case.

(2) Install the bolt to hold the line pressure sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

(3) Install the wiring connector onto the line pressure sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

LOW/REVERSE CLUTCH

DISASSEMBLY

(1) Remove the inner overrunning clutch snap-ring from the low/reverse clutch retainer (Fig. 97).

(2) Remove the outer low/reverse reaction plate flat snap-ring (Fig. 97).

(3) Remove the low/reverse clutch and the overrunning clutch from the low/reverse clutch retainer as an assembly (Fig. 97).

(4) Separate the low/reverse clutch from the overrunning clutch.

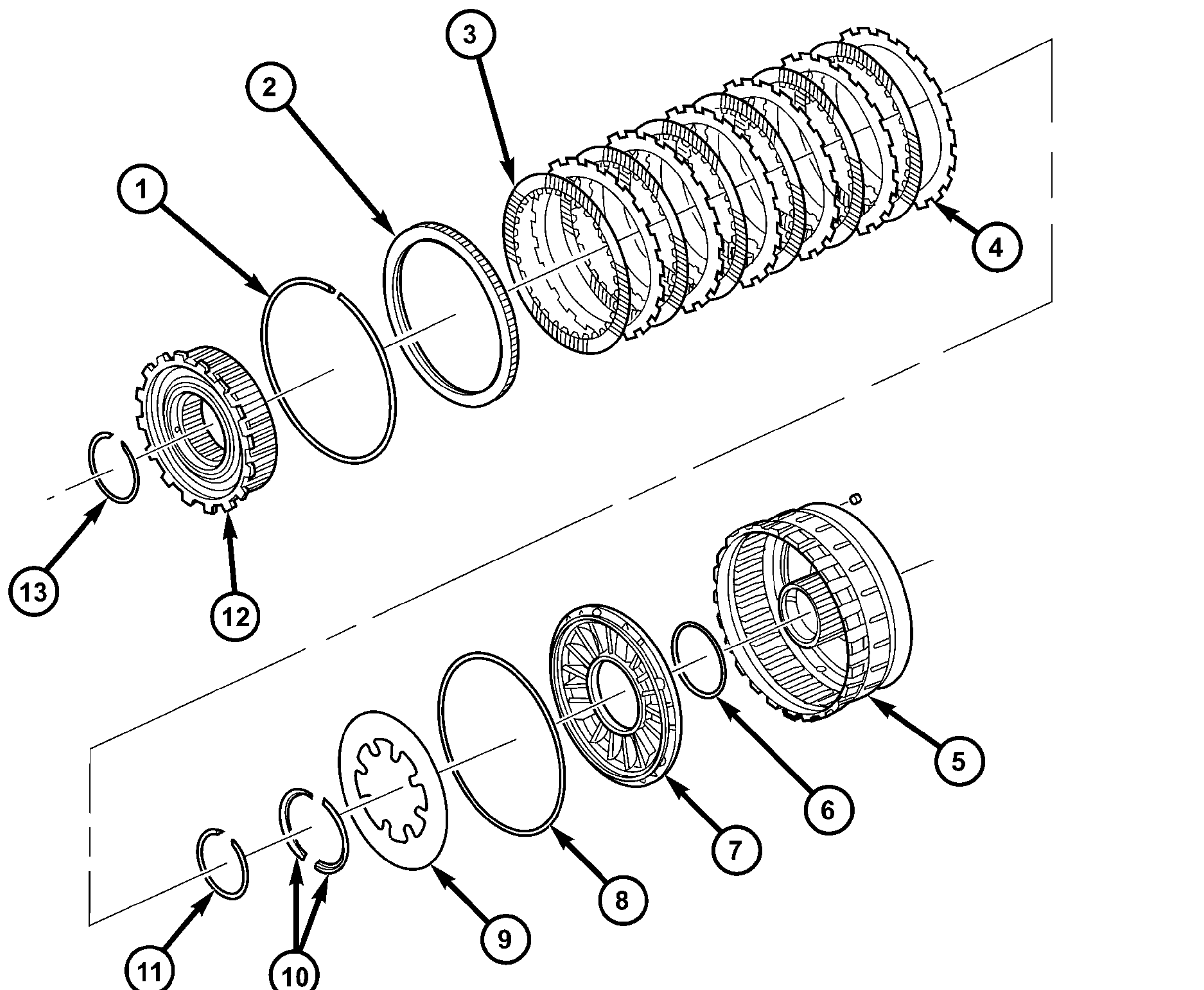


Fig. 97 Low/Reverse Clutch Assembly

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

LOW/REVERSE CLUTCH (Continued)

(5) Remove the overrunning clutch snap-ring (Fig. 98).

(6) Remove the spacer from the overrunning clutch (Fig. 98).

(7) Separate the inner and outer races of the overrunning clutch (Fig. 98).

(8) Remove the overrunning clutch lower snap-ring (Fig. 98).

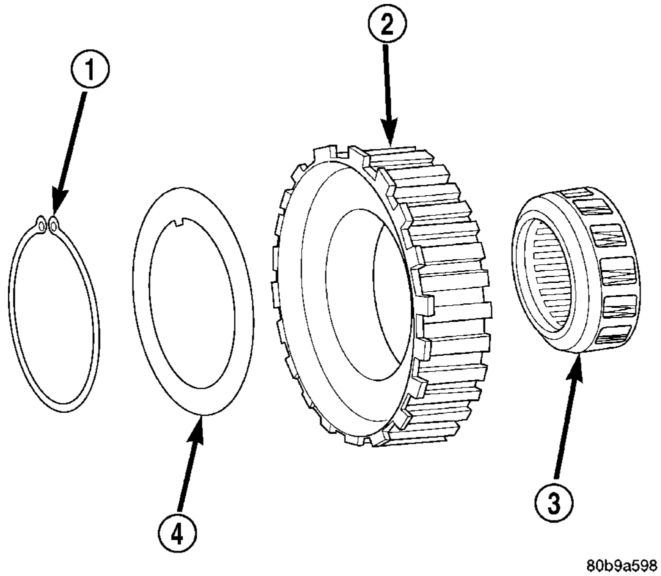


Fig. 98 Overrunning Clutch

1 - SNAP-RING
2 - OUTER RACE
3 - OVERRUNNING CLUTCH
4 - SPACER

(9) Using Spring Compressor 8285 and a suitable shop press (Fig. 99), compress the low/reverse piston Belleville spring and remove the split retaining ring holding the Belleville spring into the low/reverse clutch retainer.

(10) Remove the low/reverse clutch Belleville spring and piston from the low/reverse clutch retainer. Use 20 psi of air pressure to remove the piston if necessary.

CLEANING

Clean the overrunning clutch assembly, clutch cam, and low-reverse clutch retainer. Dry them with compressed air after cleaning.

INSPECTION

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse clutch retainer if the clutch race, roller surface or inside diameter is scored, worn or damaged.

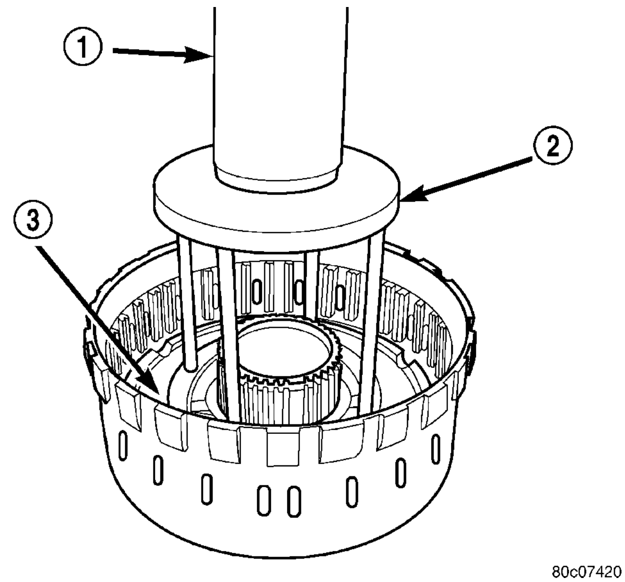


Fig. 99 Compress Low/Reverse Belleville Spring Using Tool 8285

1 - PRESS
2 - TOOL 8285
3 - BELLEVILLE SPRING

ASSEMBLY

(1) Check the bleed orifice to ensure that it is not plugged or restricted.

(2) Install a new seal on the low/reverse piston. Lubricate the seal with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.

(3) Install the low/reverse piston into the low/reverse clutch retainer.

(4) Position the low/reverse piston Belleville spring on the low/reverse piston.

(5) Using Spring Compressor 8285 and a suitable shop press (Fig. 99), compress the low/reverse piston Belleville spring and install the split retaining ring to hold the Belleville spring into the low/reverse clutch retainer.

(6) Install the lower overrunning clutch snap-ring (Fig. 98).

(7) Assemble the inner and outer races of the overrunning clutch (Fig. 98).

(8) Position the overrunning clutch spacer on the overrunning clutch.

(9) Install the upper overrunning clutch snap-ring (Fig. 98).

(10) Assemble and install the low/reverse clutch pack into the low/reverse clutch retainer (Fig. 97).

(11) Install the low/reverse reaction plate into the low/reverse clutch retainer (Fig. 97). The reaction plate is directional and must be installed with the flat side down.

(12) Install the low/reverse clutch pack snap-ring (Fig. 97). The snap-ring is selectable and should be chosen to give the correct clutch pack clearance.

LOW/REVERSE CLUTCH (Continued)

(13) Measure the low/reverse clutch pack clearance and adjust as necessary. The correct clutch clearance is 1.00-1.74 mm (0.039-0.075 in.).

(14) Install the overrunning clutch into the low/reverse clutch retainer making sure that the index splines are aligned with the retainer.

(15) Install the overrunning clutch inner snap-ring.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 100) is located at the front of the transmission inside the bell housing and behind the transmission front cover. The oil pump consists of two independent pumps (Fig. 101), a number of valves (Fig. 102), a front seal (Fig. 103), and a bolt on reaction shaft. The converter clutch switch and regulator valves, pressure regulator valve, and converter pressure limit valve are all located in the oil pump valve body.

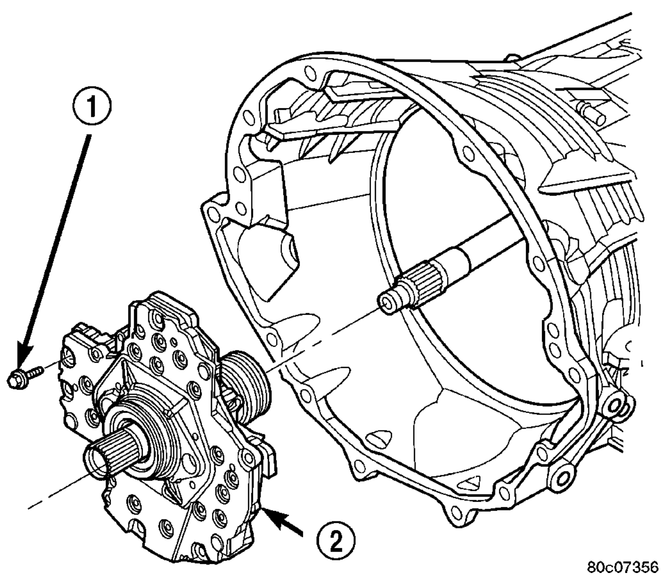


Fig. 100 Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

OPERATION

As the torque converter rotates, the converter hub rotates the oil pump drive gear. As the drive gear rotates both driven gears, a vacuum is created when the gear teeth come out of mesh. This suction draws fluid through the pump inlet from the oil pan. As the gear teeth come back into mesh, pressurized fluid is forced into the pump outlet and to the oil pump valves.

At low speeds, both sides of the pump supply fluid to the transmission. As the speed of the torque converter increases, the flow from both sides increases until the flow from the primary side alone is sufficient to meet system demands. At this point, the check valve located between the two pumps closes. The secondary side is shut down and the primary side supplies all the fluid to the transmission.

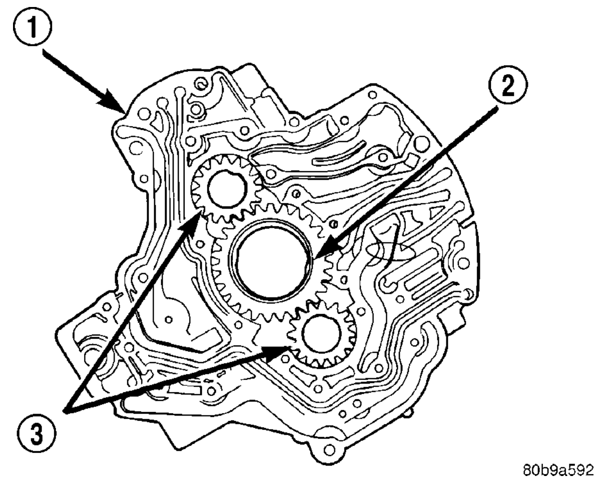


Fig. 101 Oil Pump Gears

1 - PUMP HOUSING
2 - DRIVE GEAR
3 - DRIVEN GEARS

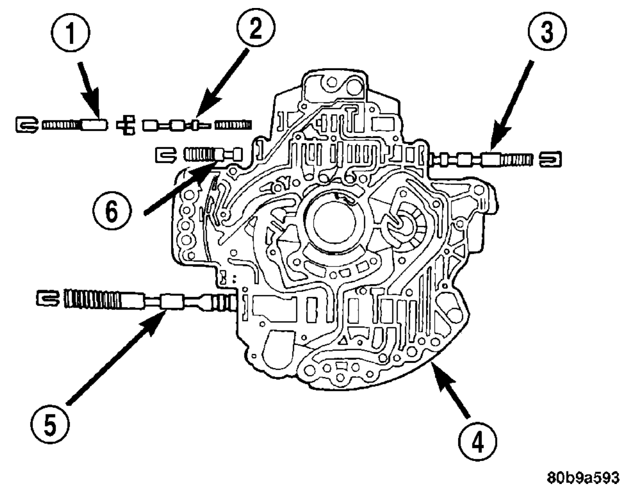


Fig. 102 Oil Pump Valves

1 - TORQUE CONVERTER CLUTCH ACCUMULATOR VALVE
2 - TORQUE CONVERTER CLUTCH CONTROL VALVE
3 - TORQUE CONVERTER CLUTCH SWITCH VALVE
4 - PUMP VALVE BODY
5 - PRESSURE REGULATOR VALVE
6 - TORQUE CONVERTER CLUTCH LIMIT VALVE

CONVERTER CLUTCH SWITCH VALVE

The converter clutch switch valve is used to control the hydraulic pressure supplied to the front (OFF) side of the torque converter clutch.

OIL PUMP (Continued)

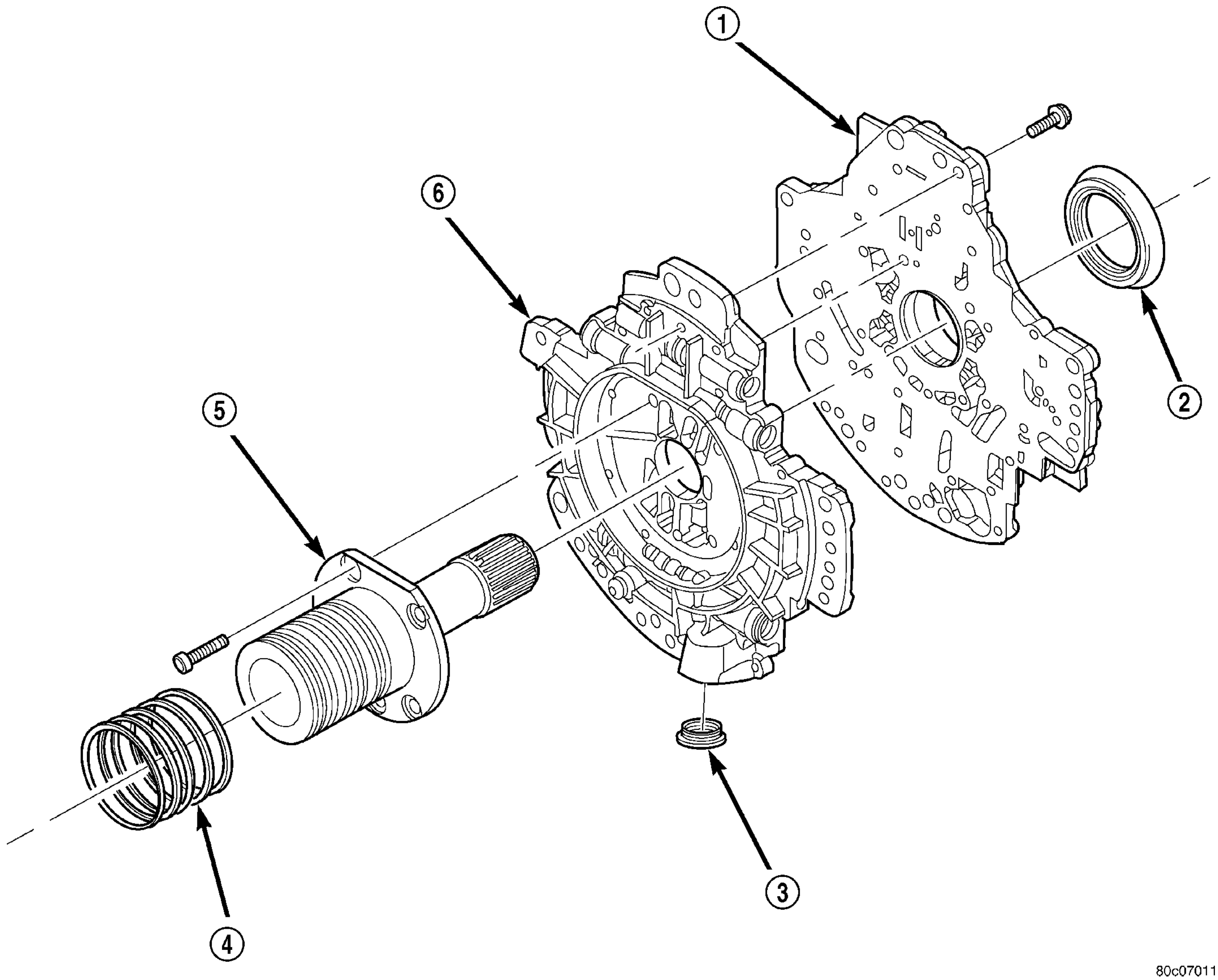


Fig. 103 Oil Pump Reaction Shaft

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

CONVERTER CLUTCH REGULATOR VALVE

The converter clutch regulator valve is used to control the hydraulic pressure supplied to the back (ON) side of the torque converter clutch.

TORQUE CONVERTER LIMIT VALVE

The torque converter limit valve serves to limit the available line pressure to the torque converter clutch.

STANDARD PROCEDURE - OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF +4, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at 1800 rpm**, with the shift selector in neutral. Verify that the transmission fluid temperature is below 104.5° C (220° F) for this test.

OIL PUMP (Continued)

(3) If one quart of transmission fluid is collected in the container in 30 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 30 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

DISASSEMBLY

(1) Remove the bolts holding the reaction shaft support to the oil pump (Fig. 104).

(2) Remove the reaction shaft support from the oil pump (Fig. 104).

(3) Remove all bolts holding the oil pump halves together (Fig. 104).

(4) Using suitable prying tools, separate the oil pump sections by inserting the tools in the supplied areas and prying the halves apart.

NOTE: The oil pump halves are aligned to each other through the use of two dowels. Be sure to pry upward evenly to prevent damage to the oil pump components.

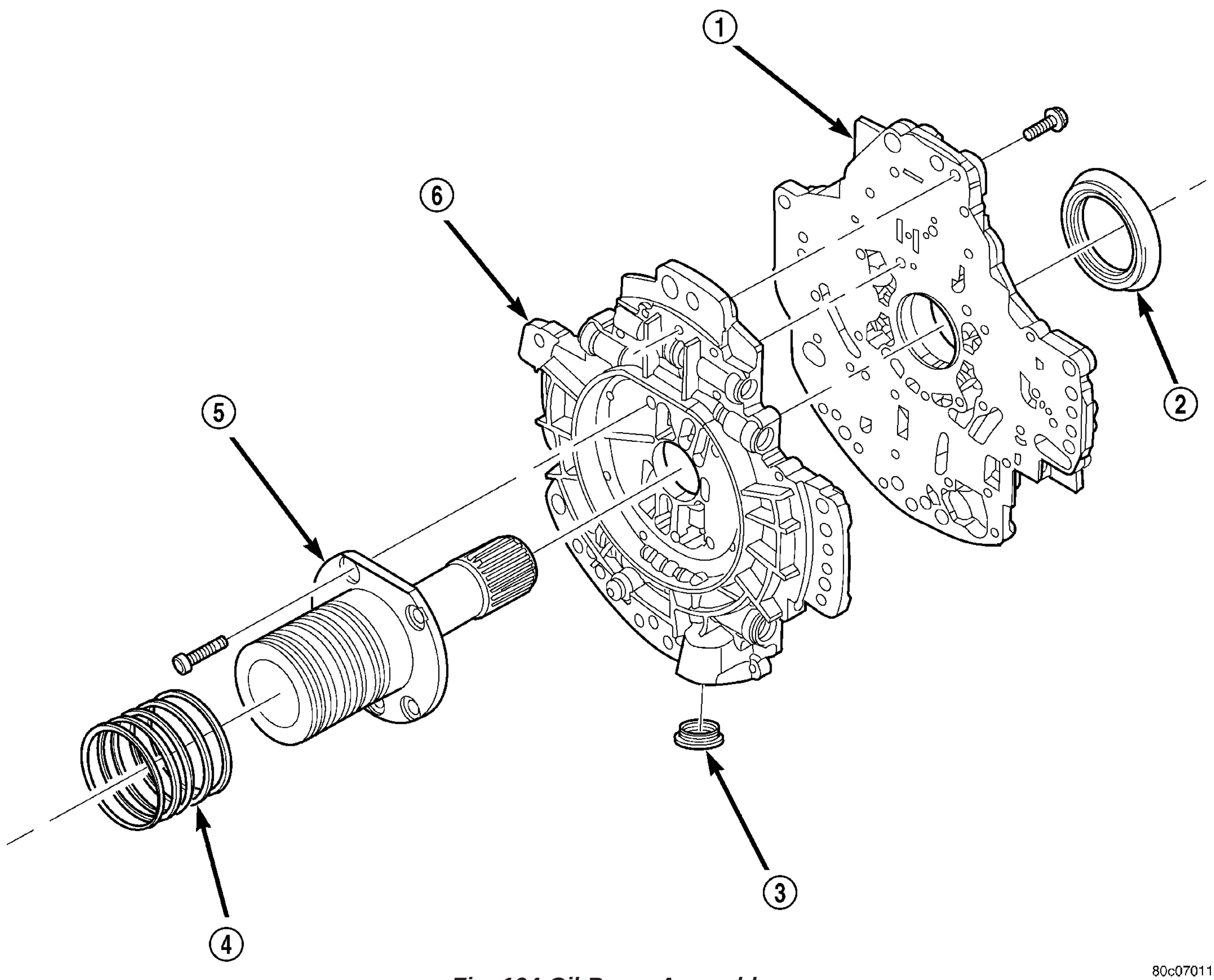


Fig. 104 Oil Pump Assembly

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

OIL PUMP (Continued)

(5) Remove the screws holding the separator plate onto the oil pump body (Fig. 105).

(6) Remove the separator plate from the oil pump body (Fig. 105).

(7) Mark all gears for location. The gears are select fit and if the oil pump is to be reused, the gears must be returned to their original locations.

(8) Remove the oil pump gears from the oil pump case (Fig. 105).

(9) Remove the oil pump valve retainers and associated valve and spring one at a time (Fig. 106) (Fig. 107). Mark the combination of components as a group and tag them as to the location from which they were removed.

CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

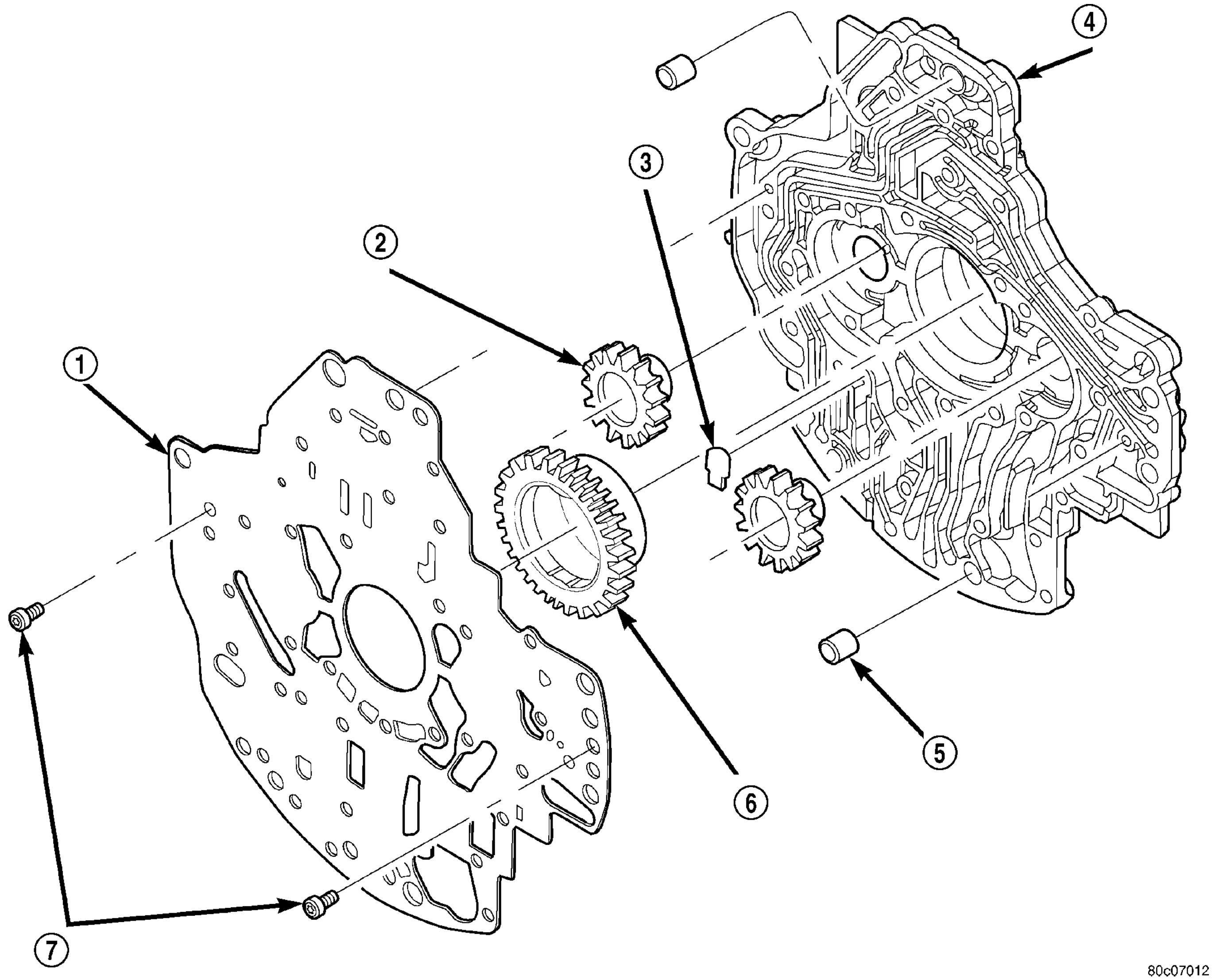


Fig. 105 Oil Pump Housing and Gears

1 - SEPARATOR PLATE
2 - DRIVEN GEAR (2)
3 - CHECK VALVE
4 - PUMP HOUSING
5 - DOWEL (2)
6 - DRIVE GEAR
7 - SCREW

OIL PUMP (Continued)

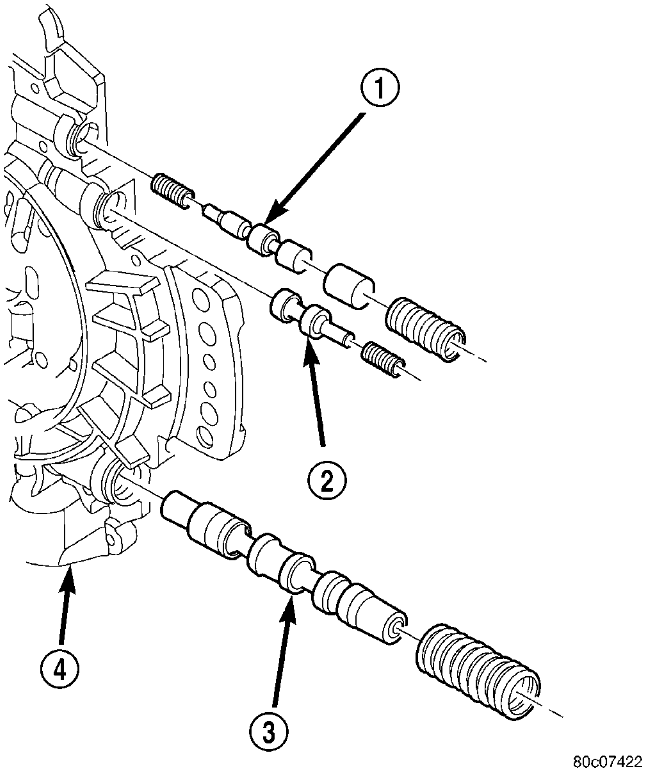


Fig. 106 Oil Pump Valve Body

1 - T/C REGULATOR VALVE
2 - T/C LIMIT VALVE
3 - REGULATOR VALVE
4 - OIL PUMP VALVE BODY

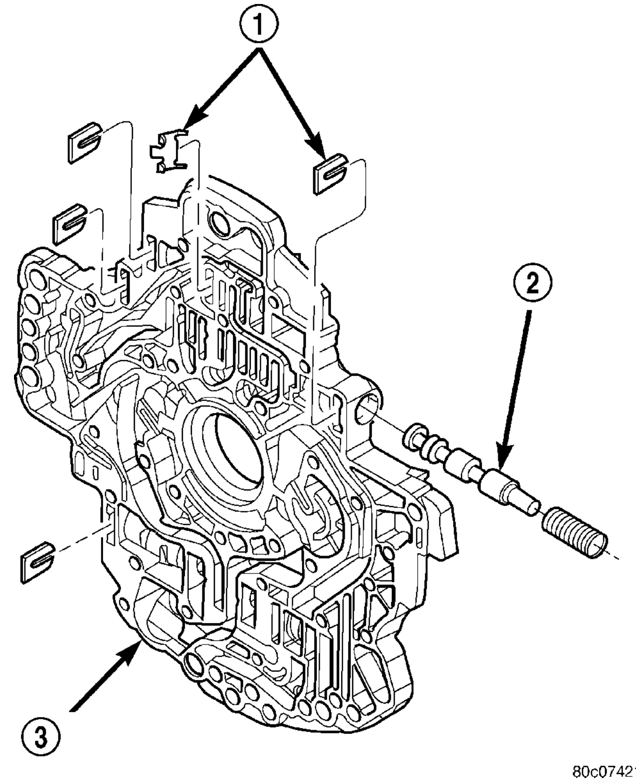


Fig. 107 T/C Switch Valve

1 - RETAINER
2 - T/C SWITCH VALVE
3 - OIL PUMP VALVE BODY

Inspect the pump reaction shaft support bushings. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the oil pump cover. Use a penlight to view the bore interiors. Replace the oil pump if any bores are distorted or scored. Inspect all of the valve springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

ASSEMBLY

(1) Clean and inspect all components. Make sure that all passages are thoroughly cleaned and are free from dirt or debris. Make sure that all valves move freely in their proper bore. Make sure that all gear pockets and bushings are free from excessive wear and scoring. Replace the oil pump if any excessive wear or scoring is found.

(2) Coat the gears with Mopar® ATF +4 and install into their original locations.

(3) Lubricate the oil pump valves with Mopar® ATF +4 and install the valve, spring and retainer into the appropriate oil pump valve body bore (Fig. 106) (Fig. 107).

(4) Place the separator plate onto the oil pump body (Fig. 105).

(5) Install the screws to hold the separator plate onto the oil pump body (Fig. 105). Tighten the screws to 4.5 N·m (40 in.lbs.).

(6) Position the oil pump cover onto the locating dowels (Fig. 104).

(7) Seat the two oil pump halves together and install all bolts finger tight.

(8) Torque all bolts down slowly starting in the center and working outward. The correct torque is 4.5 N·m (40 in.lbs.).

(9) Verify that the oil pump gears rotate freely and smoothly.

(10) Position the reaction shaft support into the oil pump (Fig. 104).

(11) Install and torque the bolts to hold the reaction shaft support to the oil pump (Fig. 104). The correct torque is 12 N·m (105 in.lbs.).

OIL PUMP FRONT SEAL

REMOVAL

(1) Remove transmission from the vehicle.

(2) Remove the torque converter from the transmission.

(3) Using a screw mounted in a slide hammer, remove the oil pump front seal.

INSTALLATION

(1) Clean seal bore of the oil pump of any residue or particles from the original seal.

(2) Install new oil seal in the oil pump housing using Seal Installer C-3860-A (Fig. 108).

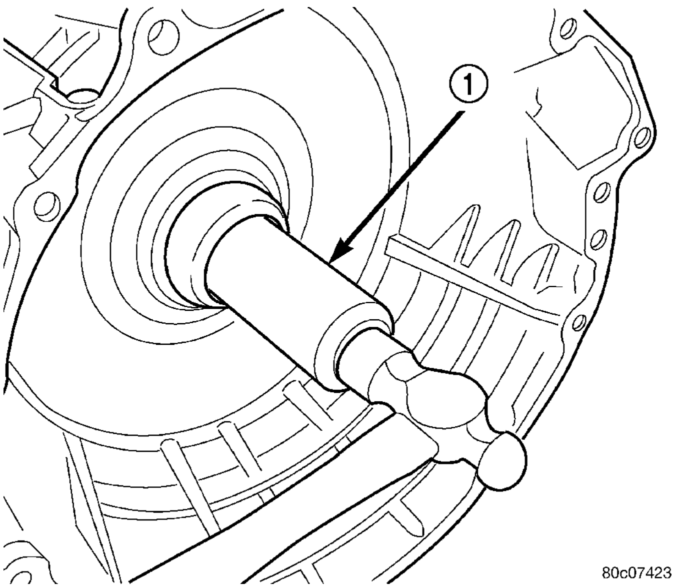


Fig. 108 Install Oil Pump Front Seal

1 - TOOL C-3860-A

OUTPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the output speed sensor (Fig. 109).

(4) Remove the bolt holding the output speed sensor to the transmission case.

(5) Remove the output speed sensor from the transmission case.

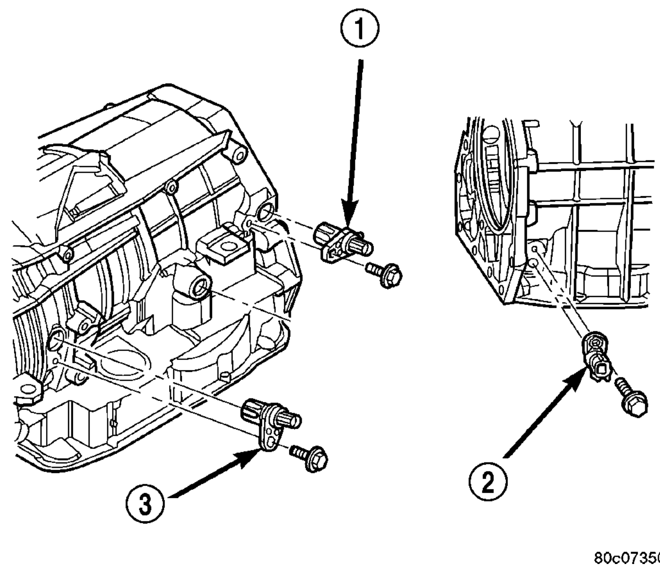


Fig. 109 Output Speed Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

INSTALLATION

(1) Install the output speed sensor into the transmission case.

(2) Install the bolt to hold the output speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

(3) Install the wiring connector onto the output speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

OVERDRIVE SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, fourth gear operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoids and allow upshifts to fourth gear. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

PARK - INTERLOCK CABLE

REMOVAL

(1) Lower the steering column.

(2) With the ignition switch in the “RUN” position depress the park-interlock cable locking tab, located on top of the cable connector (Fig. 110) at the steering column and pull the cable straight out.

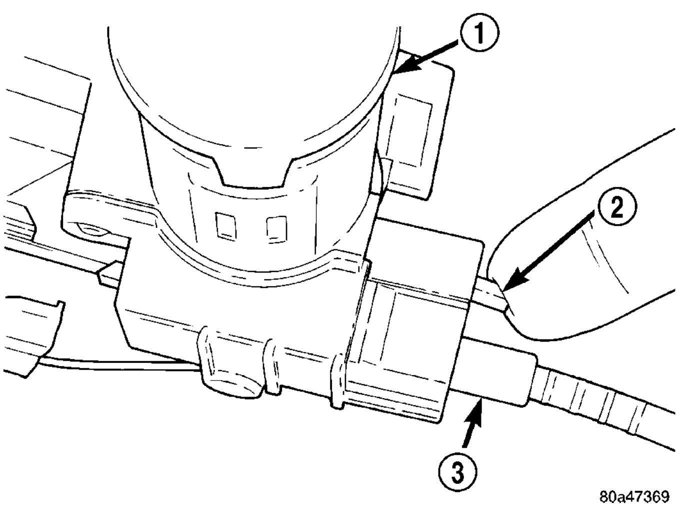


Fig. 110 Park-Interlock Cable

1 - IGNITION LOCK
2 - LOCK TAB
3 - CABLE END

(3) Remove the park-interlock cable from steering column.

(4) Remove the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(5) Disconnect the park-interlock cable from the shift lever assembly and remove the cable from the shifter assembly bracket (Fig. 111).

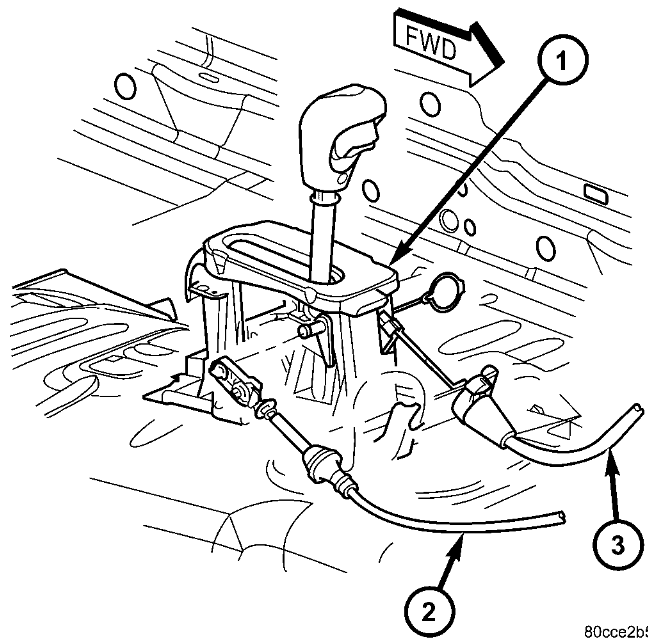


Fig. 111 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(6) Release the park-interlock cable from any remaining clips.

(7) Remove park-interlock cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Park-Interlock Cable.

(1) Push the park-interlock cable straight into the square mounting hole in the steering column until cable snaps in place (Fig. 112).

(2) Snap park-interlock cable tie strap into hole in steering column tube.

(3) Route cable to the shifter mechanism.

(4) Install the cable end fitting into shifter lever (Fig. 113).

(5) Snap cable adjuster ears into floor shifter bracket.

(6) Place the ignition key cylinder in the LOCK position.

(7) Push the cable adjuster lock clamp downward to lock it.

PARK - INTERLOCK CABLE (Continued)

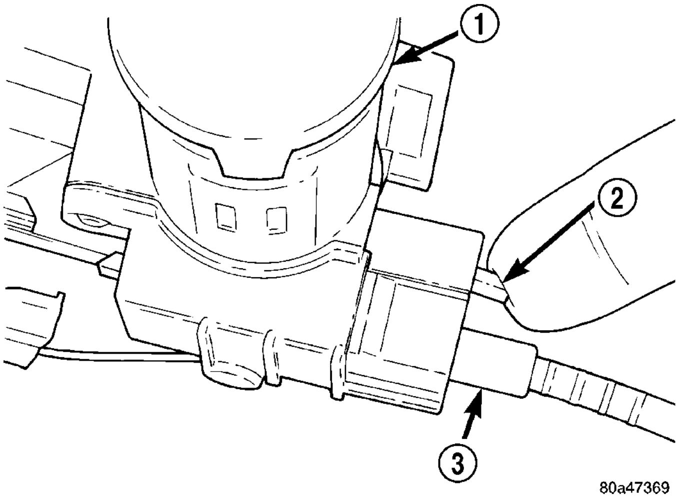


Fig. 112 Brake/Park Interlock Cable

1 - IGNITION LOCK
2 - LOCK TAB
3 - CABLE END

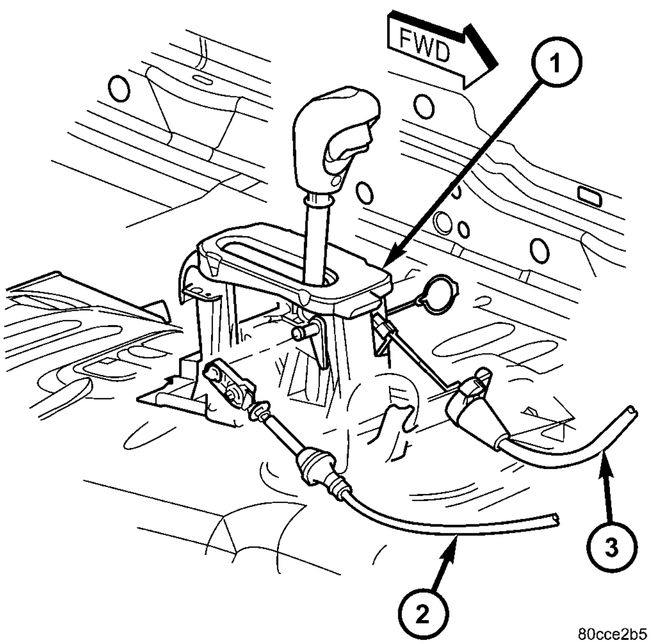


Fig. 113 Transmission Shift Cable At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

(8) Test the park-interlock cable operation.

(9) Install the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

ADJUSTMENTS - PARK-INTERLOCK CABLE

The park-interlock cable is part of the Brake Transmission Shift Interlock (BTSI) system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

(1) Remove floor console as necessary for access to the park-interlock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift the transmission into the PARK position.

(3) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(4) Pull cable lock button up to release cable (Fig. 114).

(5) Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.

(6) Push lock button down until it snaps in place.

(7) Verify proper operation. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK SYSTEM - DIAGNOSIS AND TESTING)

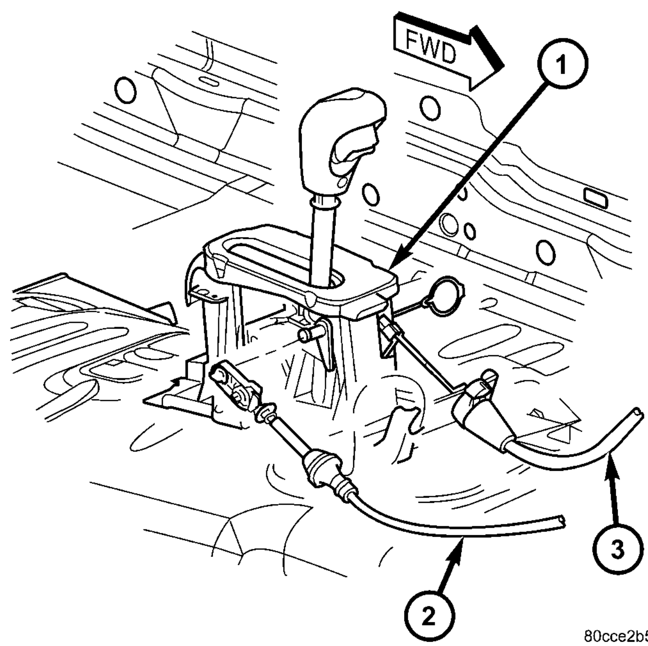


Fig. 114 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

PRESSURE

Pressure (Fig. 115) is nothing more than force (lbs.) divided by area (in or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in or 1 pound per square inch, or PSI as it is commonly referred to.

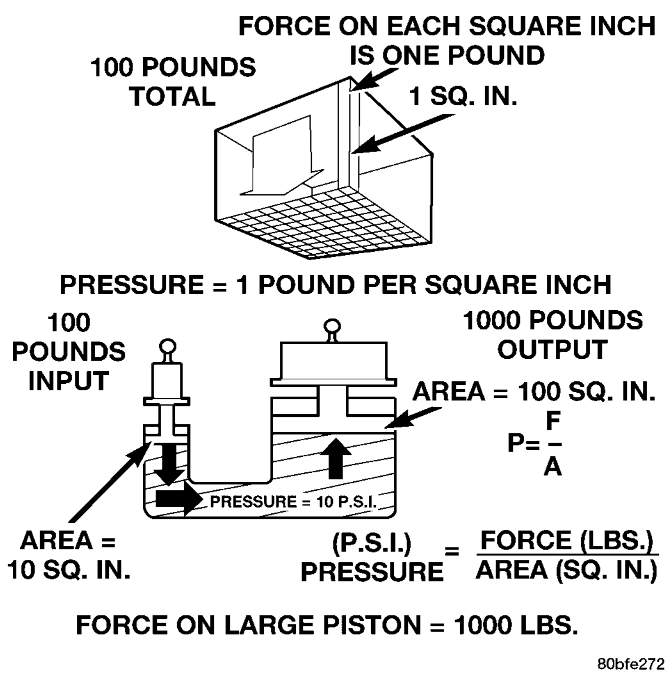


Fig. 115 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 116) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O-rings, D-rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

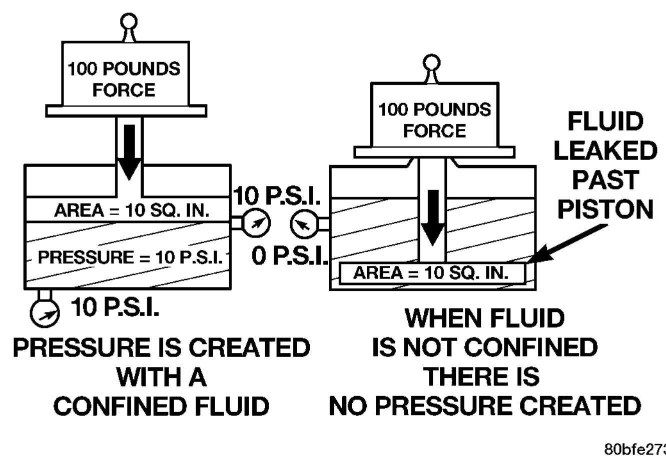


Fig. 116 Pressure on a Confined Fluid

PISTONS (Continued)

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 117), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 117), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same everywhere" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

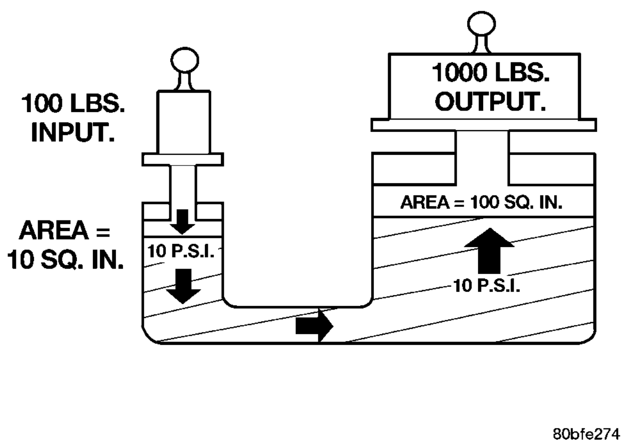


Fig. 117 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight-to-distance output rather than a pressure-to-area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 118) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

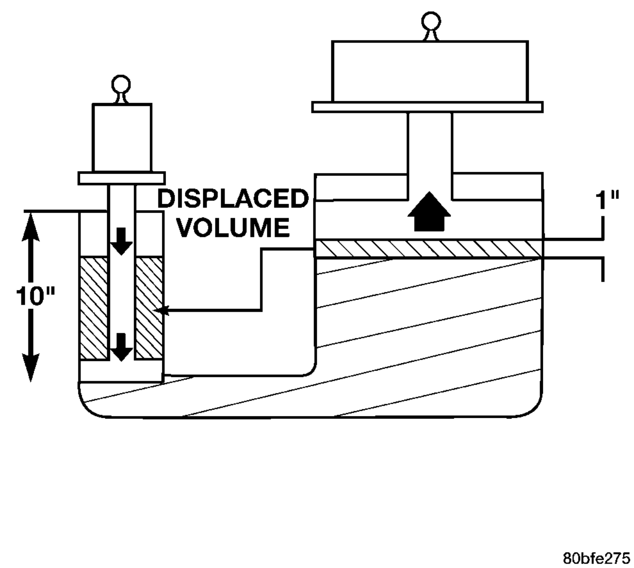


Fig. 118 Piston Travel

PLANETARY GEARTRAIN

DESCRIPTION

The planetary geartrain is located behind the 4C retainer/bulkhead, toward the rear of the transmission. The planetary geartrain consists of three primary assemblies:

- Reaction (Fig. 119).
- Reverse (Fig. 120).
- Input (Fig. 120).

OPERATION

REACTION PLANETARY GEARTRAIN

The reaction planetary carrier and reverse sun gear of the reaction planetary geartrain are a single component which is held by the 2C clutch when required. The reaction annulus gear is a stand alone component that can be driven by the reverse clutch or held by the 4C clutch. The reaction sun gear is driven by the overdrive clutch.

REVERSE PLANETARY GEARTRAIN

The reverse planetary geartrain is the middle of the three planetary sets. The reverse planetary carrier can be driven by the overdrive clutch as required. The reverse planetary carrier is also splined to the input annulus gear, which can be held by the low/reverse clutch. The reverse planetary annulus, input planetary carrier, and output shaft are all one piece.

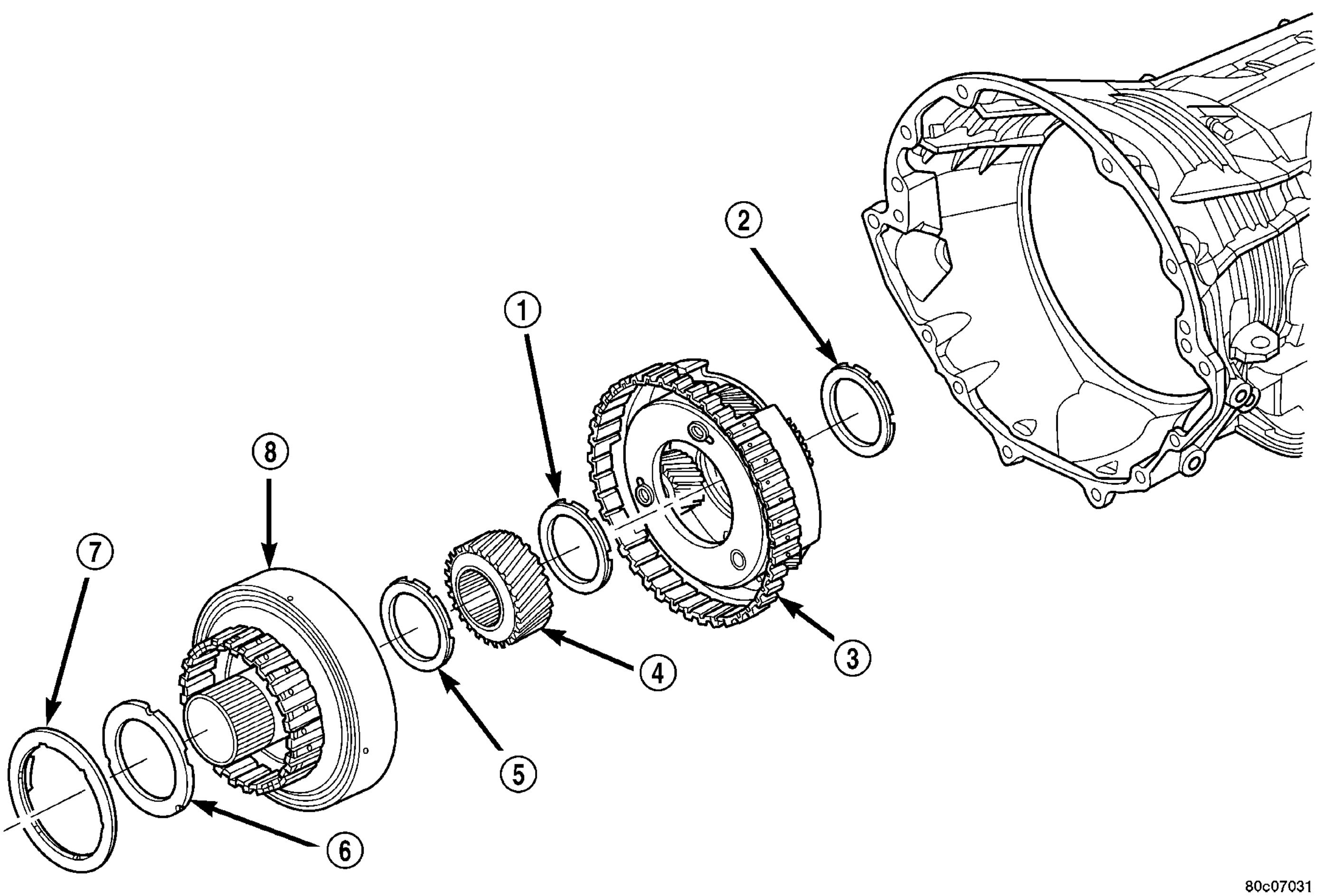


Fig. 119 Reaction Planetary Geartrain

1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS

PLANETARY GEARTRAIN (Continued)

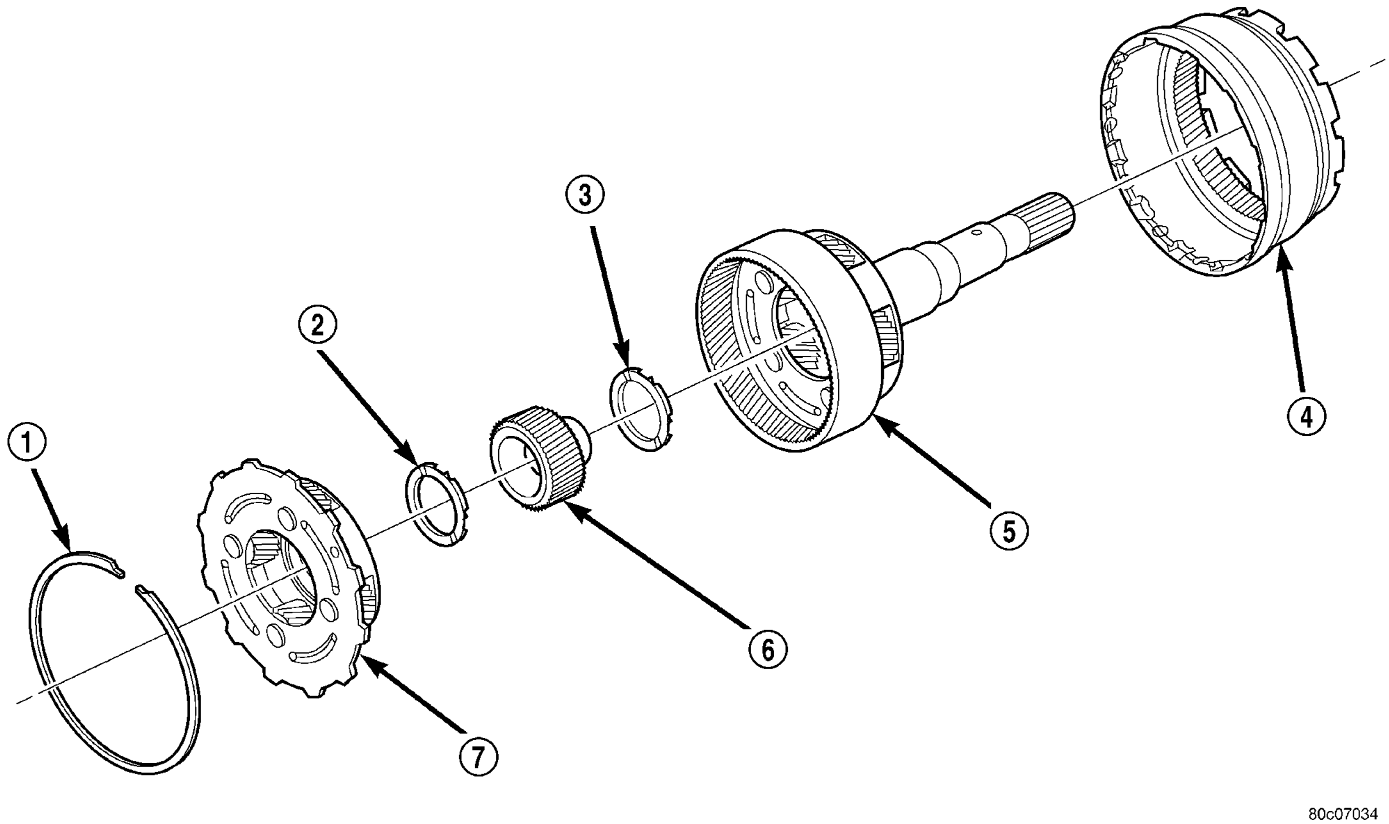


Fig. 120 Reverse/Input Planetary Geartrain

1 - SNAP-RING
2 - BEARING NUMBER 10
3 - BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

INPUT PLANETARY GEARTRAIN

The input sun gear of the input planetary geartrain is driven by the underdrive clutch.

DISASSEMBLY

(1) Remove the snap-ring holding the input annulus into the input carrier (Fig. 121).

(2) Remove the input annulus from the input carrier (Fig. 121).

(3) Remove the number 9 bearing from the reverse planetary carrier. Note that this planetary carrier has four pinion gears.

(4) Remove the reverse planetary gear carrier (Fig. 121).

(5) Remove the number 10 bearing from the input sun gear (Fig. 121).

(6) Remove the input sun gear from the input carrier (Fig. 121).

(7) Remove the number 11 bearing from the input carrier (Fig. 121).

CLEANING

Clean the planetary components in solvent and dry them with compressed air.

INSPECTION

Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location.

PLANETARY GEARTRAIN (Continued)

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install the number 11 bearing into the input planetary carrier so that the inner race will be toward the front of the transmission (Fig. 121).

(3) Install the input sun gear into the input carrier (Fig. 121).

(4) Install the number 10 bearing onto the rear of the reverse planetary carrier with the inner race toward the carrier (Fig. 121).

(5) Install the number 9 bearing onto the front of the reverse planetary carrier with the outer race toward the carrier and the inner race facing upward (Fig. 121).

(6) Install the reverse planetary gear carrier into the input carrier (Fig. 121).

(7) Install the input annulus gear into the input carrier (Fig. 121).

(8) Install the snap-ring to hold the input annulus gear into the input carrier (Fig. 121).

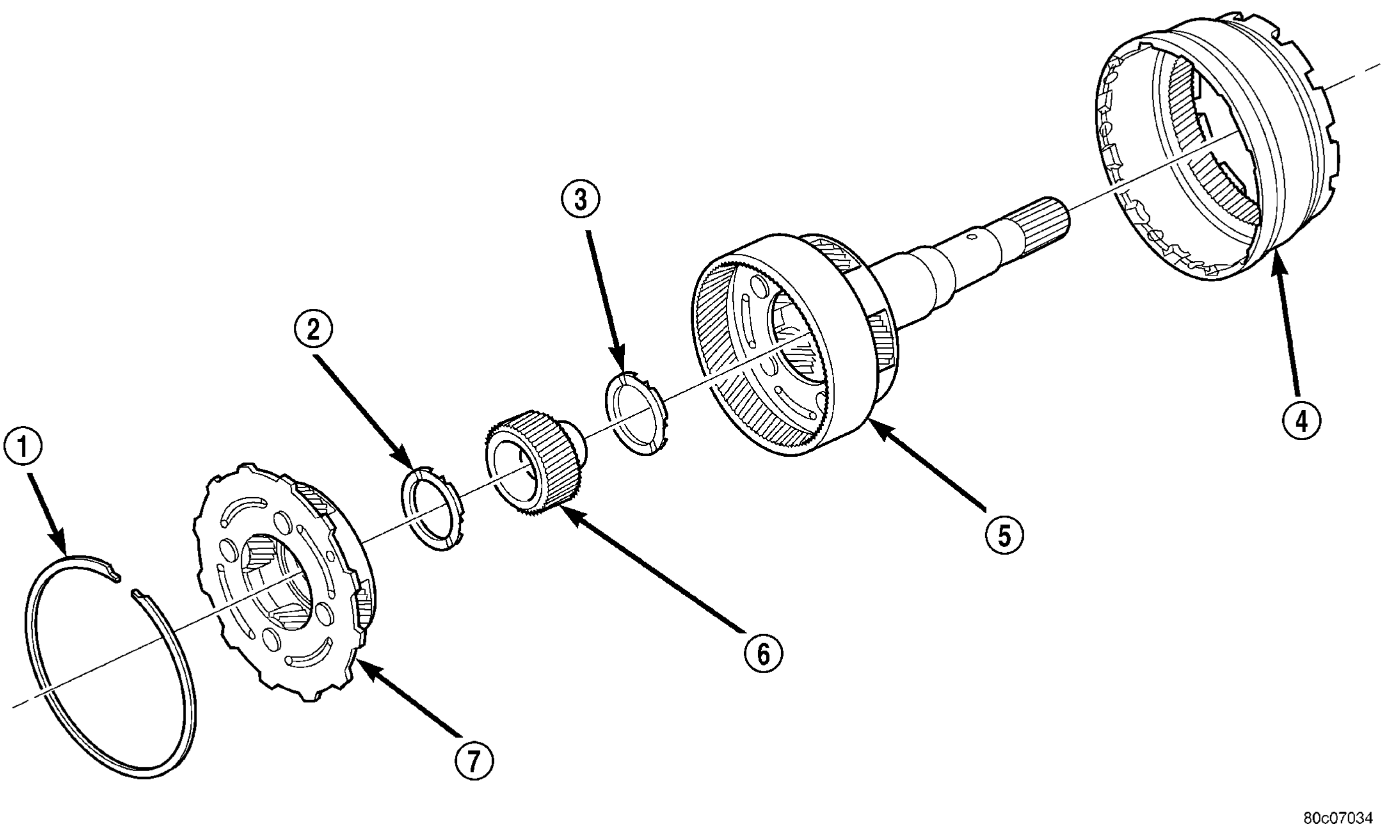


Fig. 121 Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - BEARING NUMBER 10
3 - BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

SHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides first gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides first and second gear only.

DRIVE range provides FIRST, SECOND THIRD and OVERDRIVE FOURTH gear ranges. The shift into OVERDRIVE FOURTH gear range occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The FOURTH gear upshift occurs automatically when the overdrive selector switch is in the ON position. No upshift to FOURTH gear will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to THIRD is not yet complete.
- Vehicle speed is too low for the 3-4 shift to occur.

Upshifts into FOURTH will be delayed when the transmission fluid temperature is below 4.5° C (40° F) or above 115.5° C (240° F).

REMOVAL

(1) Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift transmission into PARK.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 122).

(4) Disconnect the park-interlock cable from the shifter lever and the shifter assembly bracket.

(5) Disengage all wiring connectors from the shifter assembly.

(6) Remove all nuts holding the shifter assembly to the floor pan (Fig. 123).

(7) Remove the shifter assembly from the vehicle.

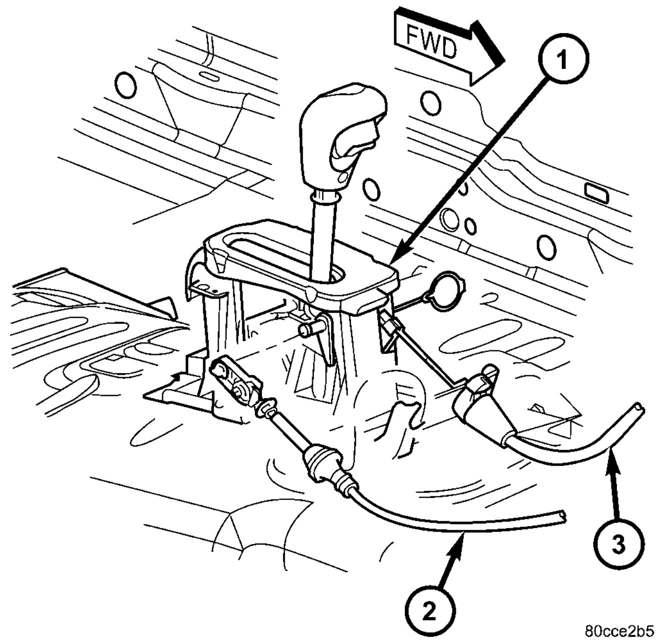


Fig. 122 Shift Cables At Shifter

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - BTSI CABLE

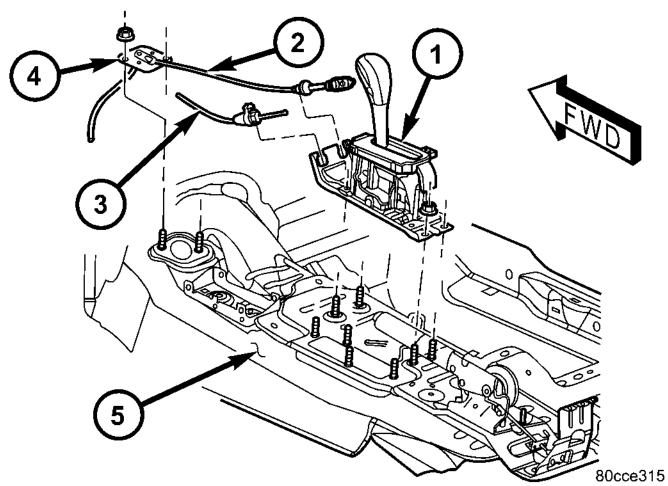


Fig. 123 Transmission Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - GEARSHIFT CABLE
3 - PARK-INTERLOCK CABLE
4 - SHIFT CABLE SEAL PLATE
5 - FLOOR PAN

SHIFT MECHANISM (Continued)

INSTALLATION

(1) Install shifter assembly onto the shifter assembly studs on the floor pan.

(2) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in.lbs.).

(3) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.

(4) Install the park-interlock cable into the shifter assembly bracket and into the shifter lever.

(5) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(6) Place the floor shifter lever in park position.

(7) Loosen the adjustment screw on the shift cable.

(8) Snap the shift cable onto the shift lever pin.

(9) Verify that the shift lever is in the PARK position.

(10) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct shifter operation.

(12) Verify proper BTSI operation.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK SYSTEM - DIAGNOSIS AND TESTING) Adjust the park-interlock cable as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/SHIFT INTERLOCK CABLE - ADJUSTMENTS)

(13) Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

SOLENOID SWITCH VALVE

DESCRIPTION

The Solenoid Switch Valve (SSV) is located in the valve body and controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

OPERATION

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, and 4th, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

SOLENOIDS

DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to posi-

SOLENOIDS (Continued)

tion the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.

OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 124) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump and contains an o-ring seal to better control oil flow.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.

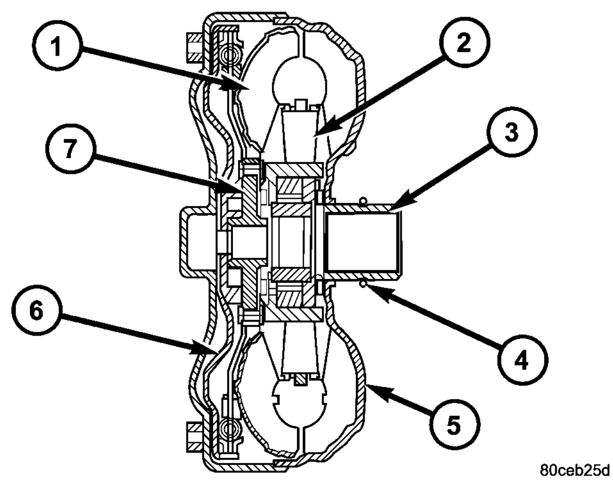


Fig. 124 Torque Converter Assembly

1 - TURBINE ASSEMBLY
2 - STATOR
3 - CONVERTER HUB
4 - O-RING
5 - IMPELLER ASSEMBLY
6 - CONVERTER CLUTCH PISTON
7 - TURBINE HUB

TORQUE CONVERTER (Continued)

IMPELLER

The impeller (Fig. 125) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

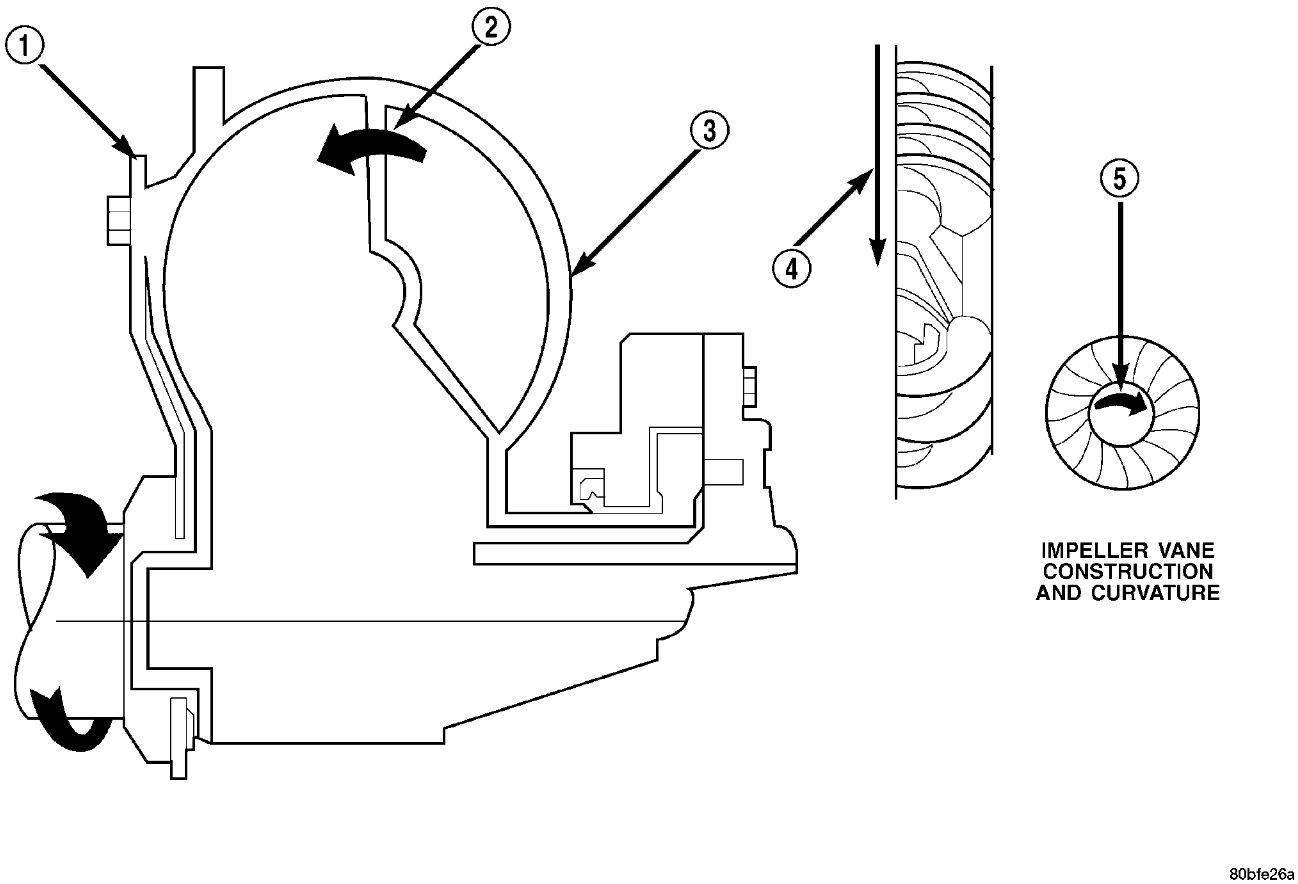


Fig. 125 Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

TORQUE CONVERTER (Continued)

TURBINE

The turbine (Fig. 126) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

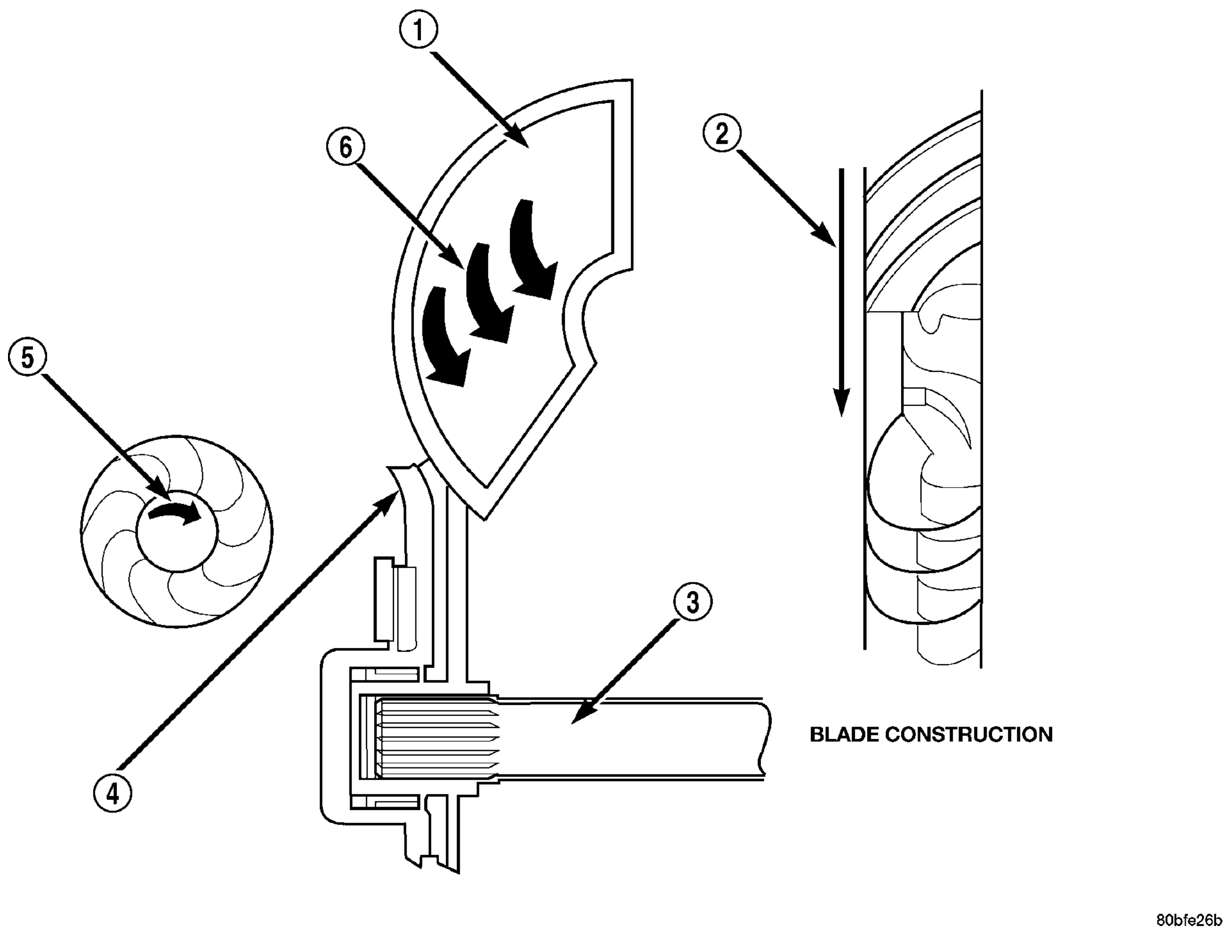


Fig. 126 Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

TORQUE CONVERTER (Continued)

STATOR

The stator assembly (Fig. 127) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 128). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

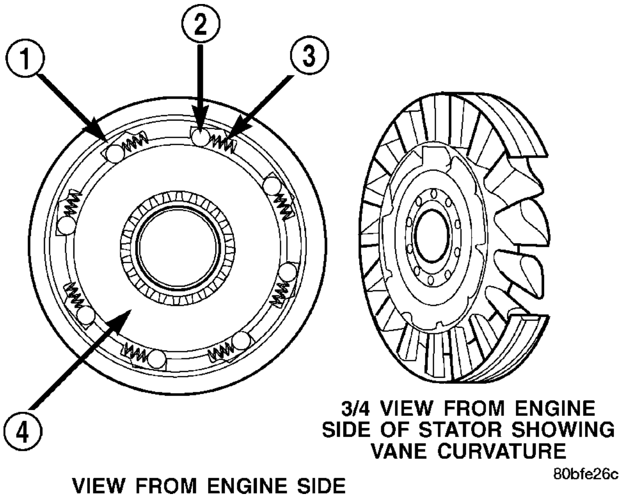


Fig. 127 Stator Components

1 - CAM (OUTER RACE)
2 - ROLLER
3 - SPRING
4 - INNER RACE

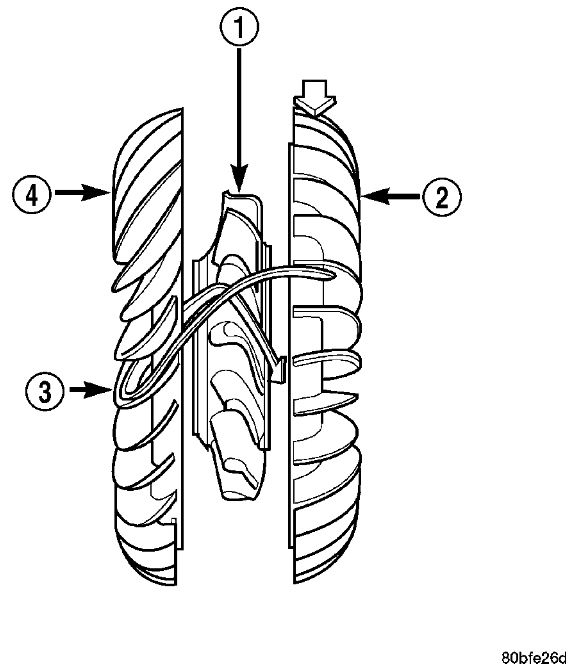


Fig. 128 Stator Location

1 - STATOR
2 - IMPELLER
3 - FLUID FLOW
4 - TURBINE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 129) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston with friction material was added to the turbine assembly to provide this mechanical lock-up.

In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

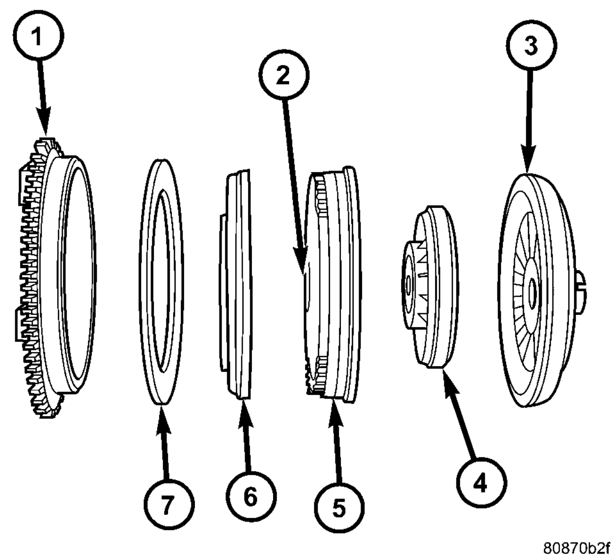


Fig. 129 Torque Converter Clutch (TCC)

1 - IMPELLER FRONT COVER
2 - THRUST WASHER ASSEMBLY
3 - IMPELLER
4 - STATOR
5 - TURBINE
6 - PISTON
7 - FRICTION DISC

TORQUE CONVERTER (Continued)

OPERATION

The converter impeller (Fig. 130) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 131). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear. If the control switch is in the

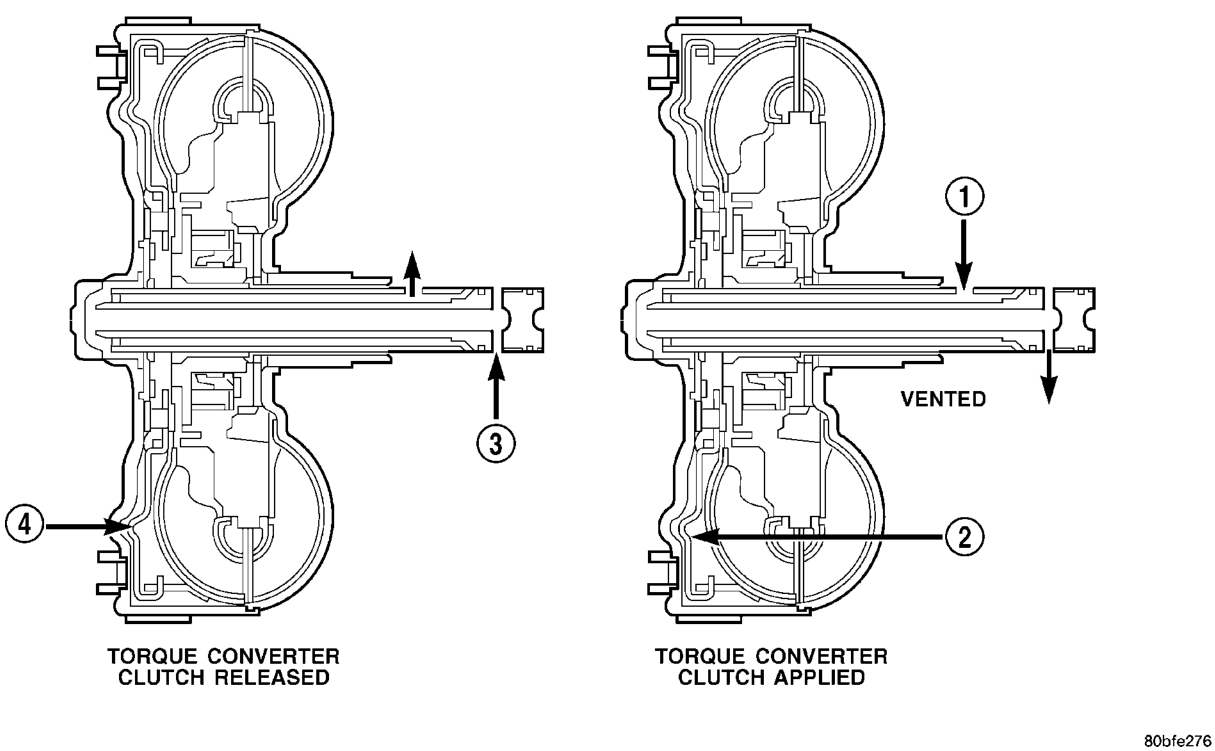


Fig. 130 Torque Converter Fluid Operation - Typical

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TORQUE CONVERTER (Continued)

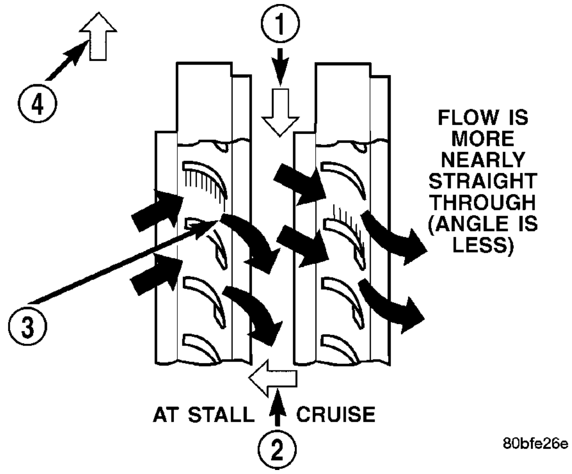


Fig. 131 Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

OFF position, the clutch will engage after the shift to third gear.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive flats for sharp edges, burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper or crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free from debris. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or converter hub o-ring while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

TORQUE CONVERTER (Continued)

(6) Check converter seating with a scale and straightedge (Fig. 132). Surface of converter lugs should be at least 13 mm (1/2 in.) to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

(9) Fill the transmission with the recommended fluid.

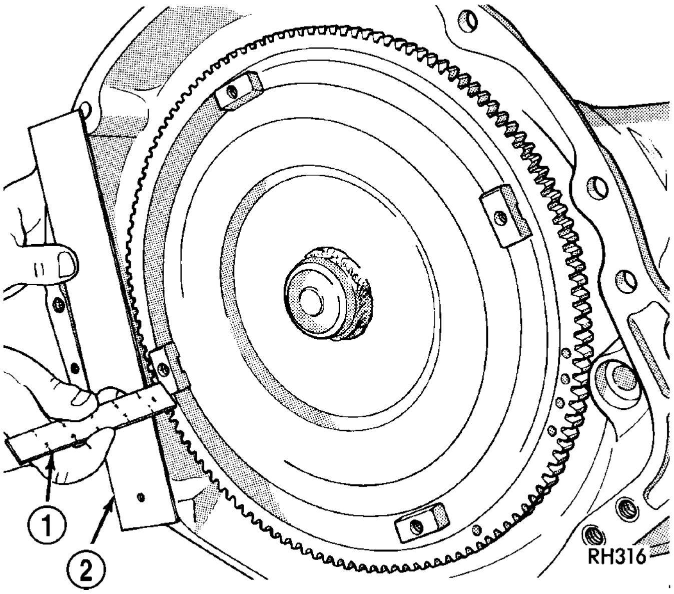


Fig. 132 Checking Torque Converter Seating-Typical

1 - SCALE
2 - STRAIGHTEDGE

TRANSMISSION CONTROL RELAY

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

TRANSMISSION RANGE SENSOR

DESCRIPTION

The Transmission Range Sensor (TRS) is part of the solenoid module, which is mounted to the top of the valve body inside the transmission.

The Transmission Range Sensor (TRS) has five switch contact pins that:

- Determine shift lever position
- Supply ground to the Starter Relay in Park and Neutral only.
- Supply +12 V to the backup lamps in Reverse only.

The TRS also has an integrated temperature sensor (thermistor) that communicates transmission temperature to the TCM and PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

There are many possible combinations of open and closed switches (codes). Seven of these possible codes are related to gear position and five are recognized as “between gear” codes. This results in many codes which should **never occur**. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

GEAR	C5	C4	C3	C2	C1
Park	CL	OP	OP	CL	CL
Temp 1	CL	OP	OP	CL	OP
Reverse	OP	OP	OP	CL	OP
Temp 2	OP	OP	CL	CL	OP
Neutral 1	OP	OP	CL	CL	CL
Neutral 2	OP	CL	CL	CL	CL
Temp 3	OP	CL	CL	CL	OP
Drive	OP	CL	CL	OP	OP
Temp 4	OP	CL	OP	OP	OP
Manual 2	CL	CL	OP	OP	OP
Temp 5	CL	OP	OP	OP	OP
Manual 1	CL	OP	CL	OP	OP

TRANSMISSION SOLENOID/ TRS ASSEMBLY

DESCRIPTION

The transmission solenoid/TRS assembly is internal to the transmission and mounted on the valve body assembly (Fig. 133). The assembly consists of six solenoids that control hydraulic pressure to the six friction elements (transmission clutches), and the torque converter clutch. The pressure control solenoid is located on the side of the solenoid/TRS assembly. The solenoid/TRS assembly also contains five pressure switches that feed information to the TCM.

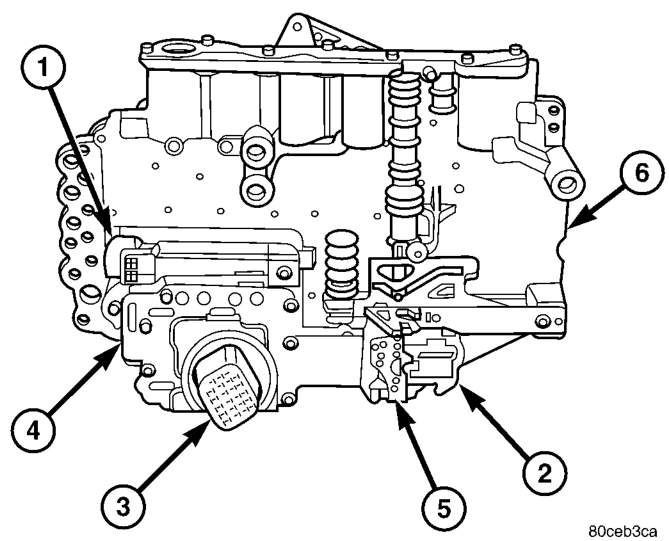


Fig. 133 Transmission Solenoid/TRS Assembly

1 - PRESSURE CONTROL SOLENOID
2 - TRANSMISSION RANGE SELECTOR PLATE
3 - 23-WAY CONNECTOR
4 - SOLENOID PACK
5 - TRANSMISSION RANGE SENSOR
6 - VALVE BODY

OPERATION

SOLENOIDS

Solenoids are used to control the L/R, 2C, 4C, OD, and UD friction elements. The reverse clutch is controlled by line pressure and the position of the manual valve in the valve body. All the solenoids are contained within the Solenoid and Pressure Switch Assembly. The solenoid and pressure switch assembly contains one additional solenoid, Multi-Select (MS), which serves primarily to provide 2nd and 3rd gear limp-in operation.

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid as necessary. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The MS and UD solenoids are normally applied to allow transmission limp-in in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The TCM relies on five pressure switches to monitor fluid pressure in the L/R, 2C, 4C, UD, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The switches close at 23 psi and open at 11 psi, and simply indicate whether or not pressure exists. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
FOURTH	OP	OP	CL	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

TRANSMISSION SOLENOID/TRS ASSEMBLY (Continued)

REMOVAL

(1) Remove the valve body from the transmission (Fig. 134).

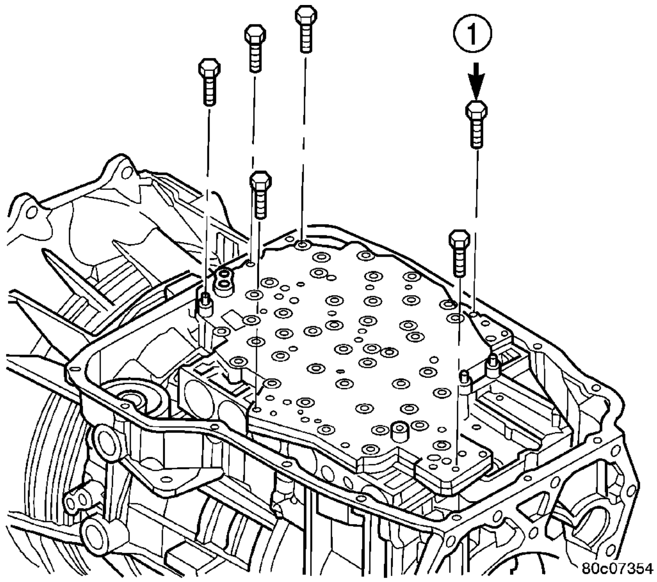


Fig. 134 Valve Body Bolts

1 - VALVE BODY TO CASE BOLT (6)

(2) Remove the screws holding the transmission solenoid/TRS assembly onto the valve body (Fig. 135).

(3) Separate the transmission solenoid/TRS assembly from the valve body.

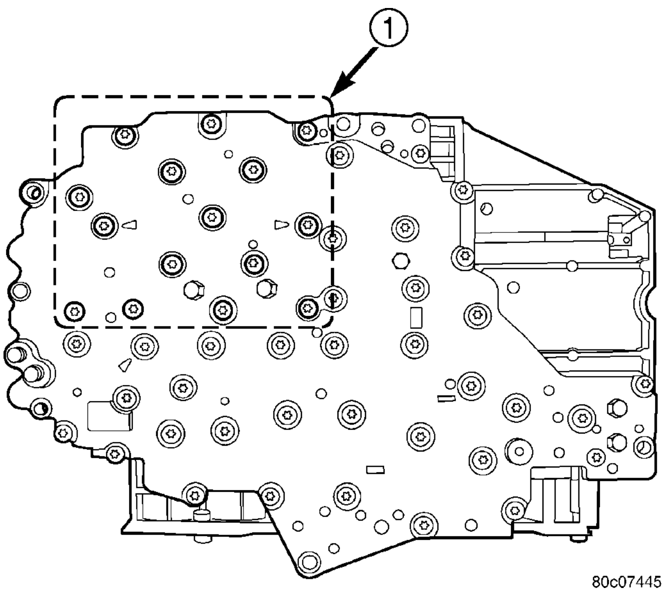


Fig. 135 Ttransmission Solenoid/TRS Assembly Screws

1 - SOLENOID PACK BOLTS (15)

INSTALLATION

(1) Place TRS selector plate in the PARK position.

(2) Position the transmission solenoid/TRS assembly onto the valve body. Be sure that both alignment dowels are fully seated in the valve body and that the TRS switch contacts are properly positioned in the selector plate

(3) Install the screws to hold the transmission solenoid/TRS assembly onto the valve body.

(4) Tighten the solenoid assembly screws adjacent to the arrows cast into the bottom of the valve body first. Tighten the screws to 5.7 N·m (50 in.lbs.).

(5) Tighten the remainder of the solenoid assembly screws to 5.7 N·m (50 in.lbs.).

(6) Install the valve body into the transmission.

TRANSMISSION TEMPERATURE SENSOR

DESCRIPTION

The transmission temperature sensor is a thermistor that is integral to the Transmission Range Sensor (TRS).

OPERATION

The transmission temperature sensor is used by the TCM to sense the temperature of the fluid in the sump. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in.

Calculated Temperature

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

VALVE BODY

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and a transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components (Fig. 136) and (Fig. 137):

- Solenoid switch valve
- Manual valve
- Low/reverse switch valve
- 5 Accumulators
- 7 check balls

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

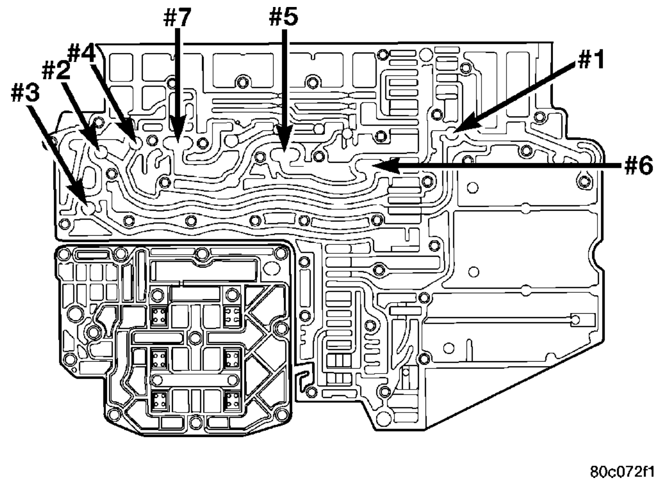


Fig. 137 Check Ball Locations

SOLENOID SWITCH VALVE

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

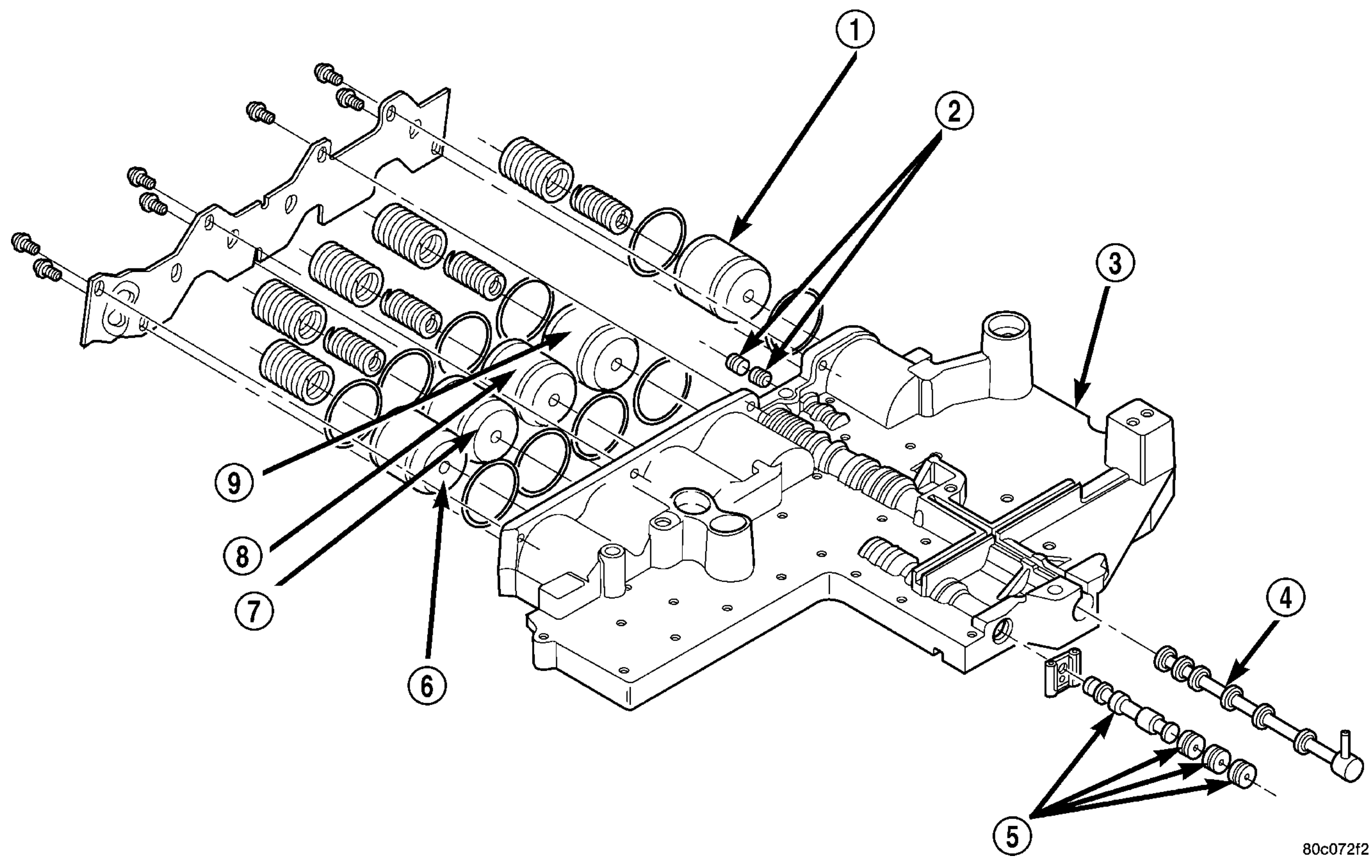


Fig. 136 Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

VALVE BODY (Continued)

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the top of the valve body. The valve is connected mechanically by a cable to the gearshift mechanism. The valve is held in each of its positions by a roller detent spring (Fig. 138) that engages the "roostercomb" of the TRS selector plate.

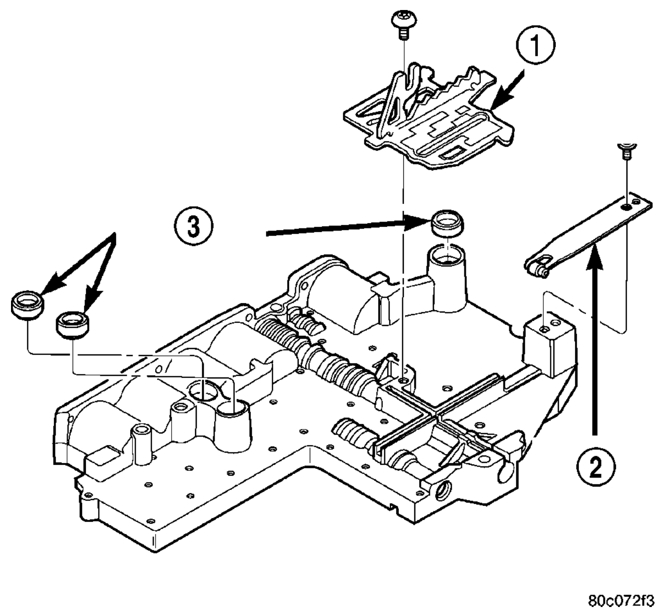


Fig. 138 TRS Selector Plate and Detent Spring

1 - TRS SELECTOR PLATE
2 - DETENT SPRING
3 - CLUTCH PASSAGE SEALS

LOW/REVERSE SWITCH VALVE

The low/reverse switch valve allows the low/reverse clutch to be operated by either the LR/CC solenoid or the MS solenoid.

REMOVAL

The valve body can be removed for service without having to remove the transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/VALVE BODY - DISASSEMBLY)

(1) Shift transmission into PARK.

(2) Raise vehicle.

(3) Disconnect wires at the solenoid and pressure switch assembly connector.

(4) Position drain pan under transmission oil pan.

(5) Remove transmission oil pan.

(6) Remove the primary oil filter from valve body. (Fig. 139)

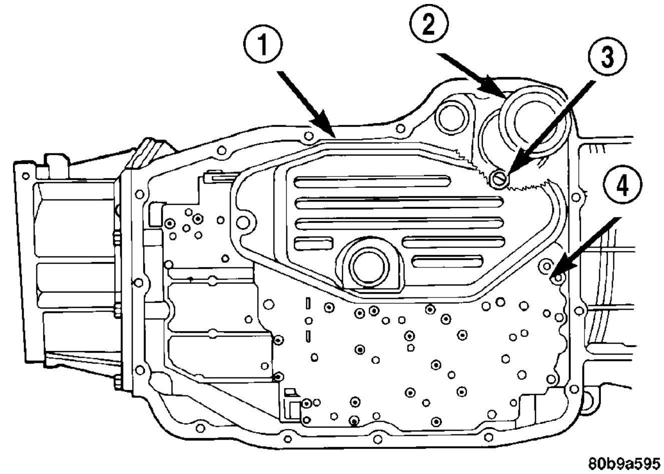


Fig. 139 Remove Primary Oil Filter

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

(7) Remove bolts attaching valve body to transmission case (Fig. 140).

(8) Lower the valve body and work the electrical connector out of transmission case.

(9) Separate the valve body from the transmission.

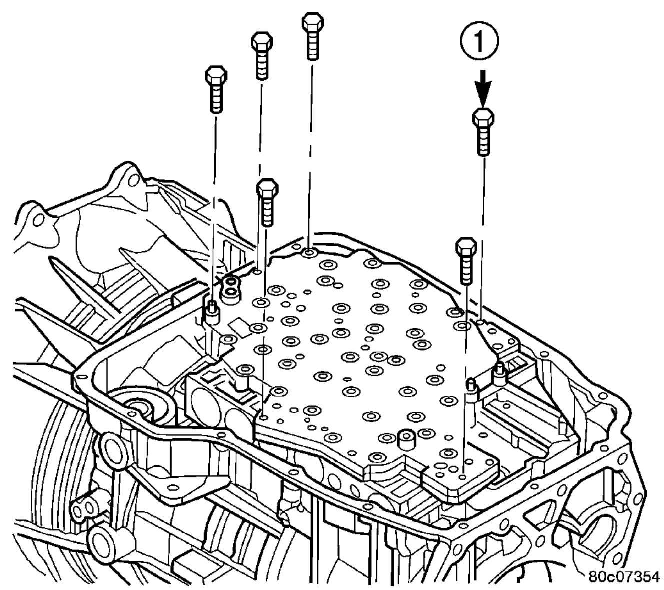


Fig. 140 Valve Body Bolts

1 - VALVE BODY TO CASE BOLT (6)

VALVE BODY (Continued)

DISASSEMBLY

(1) Remove the screws holding the solenoid and pressure switch assembly to the valve body (Fig. 141). Do not remove the screws on the top of the solenoid and pressure switch assembly.

(2) Separate the solenoid and pressure switch assembly from the valve body.

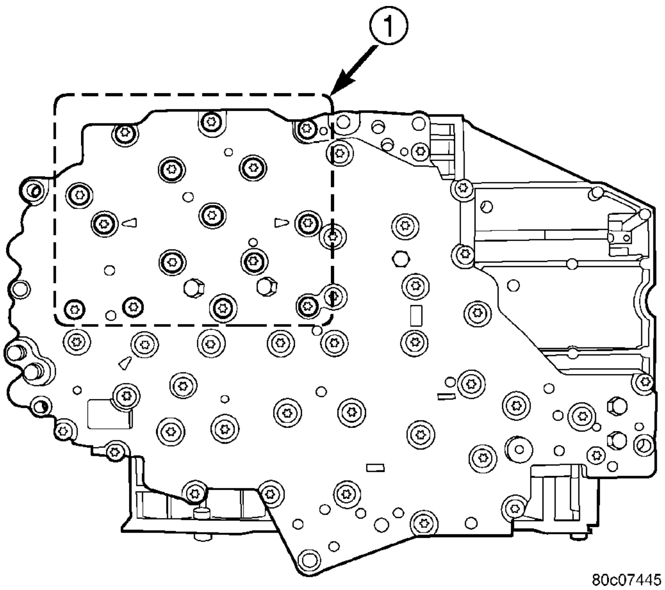


Fig. 141 Solenoid and Pressure Switch Assembly Screws

1 - SOLENOID PACK BOLTS (15)

(3) Remove the screw holding the detent spring (Fig. 142) onto the valve body.

(4) Remove the detent spring from the valve body.

(5) Remove the TRS selector plate from the valve body and the manual valve.

(6) Remove the clutch passage seals from the valve body, if necessary.

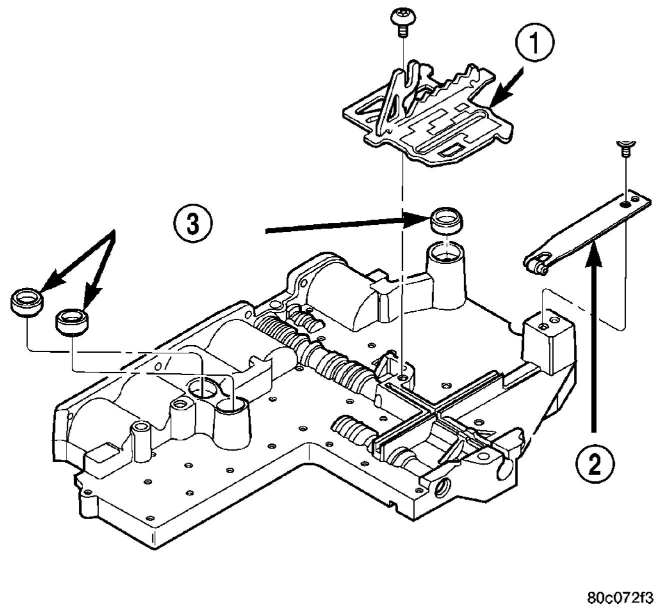


Fig. 142 Valve Body External Components

1 - TRS SELECTOR PLATE
2 - DETENT SPRING
3 - CLUTCH PASSAGE SEALS

VALVE BODY (Continued)

(7) Remove the screws holding the accumulator cover onto the valve body (Fig. 143).

(8) Remove the accumulator springs and pistons from the valve body. Note which accumulator piston and spring belong in each location.

(9) Place the valve body on the bench with the transfer plate upward.

NOTE: The valve body contains seven check balls. The transfer plate must be placed upward to prevent losing the check balls when the transfer plate is removed from the valve body.

(10) Remove the screws holding the valve body to the valve body transfer plate.

(11) Remove the transfer plate from the valve body. Note the location of all check balls (Fig. 144).

(12) Remove the check balls from the valve body.

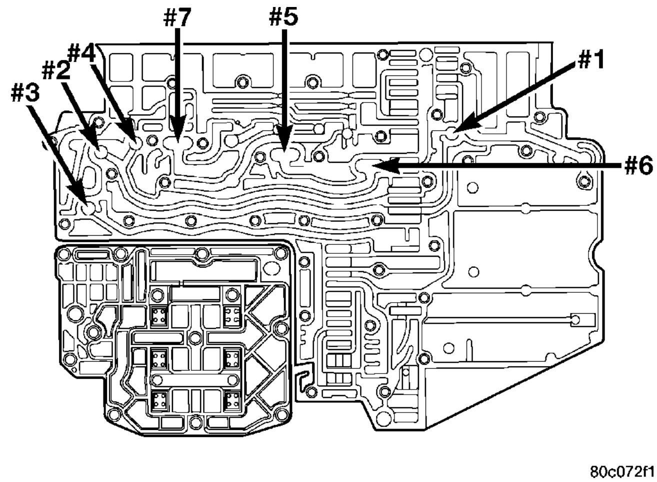


Fig. 144 Check Ball Locations

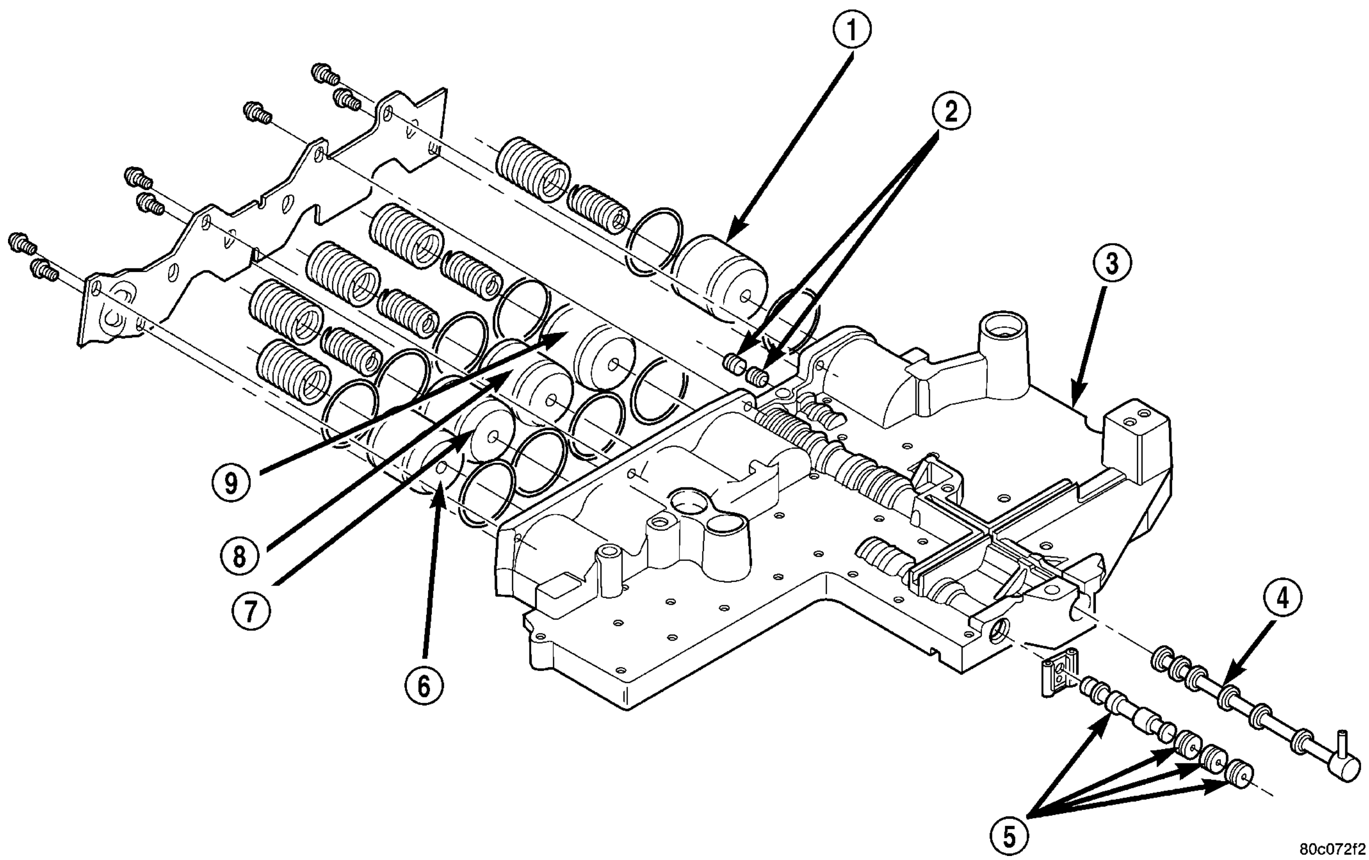


Fig. 143 Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

VALVE BODY (Continued)

(13) Remove the retainers securing the solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body and remove the associated valve and spring. Tag each valve and spring combination with location information to aid in assembly. (Fig. 145)

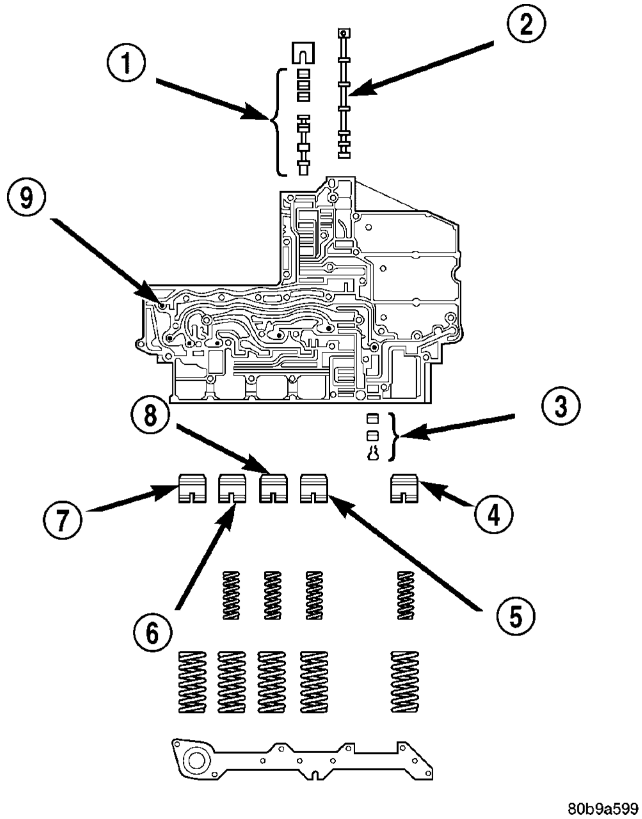


Fig. 145 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution. (Fig. 146)

Do not immerse any of the electrical components in cleaning solution. Clean the electrical components by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

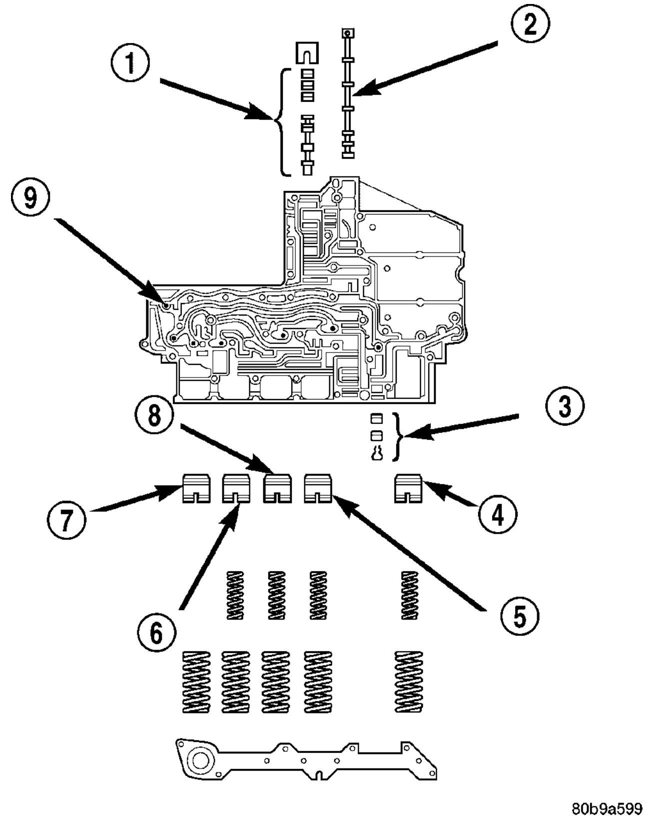


Fig. 146 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

VALVE BODY (Continued)

INSPECTION

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straight-edge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

Inspect the valves and plugs (Fig. 147) for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

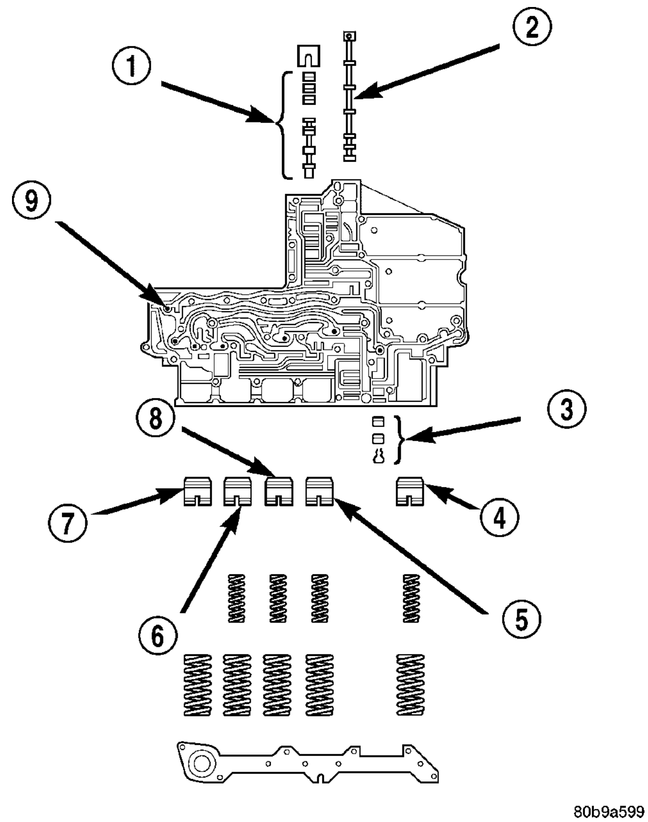


Fig. 147 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

Inspect all the accumulator bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the accumulator springs. The springs must be free of distortion, warpage or broken coils.

Inspect all the fluid seals on the valve body (Fig. 148). Replace any seals that are cracked, distorted, or damaged in any way. These seals pass fluid pressure directly to the clutches. Any pressure leak at these points, may cause transmission performance problems.

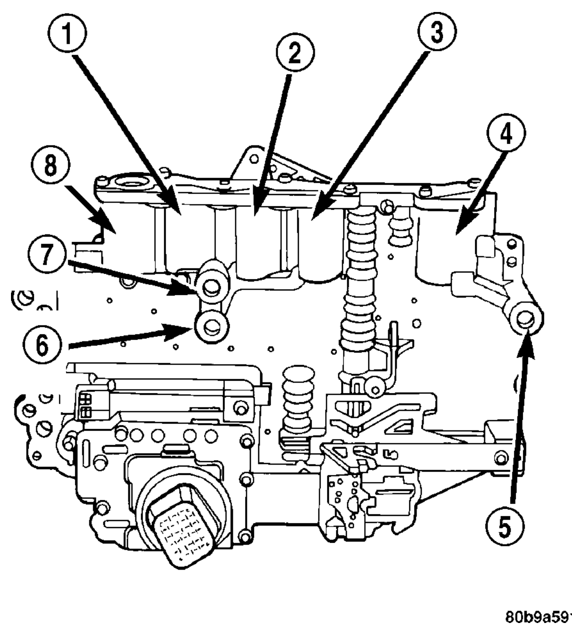


Fig. 148 Valve Body Seals

1 - UNDERDRIVE ACCUMULATOR (2 SPRINGS)
2 - 4TH CLUTCH ACCUMULATOR (2 SPRINGS)
3 - 2ND CLUTCH ACCUMULATOR (2 SPRINGS)
4 - LOW REVERSE ACCUMULATOR (2 SPRINGS)
5 - LOW/REVERSE PASSAGE SEAL
6 - 2ND CLUTCH PASSAGE SEAL
7 - 4TH CLUTCH PASSAGE SEAL
8 - OVERDRIVE ACCUMULATOR (1 SPRING)

VALVE BODY (Continued)

ASSEMBLY

(1) Lubricate valves, springs, and the housing valve bores with clean transmission fluid.

(2) Install solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body.

(3) Install the retainers to hold each valve into the valve body.

(4) Install the valve body check balls into their proper locations.

(5) Position the transfer plate onto the valve body.

(6) Install the screws to hold the transfer plate to the valve body. Tighten the screws to 5.6 N·m (50 in. lbs.).

(7) Install the accumulator pistons and springs into the valve body in the location from which they were removed. Note that all accumulators except the overdrive have two springs. The overdrive accumulator piston has only one spring.

(8) Position the accumulator cover onto the valve body.

(9) Install the screws to hold the accumulator cover onto the valve body. Tighten the screws to 4.5 N·m (40 in. lbs.).

(10) Install the TRS selector plate onto the valve body and the manual valve.

(11) Install the solenoid and pressure switch assembly onto the valve body.

(12) Install the screws to hold the solenoid and pressure switch assembly onto the valve body. Tighten the screws to 5.7 N·m (50 in. lbs.). Tighten the screws adjacent to the arrows cast into the bottom of the transfer plate first.

(13) Position the detent spring onto the valve body.

(14) Install the screw to hold the detent spring onto the valve body. Tighten the screw to 4.5 N·m (40 in. lbs.).

(15) Install new clutch passage seals onto the valve body, if necessary

INSTALLATION

(1) Check condition of seals on valve body and the solenoid and pressure switch assembly. Replace seals if cut or worn.

(2) Place TRS selector plate in the PARK position.

(3) Place the transmission in the PARK position.

(4) Lubricate seal on the solenoid and pressure switch assembly connector with petroleum jelly.

(5) Position valve body in transmission and align the manual lever on the valve body to the pin on the transmission manual shift lever.

(6) Seat valve body in case and install one or two bolts to hold valve body in place.

(7) Tighten valve body bolts alternately and evenly to 12 N·m (105 in. lbs.) torque.

(8) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(9) Place replacement filter in position on valve body and into the oil pump.

(10) Install screw to hold filter to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.

(11) Connect the solenoid and pressure switch assembly connector.

(12) Install oil pan. Tighten pan bolts to 12 N·m (105 in. lbs.) torque.

(13) Lower vehicle and fill transmission with Mopar® ATF +4.

(14) Check and adjust gearshift cable, if necessary.

TRANSFER CASE - NV231

TABLE OF CONTENTS

TRANSFER CASE - NV231

DESCRIPTION

The NV231 is a part-time transfer case with a low range reduction gear system. The NV231 has three operating ranges plus a NEUTRAL position. A low range system provides a reduction ratio for increased low speed torque capability.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

Transfer case operating ranges are:
- 2WD (2-wheel drive)
- 4Hi (4-wheel drive)
- 4 Lo (4-wheel drive low range)

The 2WD range is for use on any road surface at any time.

The 4Hi and 4 Lo ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

The low range reduction gear system is operative in 4 Lo range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

TRANSFER CASE - NV231 (Continued)

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by a shift cable. A straight line shift pattern is used. Range positions are marked on the shifter knob bezel.

IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

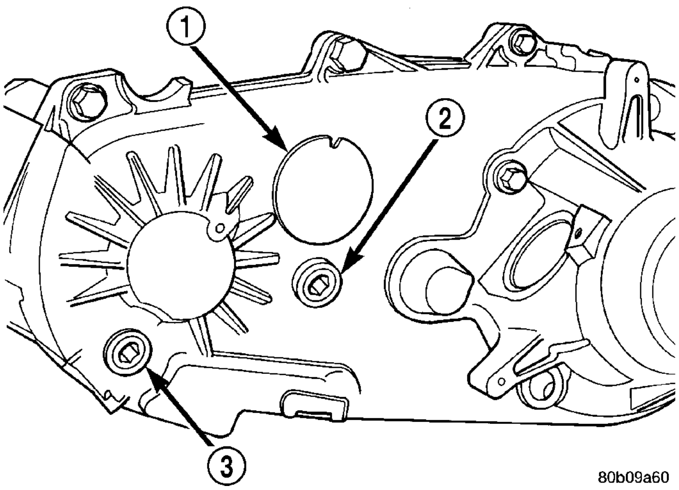


Fig. 1 Fill/Drain Plug And I.D. Tag Locations - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

TRANSFER CASE - NV231 (Continued)

DIAGNOSIS AND TESTING - TRANSFER CASE - NV231

DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer case difficult to shift or will not shift into desired range.	1) Vehicle speed too great to permit shifting.	1) Slow vehicle and shift into desired range.
	2) If vehicle was operated for an extended period in 4H mode on dry surface, driveline torque load may cause difficulty.	2) Stop vehicle and shift transfer case to Neutral position. Transfer case can then be shifted to the desired mode.
	3) Transfer case shift cable binding.	3) Repair or replace cable as necessary.
	4) Insufficient or incorrect lubricant.	4) Drain and refill transfer case with the correct type and quantity of lubricant.
	5) Internal transfer case components binding, worn, or damaged.	5) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.
Transfer case noisy while in, or jumps out of, 4L mode.	1) Transfer case not completely engaged in 4L position.	1) Slow vehicle, shift transfer case to the Neutral position, and then shift into the 4L mode.
	2) Transfer case shifter binding.	2) Repair, replace, or tighten shifter as necessary.
	3) Range fork damaged, inserts worn, or fork is binding on the shift rail.	3) Repair or replace components as necessary.
	4) Low range gear worn or damaged.	4) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Abnormal tire wear.	1) Extended operation in 4Hi mode on dry surfaces,	1) Operate vehicle in 2H mode on dry surfaces.

TRANSFER CASE - NV231 (Continued)

REMOVAL

(1) Shift transfer case into NEUTRAL.

(2) Raise vehicle.

(3) Remove skid plate (Fig. 2).

(4) Drain transfer case lubricant.

(5) Mark front and rear propeller shaft yokes for alignment reference.

(6) Disconnect front/rear propeller shafts at transfer case.

(7) Disconnect transfer case position sensor connector (Fig. 3).

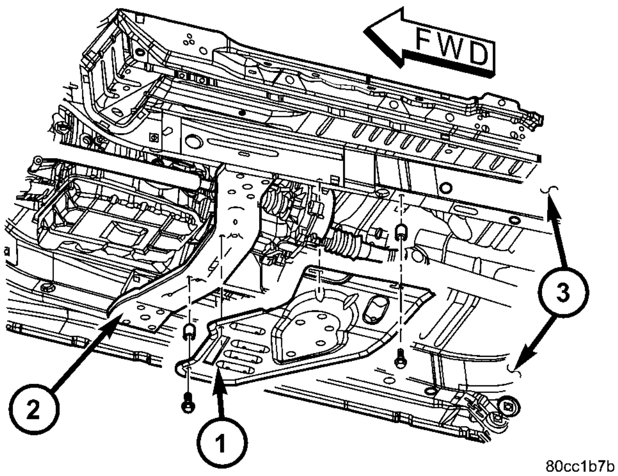


Fig. 2 Remove Skid Plate

1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

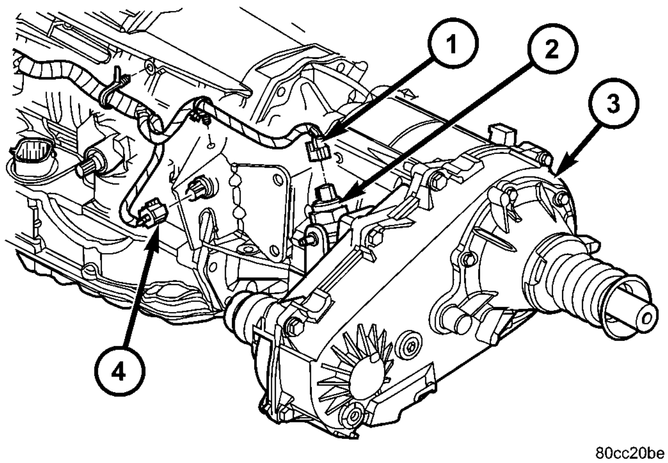


Fig. 3 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

(8) Disconnect transfer case shift cable at the range lever (Fig. 4).

(9) Disconnect the transfer case shift cable from the shift cable bracket.

(10) Disconnect transfer case vent hose (Fig. 5).

(11) Support transfer case with transmission jack.

(12) Secure transfer case to jack with chains.

(13) Remove nuts attaching transfer case to transmission.

(14) Pull transfer case and jack rearward to disengage transfer case (Fig. 5).

(15) Remove transfer case from under vehicle.

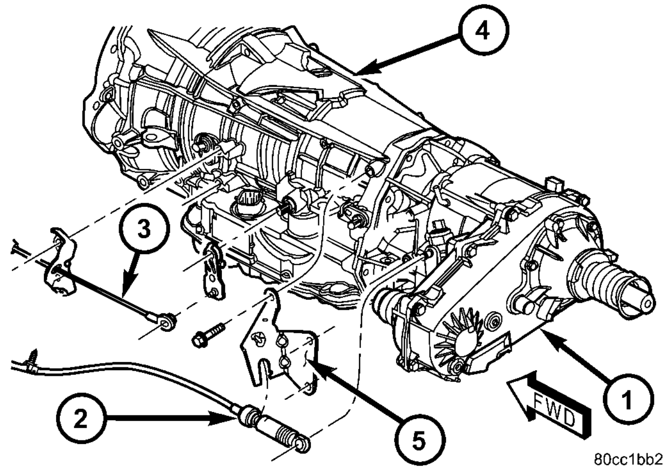


Fig. 4 Remove Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

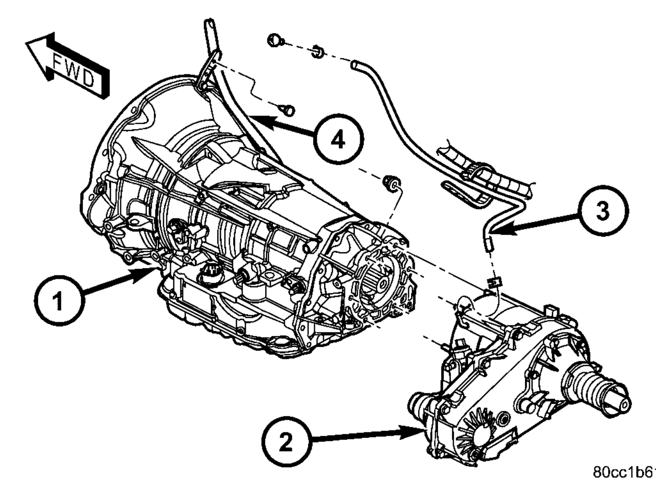


Fig. 5 Remove Vent Hose and Transfer Case

1 - AUTOMATIC TRANSMISSION
2 - TRANSFER CASE
3 - VENT HOSE
4 - FILL TUBE

TRANSFER CASE - NV231 (Continued)

DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug and drain lubricant remaining in case.

REAR RETAINER AND OIL PUMP

(1) Spread band clamp which holds output shaft boot to the output shaft slinger with a suitable awl, or equivalent.

(2) Remove output shaft boot from slinger and output shaft.

(3) Remove the output shaft rear slinger using Puller MD-998056-A (Fig. 6).

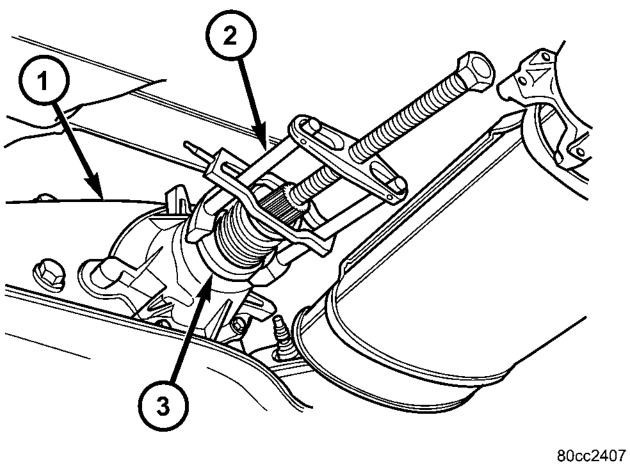


Fig. 6 Rear Slinger Removal

1 - TRANSFER CASE
2 - PULLER MD-998056-A
3 - REAR SLINGER

(4) Use a suitable pry tool, or a slide hammer mounted screw, to remove the seal from the rear retainer (Fig. 7).

(5) Remove the rear output bearing I.D. retaining ring (Fig. 8).

(6) Remove the bolts holding the rear retainer to the rear case half.

(7) Tap rear retainer with rawhide or rubber mallet to loosen sealer bead.

(8) Remove rear retainer from rear case half (Fig. 9).

(9) Remove the remaining output shaft bearing snap-ring.

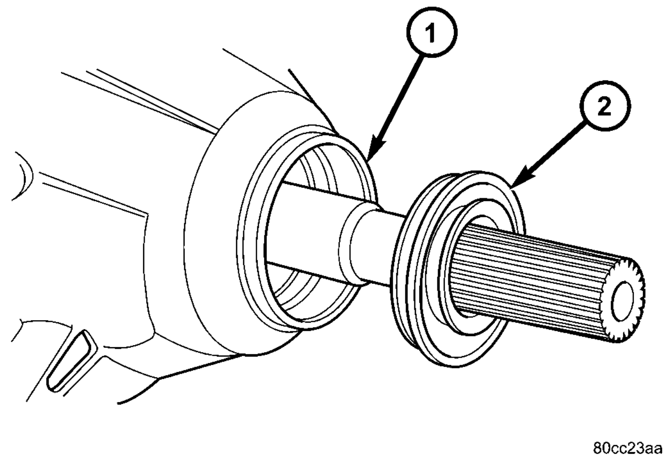


Fig. 7 Rear Retainer Seal

1 - REAR RETAINER
2 - OUTPUT SHAFT SEAL

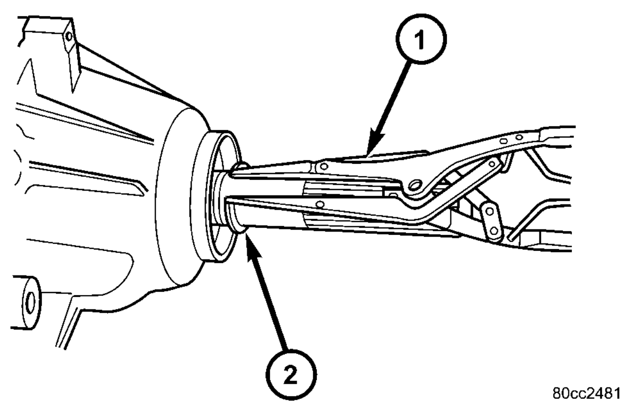


Fig. 8 Output Shaft Rear Bearing Retaining Ring

1 - SNAP-RING PLIERS
2 - RETAINING RING

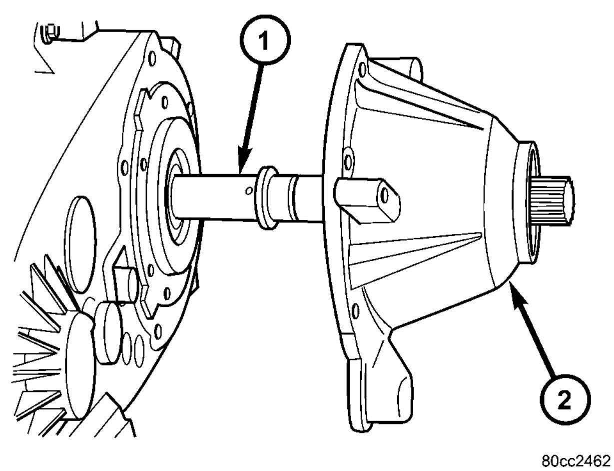


Fig. 9 Rear Retainer Removal

1 - MAINSHAFT
2 - REAR RETAINER

TRANSFER CASE - NV231 (Continued)

(10) Disengage oil pickup tube from oil pump and remove oil pump assembly. Remove oil pump by tilting the edge of the oil pump from under the edge of the rear case half and sliding the pump off the output shaft (Fig. 10).

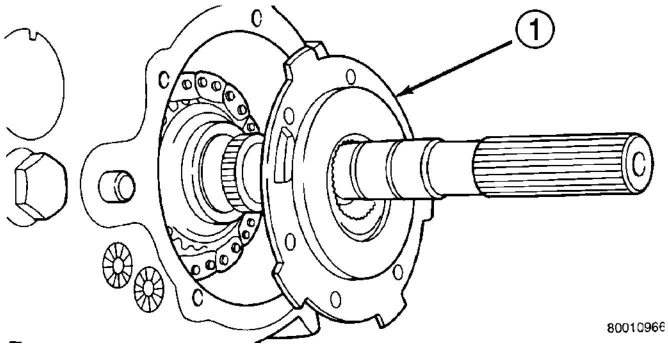


Fig. 10 Oil Pump Removal

1 - OIL PUMP

(11) Remove pick-up tube o-ring from oil pump (Fig. 11), if necessary. Do not disassemble the oil pump, it is not serviceable.

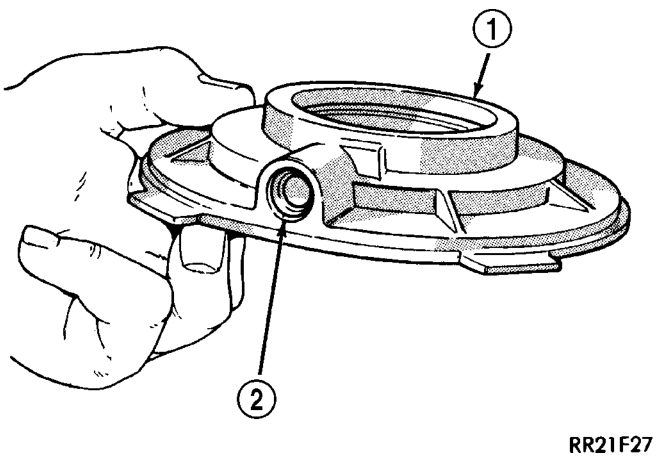


Fig. 11 Pick-up Tube O-ring Location

1 - OIL PUMP
2 - O-RING

COMPANION FLANGE AND RANGE LEVER

(1) Remove transfer case position sensor (Fig. 12).

(2) Install two bolts (Fig. 13) partially into the propellor shaft companion flange, 180° from each other.

(3) Install the rectangular end of the Flange Holder C-3281 over the bolts to hold the companion flange stationary and remove the nut holding the companion flange to the output shaft.

(4) Use Remover C-452 (Fig. 14) to remove the companion flange.

(5) Remove seal washer from front output shaft. Discard washer as it should not be reused.

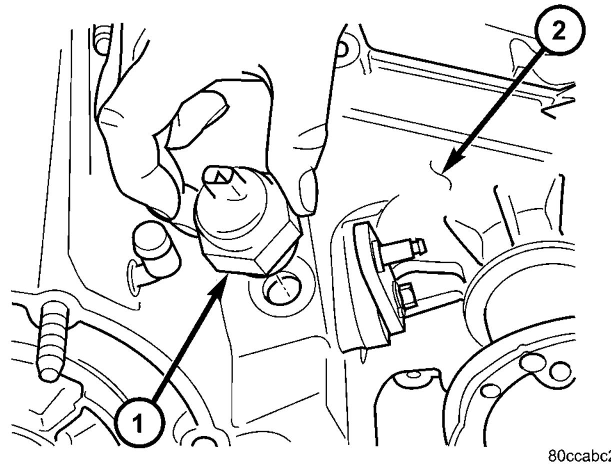


Fig. 12 Remove Transfer Case Position Sensor

1 - TRANSFER CASE POSITION SENSOR
2 - TRANSFER CASE

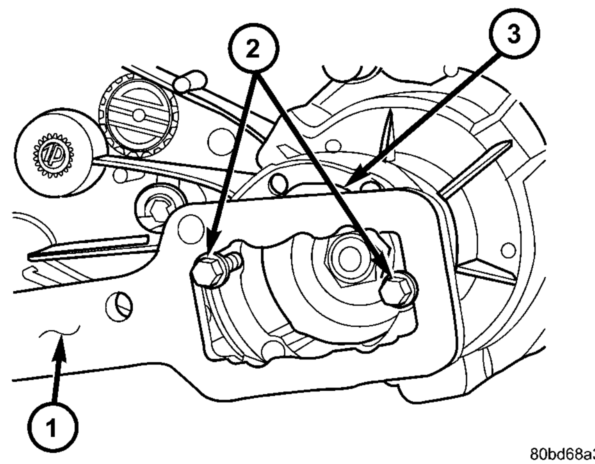


Fig. 13 Hold Companion Flange - Typical

1 - HOLDER C-3281
2 - BOLTS
3 - COMPANION FLANGE

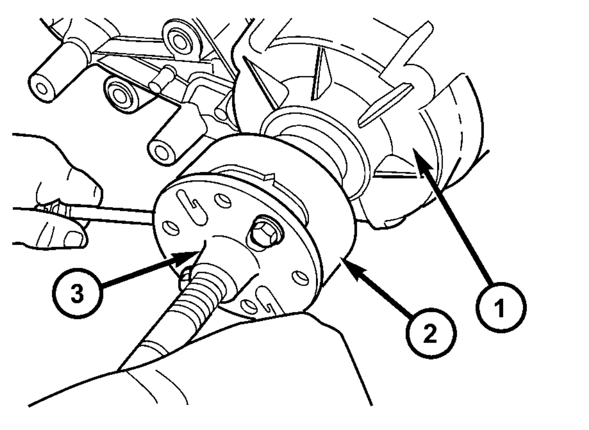


Fig. 14 Remove Companion Flange - Typical

1 - TRANSFER CASE
2 - COMPANION FLANGE
3 - REMOVER C-452

TRANSFER CASE - NV231 (Continued)

(6) 2Remove the bolt (Fig. 15) that attaches the range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft.

NOTE: Be sure to note the orientation of the range lever (lever up or down) so that it may be re-installed in the same direction.

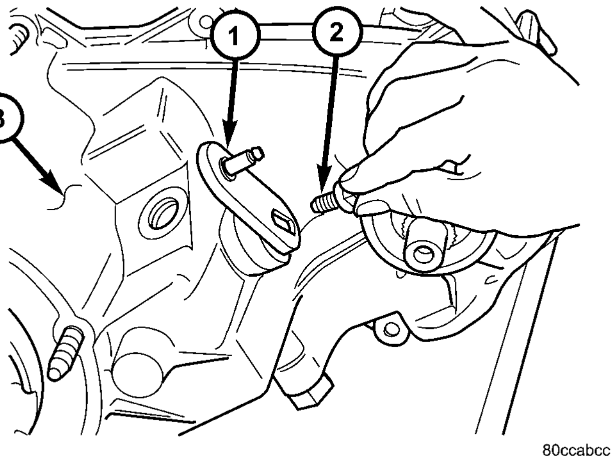


Fig. 15 Remove Shift Lever Bolt

1 - RANGE LEVER
2 - RANGE LEVER BOLT
3 - TRANSFER CASE

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Support transfer case so rear case is facing upward.

(2) Remove bolts holding front case to rear case. The case alignment bolts require flat washers (Fig. 16).

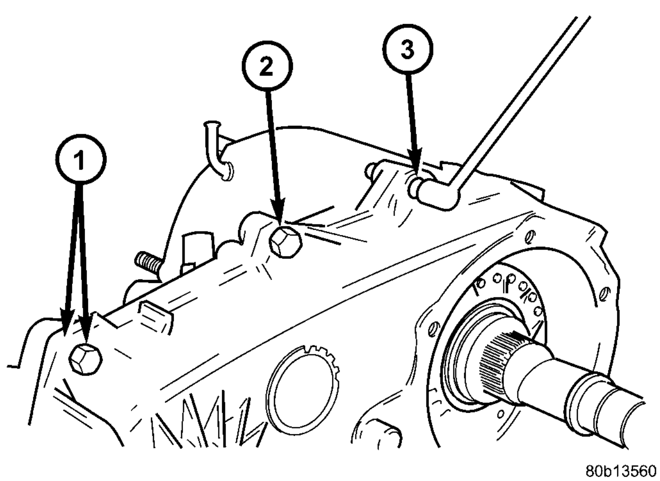


Fig. 16 Spline And Dowel Bolt Locations

1 - DOWEL BOLT AND WASHER (2)
2 - CASE BOLTS
3 - SPLINE HEAD BOLT (1)

(3) Loosen rear case with flat blade screwdriver to break sealer bead. Insert pry tool blade only into notches provided at each end of case (Fig. 17).

(4) Remove rear case from front case.

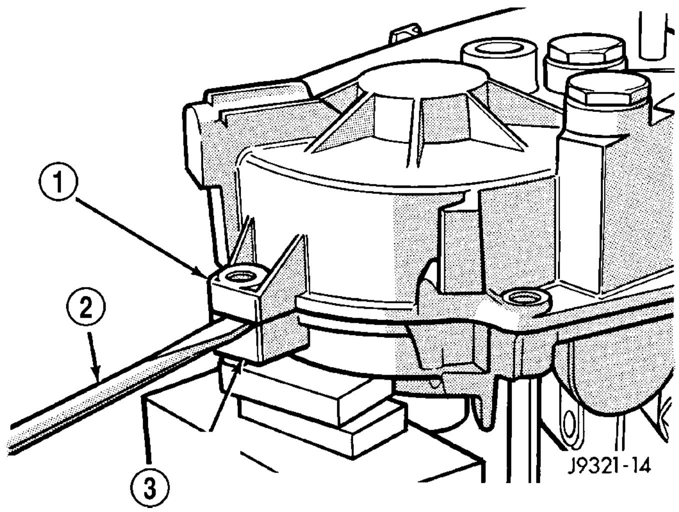


Fig. 17 Loosening Rear Case - Typical

1 - REAR CASE
2 - PRY TOOL (IN CASE SLOT)
3 - FRONT CASE

(5) Remove oil pickup tube from rear case (Fig. 18).

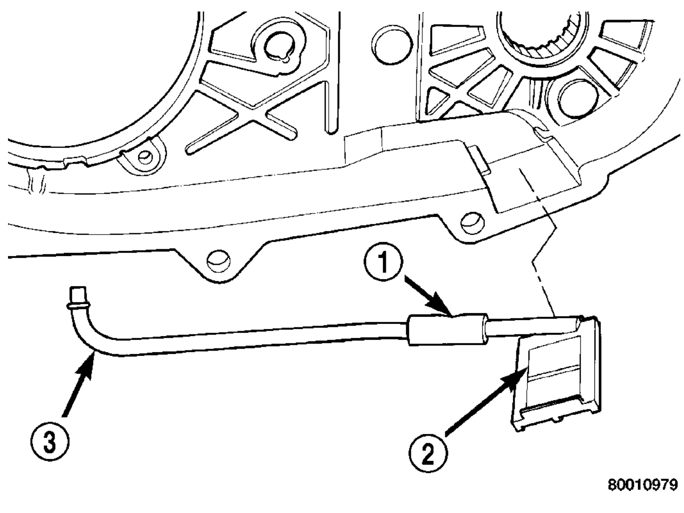


Fig. 18 Oil Pickup Tube Removal

1 - CONNECTING HOSE
2 - PICKUP SCREEN
3 - PICKUP TUBE

TRANSFER CASE - NV231 (Continued)

(6) Remove mode fork spring (Fig. 19).

(7) Pull front output shaft upward and out of front output shaft bearing (Fig. 20).

(8) Remove front output shaft and chain.

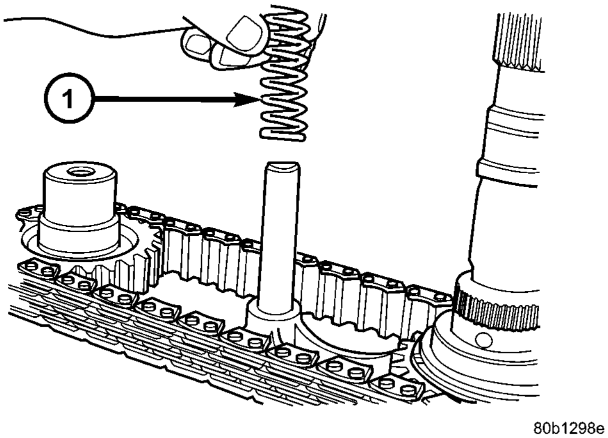


Fig. 19 Mode Fork Spring Removal

1 - MODE FORK SPRING

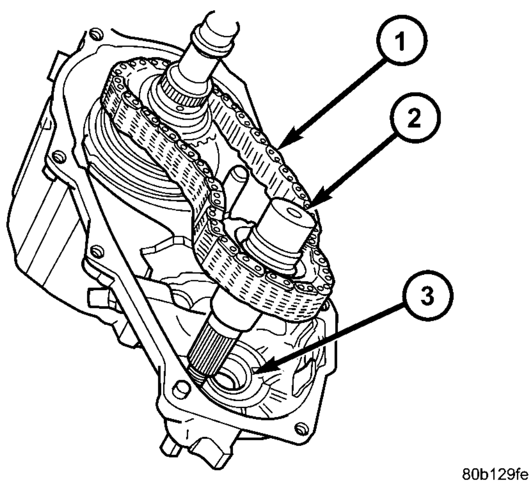


Fig. 20 Remove Front Output Shaft And Drive Chain

1 - DRIVE CHAIN
2 - FRONT OUTPUT SHAFT
3 - FRONT OUTPUT SHAFT BEARING

SHIFT FORKS AND MAINSHAFT

(1) Remove mainshaft from mode sleeve and input gear pilot bearing.

(2) Remove detent plug, O-ring, detent spring and detent plunger (Fig. 21).

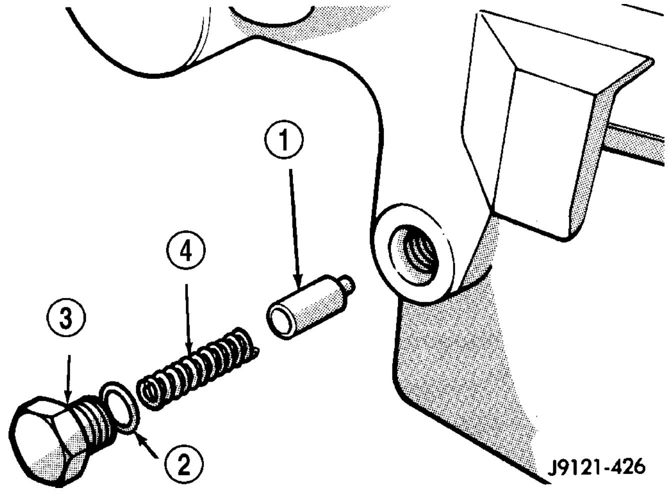


Fig. 21 Detent Plug, Spring, And Plunger Removal

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

(3) Remove mode fork and sleeve as an assembly (Fig. 22). Note position of sleeve for assembly reference. The short side of the sleeve faces upward.

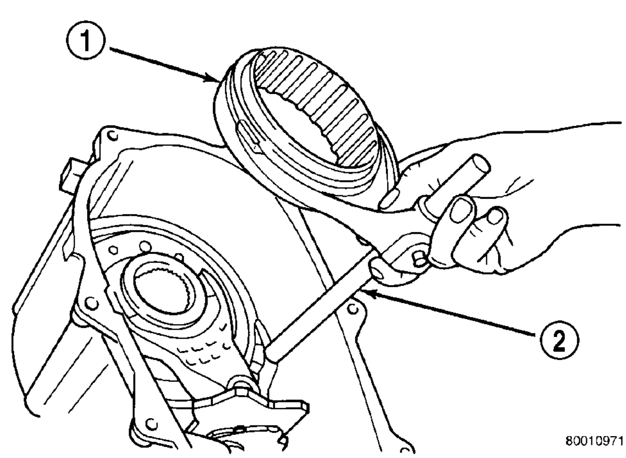


Fig. 22 Mode Fork And Sleeve Removal

1 - MODE SLEEVE
2 - MODE FORK AND RAIL

TRANSFER CASE - NV231 (Continued)

(4) Remove range fork and sleeve as an assembly (Fig. 23). Note fork position for installation reference.

(5) Remove shift sector from front case (Fig. 24).

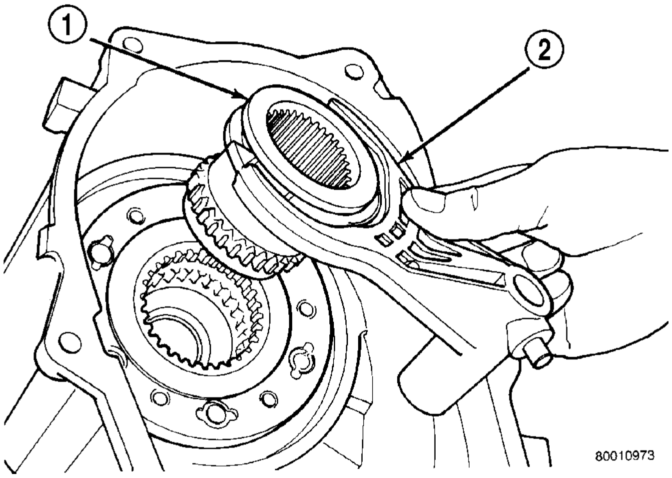


Fig. 23 Range Fork And Sleeve Removal

1 - RANGE HUB
2 - RANGE FORK

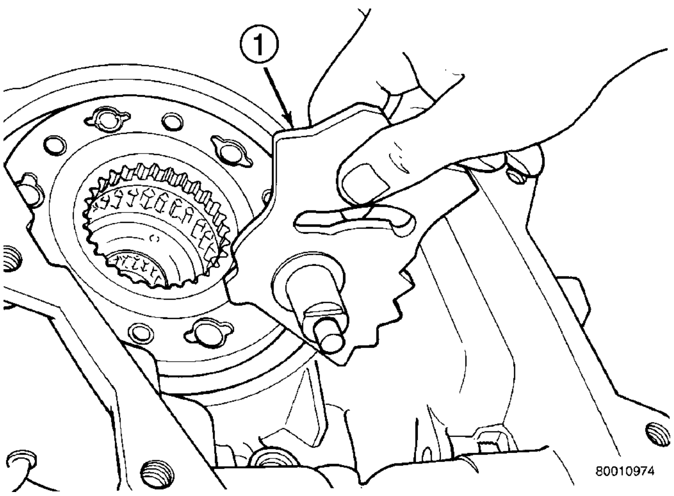


Fig. 24 Shift Sector Removal

1 - SHIFT SECTOR

(6) Remove the shift sector shaft seal (Fig. 25).

(7) Remove the shift sector shaft bearing with an appropriate socket (Fig. 26).

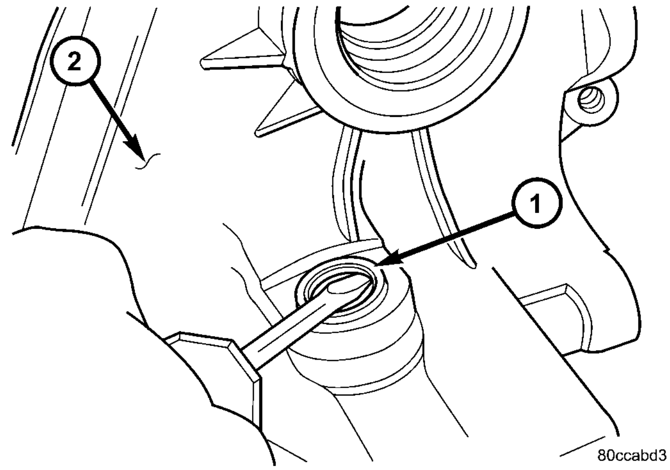


Fig. 25 Remove Shift Shaft Seal

1 - SHIFT SHAFT SEAL
2 - TRANSFER CASE

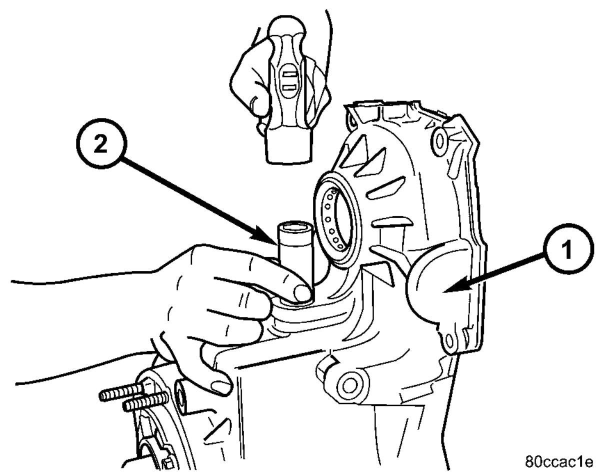


Fig. 26 Remove Shift Sector Shaft Bearing

1 - TRANSFER CASE
2 - SOCKET

TRANSFER CASE - NV231 (Continued)

MAINSHAFT

(1) Remove mode hub retaining ring with heavy duty snap-ring pliers (Fig. 27).

(2) Slide mode hub off mainshaft (Fig. 28).

(3) Slide drive sprocket off mainshaft (Fig. 29).

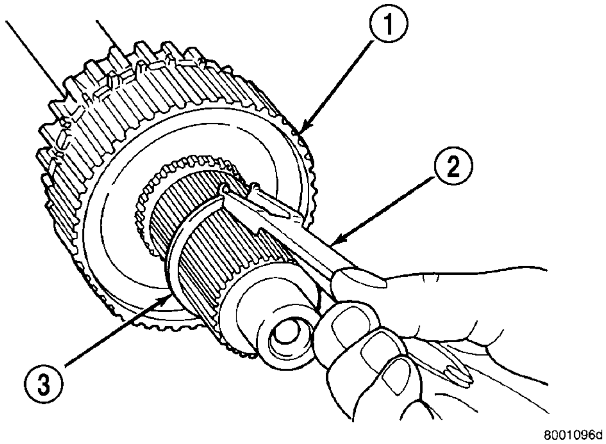


Fig. 27 Mode Hub Retaining Ring Removal

1 - MODE HUB
2 - SNAP-RING PLIERS (HEAVY DUTY)
3 - MODE HUB RETAINING RING

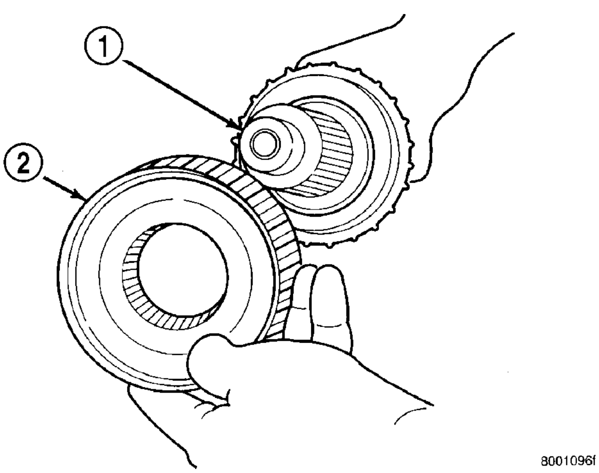


Fig. 28 Mode Hub Removal

1 - MAINSHAFT
2 - MODE HUB

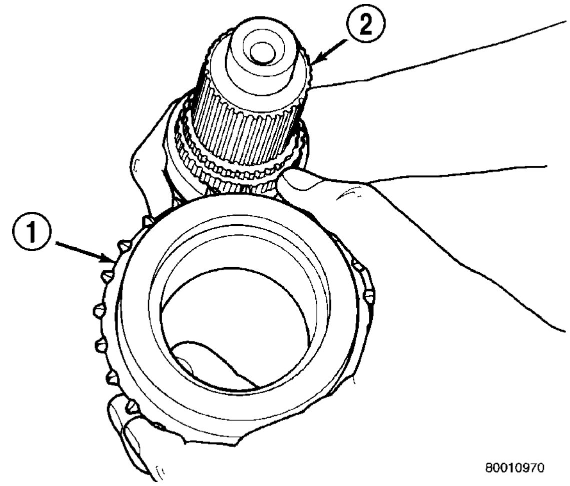


Fig. 29 Drive Sprocket Removal

1 - DRIVE SPROCKET
2 - MAINSHAFT

INPUT GEAR AND LOW RANGE GEAR

(1) Remove front bearing retainer attaching bolts (Fig. 30).

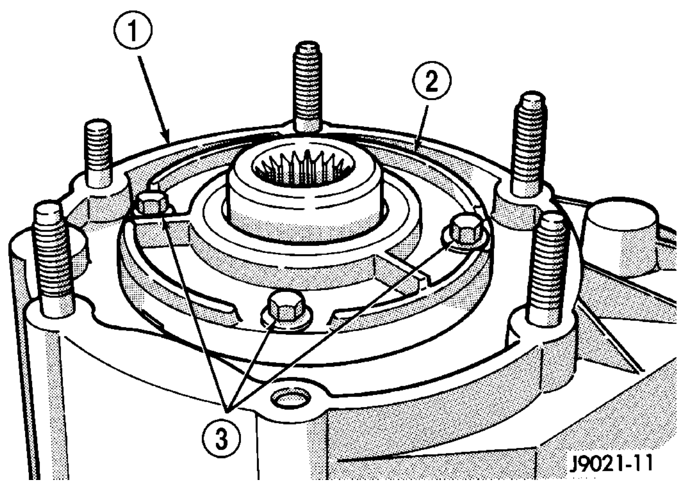


Fig. 30 Front Bearing Retainer Bolts

1 - FRONT CASE
2 - FRONT BEARING RETAINER
3 - RETAINER BOLTS

TRANSFER CASE - NV231 (Continued)

(2) Remove front bearing retainer. Pry retainer loose with pry tool positioned in slots at each end of retainer (Fig. 31).

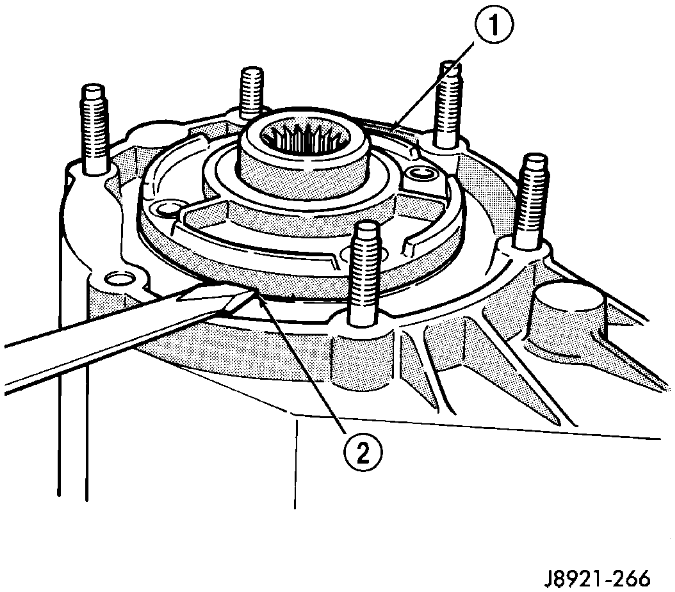


Fig. 31 Front Bearing Retainer Removal

1 - FRONT BEARING RETAINER
2 - RETAINER SLOT

(3) Remove front bearing retainer.

(4) Remove input gear retaining ring with heavy duty snap-ring pliers (Fig. 32)

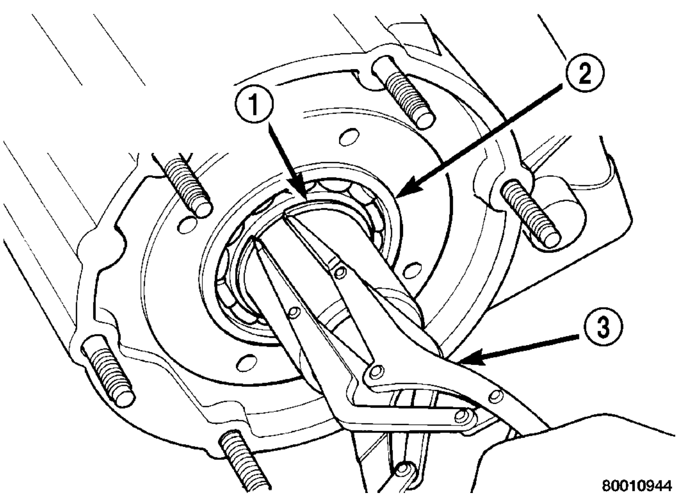


Fig. 32 Removing Input Gear Retaining Ring

1 - INPUT GEAR BEARING RETAINING RING
2 - INPUT GEAR BEARING
3 - SNAP-RING PLIERS

(5) Place front case in horizontal position. Then remove input gear and low range gear as an assembly (Fig. 33). Tap gear out of bearing with plastic mallet if necessary.

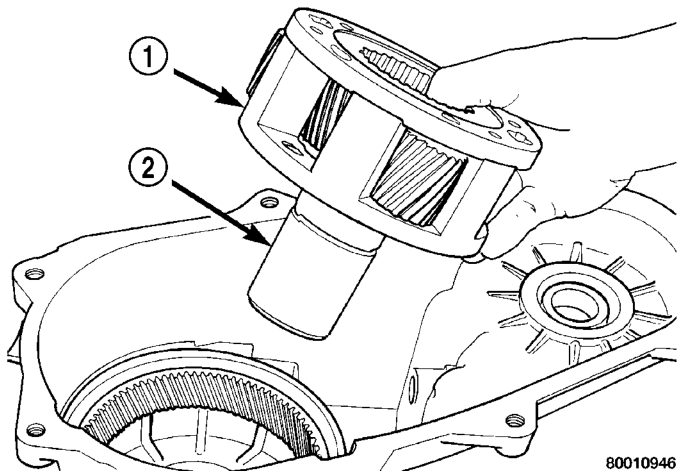


Fig. 33 Input Gear And Planetary Carrier Removal

1 - PLANETARY ASSEMBLY
2 - INPUT GEAR

INPUT AND LOW RANGE GEAR

(1) Remove snap-ring that retains input gear in low range gear (Fig. 34).

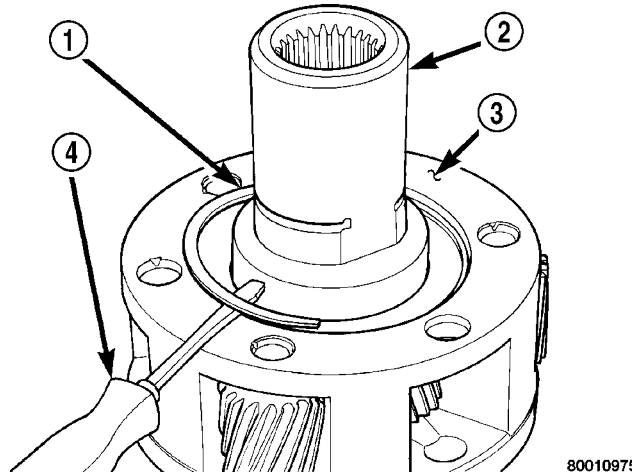


Fig. 34 Input Gear Snap-Ring Removal

1 - CARRIER LOCK RETAINING RING
2 - INPUT GEAR
3 - PLANETARY CARRIER
4 - SCREWDRIVER

TRANSFER CASE - NV231 (Continued)

(2) Remove retainer (Fig. 35).

(3) Remove front tabbed thrust washer (Fig. 36).

(4) Remove input gear (Fig. 37).

(5) Remove rear tabbed thrust washer from low range gear (Fig. 38).

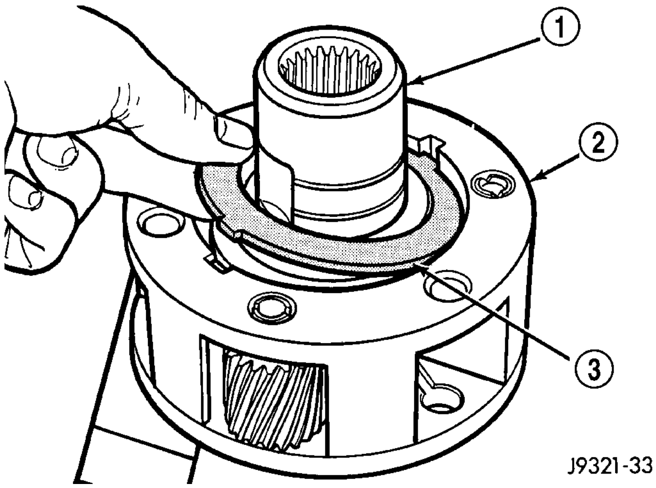


Fig. 35 Input Gear Retainer Removal

1 - INPUT GEAR
2 - LOW RANGE GEAR
3 - RETAINER

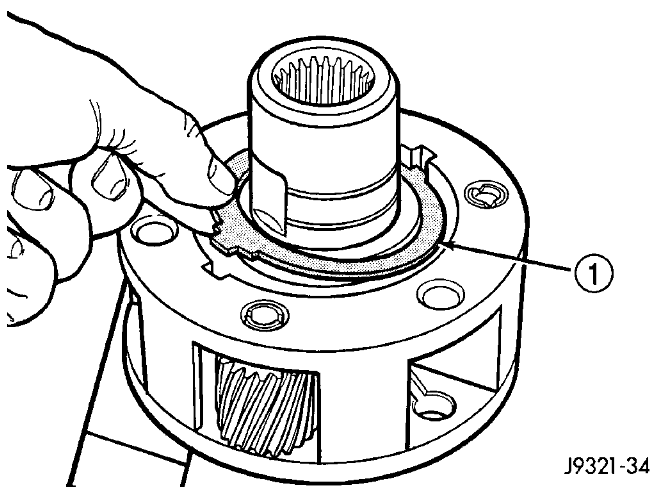


Fig. 36 Front Tabbed Thrust Washer Removal

1 - FRONT TABBED THRUST WASHER

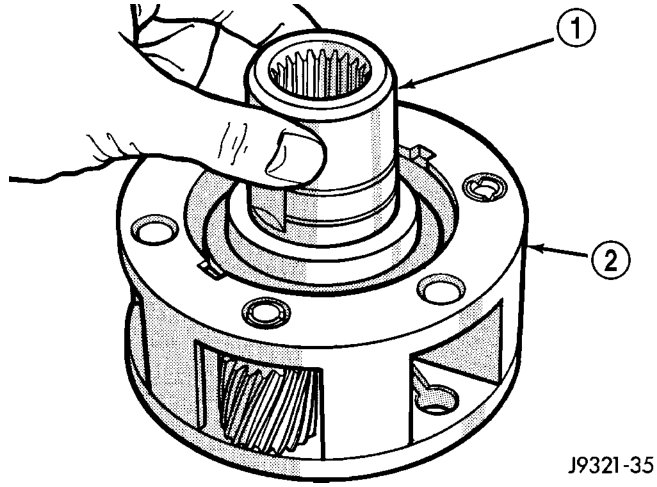


Fig. 37 Input Gear Removal

1 - INPUT GEAR
2 - LOW RANGE GEAR

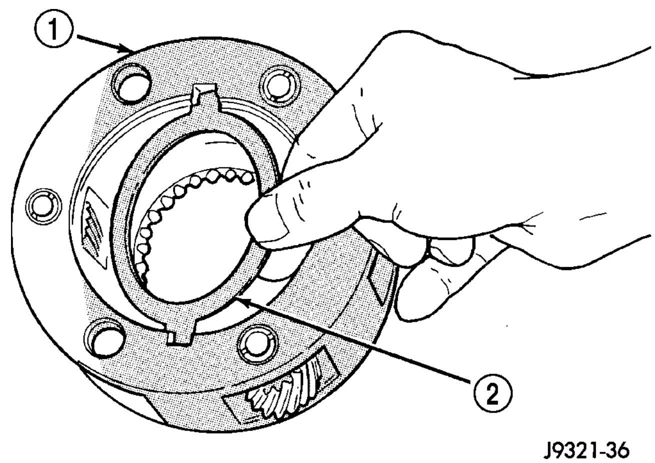


Fig. 38 Rear Tabbed Thrust Washer Removal

1 - LOW RANGE GEAR
2 - REAR TABBED THRUST WASHER

TRANSFER CASE - NV231 (Continued)

CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

INSPECTION

MAINSHAFT/SPROCKET/HUB

Inspect the splines on the hub and shaft and the teeth on the sprocket (Fig. 39). Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

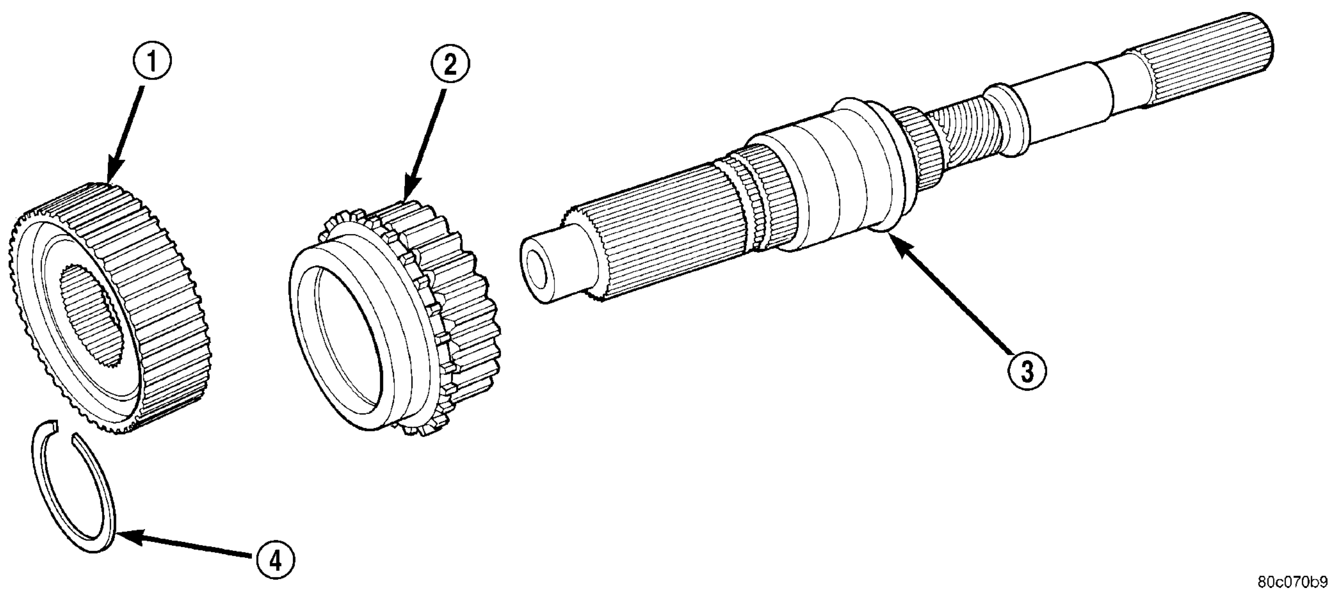


Fig. 39 Mainshaft, Mode Hub, And Drive Sprocket

1 - MODE HUB
2 - DRIVE SPROCKET
3 - MAINSHAFT
4 - MODE HUB RETAINING RING

TRANSFER CASE - NV231 (Continued)

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 40). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 41). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

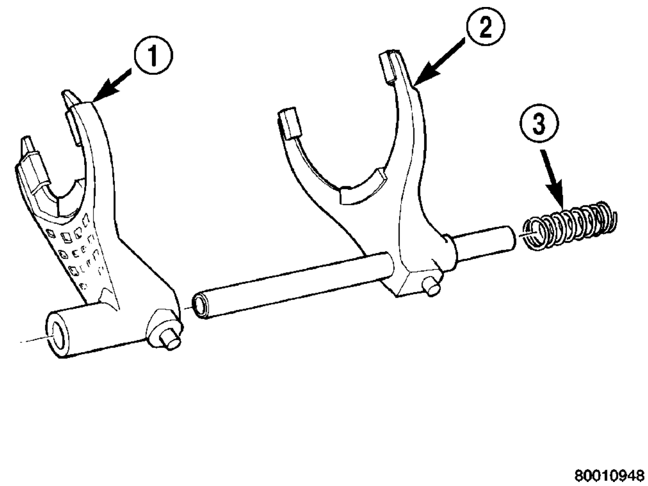


Fig. 41 Shift Forks

1 - RANGE FORK
2 - MODE FORK AND RAIL
3 - MODE SPRING

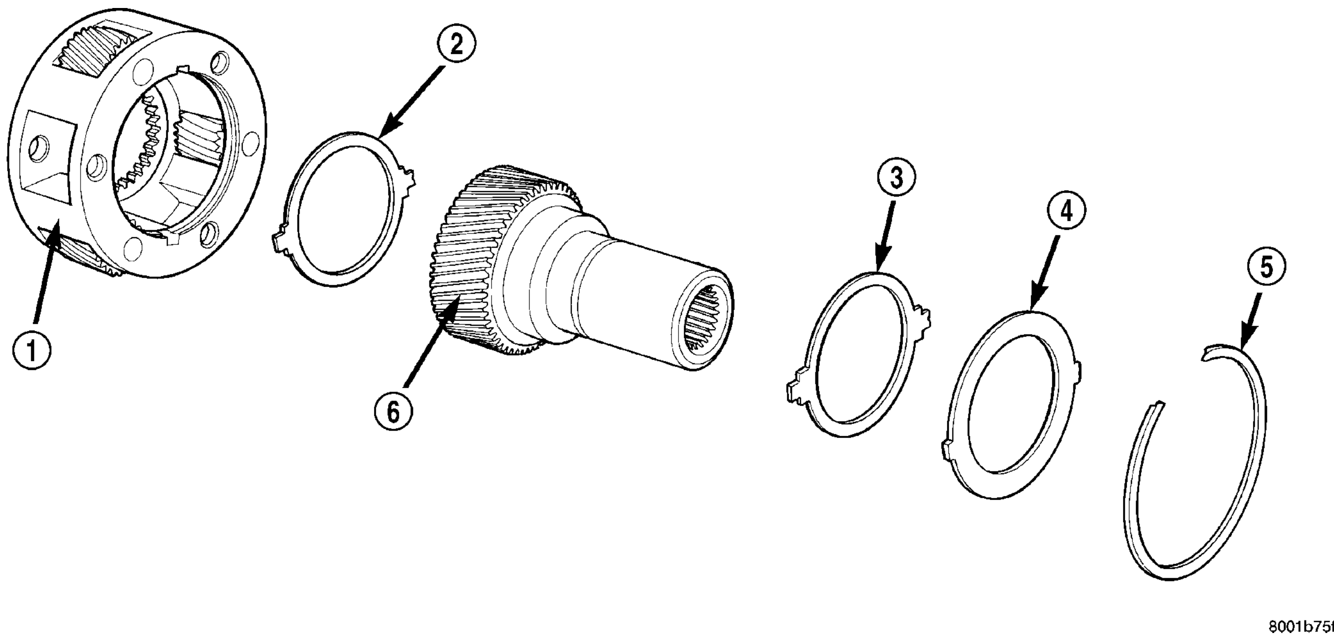


Fig. 40 Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

TRANSFER CASE - NV231 (Continued)

Inspect the shift fork wear pads (Fig. 42). The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are not serviceable. The fork must be replaced as an assembly if the pads are worn or damaged.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 43). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M™ all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

The output shaft slinger and seal should be replaced outright; do not reuse either part.

Replace any part if distorted, bent, or broken. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

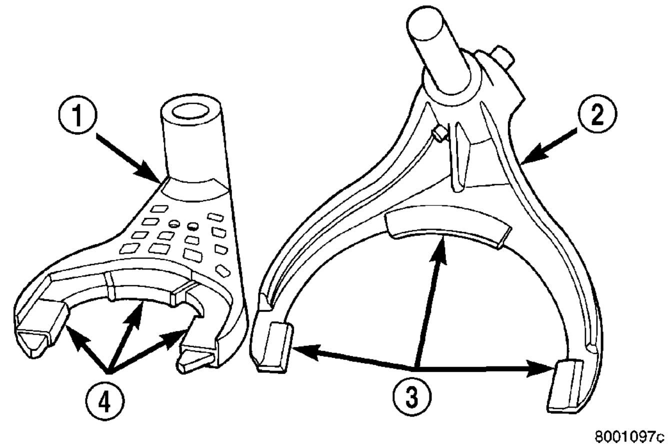


Fig. 42 Shift Fork And Wear Pad Locations

1 - RANGE FORK
2 - MODE FORK
3 - WEAR PADS (SERVICEABLE)
4 - WEAR PADS (NON-SERVICEABLE)

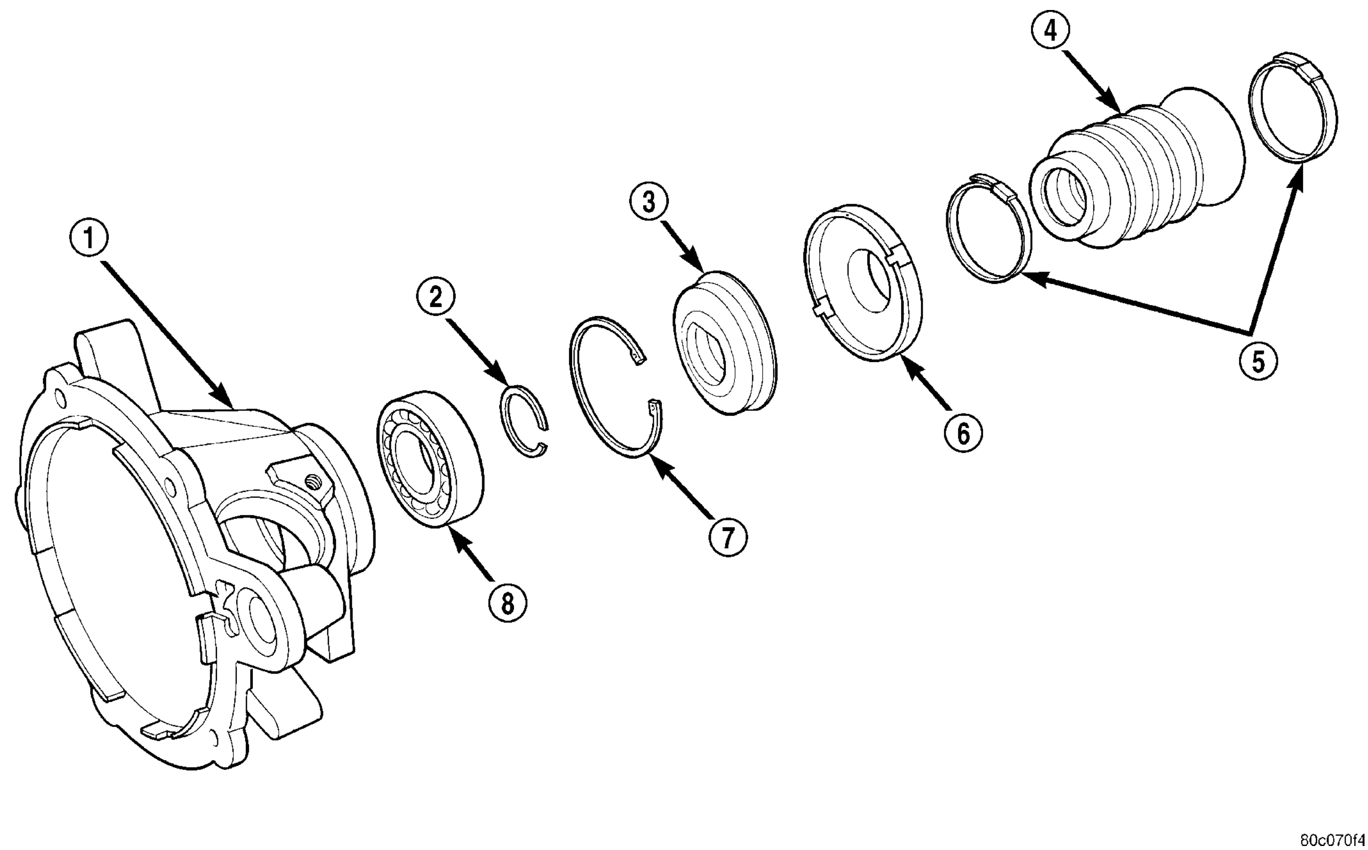


Fig. 43 Rear Retainer Without Output Shaft Damper

1 - REAR RETAINER
2 - REAR BEARING I.D. MAINSHAFT RETAINING RING
3 - REAR SEAL
4 - BOOT
5 - BAND CLAMPS
6 - REAR SLINGER
7 - REAR BEARING O.D. RETAINING RING
8 - REAR BEARING

TRANSFER CASE - NV231 (Continued)

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 44). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

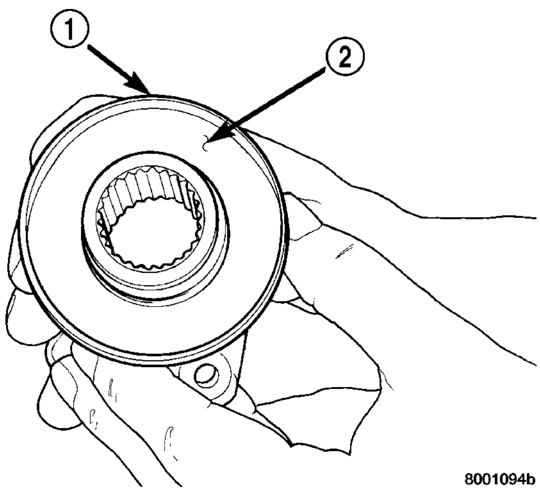


Fig. 44 Seal Contact Surface Of Yoke Slinger

1 - FRONT SLINGER (PART OF YOKE)
2 - SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 45)

FRONT/REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and 3M™ all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

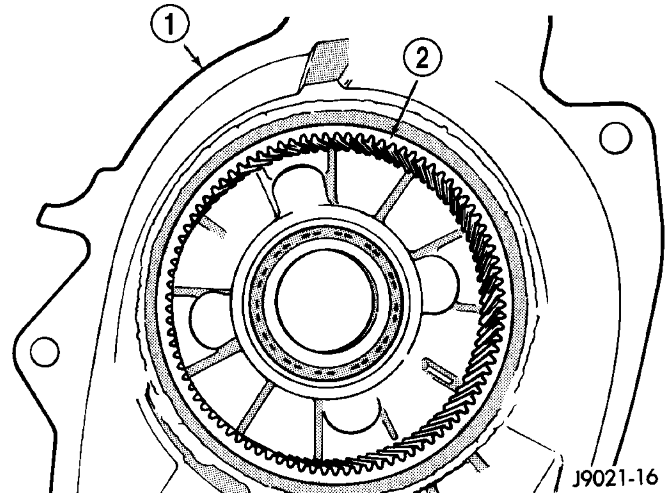


Fig. 45 Low Range Annulus Gear

1 - FRONT CASE
2 - LOW RANGE ANNULUS GEAR

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil™ stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ASSEMBLY

Lubricate transfer case components with Mopar® ATF +4, Automatic Transmission Fluid or petroleum jelly (where indicated) during assembly.

BEARINGS AND SEALS

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

TRANSFER CASE - NV231 (Continued)

(1) Remove the front output shaft seal from case with pry tool (Fig. 46).

(2) Remove the front output shaft bearing retaining ring with screwdriver (Fig. 47).

(3) Remove bearing with Tool Handle C-4171 and Tool 5065 (Fig. 48).

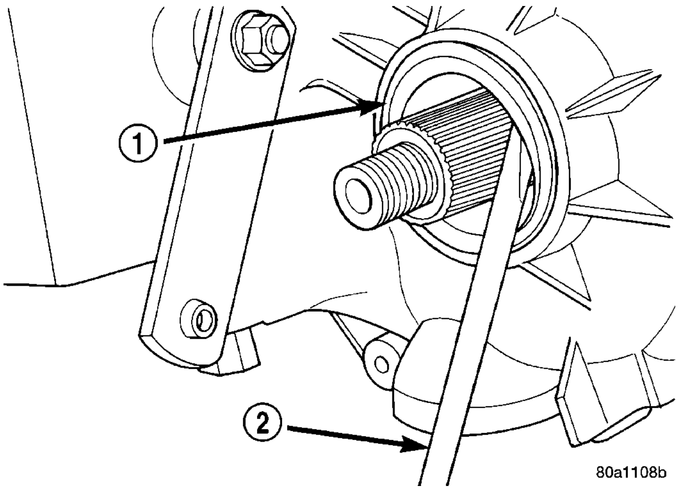


Fig. 46 Front Output Seal Removal - Typical

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

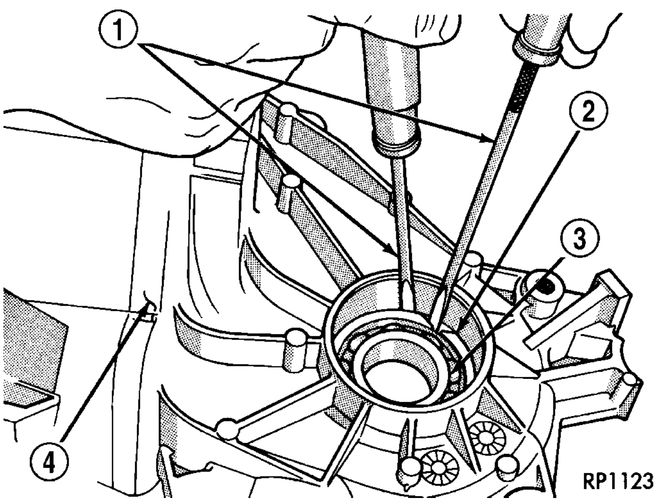


Fig. 47 Front Output Shaft Bearing Retaining Ring Removal

1 - SCREWDRIVERS
2 - SNAP-RING
3 - FRONT OUTPUT SHAFT BEARING
4 - FRONT CASE

(4) Install front output shaft front bearing in case with Tool Handle C-4171 and Installer 5064 (Fig. 49).

(5) Install output shaft front bearing retaining ring (Fig. 50). Start ring into place by hand. Then use small screwdriver to work ring into case groove. Be sure ring is fully seated before proceeding.

(6) Install new front output seal in front case with Installer Tool 8143-A as follows:

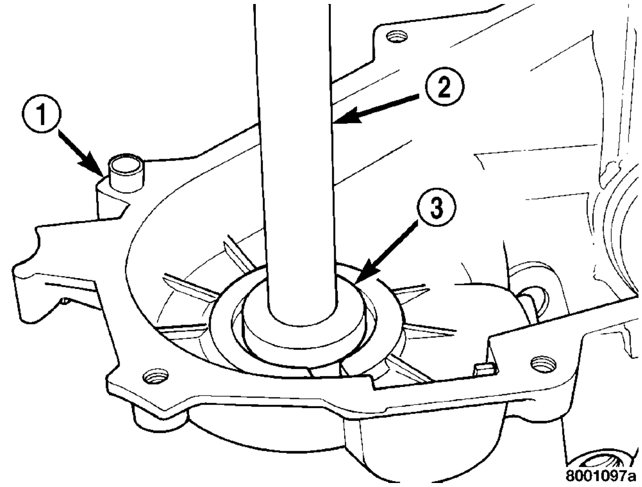


Fig. 48 Front Output Shaft Bearing Removal

1 - FRONT CASE
2 - SPECIAL TOOL C-4171
3 - SPECIAL TOOL 5065

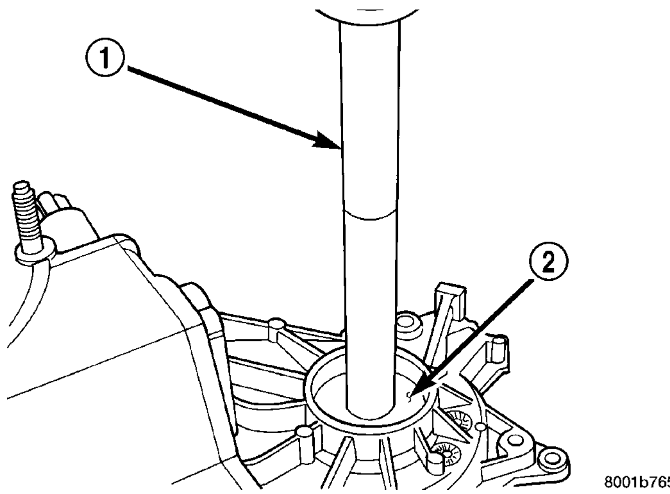


Fig. 49 Front Output Shaft Bearing Installation

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 5064

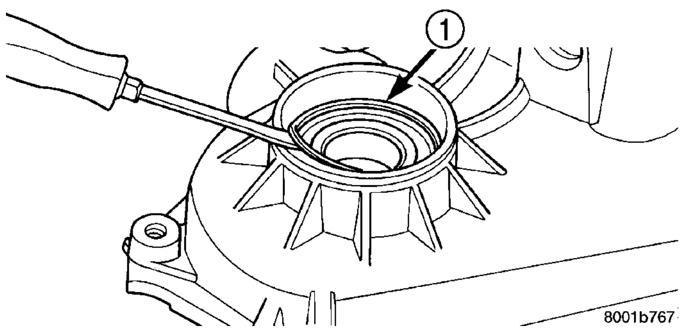


Fig. 50 Installing Output Shaft Front Bearing Retaining Ring

1 - WORK RETAINING RING INTO BORE GROOVE WITH SMALL SCREWDRIVER

TRANSFER CASE - NV231 (Continued)

(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**

(b) Start seal in bore with light taps from hammer (Fig. 51). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

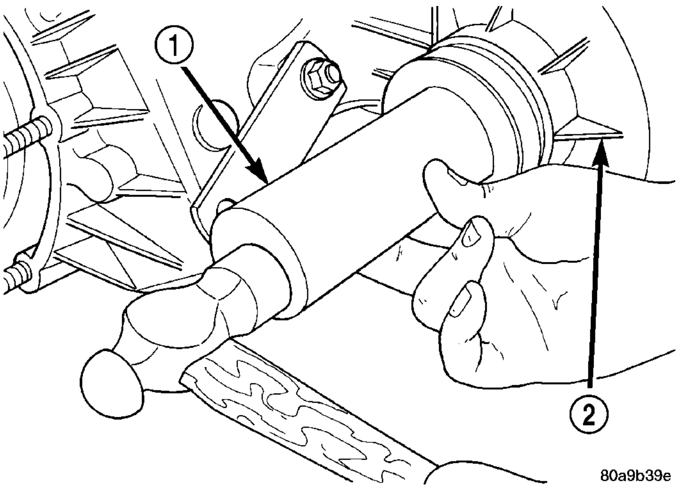


Fig. 51 Front Output Seal Installation - Typical

1 - INSTALLER 8143-A
2 - TRANSFER CASE

(7) Remove the output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 52).

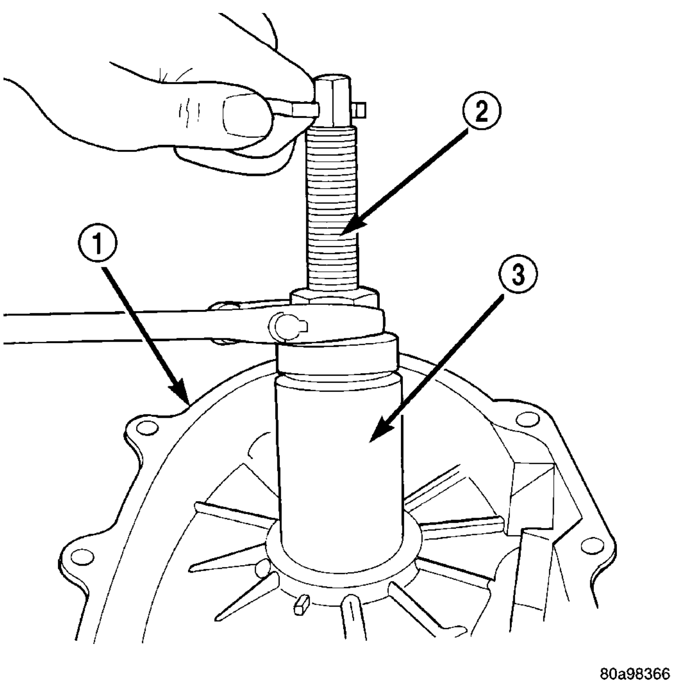


Fig. 52 Output Shaft Rear Bearing Removal

1 - REAR CASE
2 - SPECIAL TOOL L-4454-1 AND L-4454-3
3 - SPECIAL TOOL 8148

(8) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 53). The bearing bore is chamfered at the top. Install the bearing so it is flush with the lower edge of this chamfer (Fig. 54).

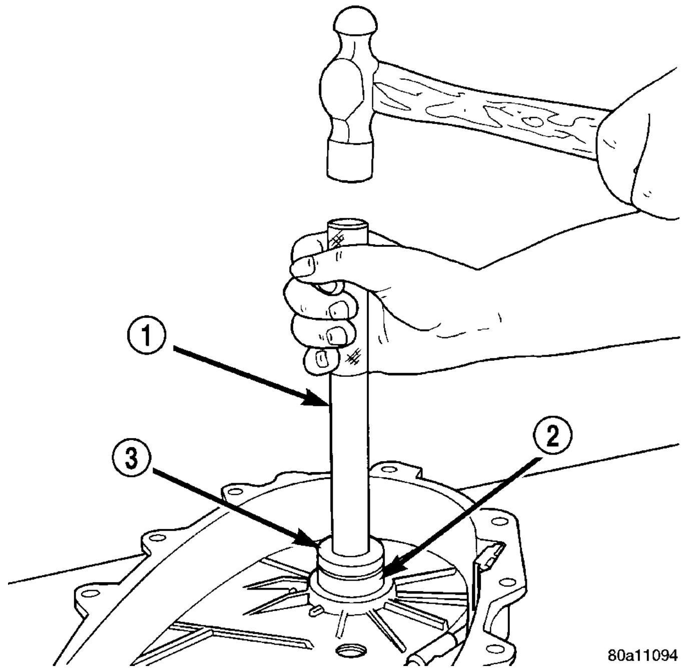


Fig. 53 Output Shaft Rear Bearing Installation

1 - HANDLE C-4171
2 - OUTPUT SHAFT INNER BEARING
3 - INSTALLER 5066

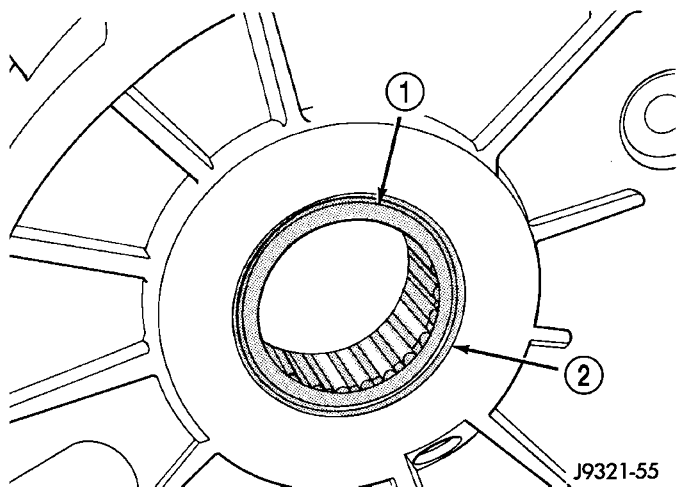


Fig. 54 Output Shaft Rear Bearing Installation Depth

1 - BEARING (SEATED) AT LOWER EDGE OF CHAMFER
2 - CHAMFER

TRANSFER CASE - NV231 (Continued)

(9) Using Remover C-4210 and Handle C-4171, drive input shaft bearing from inside the annulus gear opening in the case (Fig. 55).

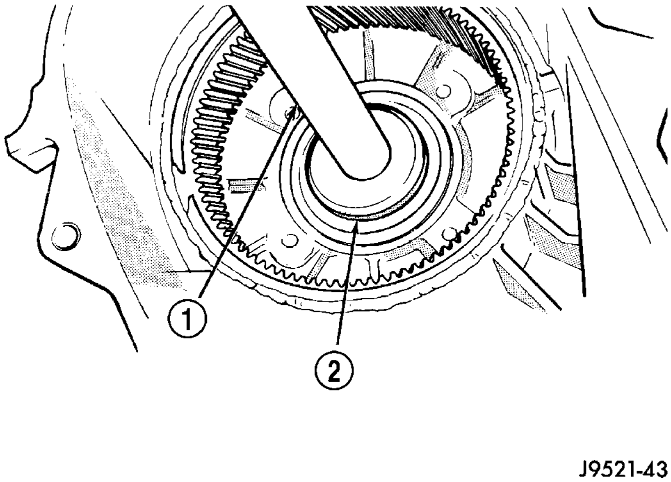


Fig. 55 Input Shaft Bearing Removal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-4210

(10) Install locating ring on new bearing.

(11) Position case so forward end is facing upward.

(12) Using Remover C-4210 and Handle C-4171, drive input shaft bearing into case. The bearing locating ring must be fully seated against case surface (Fig. 56).

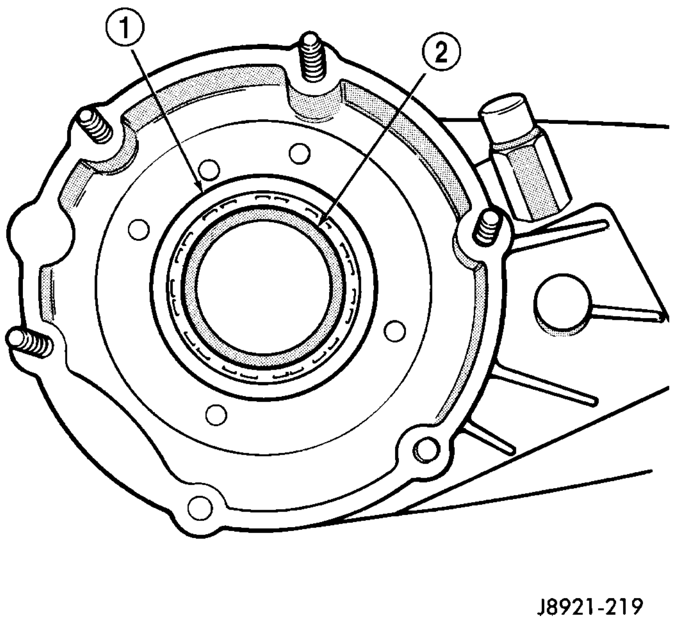


Fig. 56 Seating Input Shaft Bearing

1 - SNAP-RING
2 - INPUT SHAFT BEARING

(13) Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 57).

(14) Install new pilot bearing with Installer 5065 and Handle C-4171 (Fig. 58).

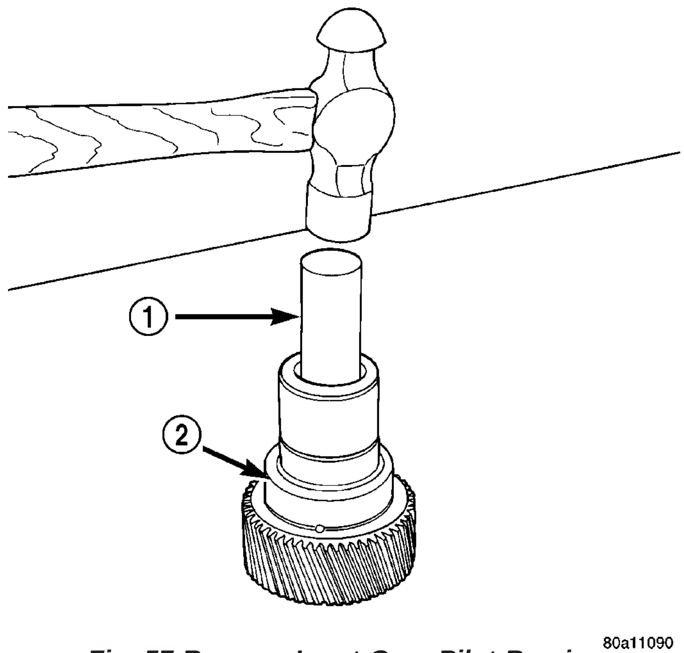


Fig. 57 Remove Input Gear Pilot Bearing

1 - DRIFT
2 - INPUT GEAR

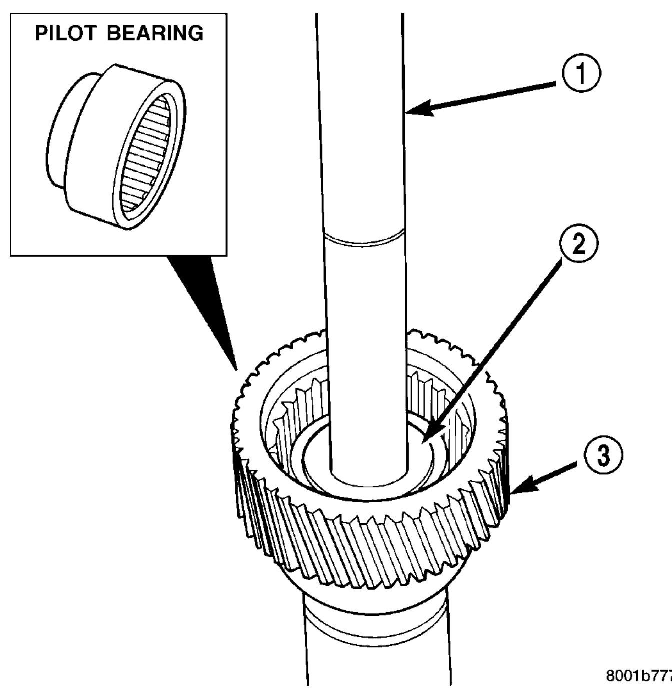


Fig. 58 Install Input Gear Pilot Bearing

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 5065
3 - INPUT GEAR

(15) Remove front bearing retainer seal with suitable pry tool.

TRANSFER CASE - NV231 (Continued)

(16) Install new front bearing retainer seal with Installer 7884 (Fig. 59).

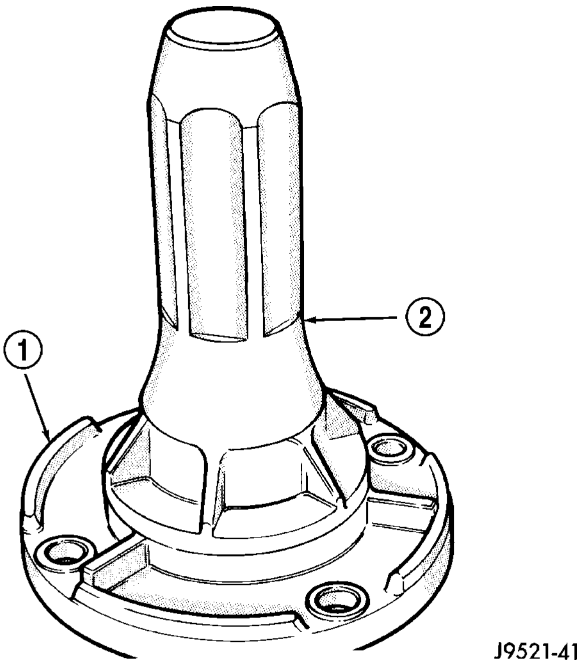


Fig. 59 Install Front Bearing Retainer Seal

1 - FRONT BEARING RETAINER
2 - SPECIAL TOOL 7884

(17) Remove seal from oil pump housing with a suitable pry tool

(18) Install new seal in oil pump housing with Installer 7888 (Fig. 60).

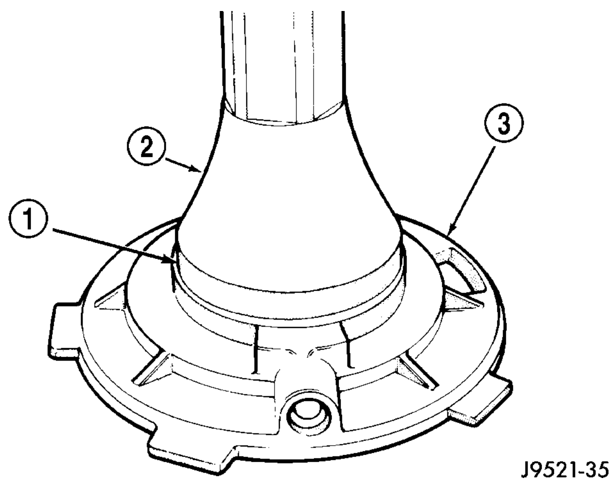


Fig. 60 Oil Pump Seal Installation

1 - HOUSING SEAL
2 - SPECIAL TOOL 7888
3 - OIL PUMP FEED HOUSING

(19) Remove rear retainer bearing with Installer 8128 and Handle C-4171.

(20) Install rear bearing in retainer with Handle C-4171 and Installer 5052 (Fig. 61).

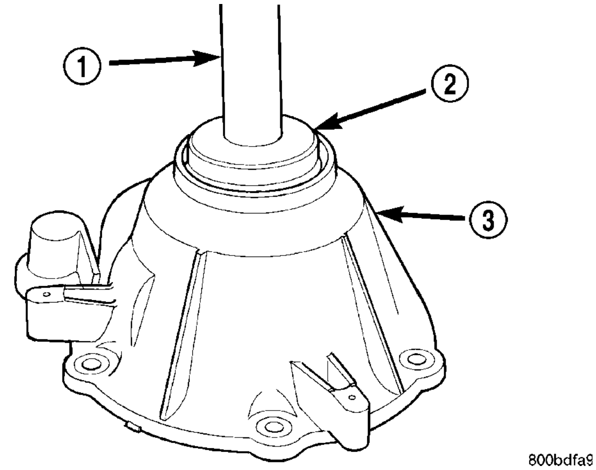


Fig. 61 Installing Rear Bearing In Retainer

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 5052
3 - REAR RETAINER

INPUT AND LOW RANGE GEAR

(1) Install first thrust washer in low range gear (Fig. 62). Be sure washer tabs are properly aligned in gear notches.

(2) Install input gear in low range gear. Be sure input gear is fully seated.

(3) Install remaining thrust washer in low range gear and on top of input gear. Be sure washer tabs are properly aligned in gear notches.

(4) Install retainer on input gear and install snap-ring.

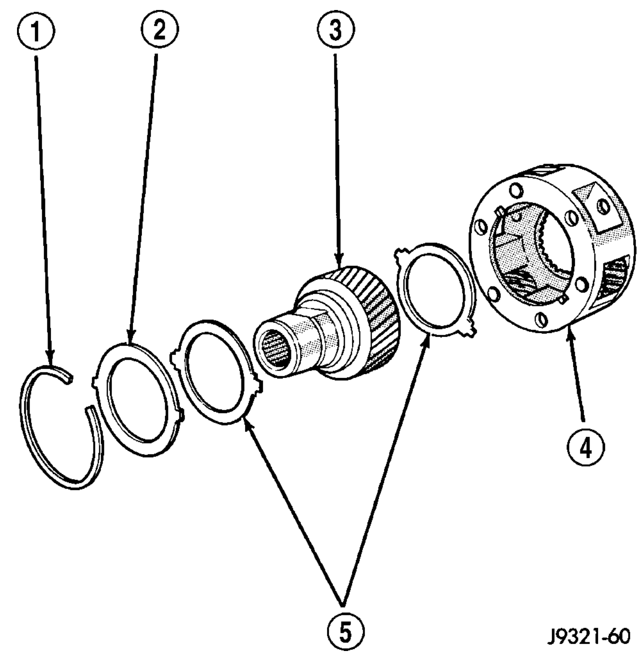


Fig. 62 Input/Low Range Gear Components

1 - SNAP-RING
2 - RETAINER PLATE
3 - INPUT GEAR
4 - LOW RANGE GEAR
5 - THRUST WASHERS

TRANSFER CASE - NV231 (Continued)

(5) Align and install low range/input gear assembly in front case (Fig. 63). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

(6) Install snap-ring to hold input/low range gear into front bearing (Fig. 64).

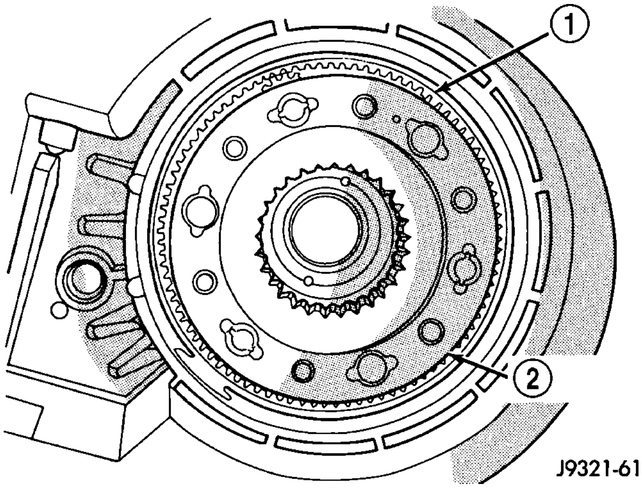


Fig. 63 Input/Low Range Gear Installation

1 - ANNULUS GEAR
2 - INPUT/LOW RANGE GEAR

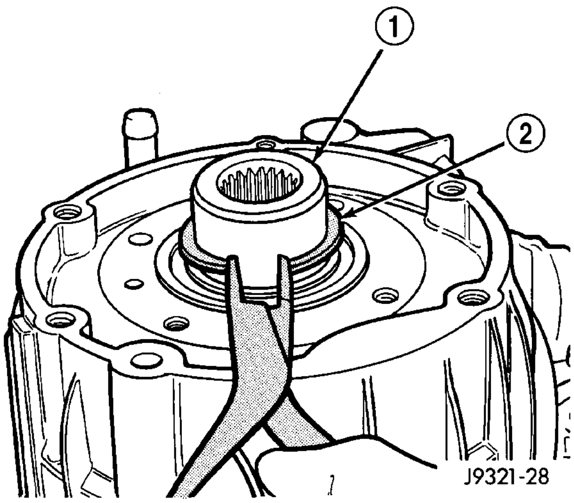


Fig. 64 Install Snap-Ring

1 - INPUT GEAR
2 - SNAP-RING

(7) Clean gasket sealer residue from retainer and inspect retainer for cracks or other damage.

(8) Apply a 3 mm (1/8 in.) bead of Mopar® gasket maker or silicone adhesive to sealing surface of retainer.

(9) Align cavity in seal retainer with fluid return hole in front of case.

CAUTION: Do not block fluid return cavity on sealing surface of retainer when applying Mopar® gasket maker or silicone adhesive sealer. Seal failure and fluid leak can result.

(10) Install bolts to hold retainer to transfer case (Fig. 65). Tighten to 21 N·m (16 ft. lbs.) of torque.

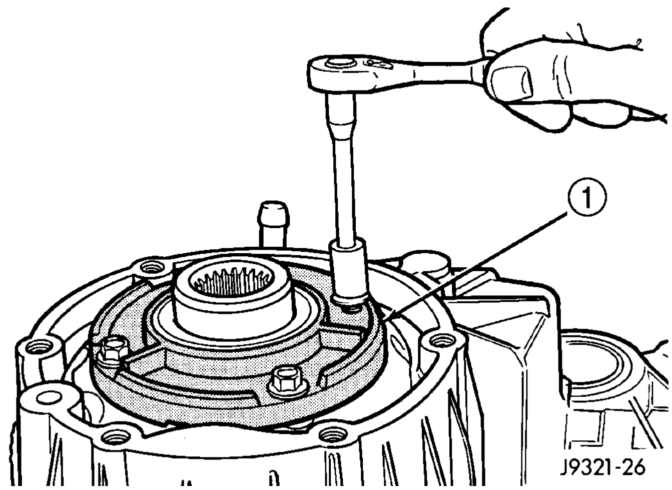


Fig. 65 Install Front Bearing Retainer

1 - FRONT BEARING RETAINER

MAINSHAFT

(1) Lubricate mainshaft splines with recommended transmission fluid.

(2) Slide drive sprocket onto mainshaft.

(3) Slide mode hub onto mainshaft.

(4) Install mode hub retaining ring. Verify that the retaining ring is fully seated in mainshaft groove.

SHIFT FORKS, SECTOR, AND MAINSHAFT

(1) Install the shift sector shaft bearing using a suitable socket until the bearing is flush to the bottom, inner edge of the bore (Fig. 66).

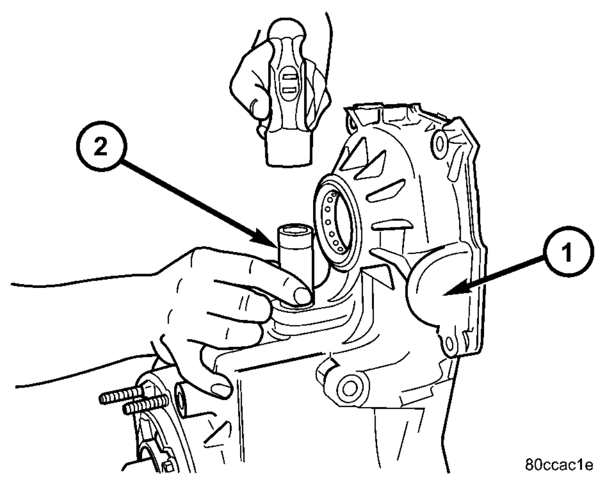


Fig. 66 Install Shift Sector Shaft Bearing

1 - TRANSFER CASE
2 - SOCKET

TRANSFER CASE - NV231 (Continued)

(2) Install a new shift sector shaft seal using a suitable socket until the seal is flush to the bottom of the bore lead-in chamfer.

(3) Install shift sector in case (Fig. 67). Lubricate sector shaft with transmission fluid before installation.

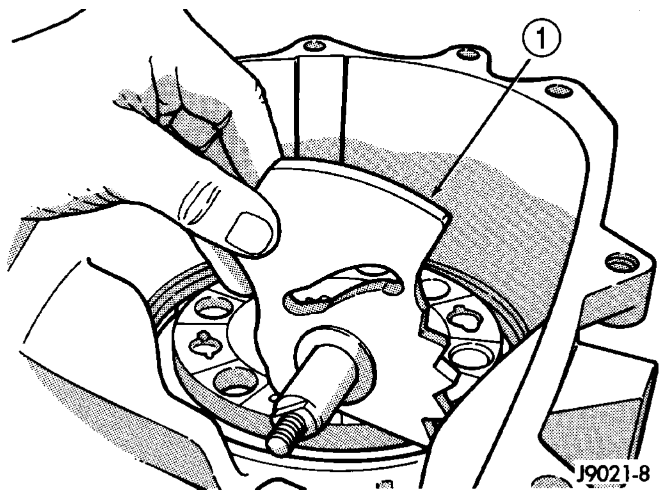


Fig. 67 Shift Sector Installation

1 - SHIFT SECTOR

(4) Assemble and install range fork and hub (Fig. 68). Be sure hub is properly seated in low range gear and engaged to the input gear.

(5) Align and insert range fork pin in shift sector slot.

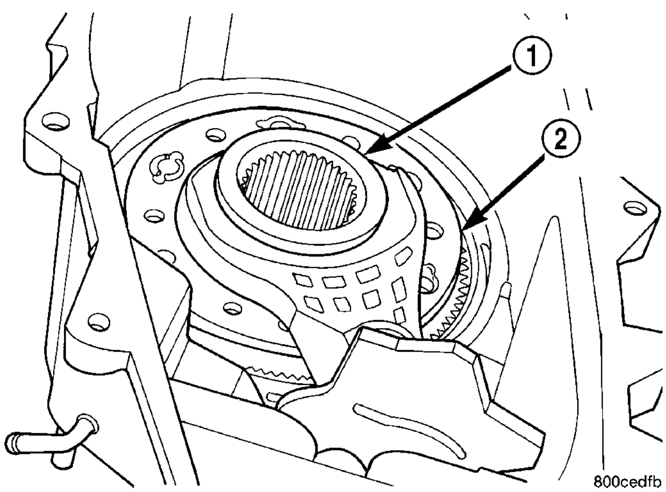


Fig. 68 Install Range Fork And Sleeve Assembly

1 - RANGE SLEEVE
2 - RANGE FORK

(6) Install assembled mainshaft (Fig. 69). Be sure shaft is seated in pilot bearing and input gear.

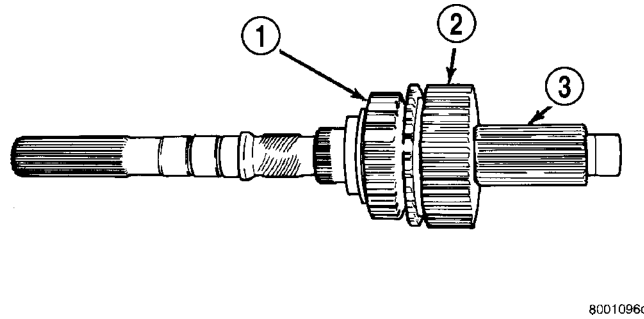


Fig. 69 Mainshaft Assembly Installation

1 - DRIVE SPROCKET
2 - MODE HUB
3 - MAINSHAFT

(7) Install new pads on mode fork if necessary.

(8) Insert mode sleeve in mode fork mode fork. Be sure long side of sleeve is toward long end of shift rail (Fig. 70).

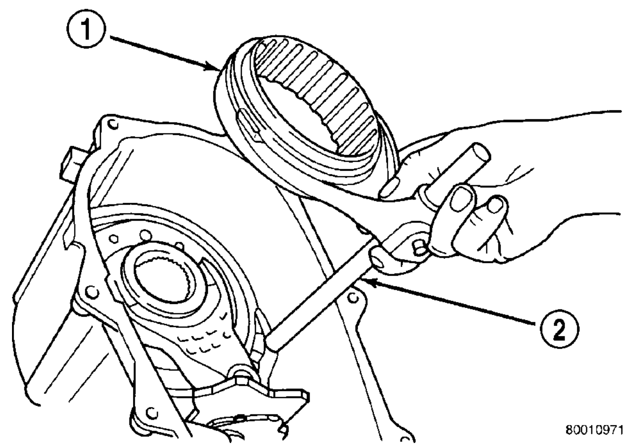


Fig. 70 Assembling Mode Fork And Sleeve

1 - MODE SLEEVE
2 - MODE FORK AND RAIL

TRANSFER CASE - NV231 (Continued)

(9) Install assembled mode fork and sleeve (Fig. 71). Be sure fork rail goes through range fork and into case bore. Also be sure sleeve is aligned and seated on mainshaft hub.

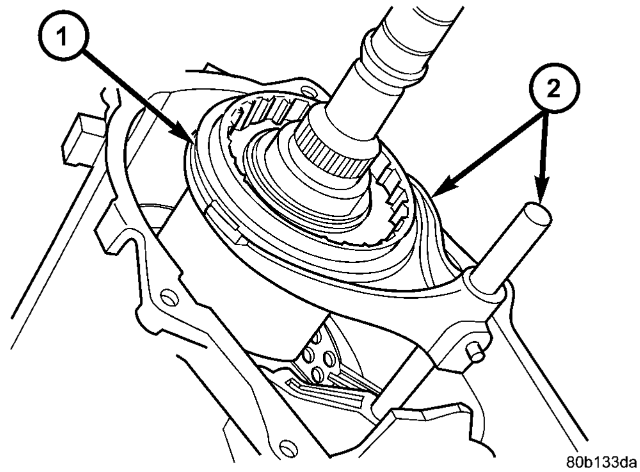


Fig. 71 Mode Fork And Sleeve Installation

1 - MODE SLEEVE
2 - MODE FORK AND RAIL

(10) Rotate sector to NEUTRAL position.

(11) Install new O-ring on detent plug (Fig. 72).

(12) Lubricate detent plunger with transmission fluid or light coat of petroleum jelly.

(13) Install detent plunger, spring and plug (Fig. 72).

(14) Verify that plunger is properly engaged in sector.

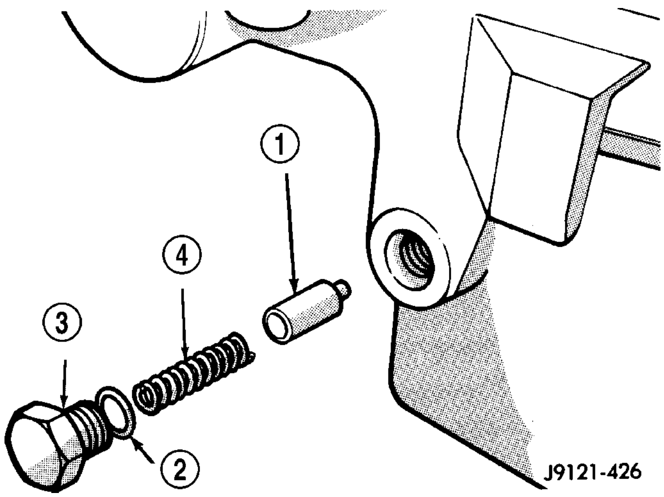


Fig. 72 Detent Plug, Spring, And Plunger Installation

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Lubricate front output shaft-sprocket assembly, drive chain, and drive sprocket with transmission fluid.

(2) Assemble drive chain and front output shaft (Fig. 73).

(3) Start chain on mainshaft drive sprocket.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 73).

(5) Install mode spring on upper end of mode fork shift rail (Fig. 74).

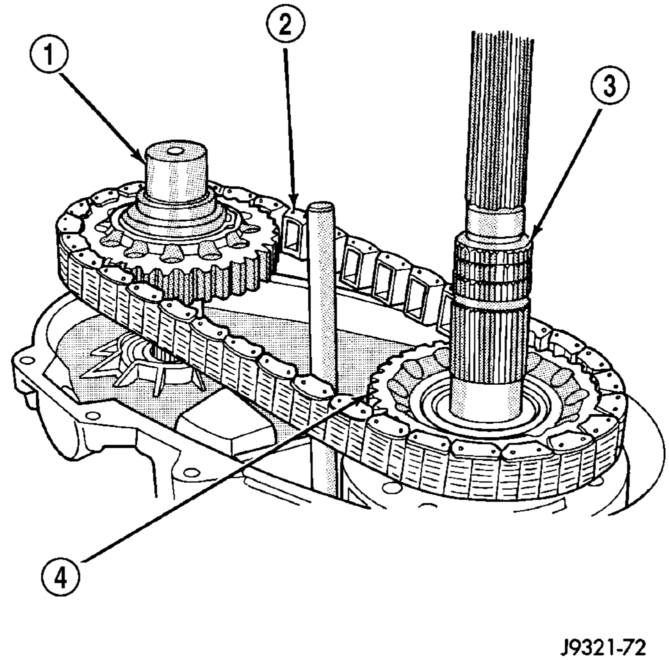


Fig. 73 Installing Drive Chain And Front Output Shaft

1 - FRONT OUTPUT SHAFT
2 - DRIVE CHAIN
3 - MAINSHAFT
4 - DRIVE SPROCKET

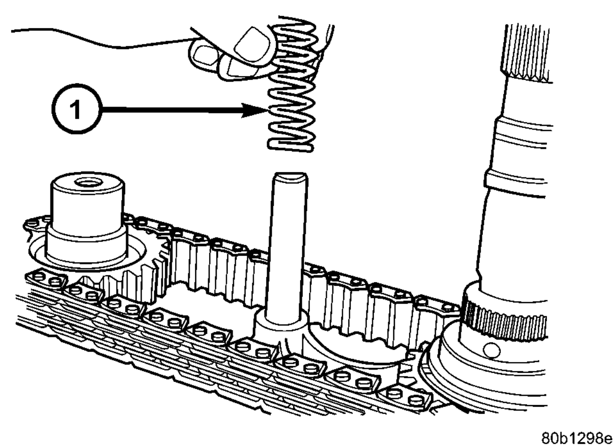


Fig. 74 Mode Fork Spring Removal

1 - MODE FORK SPRING

TRANSFER CASE - NV231 (Continued)

OIL PUMP AND REAR CASE

(1) Install magnet in front case pocket (Fig. 75).

(2) Assemble oil pickup screen, connecting hose, and tube.

(3) Install new pickup tube O-ring in oil pump (Fig. 76).

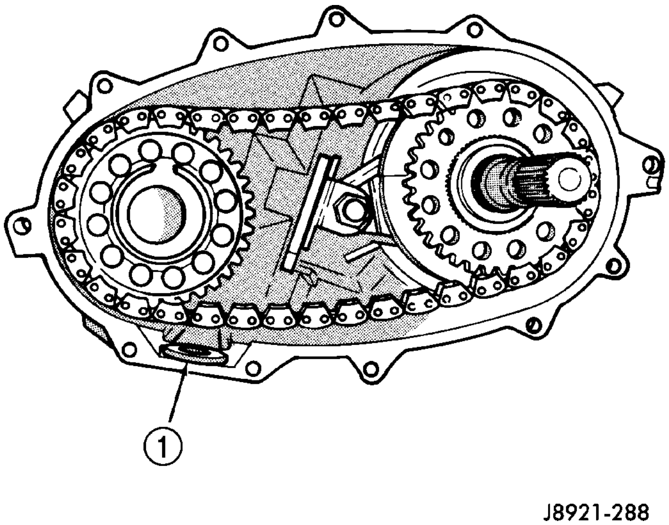


Fig. 75 Installing Case Magnet

1 - MAGNET

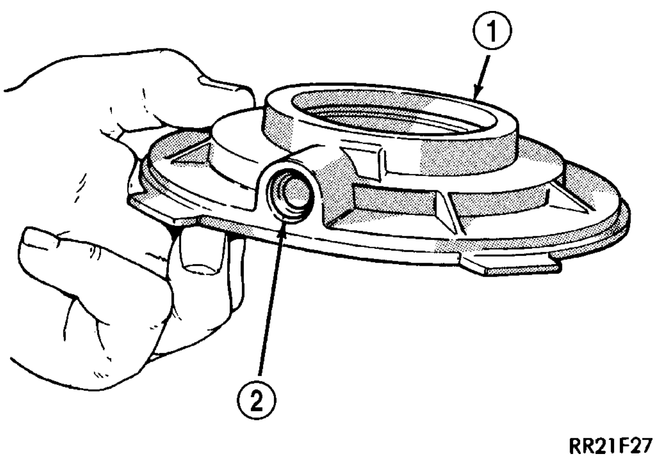


Fig. 76 Pickup Tube O-Ring Position

1 - OIL PUMP
2 - O-RING

(4) Insert oil pickup tube in oil pump inlet.

(5) Position assembled oil pump and pickup tube in rear case. Be sure pickup screen is securely seated in case slot. Also be sure oil pump locating tabs are outside rear case (Fig. 77).

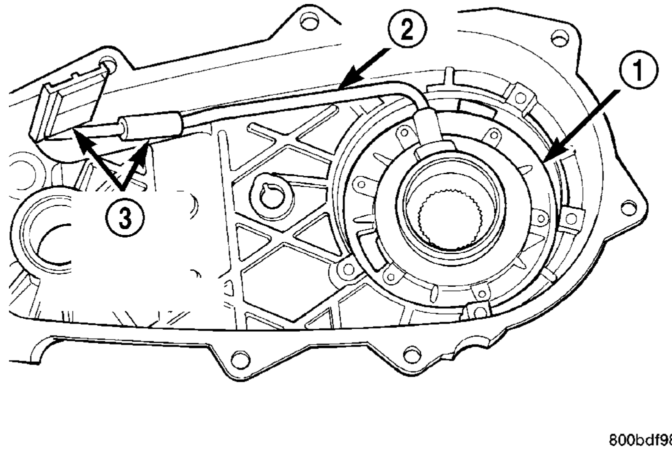


Fig. 77 Oil Pump And Pickup Tube Installation

1 - OIL PUMP
2 - PICKUP TUBE
3 - PICKUP SCREEN AND CONNECTOR

(6) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting flange of front case. Work sealer bead around bolt holes.

(7) Lift rear case and oil pump and carefully position assembly on front case. Be sure case dowels are aligned and that mode fork rail extends through rear case before seating rear case on front case.

(8) Install case attaching bolts. Alignment bolts at each end of case are only ones requiring washers (Fig. 78).

(9) Tighten case bolts to 27-34 N·m (20-25 ft. lbs.) torque.

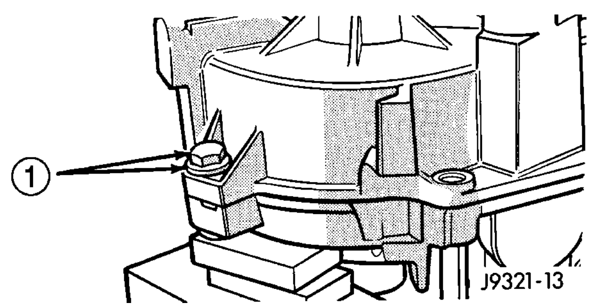


Fig. 78 Alignment Bolt Location

1 - ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

TRANSFER CASE - NV231 (Continued)

COMPANION FLANGE AND RANGE LEVER

(1) Install range lever and bolt on sector shaft (Fig. 79). Tighten bolt to 27-34 N·m (20-25 ft. lbs.) torque.

(2) Inspect the o-ring on the transfer case position sensor. Replace the o-ring if necessary.

(3) Install the transfer case position sensor in the front case (Fig. 80). Tighten sensor to 20-34 N·m (15-25 ft. lbs.) torque.

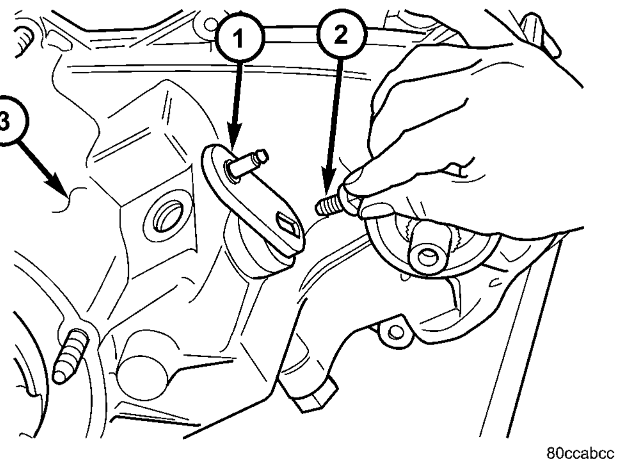


Fig. 79 Install Shift Lever Bolt

1 - RANGE LEVER
2 - RANGE LEVER BOLT
3 - TRANSFER CASE

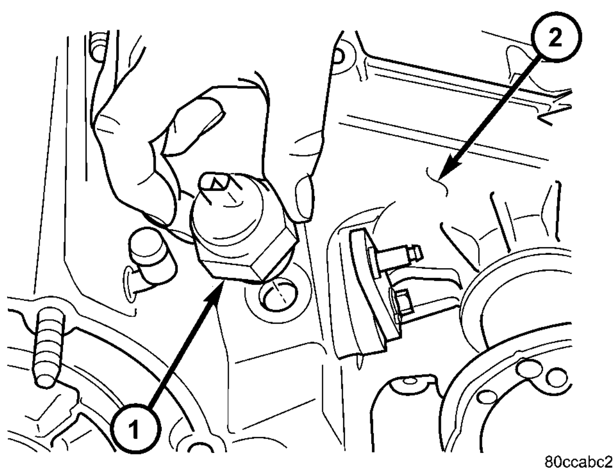


Fig. 80 Install Transfer Case Position Sensor

1 - TRANSFER CASE POSITION SENSOR
2 - TRANSFER CASE

(4) Install new seal washer on front output shaft (Fig. 81).

(5) Lubricate companion flange hub with transmission fluid and install flange onto the front output shaft.

(6) Install new seal washer on front shaft.

(7) Install new flange nut onto front output shaft.

(8) Tighten flange nut to 122-176 N·m (90-130 ft. lbs.) torque.

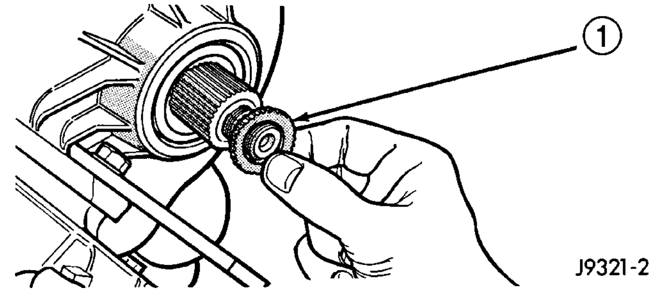


Fig. 81 Seal Washer Installation

1 - SEAL WASHER

REAR RETAINER

(1) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 inch.

(2) Install the forward rear output shaft bearing locating snap-ring.

(3) Install rear retainer on rear case. Tighten retainer bolts to 20-27 N·m (15-20 ft. lbs.) torque.

(4) Install rear bearing I.D. retaining ring onto output shaft.

(5) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(6) Slide seal onto Seal Protector 8824 (Fig. 82). Slide seal protector and seal onto output shaft.

(7) Slide Installer 8691 onto seal and mainshaft. Drive seal into rear bearing retainer (Fig. 83).

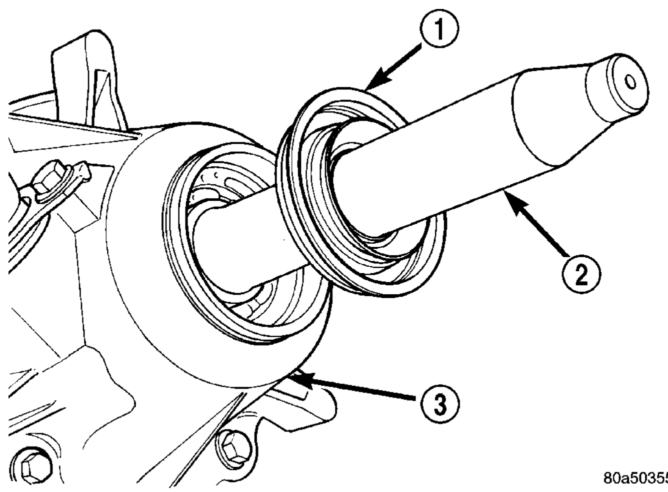


Fig. 82 Output Shaft Seal and Protector

1 - OUTPUT SHAFT SEAL
2 - SPECIAL TOOL 8824
3 - TRANSFER CASE

(8) Install a new output shaft rear slinger with Installer 9023.

TRANSFER CASE - NV231 (Continued)

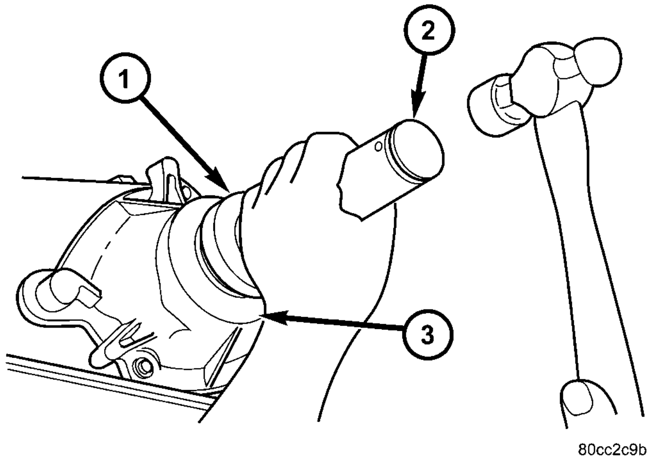


Fig. 83 Rear Seal Installation

1 - SPECIAL TOOL 8691
2 - HANDLE
3 - TRANSFER CASE

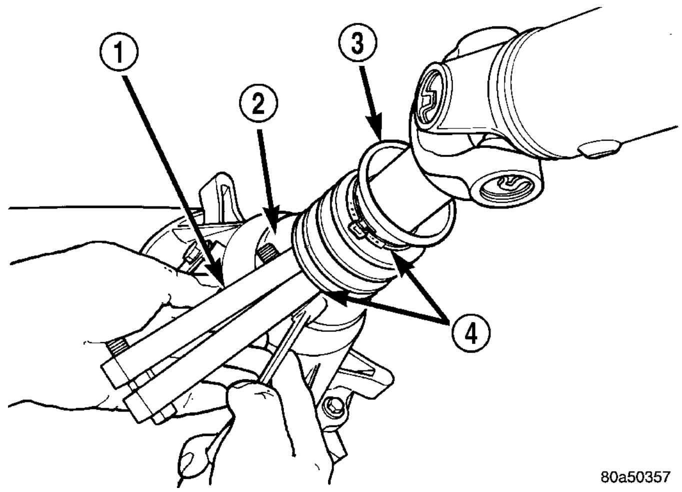


Fig. 84 Slinger Boot Installation - Typical

1 - SPECIAL TOOL C-4975-A
2 - SLINGER
3 - BOOT
4 - CLAMP

(9) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 84).

INSTALLATION

(1) Mount transfer case on a transmission jack.
(2) Secure transfer case to jack with chains.
(3) Position transfer case under vehicle.
(4) Align transfer case and transmission shafts and install transfer case on transmission.
(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.
(6) Connect vent hose.
(7) Connect transfer case position sensor connector to sensor.
(8) Align and connect propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).
(9) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.
(10) Install skid plate.(Refer to 13 - FRAME & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
(11) Remove transmission jack and support stand.
(12) Connect shift cable to transfer case range lever.
(13) Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

TRANSFER CASE - NV231

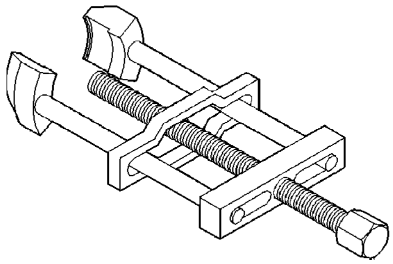
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Front Brg. Retainer	21	16	-
Bolt, Case Half	27-34	20-25	-
Nut, Front Companion Flange	122-176	90-130	-
Bolt, Range Lever	27-34	20-25	-
Bolt, Rear Retainer	35-46	26-34	-
Nuts, Mounting	35-47	26-35	-
Sensor, Transfer Case Position	20-34	15-25	-

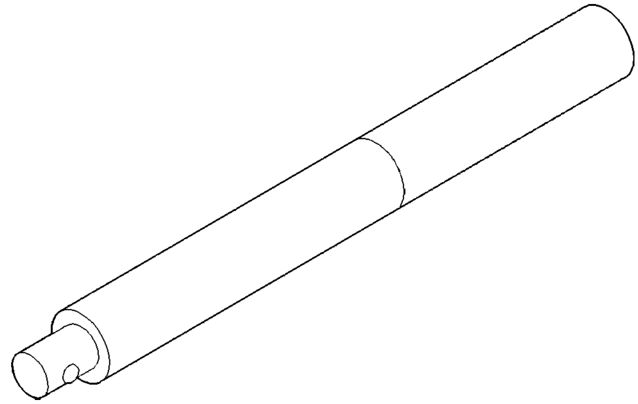
TRANSFER CASE - NV231 (Continued)

SPECIAL TOOLS

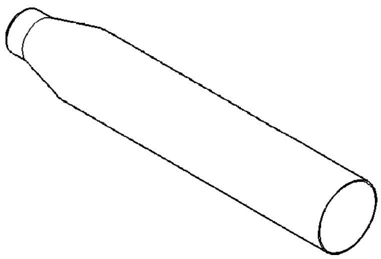
TRANSFER CASE - NV231



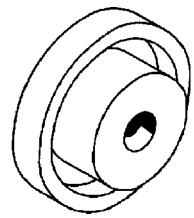
Puller, Slinger - MD-998056-A



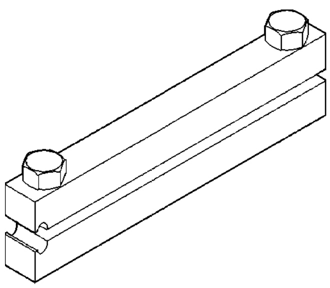
Handle, Universal - C-4171



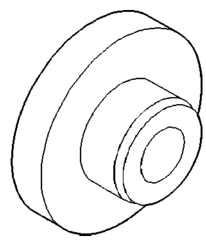
Protector, Seal - 8824



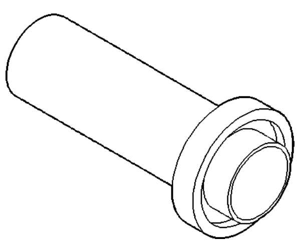
Installer, Seal - C-4210



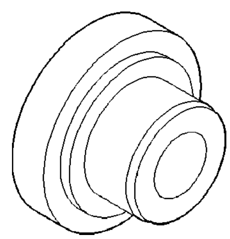
Installer, Boot Clamp - C-4975-A



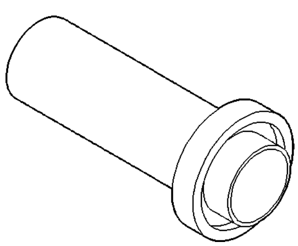
Installer, Bearing - 5052



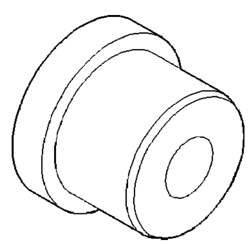
Installer, Seal - 8143-A



Installer, Bearing - 5065

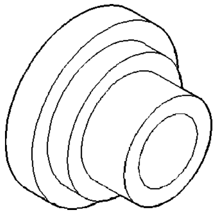


Installer, Seal - 8691

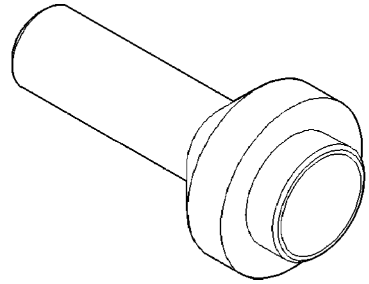


Installer, Bushing - 5066

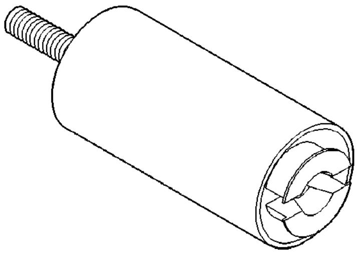
TRANSFER CASE - NV231 (Continued)



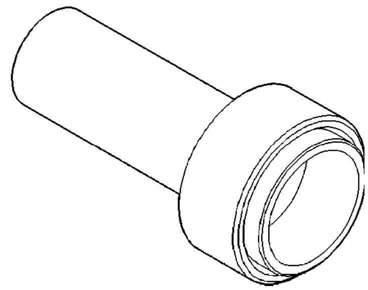
Installer, Bearing - 8128



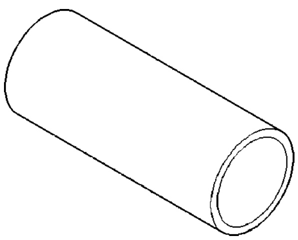
Installer, Seal - 7884



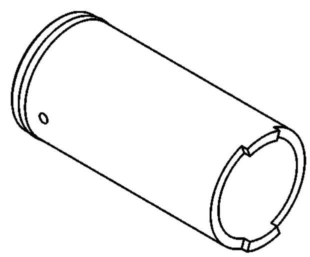
Remover - L-4454



Installer, Pump Housing Seal - 7888



Cup - 8148



Installer, Output Shaft Slinger - 8408

FLUID

STANDARD PROCEDURE - FLUID DRAIN AND FILL

The fill and drain plugs are both in the rear case (Fig. 85). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

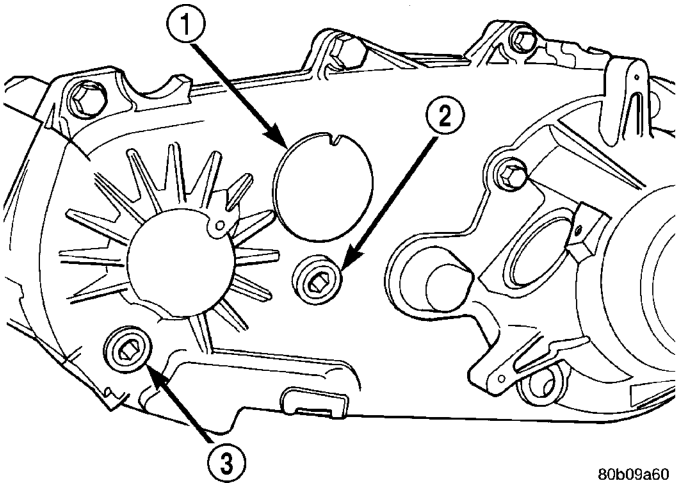


Fig. 85 Fill/Drain Plug and I.D. Tag Location - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(3) Remove front output shaft companion flange.

(4) Remove seal from front case with pry tool (Fig. 86).

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 8143-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 87). Once seal is started, continue tapping seal into bore until installer tool seats against case.

(2) Install the front output shaft companion flange.

(3) Install the front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

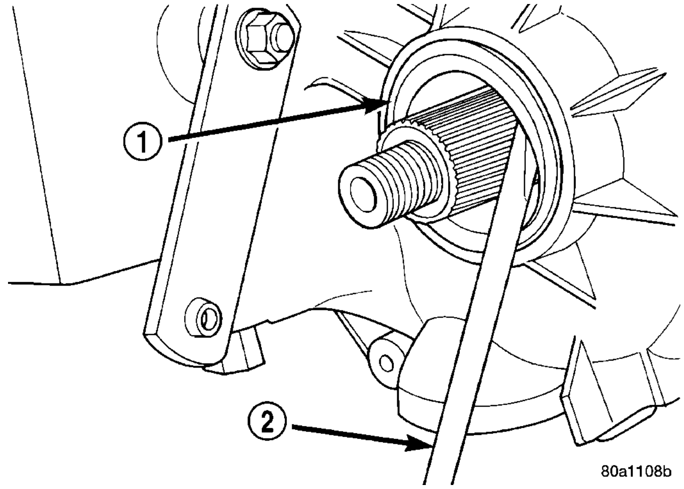


Fig. 86 Remove Front Output Shaft Seal - Typical

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

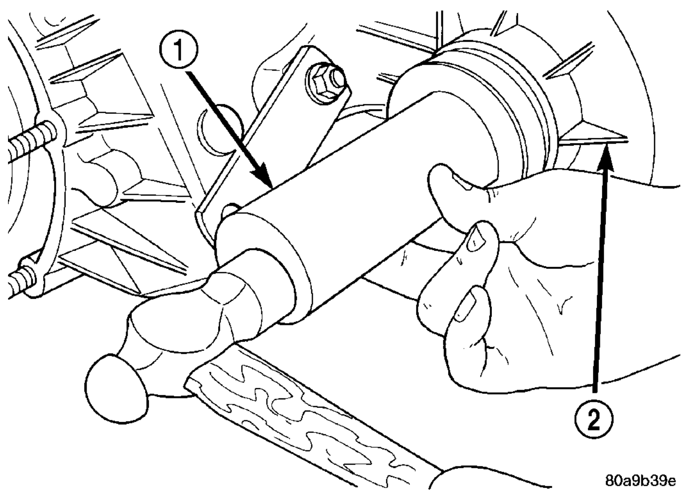


Fig. 87 Front Output Seal Installation - Typical

1 - INSTALLER 8143-A
2 - TRANSFER CASE

POSITION SENSOR

DESCRIPTION

The transfer case position sensor (Fig. 88) is an electronic device whose output can be interpreted to indicate the transfer case's current operating mode. The sensor consists of a five position, resistive multiplexed circuit which returns a specific resistance value to the Powertrain Control Module (PCM) for each transfer case operating mode. The sensor is located on the top of the transfer case, just left of the transfer case centerline and rides against the sector plate roostercomb. The PCM supplies 5VDC (+/- 0.5V) to the sensor and monitors the return voltage to determine the sector plate, and therefore the transfer case, position.

POSITION SENSOR (Continued)

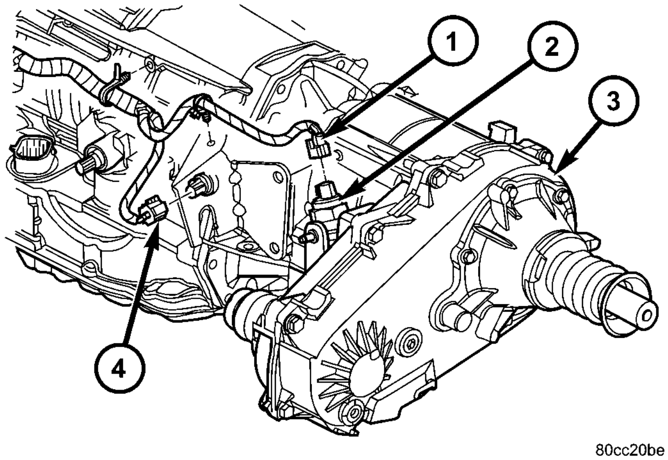


Fig. 88 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

OPERATION

During normal vehicle operation, the Powertrain Control Module (PCM) monitors the transfer case position sensor return voltage to determine the operating mode of the transfer case. Refer to the Operating Mode Versus Resistance table for the correct resistance for each position (Fig. 89). Note that the NEUTRAL position is allowed to float between sensor positions 3 and 4. If a resistance is measured anywhere in either range, the sensor is operating correctly.

OPERATING MODE VERSUS RESISTANCE

SENSOR POSITION	OPERATING MODE	SENSOR RESISTANCE (ohms)
1	2WD	1124-1243
2	4WD PART TIME	650-719
3	NEUTRAL	389-431
4	NEUTRAL	199-221
5	4WD LOW	57-64

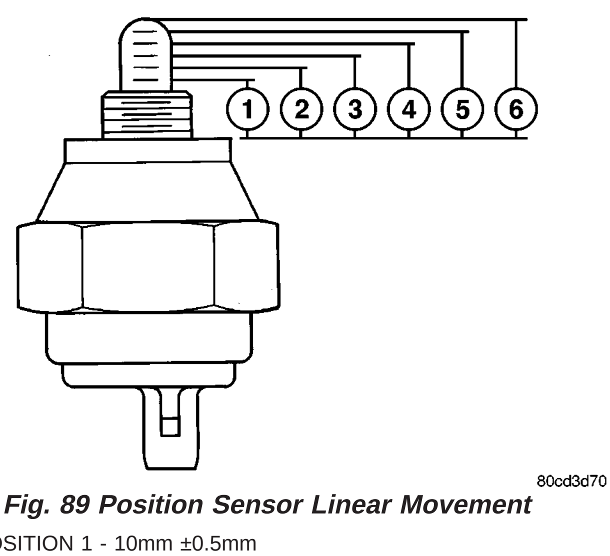


Fig. 89 Position Sensor Linear Movement

1 - POSITION 1 - 10mm ±0.5mm
2 - POSITION 2 - 12mm ±0.5mm
3 - POSITION 3 - 14mm ±0.5mm
4 - POSITION 4 - 16mm ±0.5mm
5 - POSITION 5 - 18mm ±0.5mm
6 - POSITION 6 - 20mm±0.5mm - FULL EXTENSION

POSITION SENSOR (Continued)

REMOVAL

(1) Raise and support the vehicle.

(2) Disengage the transfer case position sensor connector from the position sensor (Fig. 90).

(3) Remove the position sensor from the transfer case.

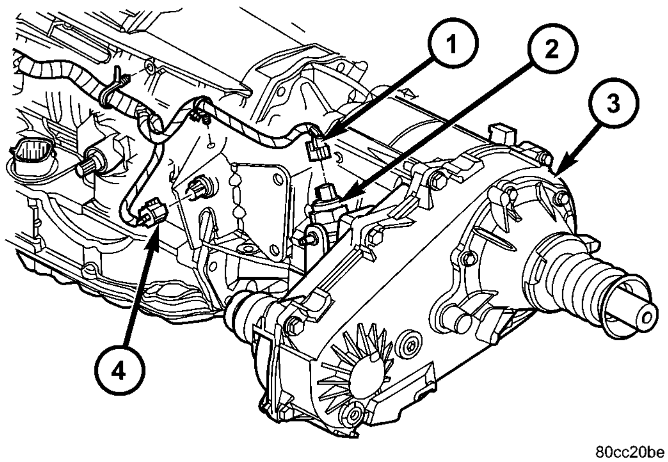


Fig. 90 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

INSTALLATION

(1) Inspect the o-ring seal on the transfer case position sensor. Replace the o-ring if necessary.

(2) Install the transfer case position sensor into the transfer case. Torque the sensor to 20-34 N·m (15-25 ft.lbs.).

(3) Engage the transfer case position sensor connector to the position sensor.

(4) Lower vehicle.

(5) Verify proper sensor operation.

REAR OUTPUT SHAFT SEAL

REMOVAL

(1) Shift the transmission and transfer case into NEUTRAL.

(2) Raise and support vehicle.

(3) Mark a line across the pinion shaft and at each end of the propeller shaft for installation reference.

(4) Remove the U-joint strap bolts at the pinion shaft yoke.

(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 91).

(6) Slide the slip yoke off of the transmission/ transfer case output shaft and remove the propeller shaft.

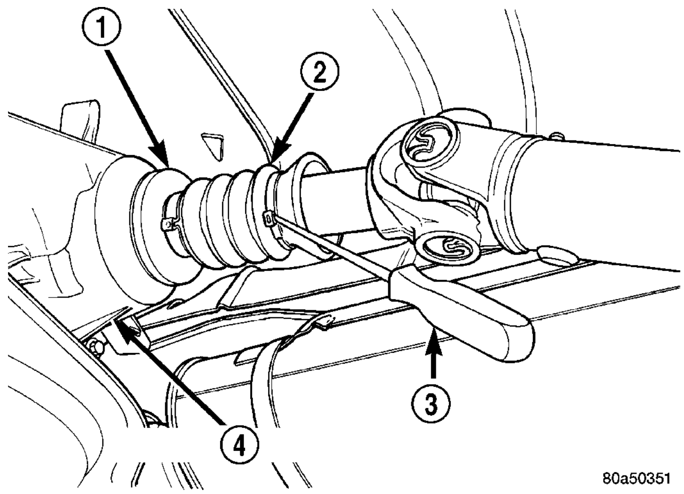


Fig. 91 Dust Boot Clamp

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

(7) Spread band clamp which holds output shaft boot to the output shaft slinger with a suitable awl, or equivalent.

(8) Remove output shaft boot from slinger and output shaft.

(9) Remove the output shaft rear slinger using Puller MD-998056-A (Fig. 92).

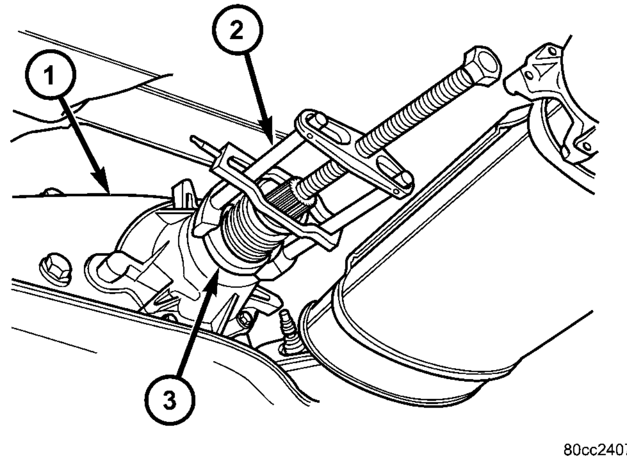


Fig. 92 Rear Slinger Removal

1 - TRANSFER CASE
2 - PULLER MD-998056-A
3 - REAR SLINGER

REAR OUTPUT SHAFT SEAL (Continued)

(10) Use a suitable pry tool, or a slide hammer mounted screw, to remove the seal from the rear retainer (Fig. 93).

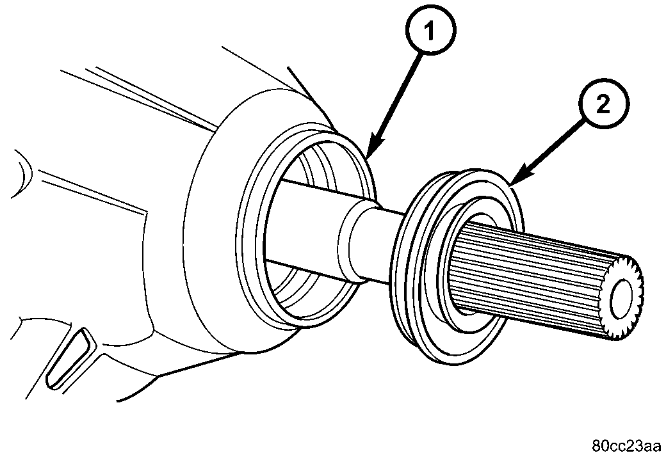


Fig. 93 Rear Retainer Seal

1 - REAR RETAINER
2 - OUTPUT SHAFT SEAL

INSTALLATION

(1) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(2) Slide seal onto Seal Protector 8824 (Fig. 94). Slide seal protector and seal onto output shaft.

(3) Slide Installer 8691 onto seal and mainshaft. Drive seal into rear bearing retainer (Fig. 95).

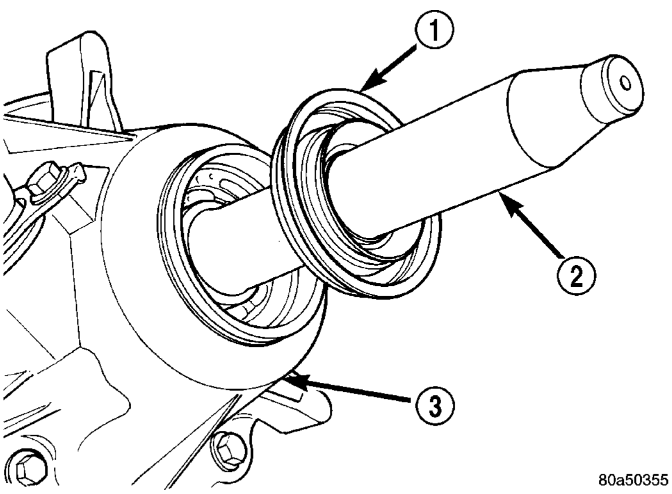


Fig. 94 Output Shaft Seal and Protector

1 - OUTPUT SHAFT SEAL
2 - SPECIAL TOOL 8824
3 - TRANSFER CASE

(4) Install a new output shaft rear slinger with Installer 9023.

(5) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 96).

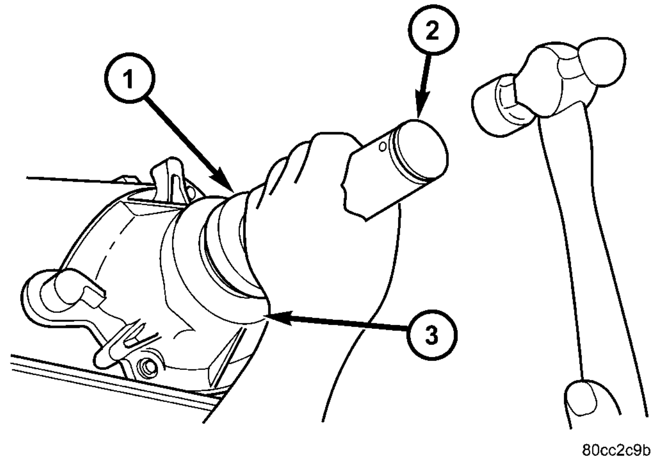


Fig. 95 Rear Seal Installation

1 - SPECIAL TOOL 8691
2 - HANDLE
3 - TRANSFER CASE

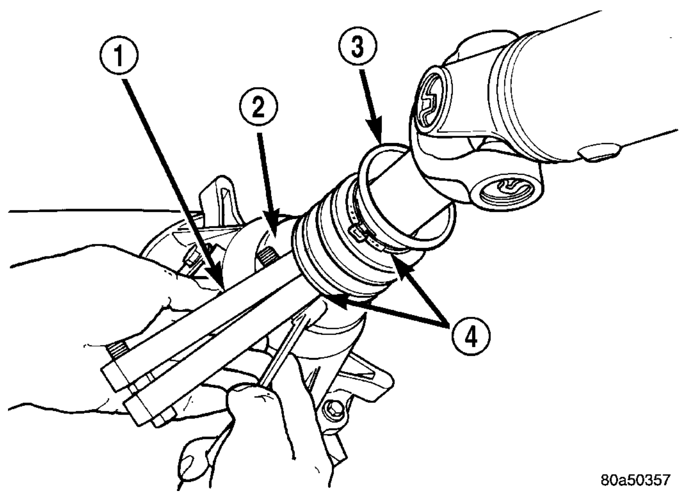


Fig. 96 Slinger Boot Installation - Typical

1 - SPECIAL TOOL C-4975-A
2 - SLINGER
3 - BOOT
4 - CLAMP

(6) Slide the slip yoke on the transmission/transfer case output shaft. Align installation reference marks at the axle yoke and install the propeller shaft.

(7) Tighten the U-joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.).

(8) Crimp clamp with Clamp Tool C-4975A to hold dust boot to propeller shaft yoke.

(9) Remove support and lower the vehicle.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.

(2) Raise vehicle.

(3) Remove clip securing the transfer case shift cable to the shift cable support bracket (Fig. 97) and (Fig. 98).

(4) Disengage any additional shift cable routing clips, if necessary.

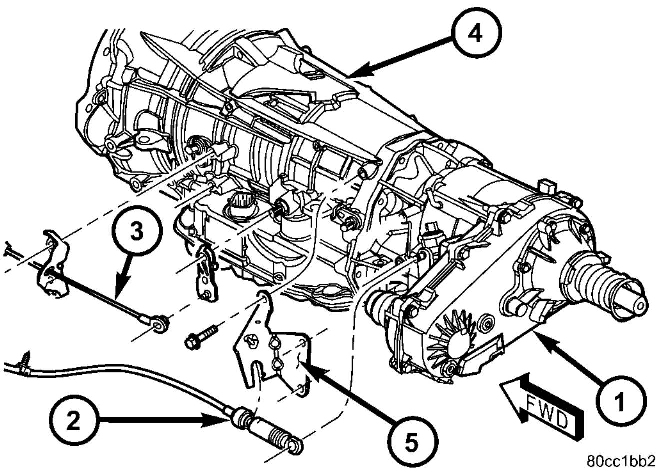


Fig. 97 Transfer Case Shift Cable - Automatic Transmission

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

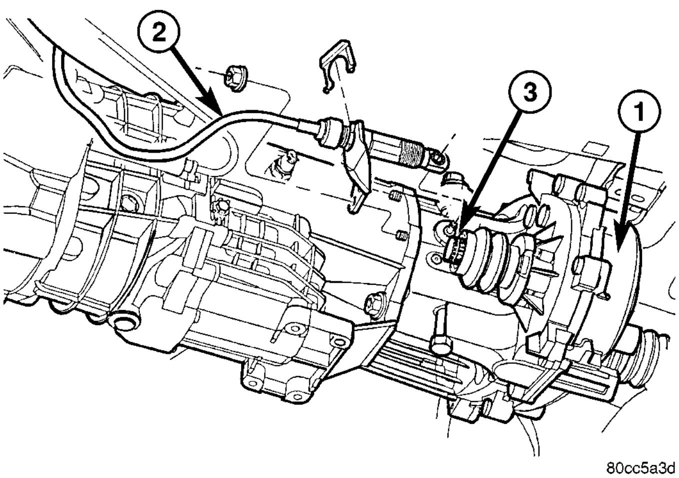


Fig. 98 Transfer Case Shift Cable - Manual Transmission

1 - TRANSFER CASE
2 - SHIFT CABLE
3 - MANUAL LEVER

(5) Disengage the shift cable from the transfer case manual lever.

(6) Lower vehicle.

(7) Remove the floor console as necessary to access the shifter mechanism. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(8) Remove the nuts attaching lever assembly to floorpan and remove assembly and shift cable (Fig. 99).

(9) Remove the shifter mechanism and cable assembly from the vehicle.

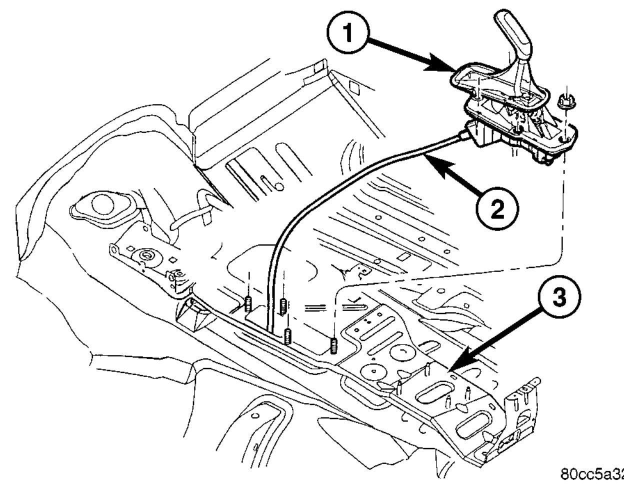


Fig. 99 Transfer Case Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - SHIFT CABLE
3 - FLOOR PAN

INSTALLATION

(1) Route the shift cable through the opening in the floor pan.

(2) Position the shift mechanism over the shifter retaining studs on the floor pan.

(3) Install the nuts to hold the shifter mechanism to the floor pan. Tighten the nuts to 11.86 N·m (105 in.lbs.).

(4) Install any floor console components previously removed. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

(5) Verify that the floor shifter is in the 4L position.

(6) Raise vehicle.

(7) Route the shift cable through the opening in the shift cable support bracket.

(8) Install the cable and a new spring clip into the slot in the support bracket.

(9) Install any additional routing clips on the shift cable.

(10) Verify that the transfer case is in the 4L position. The 4L position for the transfer case is with the manual lever to the full rearward position.

(11) Attach the shift cable to the transfer case manual lever.

(12) Lower vehicle and check for proper transfer case shifter operation.

TRANSFER CASE - NV242

TABLE OF CONTENTS

TRANSFER CASE - NV242

DESCRIPTION

The NV242 is a full-time transfer case. It provides full time 2-wheel, or 4-wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

OPERATING RANGES

NV242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, 4 Lo, and Neutral.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

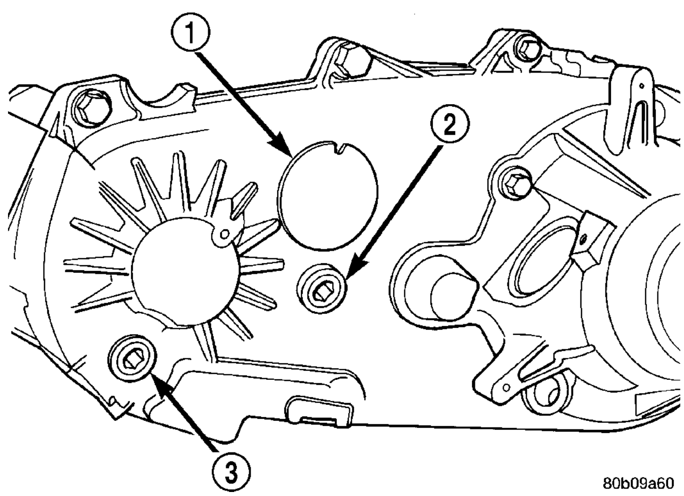


Fig. 1 Fill/Drain Plug And I.D. Tag Locations - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the trans-

TRANSFER CASE - NV242 (Continued)

fer case range lever by a shift cable. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate, or on the shift knob.

OPERATION

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV242

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case shift cable binding.	1) Repair or replace cable as necessary.
	2) Insufficient or incorrect lubricant.	2) Drain and refill transfer case with the correct type and quantity of lubricant.
	3) Internal transfer case components binding, worn, or damaged.	3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Transfer case will not shift through 4X4 part time range (light remains on)	1) Incomplete shift due to drivetrain torque load.	1) Momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive Tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

TRANSFER CASE - NV242 (Continued)

REMOVAL

(1) Shift transfer case into NEUTRAL.

(2) Raise vehicle.

(3) Remove skid plate (Fig. 2).

(4) Drain transfer case lubricant.

(5) Mark front and rear propeller shaft yokes for alignment reference.

(6) Disconnect front/rear propeller shafts at transfer case.

(7) Disconnect transfer case position sensor connector (Fig. 3).

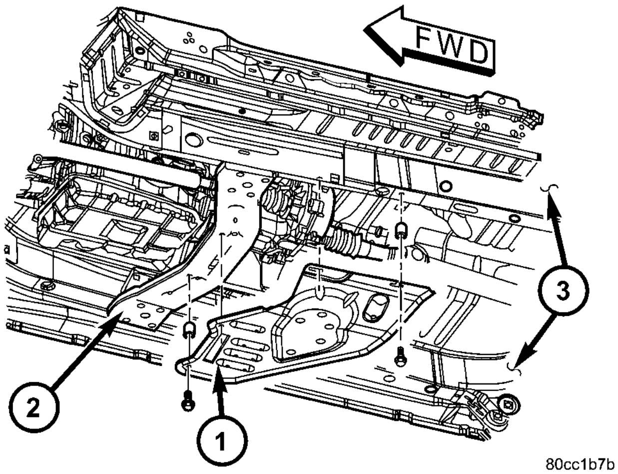


Fig. 2 Remove Skid Plate

1 - SKID PLATE
2 - TRANSMISSION CROSSMEMBER
3 - FRAME RAILS

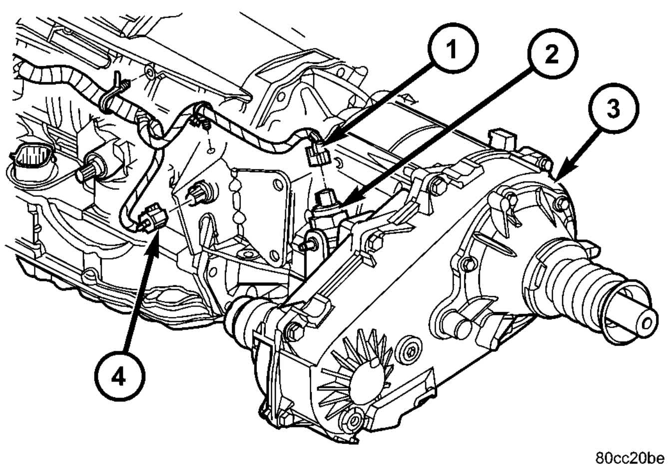


Fig. 3 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

(8) Disconnect transfer case shift cable at the range lever (Fig. 4).

(9) Disconnect the transfer case shift cable from the shift cable bracket.

(10) Disconnect transfer case vent hose (Fig. 5).

(11) Support transfer case with transmission jack.

(12) Secure transfer case to jack with chains.

(13) Remove nuts attaching transfer case to transmission.

(14) Pull transfer case and jack rearward to disengage transfer case (Fig. 5).

(15) Remove transfer case from under vehicle.

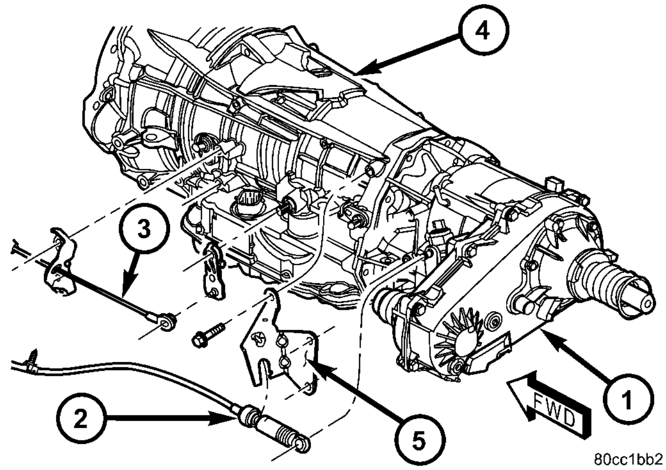


Fig. 4 Remove Shift Cables

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

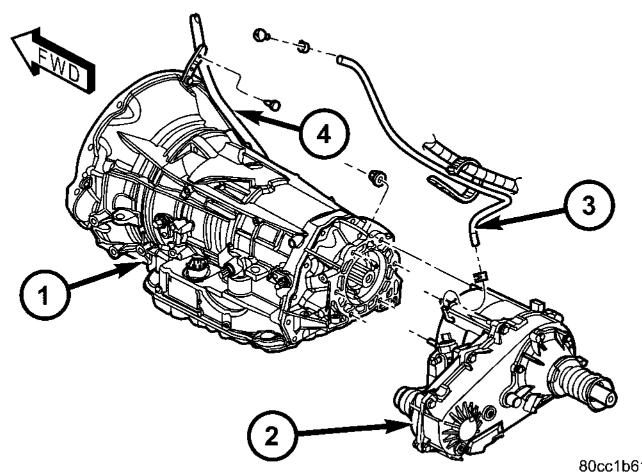


Fig. 5 Remove Vent Hose and Transfer Case

1 - AUTOMATIC TRANSMISSION
2 - TRANSFER CASE
3 - VENT HOSE
4 - FILL TUBE

DISASSEMBLY

REAR RETAINER

(1) Remove output shaft boot. Spread band clamp that secures boot on slinger with a suitable awl. Then slide boot off shaft (Fig. 6).

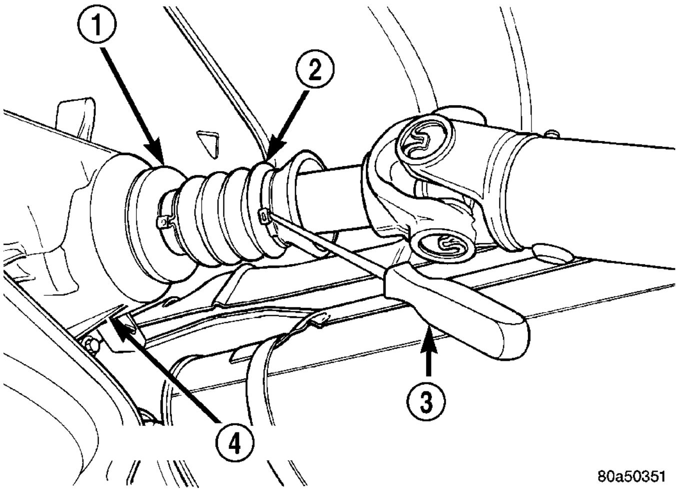


Fig. 6 Output Boot - Typical

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

(2) Using puller MD-998056-A, remove rear slinger (Fig. 7).

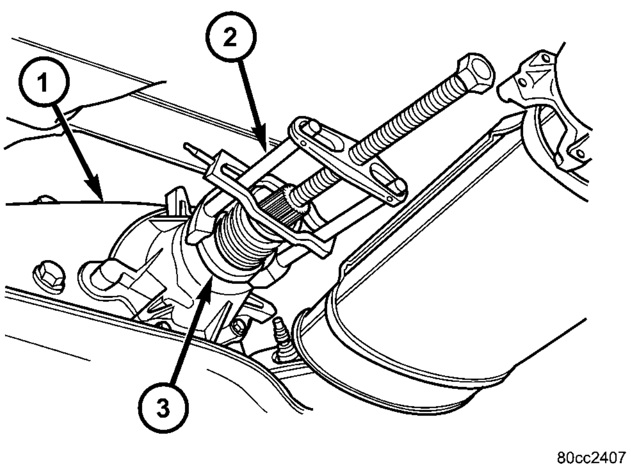


Fig. 7 Rear Slinger Removal

1 - TRANSFER CASE
2 - PULLER MD-998056-A
3 - REAR SLINGER

(3) Remove rear seal from retainer (Fig. 8). Use pry tool, or collapse seal with punch to remove it.

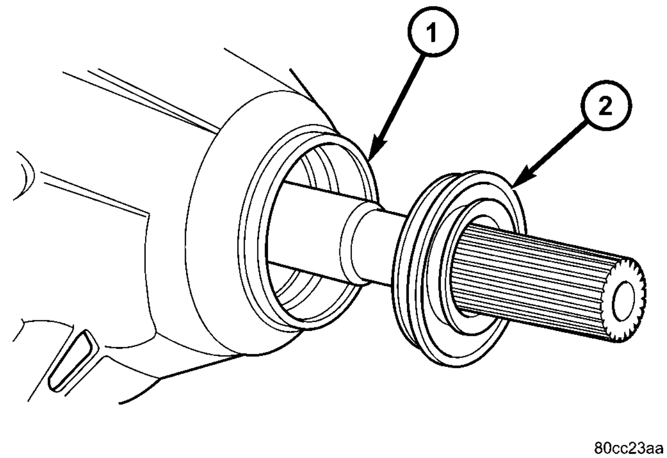


Fig. 8 Rear Retainer Seal

1 - REAR RETAINER
2 - OUTPUT SHAFT SEAL

(4) Remove rear output bearing I.D. retaining ring (Fig. 9).

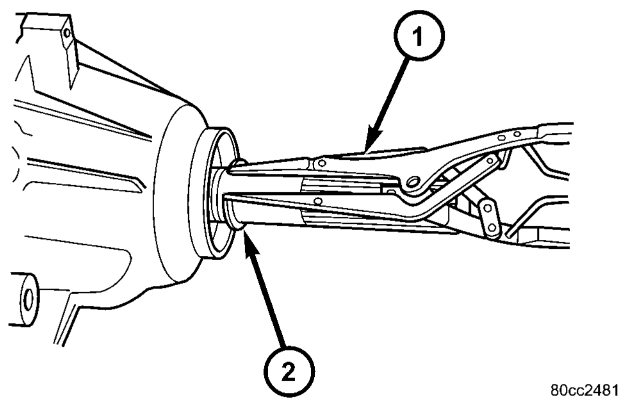


Fig. 9 Output Shaft Rear Bearing Retaining Ring

1 - SNAP-RING PLIERS
2 - RETAINING RING

TRANSFER CASE - NV242 (Continued)

(5) Remove rear retainer bolts.

(6) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and output shaft (Fig. 10).

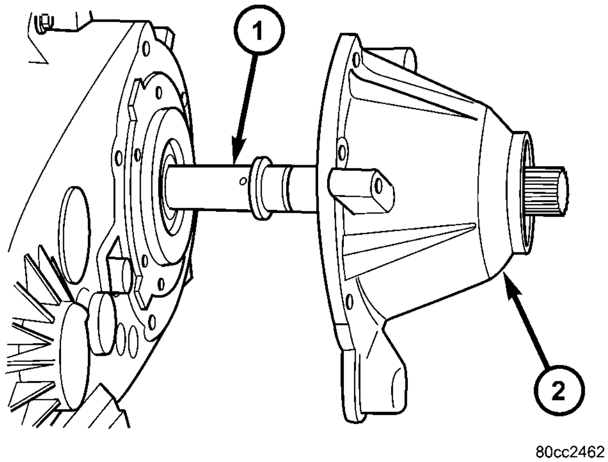


Fig. 10 Rear Retainer Removal

1 - MAINSHAFT
2 - REAR RETAINER

(7) Remove rear bearing O.D. retaining ring with snap-ring pliers. Then tilt pump and slide it off output shaft (Fig. 11)

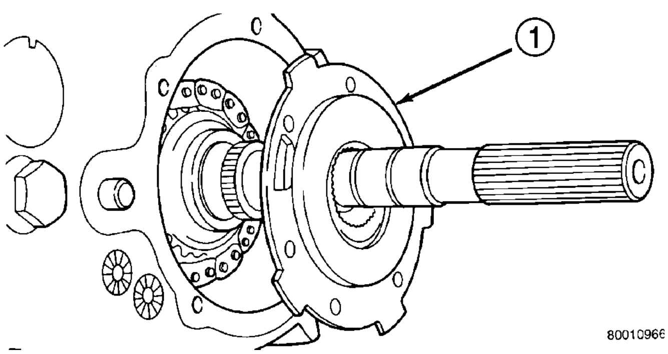


Fig. 11 Oil Pump Removal

1 - OIL PUMP

(8) Remove pickup tube O-ring from pump (Fig. 12) but do not disassemble pump; it is not a serviceable part.

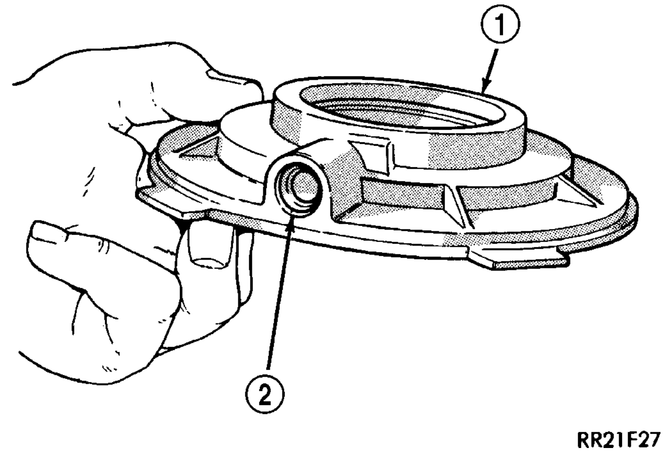


Fig. 12 Pickup Tube O-Ring Location

1 - OIL PUMP
2 - O-RING

(9) Remove bolts attaching rear case to front case (Fig. 13). Note position of the two black finish bolts at each end of the case. These bolts go through the case dowels and require a washer under the bolt head.

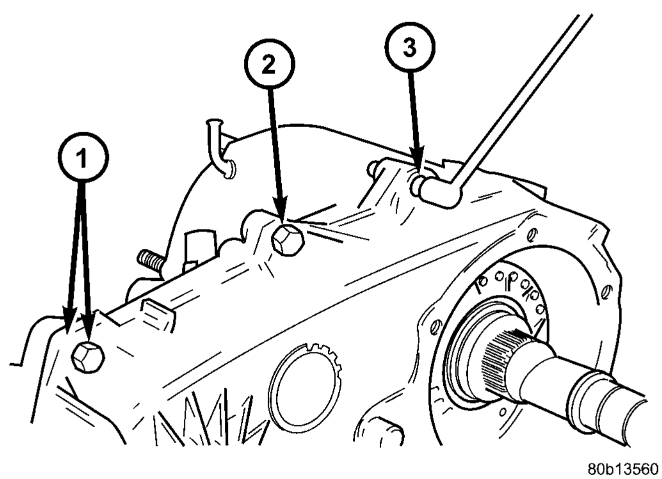


Fig. 13 Spline And Dowel Bolt Locations

1 - DOWEL BOLT AND WASHER (2)
2 - CASE BOLTS
3 - SPLINE HEAD BOLT (1)

TRANSFER CASE - NV242 (Continued)

(10) Remove rear case from front case (Fig. 14). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

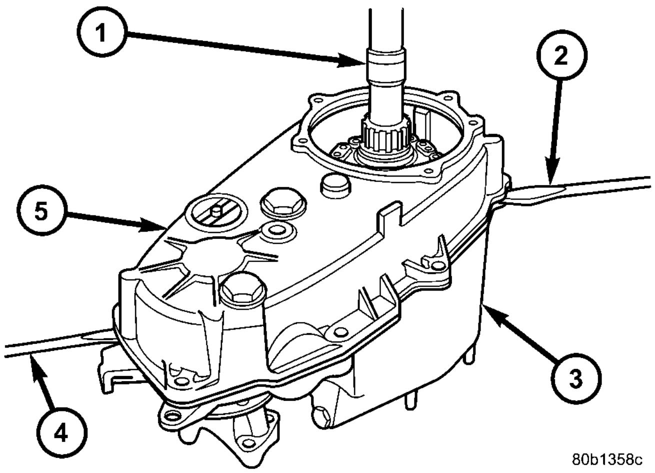


Fig. 14 Loosening/Removing Rear Case

1 - MAINSHAFT
2 - SCREWDRIVER
3 - FRONT CASE
4 - SCREWDRIVER
5 - REAR CASE

(11) Remove oil pickup tube and screen from rear case (Fig. 15).

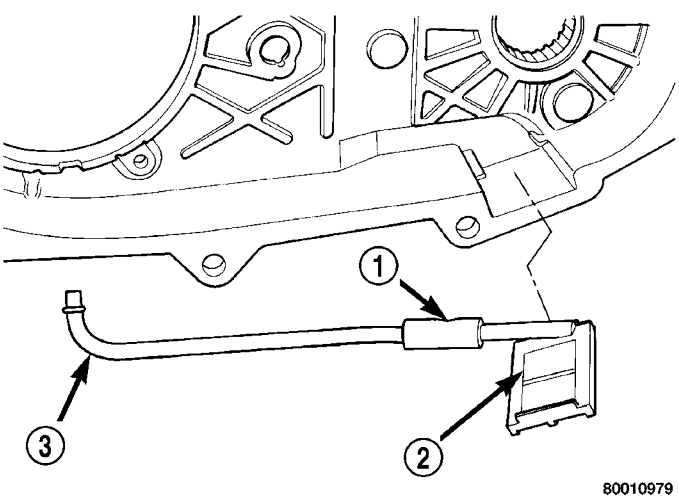


Fig. 15 Oil Pickup Screen, Hose And Tube Removal

1 - CONNECTING HOSE
2 - PICKUP SCREEN
3 - PICKUP TUBE

COMPANION FLANGE AND RANGE LEVER

(1) Remove transfer case position sensor (Fig. 16).

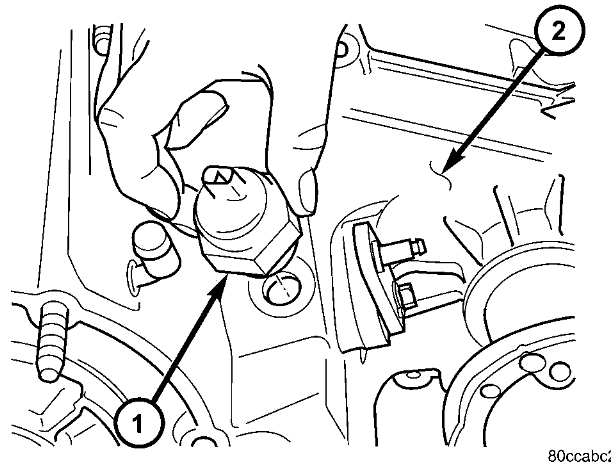


Fig. 16 Remove Transfer Case Position Sensor

1 - TRANSFER CASE POSITION SENSOR
2 - TRANSFER CASE

(2) Install two bolts (Fig. 17) partially into the propellor shaft companion flange, 180° from each other.

(3) Install the rectangular end of the Flange Holder C-3281 over the bolts to hold the companion flange stationary and remove the nut holding the companion flange to the output shaft.

(4) Use Remover C-452 (Fig. 18) to remove the companion flange.

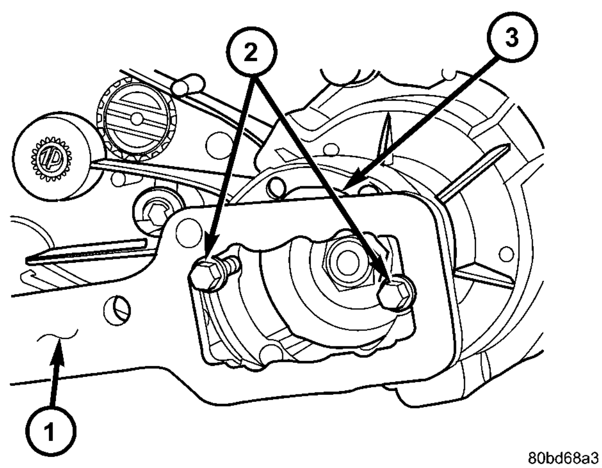


Fig. 17 Hold Companion Flange - Typical

1 - HOLDER C-3281
2 - BOLTS
3 - COMPANION FLANGE

TRANSFER CASE - NV242 (Continued)

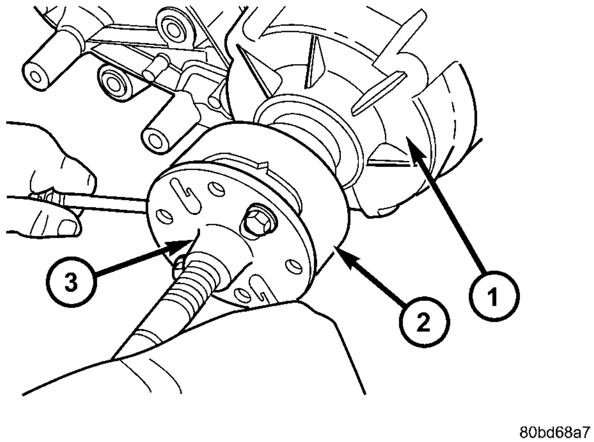


Fig. 18 Remove Companion Flange - Typical

1 - TRANSFER CASE
2 - COMPANION FLANGE
3 - REMOVER C-452

(5) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(6) Remove the bolt (Fig. 19) that attaches the range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft.

NOTE: Be sure to note the orientation of the range lever (lever up or down) so that it may be re-installed in the same direction.

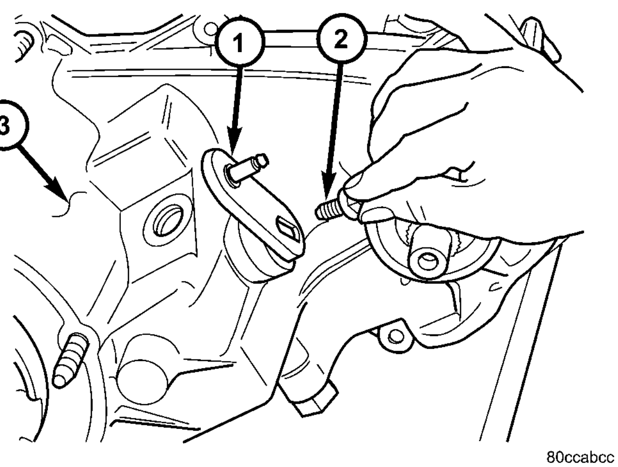


Fig. 19 Remove Shift Lever Bolt - Typical

1 - RANGE LEVER
2 - RANGE LEVER BOLT
3 - TRANSFER CASE

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Remove drive sprocket snap-ring (Fig. 20).

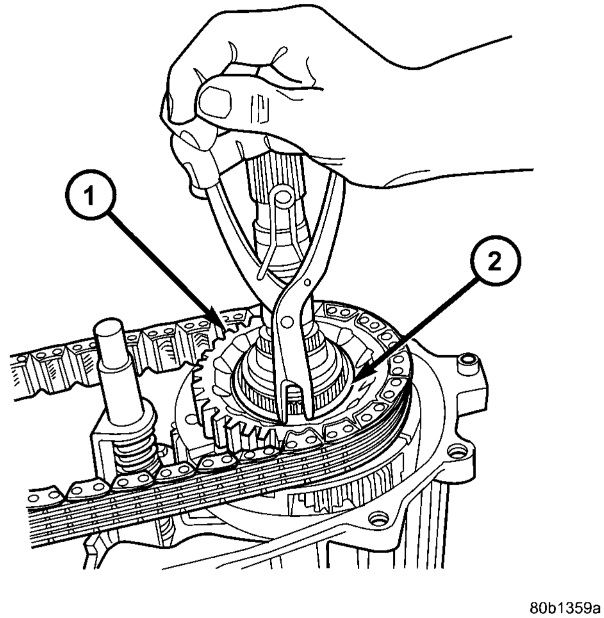


Fig. 20 Drive Sprocket Snap-Ring Removal

1 - DRIVE SPROCKET
2 - DRIVE SPROCKET SNAP-RING

(2) Remove drive sprocket and chain (Fig. 21).

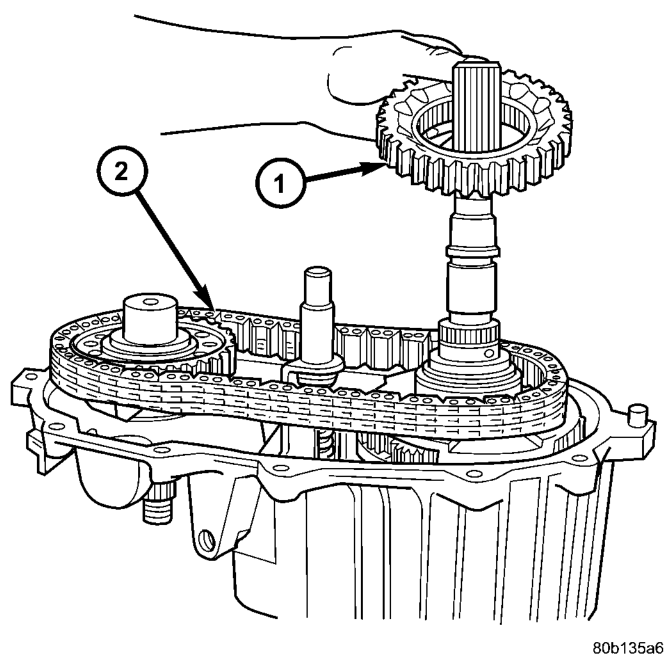


Fig. 21 Drive Sprocket And Chain Removal

1 - DRIVE SPROCKET
2 - DRIVE CHAIN

TRANSFER CASE - NV242 (Continued)

(3) Remove front output shaft (Fig. 22).

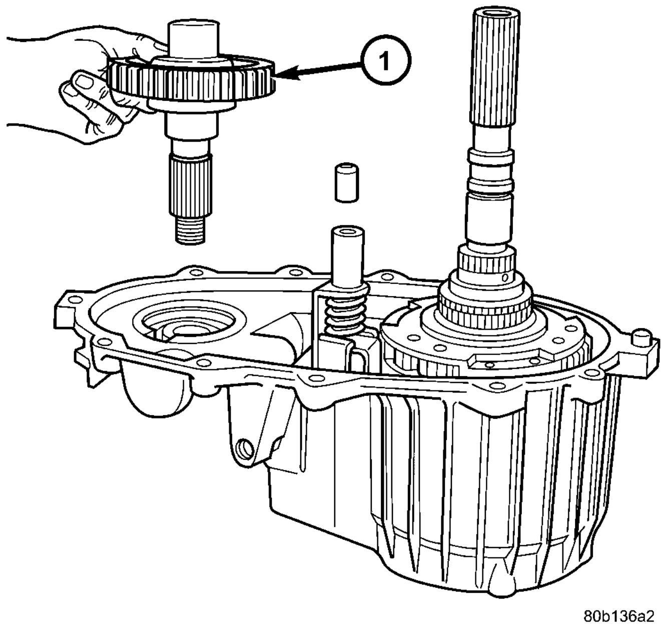


Fig. 22 Removing Front Output Shaft

1 - FRONT OUTPUT SHAFT

SHIFT FORKS AND MAINSHAFT

(1) Remove shift detent plug, spring and pin (Fig. 23).

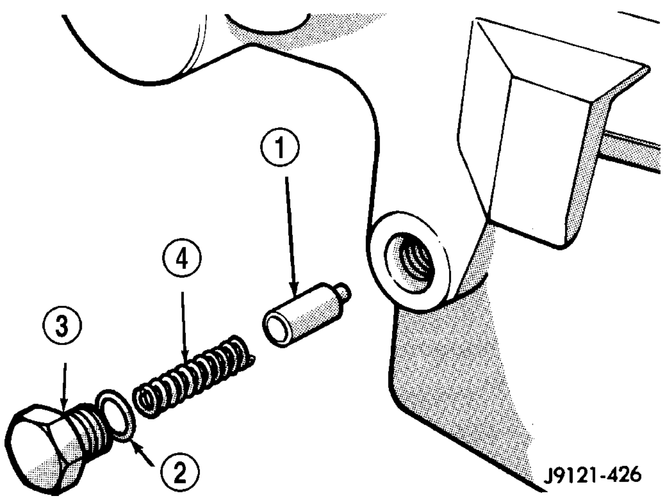


Fig. 23 Detent Component Removal

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

(2) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole.

(3) Remove range fork lockpin with size number one easy-out tool as follows:

(a) Insert easy-out tool through access hole in side of transfer case and into lock-pin.

(b) Tap easy-out tool into lock-pin with hammer until tool is securely engaged into the lock-pin.

(c) Install a t-handle, such as from a tap and die set, onto the easy-out tool.

(d) Securely tighten the t-handle onto the tool.

(e) In one motion, pull upward and turn the t-handle counter-clockwise to remove the lock-pin.

(4) Remove shift rail by pulling it straight up and out of fork (Fig. 24).

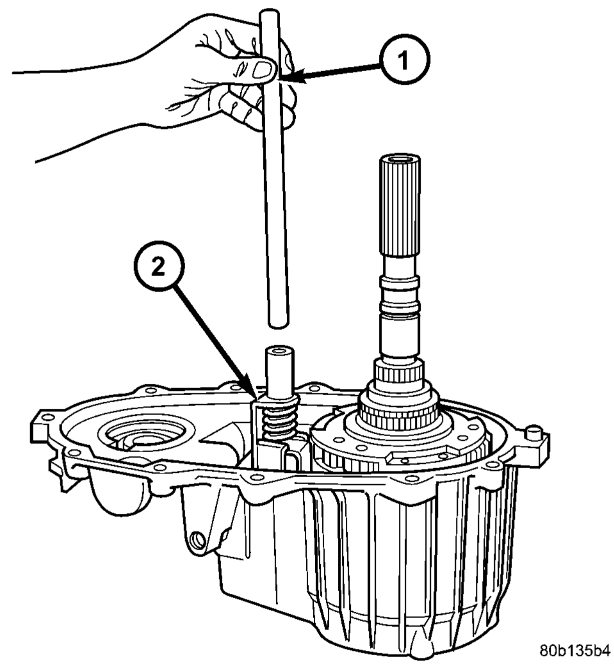


Fig. 24 Shift Rail Removal

1 - SHIFT RAIL
2 - MODE FORK

TRANSFER CASE - NV242 (Continued)

(5) Remove mode fork and mainshaft as assembly (Fig. 25).

(6) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 26). Note position of mode sleeve in fork and remove sleeve.

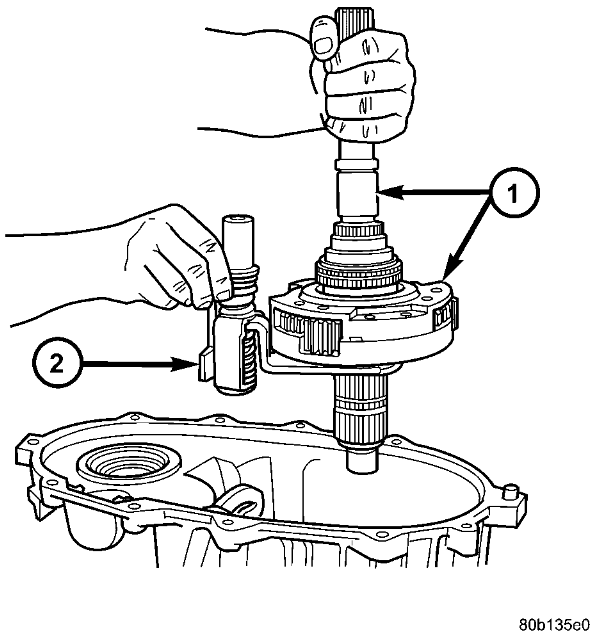


Fig. 25 Mainshaft And Mode Fork Removal

1 - MAINSHAFT ASSEMBLY
2 - MODE FORK

(7) Remove intermediate clutch shaft snap-ring (Fig. 27).

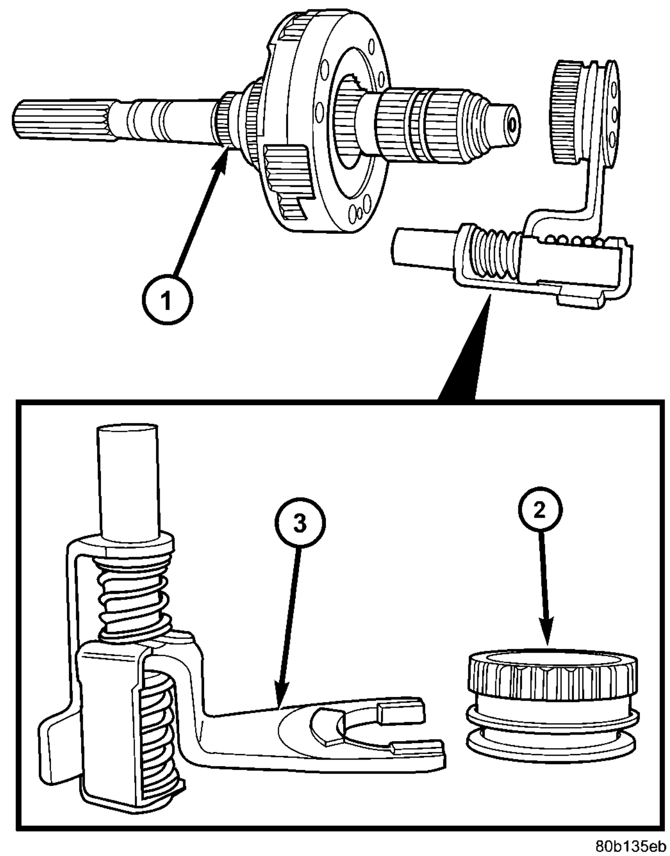


Fig. 26 Separate Mode Fork And Sleeve

1 - MAINSHAFT
2 - MODE SLEEVE
3 - MODE FORK ASSEMBLY

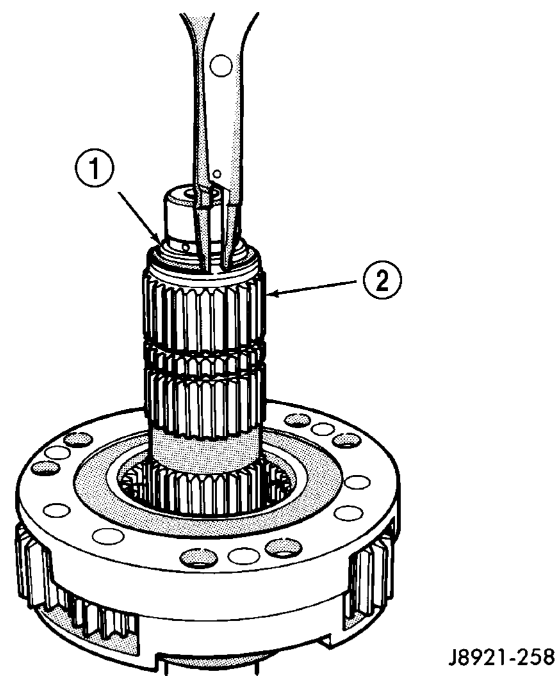


Fig. 27 Intermediate Clutch Shaft Snap-Ring Removal

1 - SNAP-RING
2 - INTERMEDIATE CLUTCH SHAFT

TRANSFER CASE - NV242 (Continued)

(8) Remove clutch shaft thrust ring (Fig. 28).

(9) Remove intermediate clutch shaft (Fig. 29).

Fig. 28 Clutch Shaft Thrust Ring Removal

1 - CLUTCH SHAFT THRUST RING

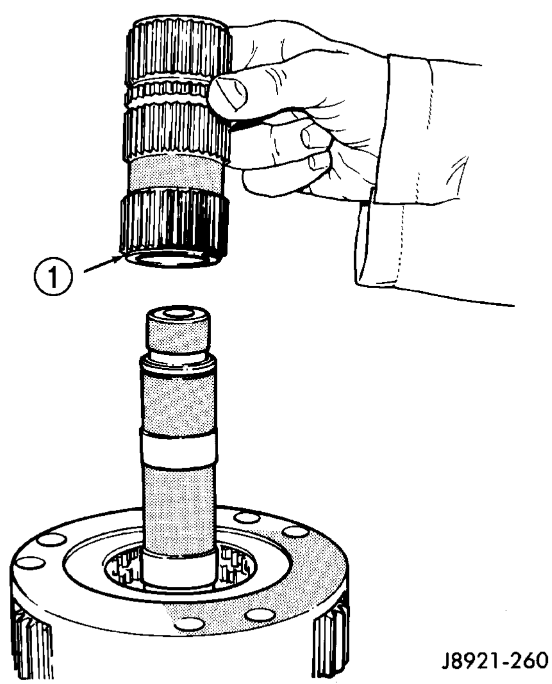


Fig. 29 Intermediate Clutch Shaft Removal

1 - INTERMEDIATE CLUTCH SHAFT

(10) Remove differential snap-ring (Fig. 30).

(11) Remove differential (Fig. 31).

(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

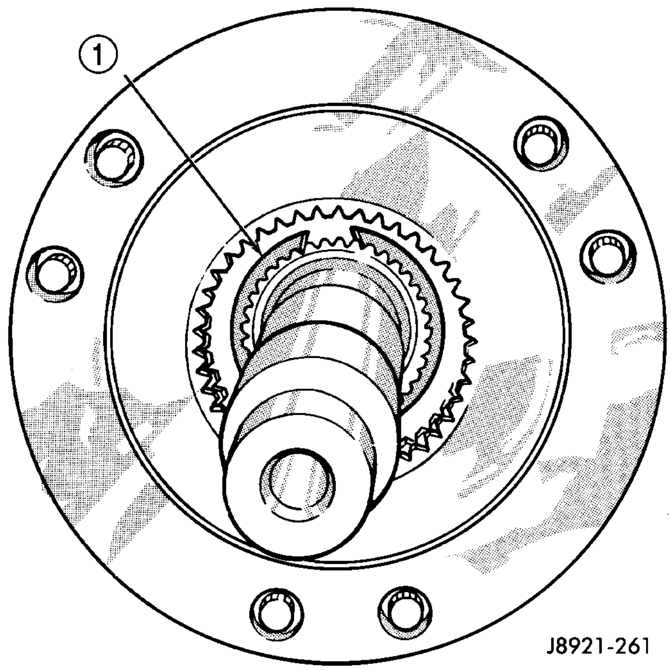


Fig. 30 Differential Snap-Ring Removal

1 - DIFFERENTIAL SNAP-RING

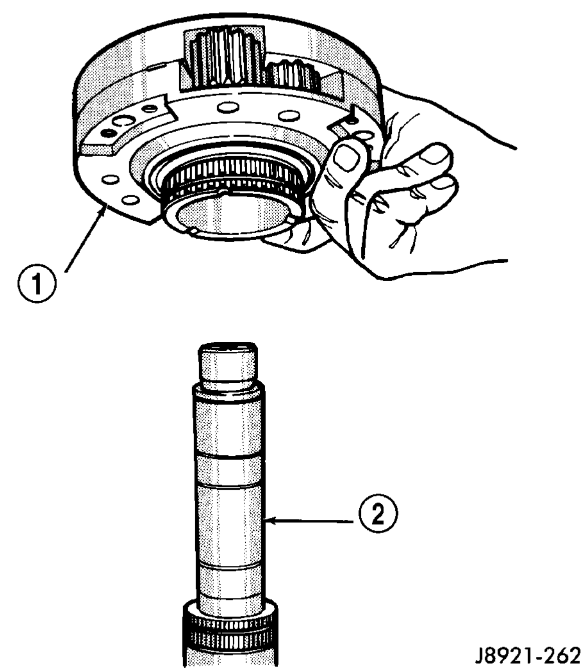


Fig. 31 Differential Removal

1 - DIFFERENTIAL
2 - MAINSHAFT

TRANSFER CASE - NV242 (Continued)

(13) Slide low range fork pin out of shift sector slot.

(14) Remove low range fork and sleeve (Fig. 32).

(15) Remove shift sector.

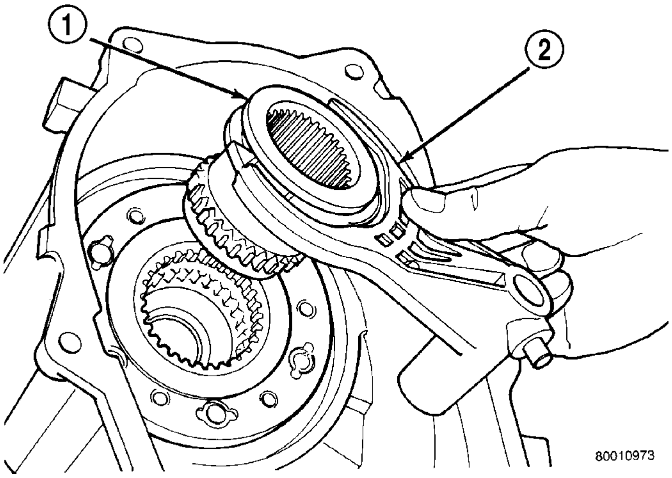


Fig. 32 Range Fork And Sleeve Removal

1 - RANGE HUB
2 - RANGE FORK

(16) Remove the shift sector shaft seal (Fig. 33).

(17) Remove the shift sector shaft bearing with an appropriate socket (Fig. 34).

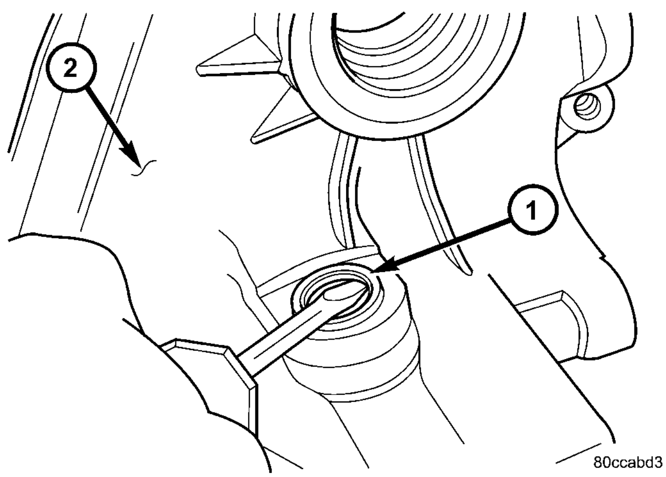


Fig. 33 Remove Shift Shaft Seal

1 - SHIFT SHAFT SEAL
2 - TRANSFER CASE

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Remove front bearing retainer bolts.

(2) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 35). Position screwdriver in slots cast into retainer.

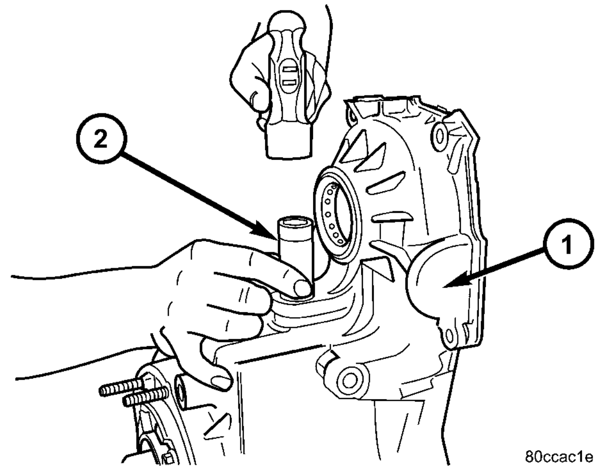


Fig. 34 Remove Shift Sector Shaft Bearing

1 - TRANSFER CASE
2 - SOCKET

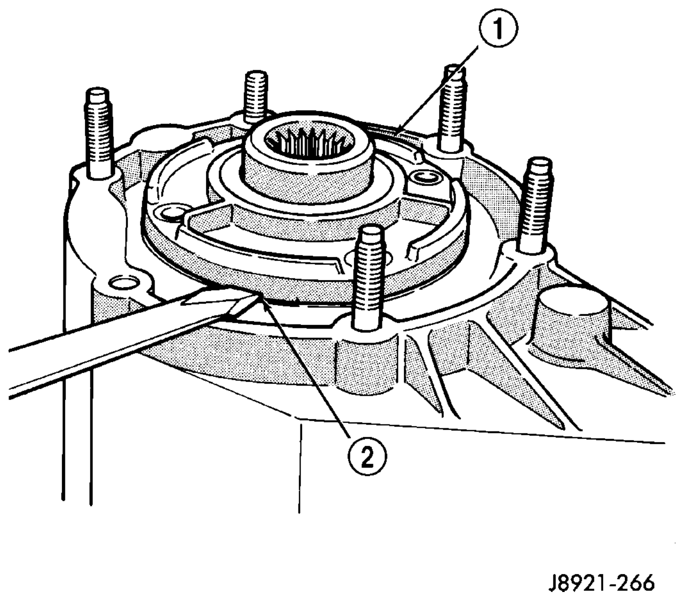


Fig. 35 Front Bearing Retainer Removal

1 - FRONT BEARING RETAINER
2 - RETAINER SLOT

TRANSFER CASE - NV242 (Continued)

(3) Remove input gear snap-ring (Fig. 36).

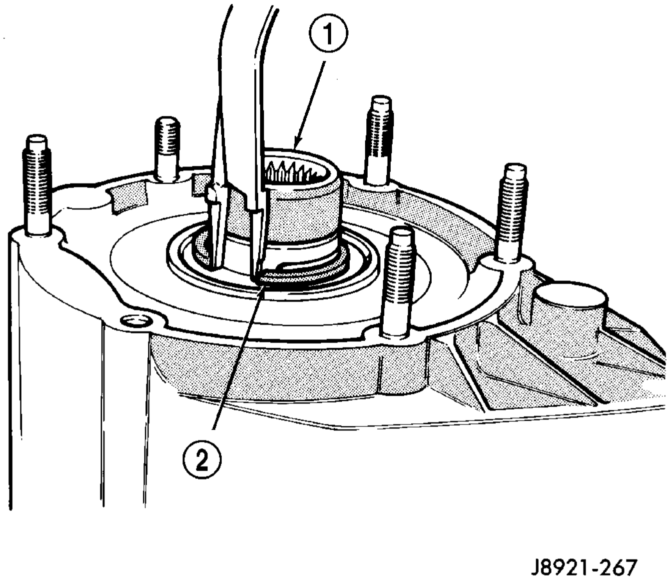


Fig. 36 Input Gear Snap-Ring Removal

1 - INPUT GEAR
2 - SNAP-RING

(4) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829-A (Fig. 37).

(5) Remove low range gear snap-ring (Fig. 38).

(6) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 39).

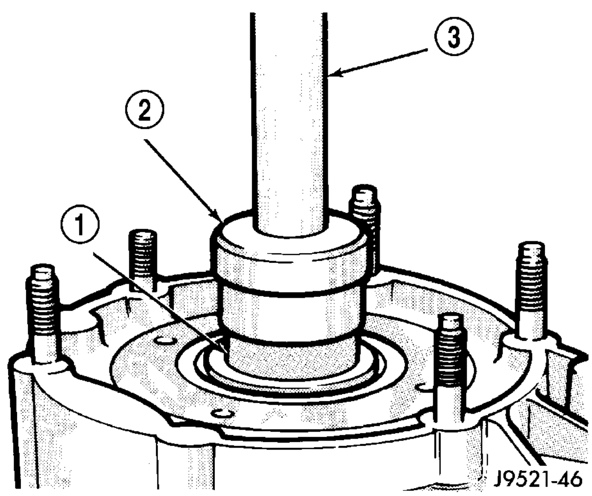


Fig. 37 Input And Low Range Gear Assembly Removal

1 - INPUT-LOW RANGE GEARS
2 - SPECIAL TOOL 7829-A
3 - SPECIAL TOOL C-4171

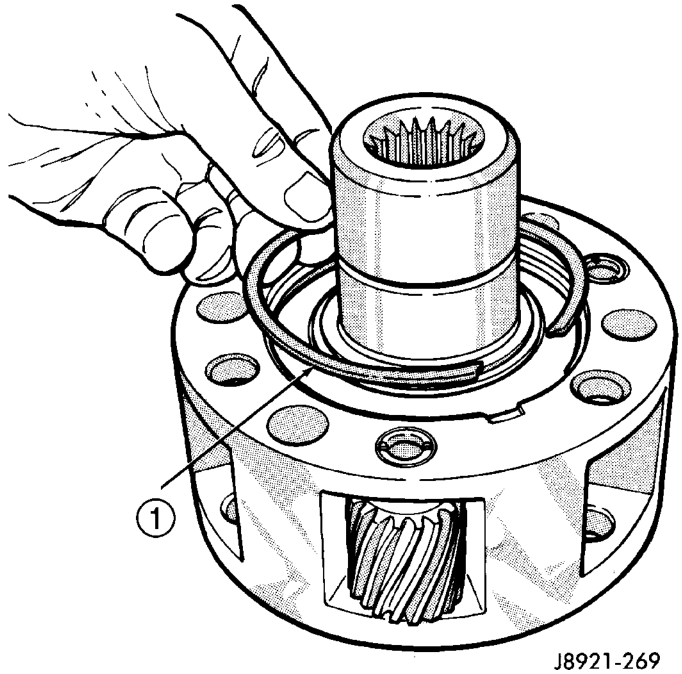


Fig. 38 Low Range Gear Snap-Ring Removal/ Installation

1 - LOW RANGE GEAR SNAP-RING

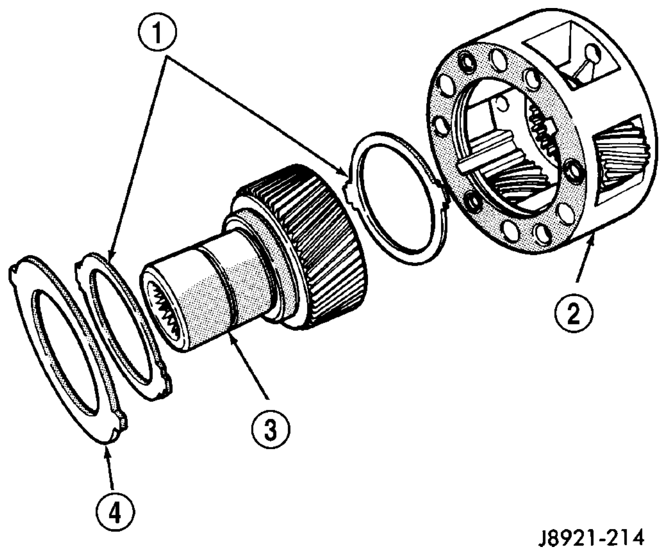


Fig. 39 Low Range Gear Disassembly

1 - THRUST WASHERS
2 - LOW RANGE GEAR
3 - INPUT GEAR
4 - RETAINER

TRANSFER CASE - NV242 (Continued)

(7) Inspect low range annulus gear (Fig. 40). The annulus gear is not a serviceable component. If damaged, replace gear and front case as assembly.

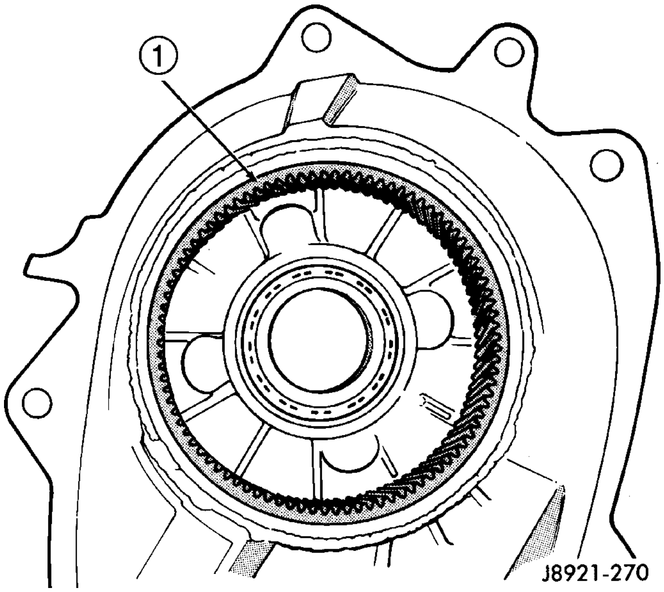


Fig. 40 Inspecting Low Range Annulus Gear

1 - LOW RANGE ANNULUS GEAR

(8) Remove oil seals from following components:
- front bearing retainer.
- rear retainer.
- oil pump.
- case halves.

DIFFERENTIAL

(1) Mark differential case halves for reference.

(2) Remove differential case bolts.

(3) Invert differential on workbench.

(4) Separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 41).

(5) Remove thrust washers and planet gears from case pins (Fig. 42).

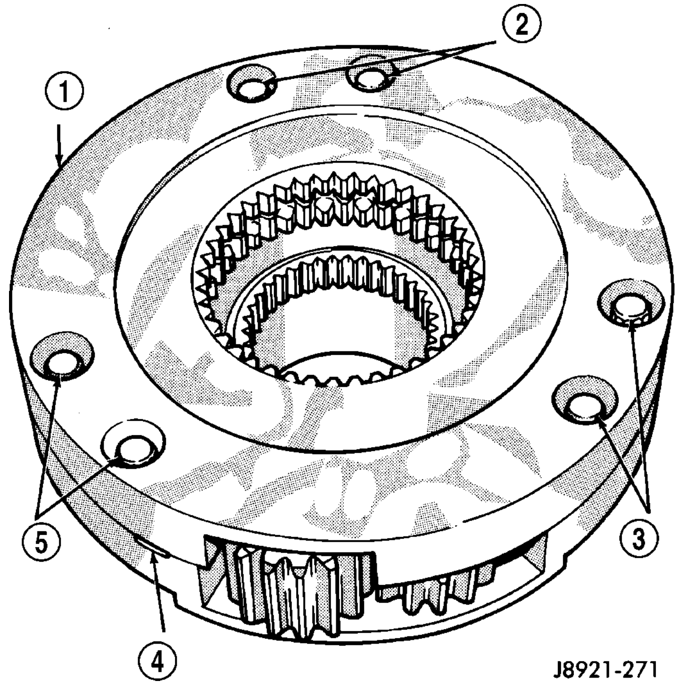


Fig. 41 Separating Differential Case Halves

1 - TOP CASE
2 - CASE BOLTS
3 - CASE BOLTS
4 - CASE SLOTS
5 - CASE BOLTS

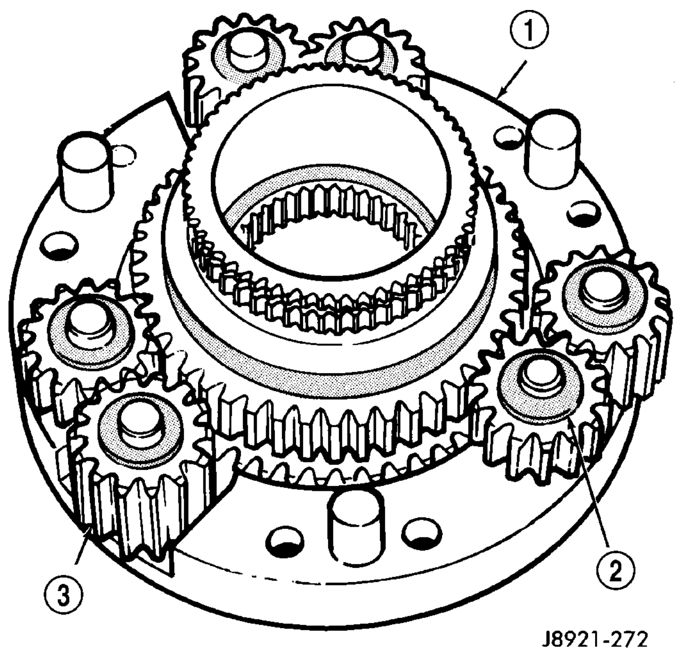


Fig. 42 Planet Gears And Thrust Washer Removal

1 - BOTTOM CASE
2 - THRUST WASHERS (12)
3 - PLANET GEARS (6)

TRANSFER CASE - NV242 (Continued)

(6) Remove mainshaft and sprocket gears from bottom case (Fig. 43). Note gear position for reference before separating them.

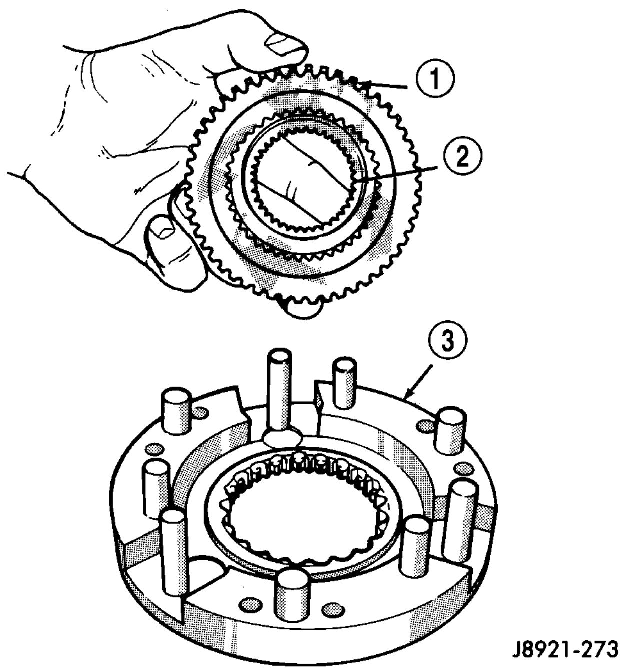


Fig. 43 Mainshaft And Sprocket Gear Removal

1 - MAINSHAFT GEAR
2 - SPROCKET GEAR
3 - BOTTOM CASE

CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

INSPECTION

MAINSHAFT/SPROCKET/HUB

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 44). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

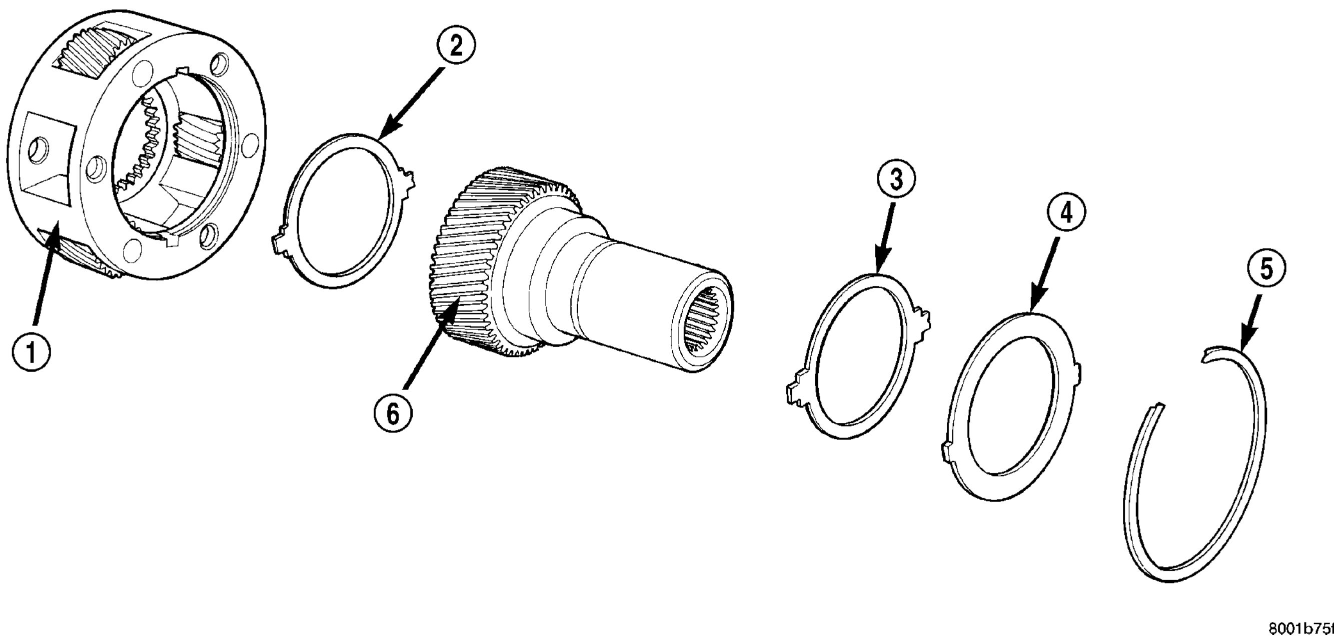


Fig. 44 Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

TRANSFER CASE - NV242 (Continued)

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 45). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

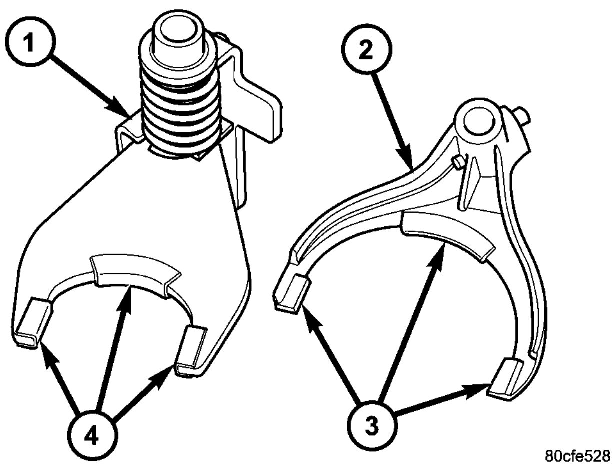


Fig. 45 Shift Fork And Wear Pad Locations

1 - MODE FORK
2 - RANGE FORK
3 - WEAR PADS (SERVICEABLE)
4 - WEAR PADS (SERVICEABLE)

Inspect the shift fork wear pads. The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are also serviceable.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 46). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Replace any part if distorted, bent, or broken. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 47). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 48)

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil™ stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

TRANSFER CASE - NV242 (Continued)

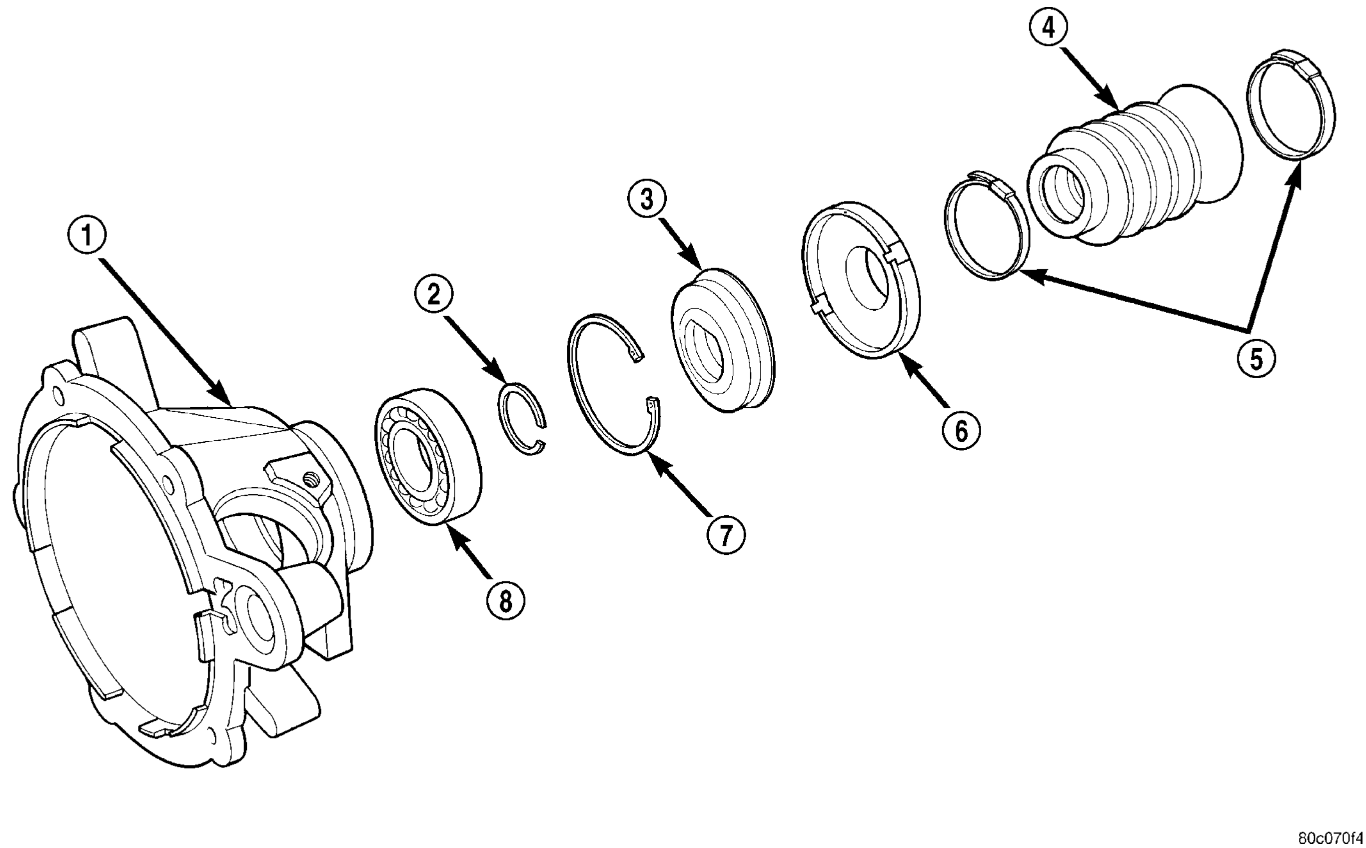


Fig. 46 Rear Retainer - Typical

1 - REAR RETAINER
2 - REAR BEARING I.D. MAINSHAFT RETAINING RING
3 - REAR SEAL
4 - BOOT
5 - BAND CLAMPS
6 - REAR SLINGER
7 - REAR BEARING O.D. RETAINING RING
8 - REAR BEARING

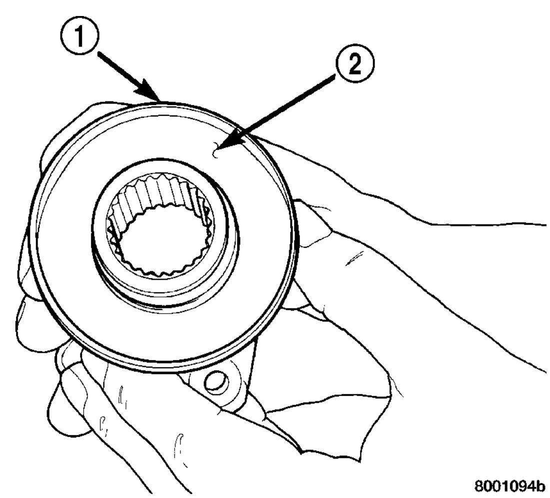


Fig. 47 Seal Contact Surface Of Yoke Slinger

1 - FRONT SLINGER (PART OF YOKE)
2 - SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

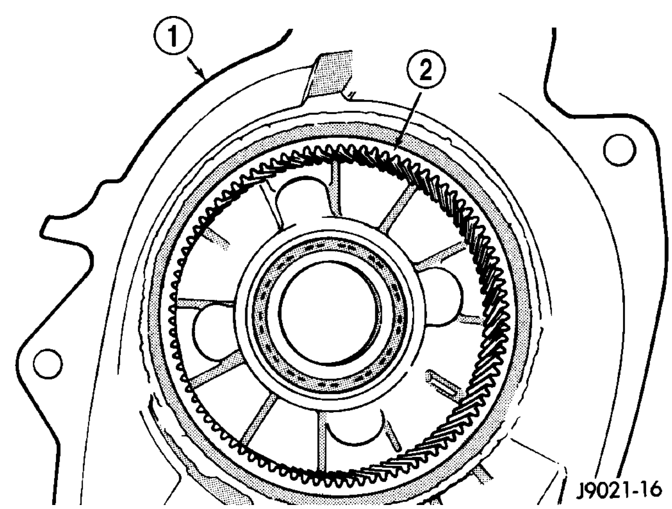


Fig. 48 Low Range Annulus Gear

1 - FRONT CASE
2 - LOW RANGE ANNULUS GEAR

TRANSFER CASE - NV242 (Continued)

ASSEMBLY

Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

BEARINGS AND SEALS

(1) Remove snap-ring that retains front output shaft front bearing in case (Fig. 49). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.

(2) Install new front output shaft front bearing with Tool Handle C-4171 and Installer 8033-A with the tapered cone upward (Fig. 50).

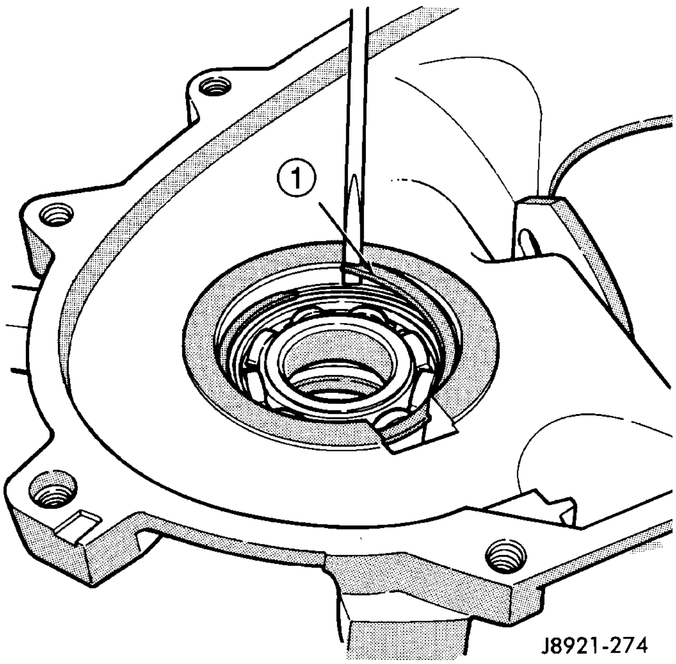


Fig. 49 Front Output Shaft Front Bearing Snap-Ring Removal

1 - FRONT BEARING SNAP RING

(3) Install front bearing snap-ring (Fig. 49).

(4) Remove front output shaft seal using an appropriate pry tool (Fig. 51) or slide-hammer mounted screw.

(5) Install new front output shaft oil seal with Installer 6952-A (Fig. 52).

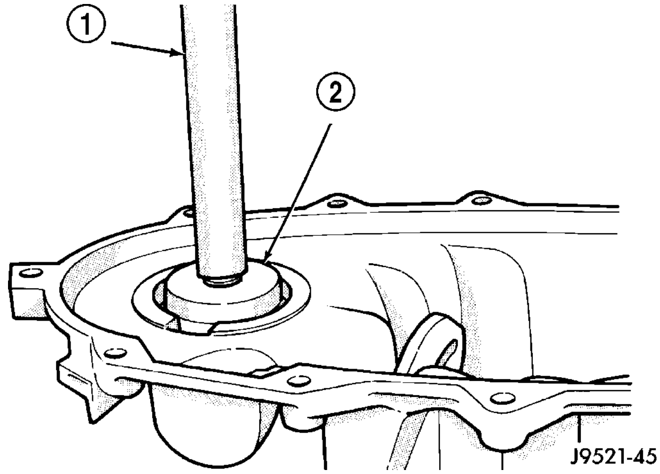


Fig. 50 Front Output Shaft Front Bearing Installation

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 8033A

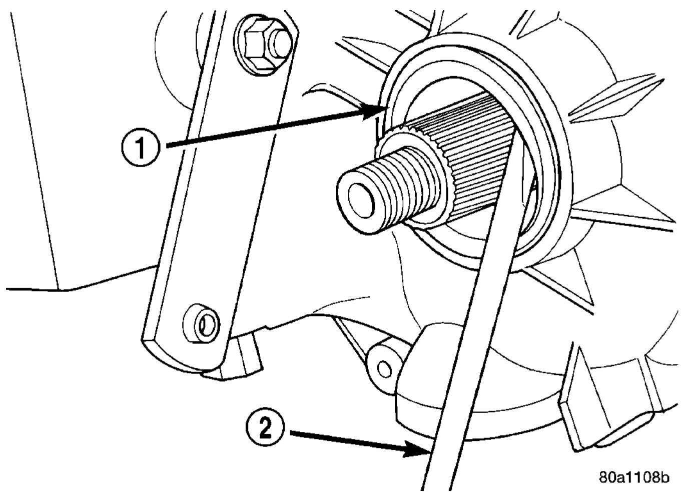


Fig. 51 Remove Front Output Shaft Seal - Typical

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

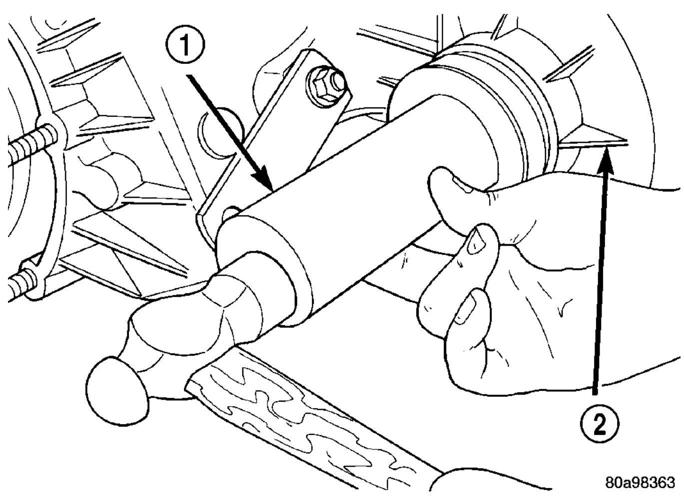


Fig. 52 Install Front Output Shaft Seal - Typical

1 - INSTALLER 6952-A
2 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 53).

(7) Install snap-ring on new input gear bearing.

(8) Install new input gear bearing with Tool Handle C-4171 and Remover C-4210. Install bearing far enough to seat snap-ring against case (Fig. 54).

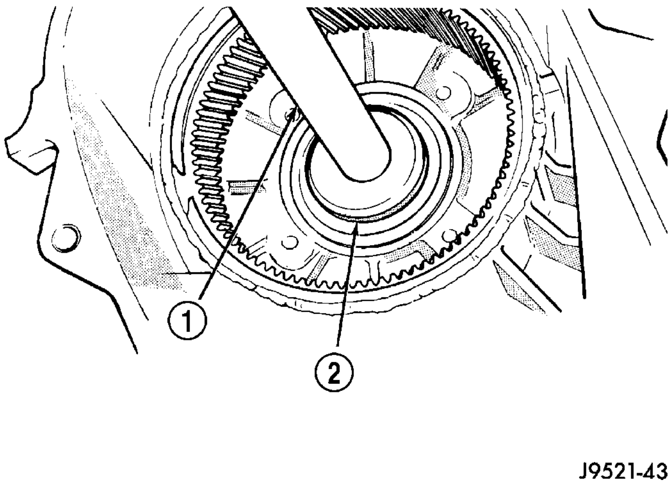


Fig. 53 Input Gear Bearing Removal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-4210

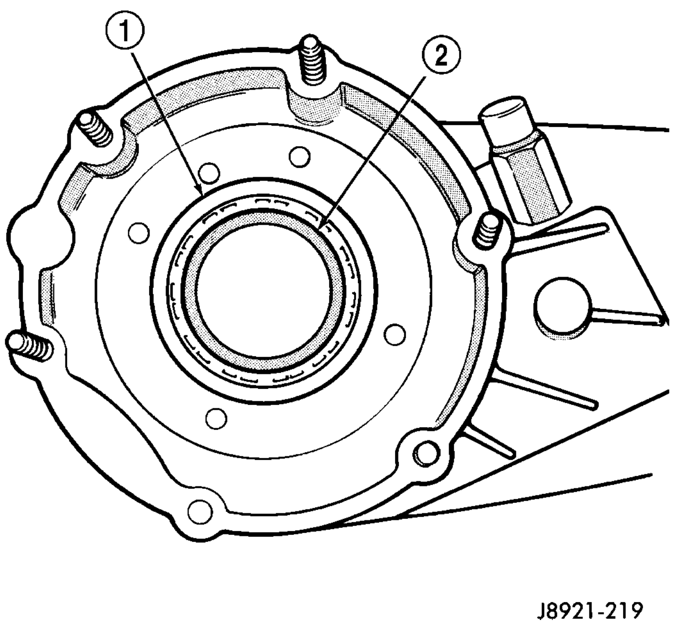


Fig. 54 Seating Input Gear Bearing

1 - SNAP-RING
2 - INPUT SHAFT BEARING

(9) Remove the input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 55).

(10) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 56).

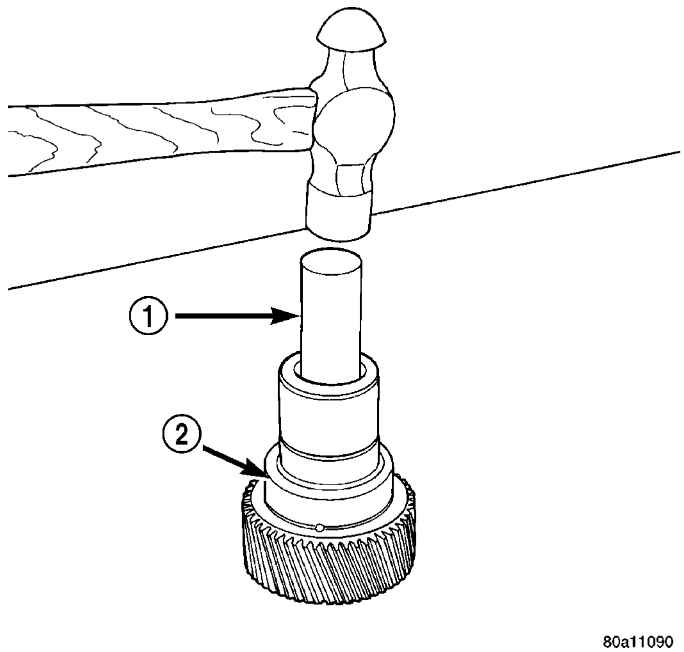


Fig. 55 Remove Input Gear Pilot Bearing

1 - DRIFT
2 - INPUT GEAR

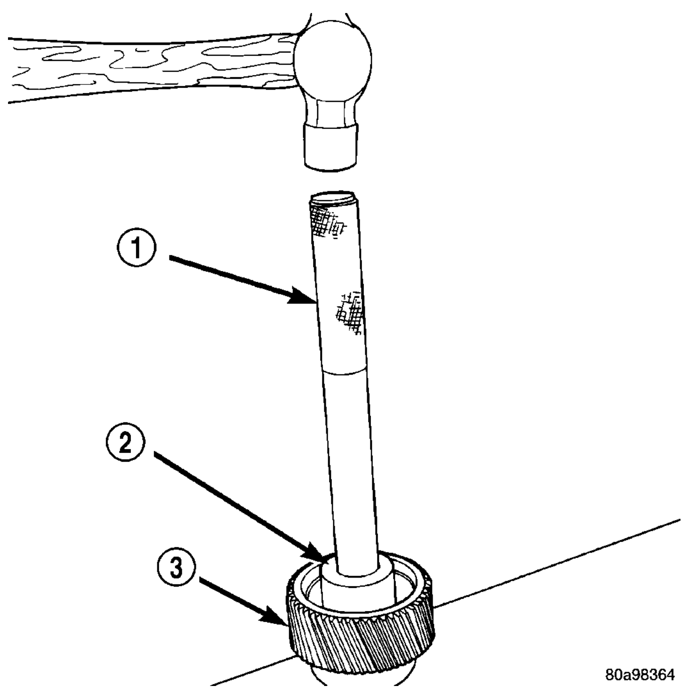


Fig. 56 Install Input Gear Pilot Bearing

1 - HANDLE C-4171
2 - INSTALLER 8128
3 - INPUT GEAR

TRANSFER CASE - NV242 (Continued)

(11) Install new seal in front bearing retainer with Installer 7884 (Fig. 57).

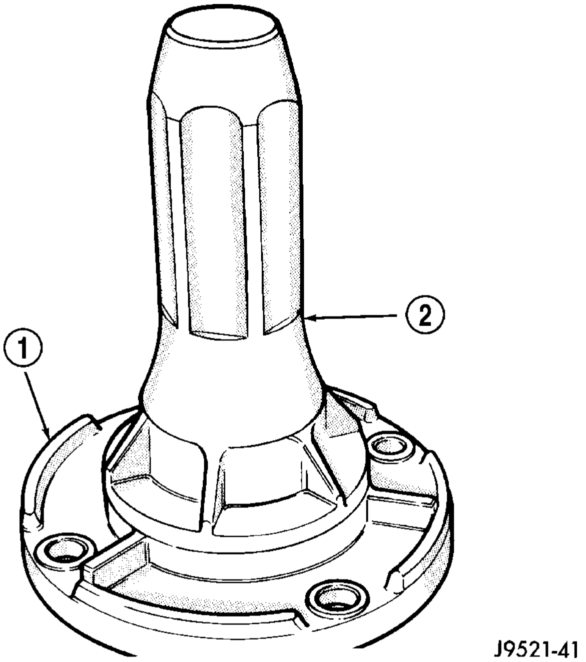


Fig. 57 Front Bearing Retainer Seal Installation

1 - FRONT BEARING RETAINER
2 - SPECIAL TOOL 7884

(12) Remove output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 58).

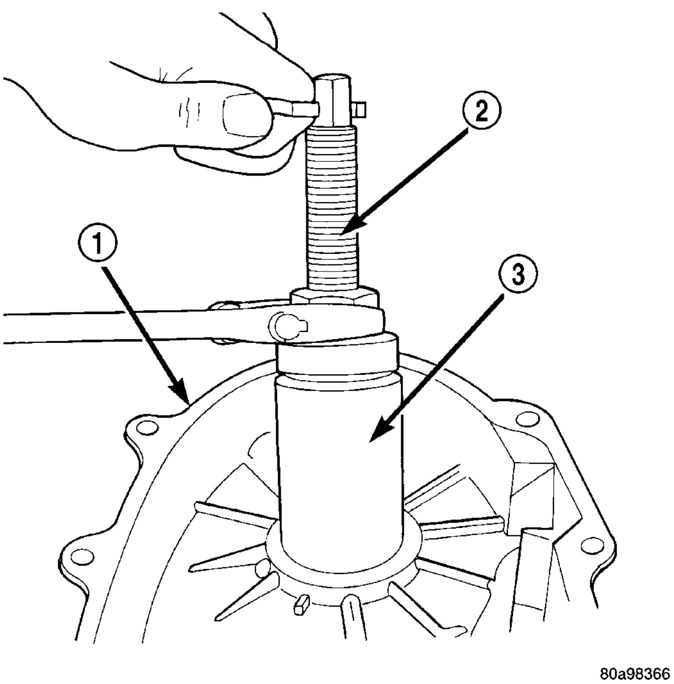


Fig. 58 Remove Front Output Shaft Rear Bearing

1 - REAR CASE
2 - SPECIAL TOOL L-4454-1 AND L-4454-3
3 - SPECIAL TOOL 8148

(13) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 59). Lubricate bearing after installation.

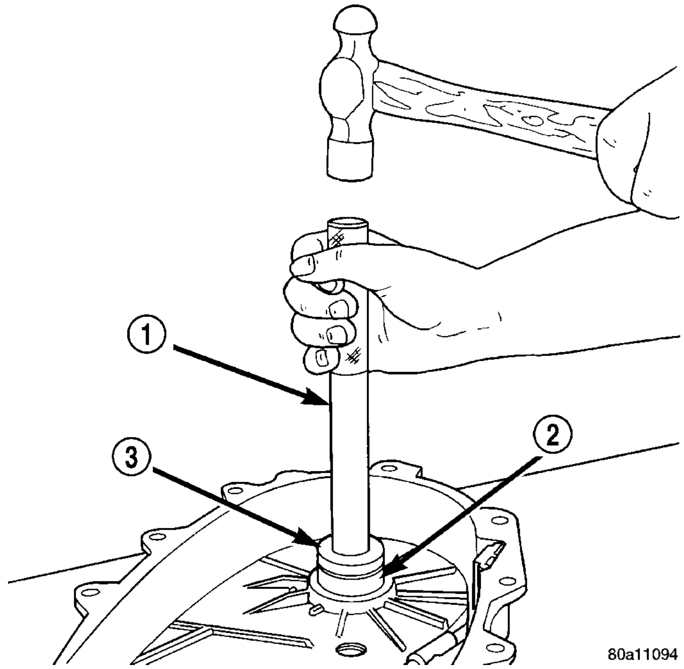


Fig. 59 Install Front Output Shaft Rear Bearing

1 - HANDLE C-4171
2 - OUTPUT SHAFT INNER BEARING
3 - INSTALLER 5066

(14) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 60).

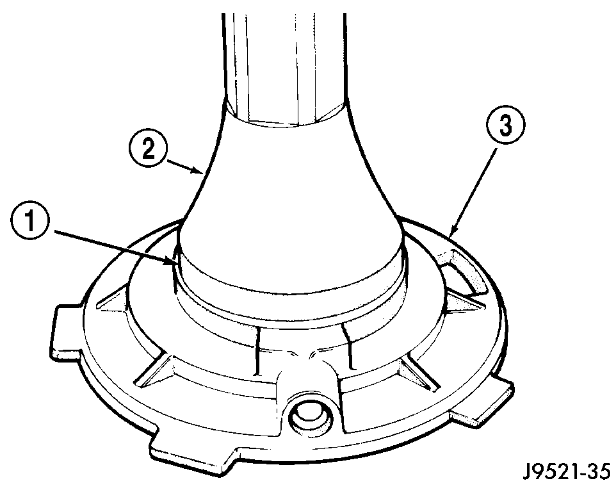


Fig. 60 Oil Pump Seal Installation

1 - HOUSING SEAL
2 - SPECIAL TOOL 7888
3 - OIL PUMP FEED HOUSING

TRANSFER CASE - NV242 (Continued)

(15) Install new pickup tube O-ring in oil pump (Fig. 61).

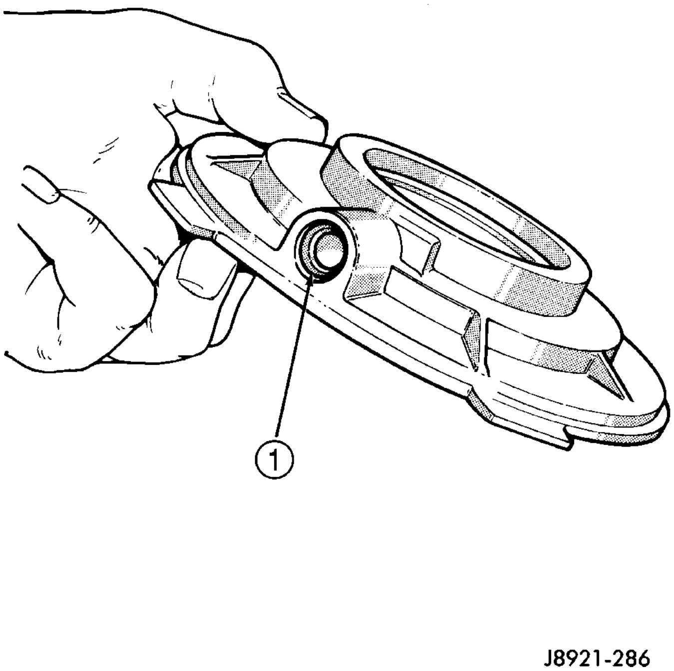


Fig. 61 Pickup Tube O-Ring Installation

1 - PICKUP TUBE O-RING

DIFFERENTIAL

(1) Lubricate differential components with automatic transmission fluid.

(2) Install sprocket gear in differential bottom case (Fig. 62).

(3) Install differential planet gears and new thrust washers (Fig. 63). Be sure thrust washers are installed at top and bottom of each planet gear.

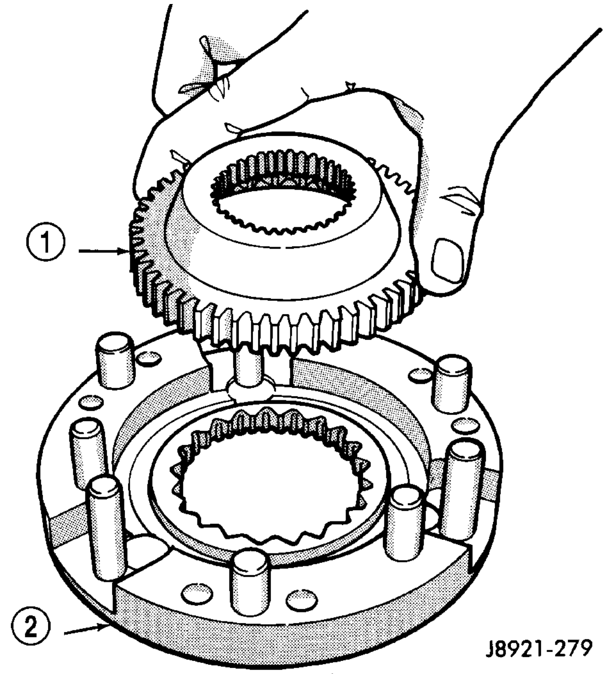


Fig. 62 Installing Differential Sprocket Gear

1 - SPROCKET GEAR
2 - BOTTOM CASE

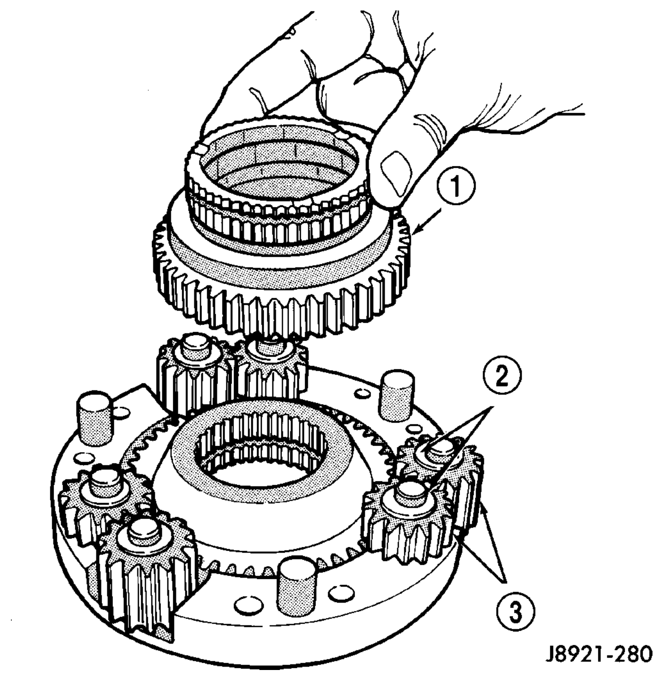


Fig. 63 Installing Mainshaft And Planet Gears

1 - MAINSHAFT GEAR
2 - THRUST WASHERS (12)
3 - PLANET GEARS (6)

TRANSFER CASE - NV242 (Continued)

(4) Install differential mainshaft gear (Fig. 63).

(5) Align and position differential top case on bottom case (Fig. 64). Align using scribe marks made at disassembly.

(6) While holding differential case halves together, invert the differential and start the differential case bolts.

(7) Tighten differential case bolts to specified torque.

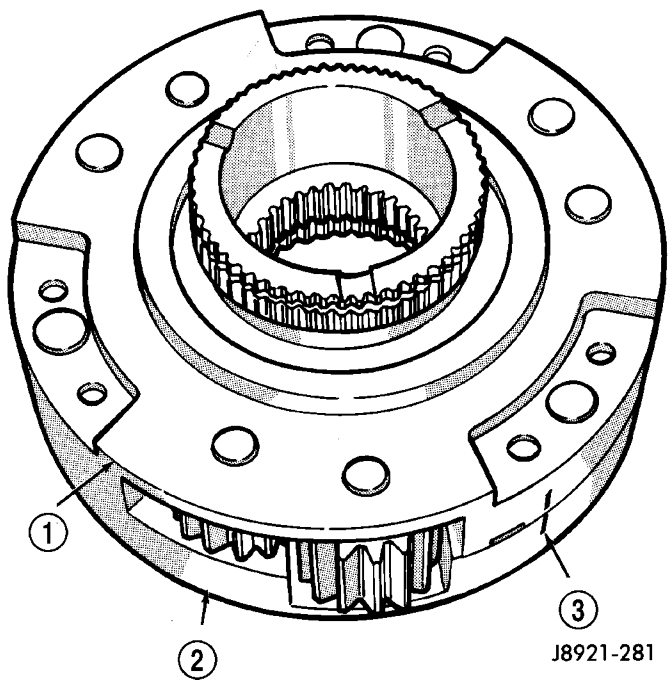


Fig. 64 Differential Case Assembly

1 - TOP CASE
2 - BOTTOM CASE
3 - CASE ALIGNMENT MARKS

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 65).

(2) Install low range gear snap-ring (Fig. 66).

(3) Lubricate input gear and low range gears with automatic transmission fluid.

(4) Start input gear shaft into front case bearing.

(5) Press input gear shaft into front bearing.

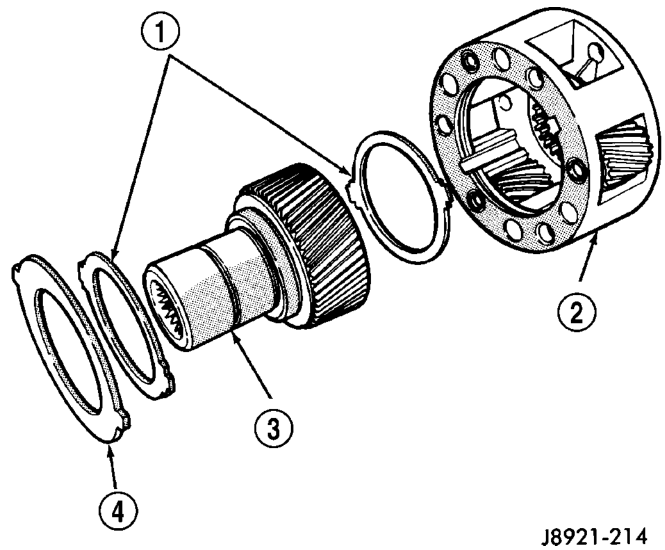


Fig. 65 Low Range And Input Gear Assembly

1 - THRUST WASHERS
2 - LOW RANGE GEAR
3 - INPUT GEAR
4 - RETAINER

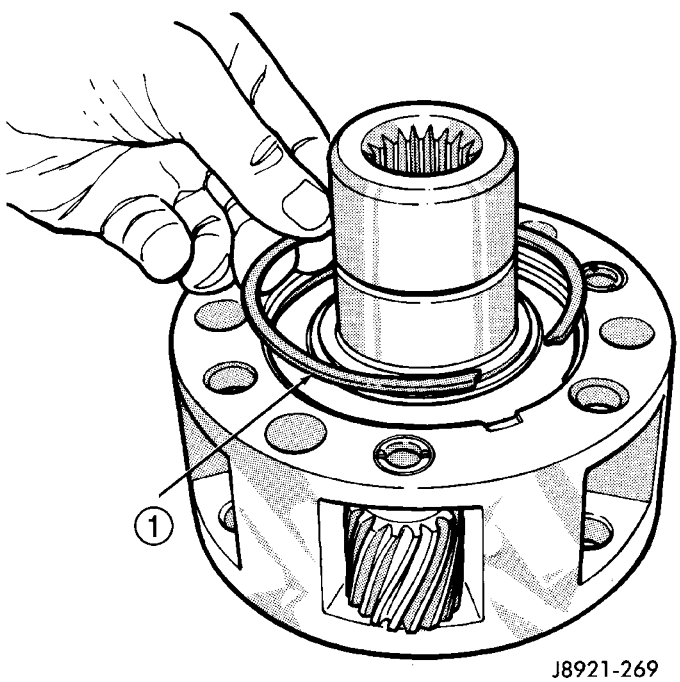


Fig. 66 Install Low Range Gear Snap-Ring

1 - LOW RANGE GEAR SNAP-RING

(6) Install new input gear snap ring (Fig. 67).

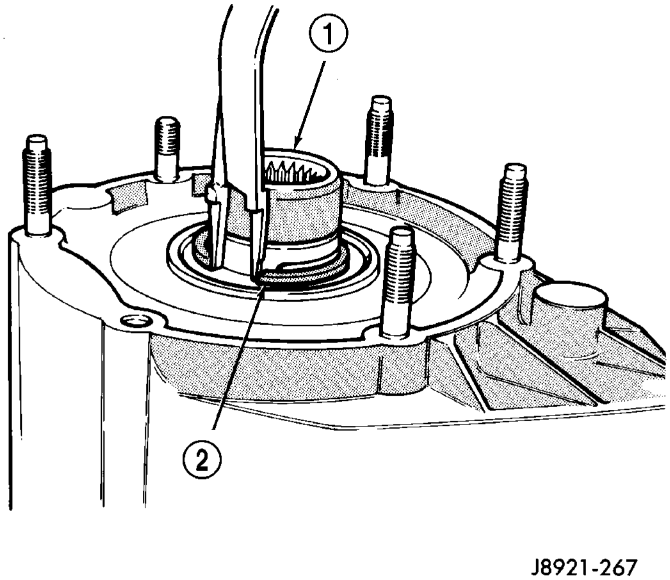


Fig. 67 Input Gear Snap-Ring Installation

1 - INPUT GEAR
2 - SNAP-RING

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front bearing retainer.

(8) Install front bearing retainer (Fig. 68). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

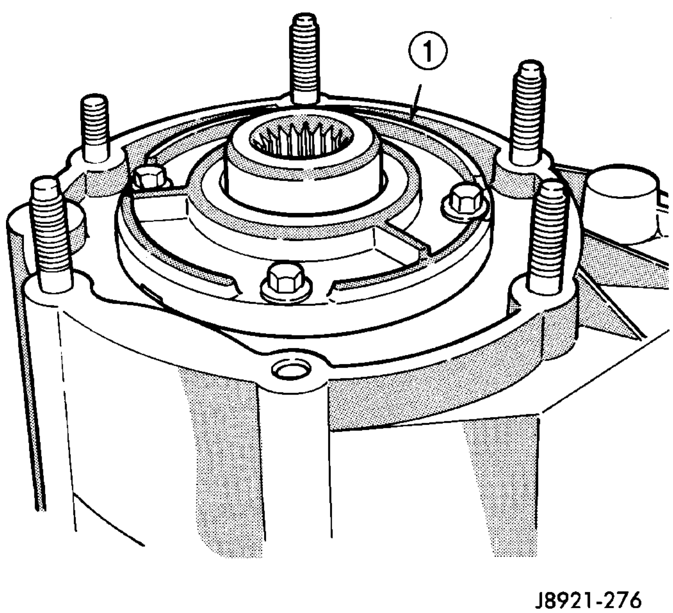


Fig. 68 Installing Front Bearing Retainer

1 - FRONT BEARING RETAINER

SHIFT FORKS, SECTOR, AND MAINSHAFT

(1) Install the shift sector shaft bearing using a suitable socket until the bearing is flush to the bottom, inner edge of the bore (Fig. 69).

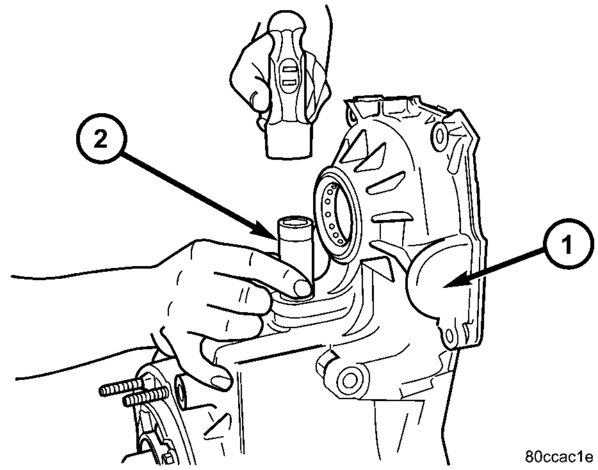


Fig. 69 Install Shift Sector Shaft Bearing

1 - TRANSFER CASE
2 - SOCKET

(2) Install a new shift sector shaft seal using a suitable socket until the seal is flush to the bottom of the bore lead-in chamfer.

(3) Install shift sector.

(4) Install new pads on low range fork, if necessary.

(5) Assemble low range fork and sleeve.

(6) Position low range fork and sleeve in case. Be sure low range fork pin is engaged in shift sector slot (Fig. 70).

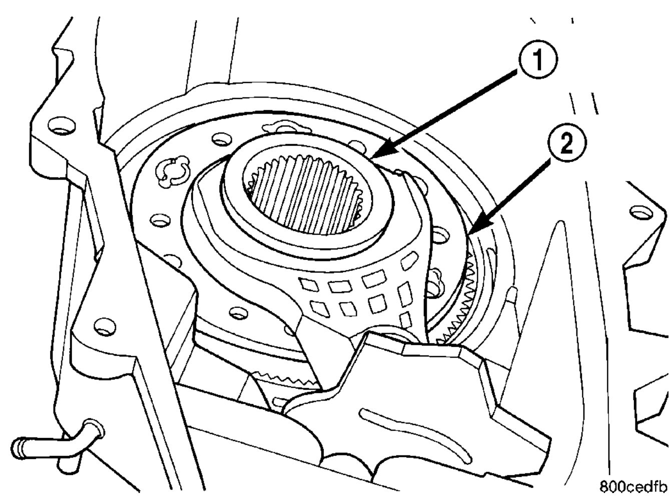


Fig. 70 Install Range Fork And Sleeve Assembly

1 - RANGE SLEEVE
2 - RANGE FORK

TRANSFER CASE - NV242 (Continued)

(7) Install first mainshaft bearing spacer on mainshaft (Fig. 71).

(8) Install bearing rollers on mainshaft (Fig. 71). Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.

(9) Install remaining bearing spacer on mainshaft (Fig. 71). Do not displace any bearings while installing spacer.

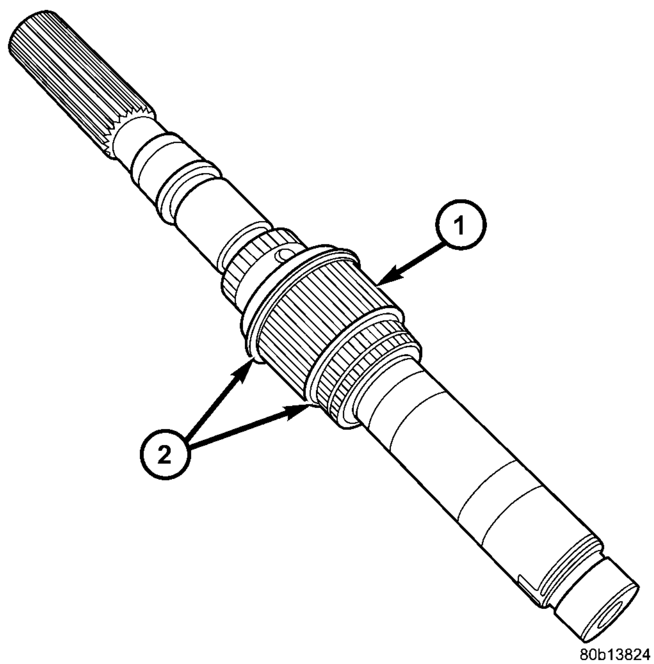


Fig. 71 Installing Mainshaft Bearing Rollers and Spacers

1 - MAINSHAFT BEARING ROLLERS
2 - BEARING SPACERS

(10) Install differential (Fig. 72). Do not displace mainshaft bearings when installing differential.

(11) Install differential snap-ring (Fig. 73).

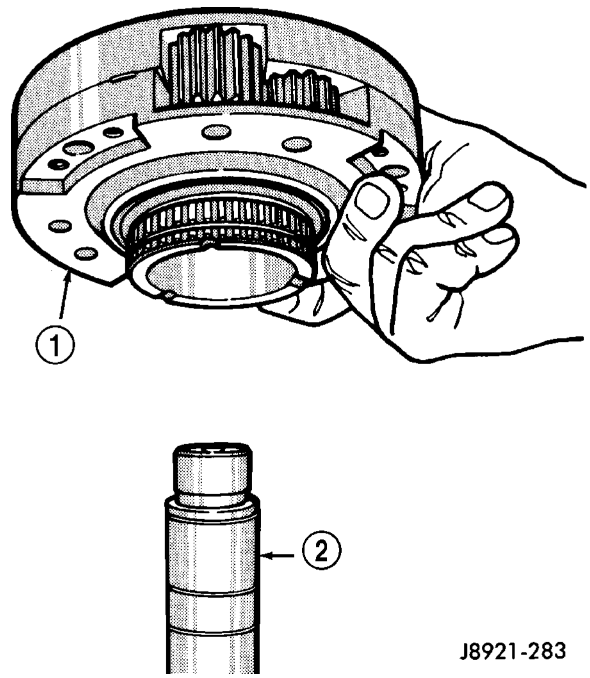


Fig. 72 Differential Installation

1 - DIFFERENTIAL
2 - MAINSHAFT

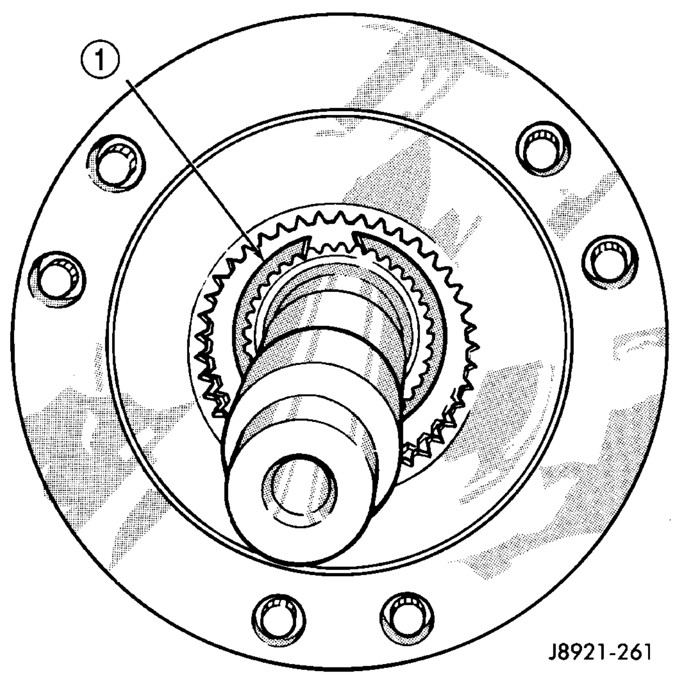


Fig. 73 Installing Differential Snap-Ring

1 - DIFFERENTIAL SNAP-RING

TRANSFER CASE - NV242 (Continued)

(12) Install intermediate clutch shaft (Fig. 74).

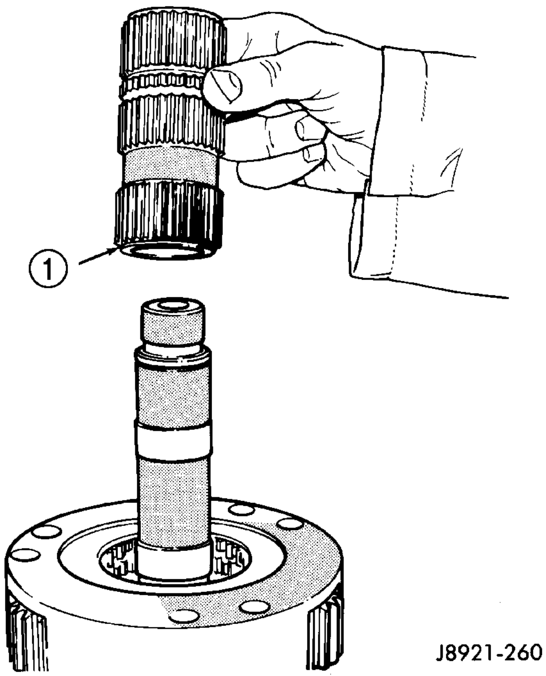


Fig. 74 Installing Intermediate Clutch Shaft

1 - INTERMEDIATE CLUTCH SHAFT

(13) Install clutch shaft thrust washer (Fig. 75).
(14) Install clutch shaft snap-ring (Fig. 76).

Fig. 75 Installing Clutch Shaft Thrust Washer

1 - CLUTCH SHAFT THRUST RING

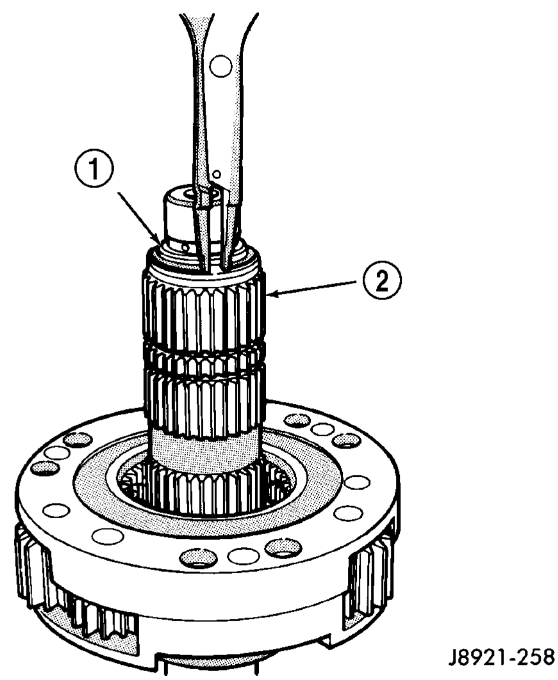


Fig. 76 Installing Clutch Shaft Snap-Ring

1 - SNAP-RING
2 - INTERMEDIATE CLUTCH SHAFT

TRANSFER CASE - NV242 (Continued)

(15) Inspect mode fork assembly (Fig. 77). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 77). Replace worn, damaged components.

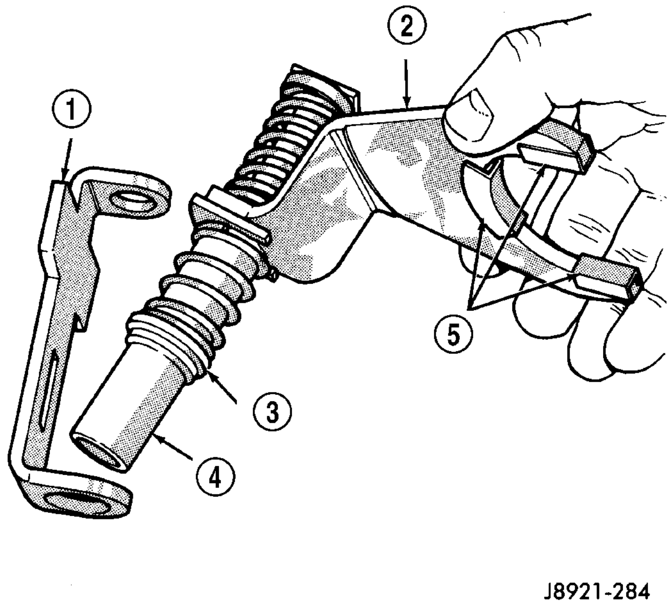


Fig. 77 Mode Fork Assembly Inspection

1 - SLIDER
2 - MODE FORK
3 - BUSHING/SPRING
4 - TUBE
5 - PADS

(16) Install mode sleeve in mode fork (Fig. 78). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

(17) Install mode fork and mainshaft assembly in case (Fig. 79). Rotate mainshaft slightly to engage shaft with low range gears.

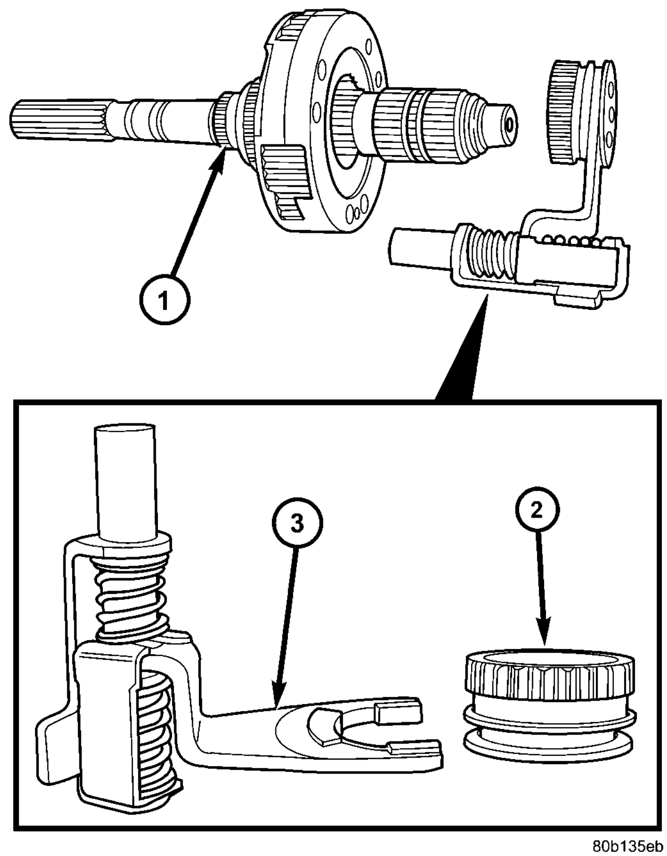


Fig. 78 Installing Mode Fork And Sleeve

1 - MAINSHAFT
2 - MODE SLEEVE
3 - MODE FORK ASSEMBLY

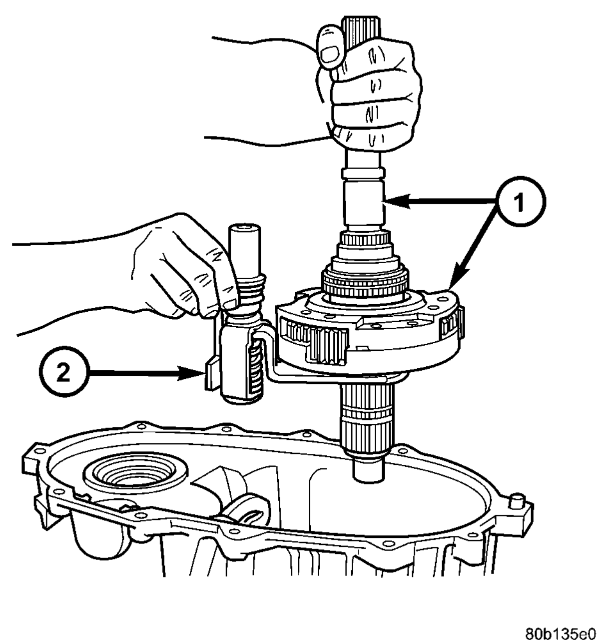


Fig. 79 Assembled Mainshaft And Mode Fork Installation

1 - MAINSHAFT ASSEMBLY
2 - MODE FORK

TRANSFER CASE - NV242 (Continued)

(18) Rotate mode fork pin into shift sector slot.

(19) Install shift rail (Fig. 80). Be sure rail is seated in both shift forks.

(20) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(21) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 81). Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.

(22) Insert lockpin through access hole and into shift fork (Fig. 81). Then remove easy-out and seat the pin with pin punch.

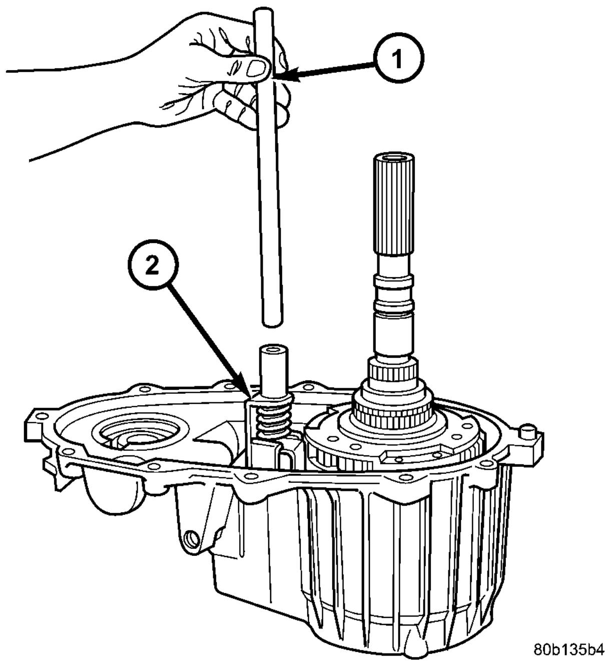


Fig. 80 Shift Rail Installation

1 - SHIFT RAIL
2 - MODE FORK

(23) Install plug in lockpin access hole.

(24) Install detent plunger, detent spring and detent plug in case (Fig. 82).

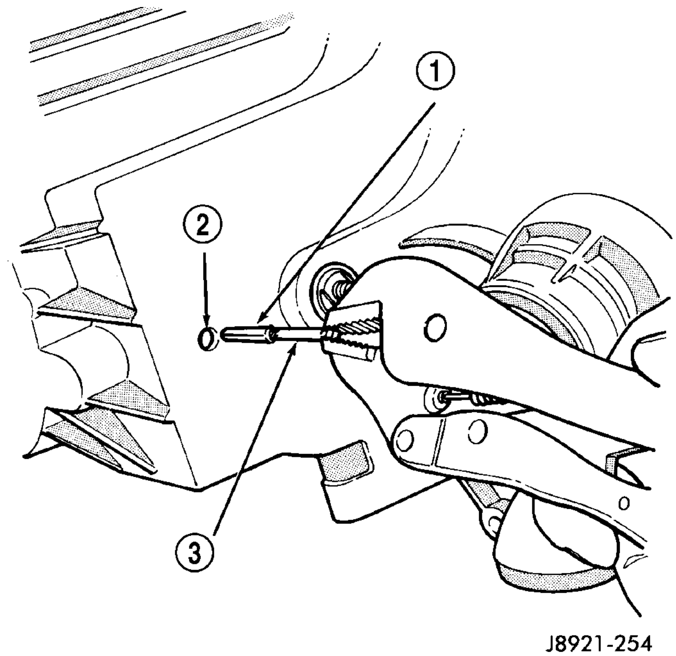


Fig. 81 Installing Low Range Fork Lockpin

1 - LOW RANGE FORK LOCK PIN
2 - ACCESS HOLE
3 - EASY-OUT

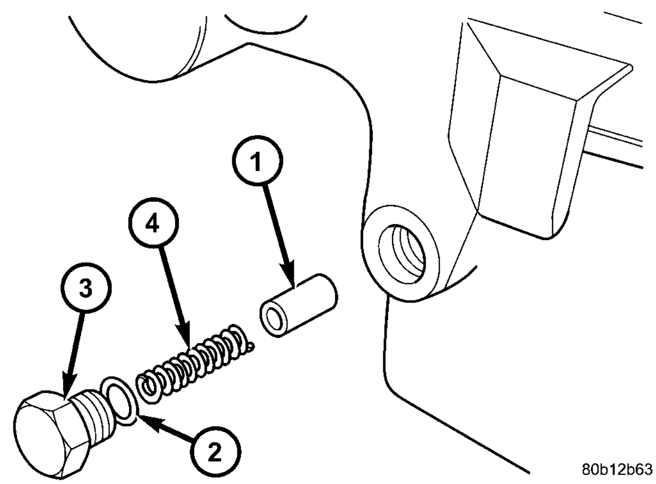


Fig. 82 Detent Pin, Spring And Plug Installation

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

TRANSFER CASE - NV242 (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Install front output shaft (Fig. 83).

(2) Install drive chain (Fig. 83). Engage chain with front output shaft sprocket teeth.

(3) Install drive sprocket (Fig. 83). Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

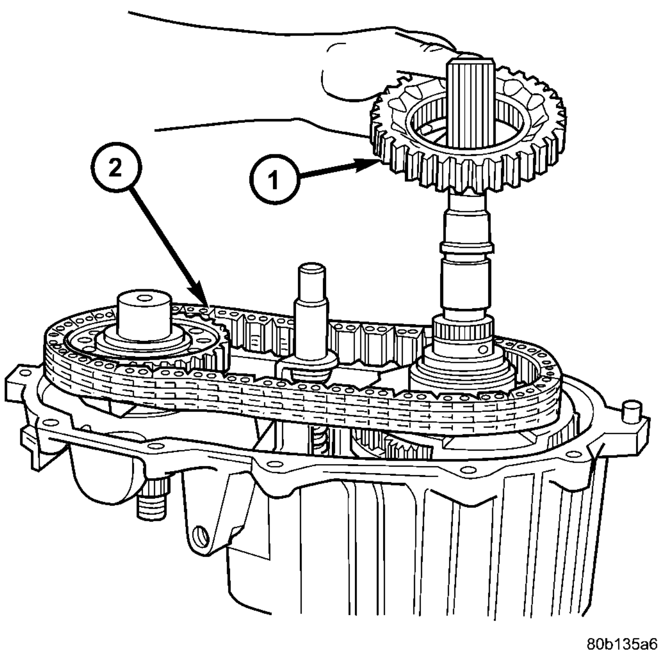


Fig. 83 Drive Chain And Sprocket Installation

1 - DRIVE SPROCKET
2 - DRIVE CHAIN

(4) Install drive sprocket snap-ring (Fig. 84).

OIL PUMP AND REAR CASE

(1) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 85). Be sure screen is seated in case slot as shown.

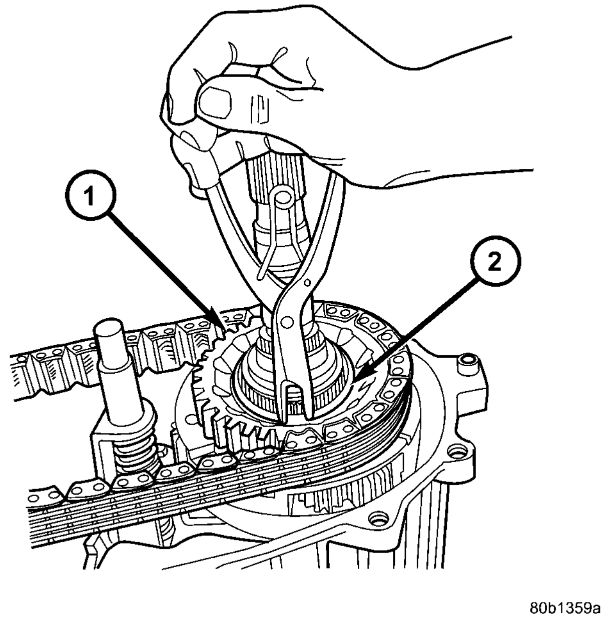


Fig. 84 Drive Sprocket Snap-Ring Installation

1 - DRIVE SPROCKET
2 - DRIVE SPROCKET SNAP-RING

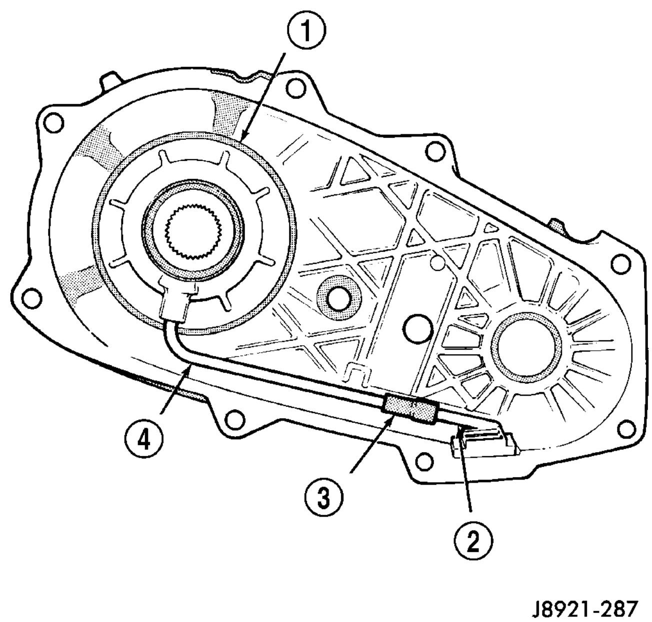


Fig. 85 Oil Screen And Pickup Tube Installation

1 - OIL PUMP
2 - OIL SCREEN
3 - CONNECTOR
4 - PICKUP TUBE

TRANSFER CASE - NV242 (Continued)

(2) Install magnet in front case pocket (Fig. 86).

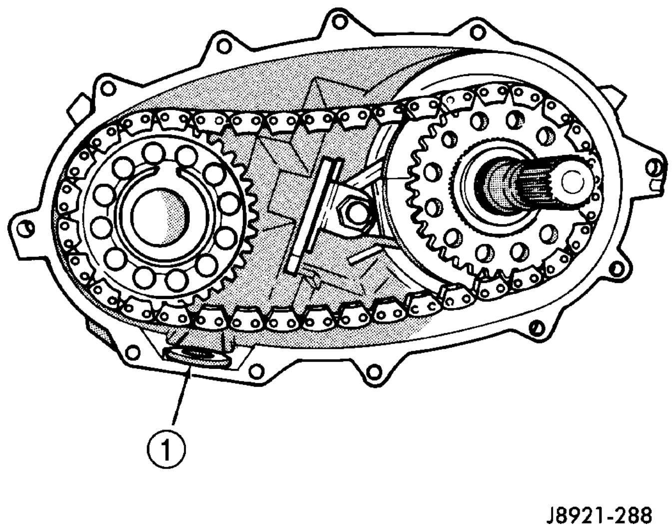


Fig. 86 Installing Case Magnet

1 - MAGNET

(3) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front case.

(4) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(5) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. Be sure to install a washer under each bolt used at case dowel locations.

REAR RETAINER

(1) Remove rear bearing in retainer using Installer 8128 and Handle C-4171.

(2) Install rear bearing in retainer with Tools C-4171 and 5064 (Fig. 87).

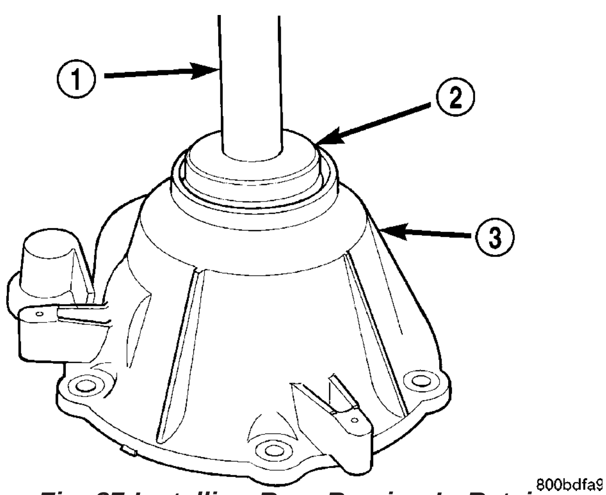


Fig. 87 Installing Rear Bearing In Retainer

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 5052
3 - REAR RETAINER

(3) Install rear bearing O.D. retaining ring with snap-ring pliers (Fig. 88). Be sure retaining ring is fully seated in retainer groove.

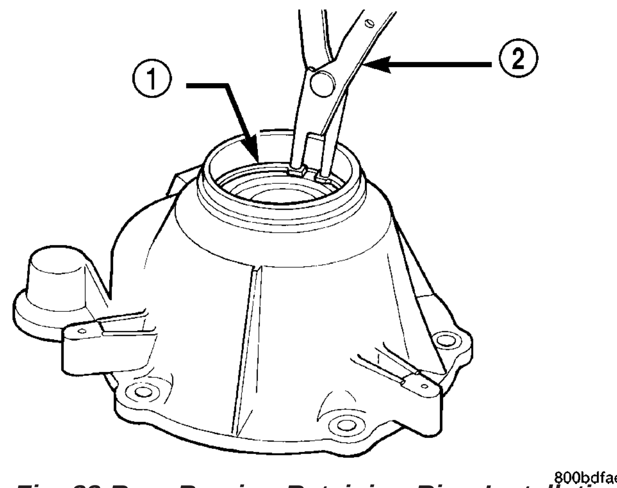


Fig. 88 Rear Bearing Retaining Ring Installation

1 - REAR BEARING O.D. RETAINING RING
2 - SNAP-RING PLIERS

(4) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

(5) Install rear retainer on rear case. Tighten retainer bolts to 20-27 N·m (15-20 ft. lbs.) torque.

(6) Install rear bearing I.D. retaining ring and spacer on output shaft.

(7) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(8) Slide seal onto Seal Protector 8824 (Fig. 89). Slide seal protector and seal onto output shaft.

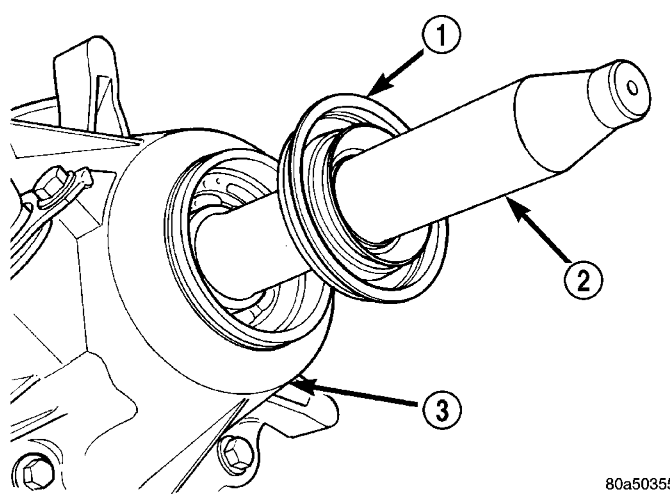


Fig. 89 Output Shaft

1 - OUTPUT SHAFT SEAL
2 - SPECIAL TOOL 8824
3 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

(9) Slide Installer 8691 onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with Installer 8691 (Fig. 90).

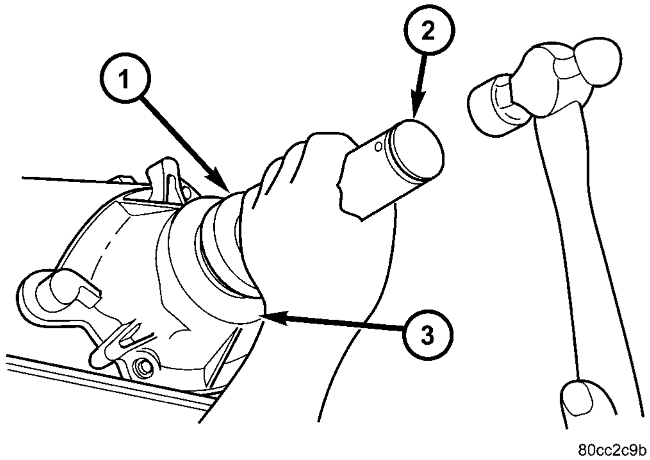


Fig. 90 Rear Seal Installation

1 - SPECIAL TOOL 8691
2 - HANDLE
3 - TRANSFER CASE

(10) Install rear slinger with Installer 9023.

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 91).

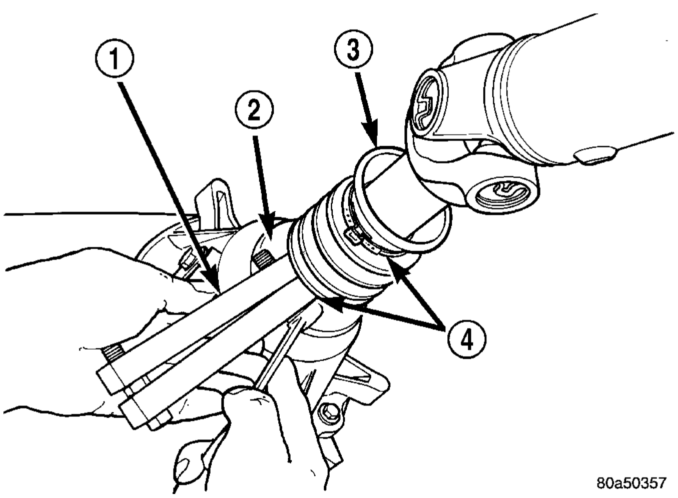


Fig. 91 Slinger Boot Installation

1 - SPECIAL TOOL C-4975-A
2 - SLINGER
3 - BOOT
4 - CLAMP

COMPANION FLANGE AND RANGE LEVER

(1) Install range lever and bolt on sector shaft (Fig. 92). Tighten bolt to 27-34 N·m (20-25 ft. lbs.) torque.

(2) Inspect the o-ring on the transfer case position sensor. Replace the o-ring if necessary.

(3) Install the transfer case position sensor in the front case (Fig. 93). Tighten sensor to 20-34 N·m (15-25 ft. lbs.) torque.

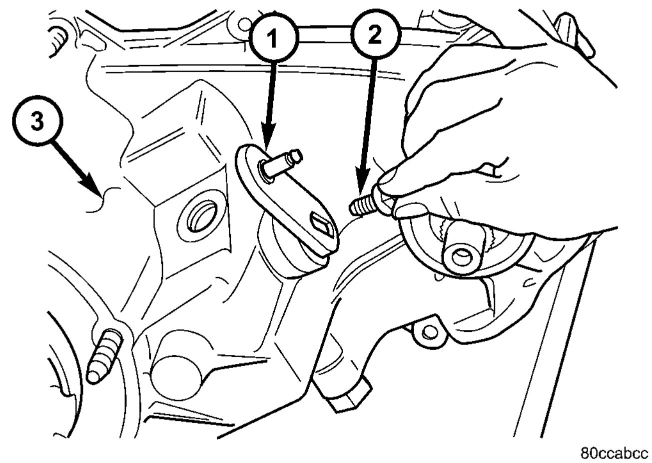


Fig. 92 Install Shift Lever Bolt

1 - RANGE LEVER
2 - RANGE LEVER BOLT
3 - TRANSFER CASE

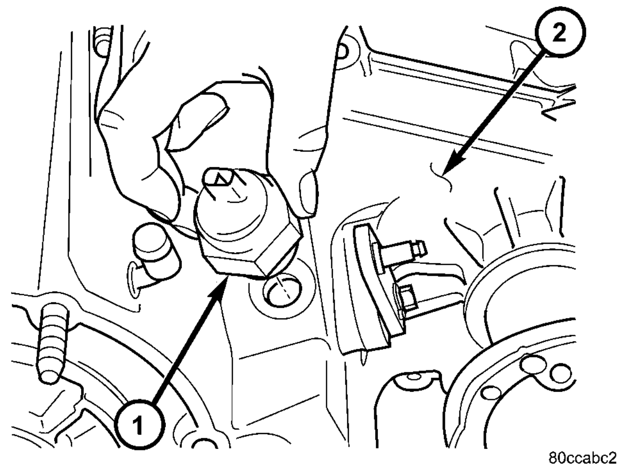


Fig. 93 Install Transfer Case Position Sensor

1 - TRANSFER CASE POSITION SENSOR
2 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

(4) Install new seal washer on front output shaft (Fig. 94).

(5) Lubricate companion flange hub with transmission fluid and install flange onto the front ouput shaft.

(6) Install new seal washer on front shaft.

(7) Install new flange nut onto front output shaft.

(8) Tighten flange nut to 122-176 N·m (90-130 ft. lbs.) torque.

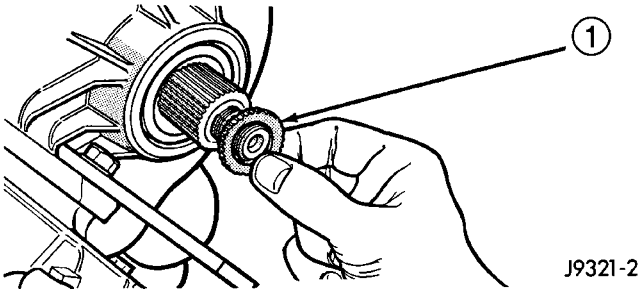


Fig. 94 Seal Washer Installation

1 - SEAL WASHER

INSTALLATION

(1) Mount transfer case on a transmission jack.

(2) Secure transfer case to jack with chains.

(3) Position transfer case under vehicle.

(4) Align transfer case and transmission shafts and install transfer case on transmission.

(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.

(6) Connect vent hose.

(7) Connect transfer case position sensor connector to sensor.

(8) Align and connect propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

(9) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(10) Install skid plate.(Refer to 13 - FRAME & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)

(11) Remove transmission jack and support stand.

(12) Connect shift cable to transfer case range lever.

(13) Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

NV242 TRANSFER CASE

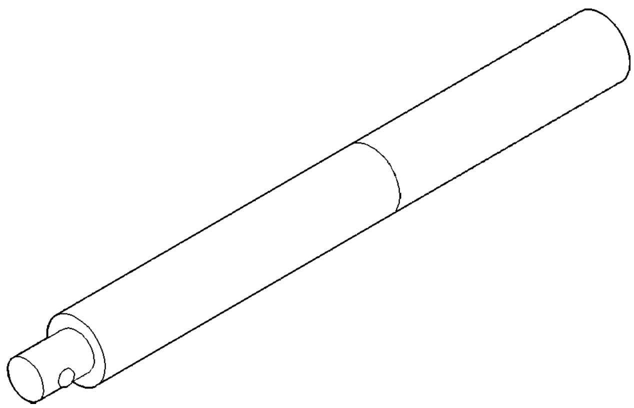
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Bolt, Differential Case	17-27	15-24	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Front Brg. Retainer	16-27	12-20	-
Bolt, Case Half	35-46	26-34	-
Nut, Front Companion Flange	122-176	90-130	-
Bolt, Range Lever	27-34	20-25	-
Bolt, Rear Retainer	35-46	26-34	-
Nuts, Mounting	35	26	-
Screw, Oil Pump	1.2-1.8	-	12-15
Sensor, Transfer Case Position	20-34	16-25	-

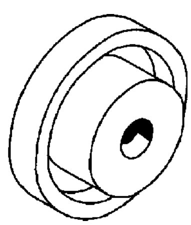
TRANSFER CASE - NV242 (Continued)

SPECIAL TOOLS

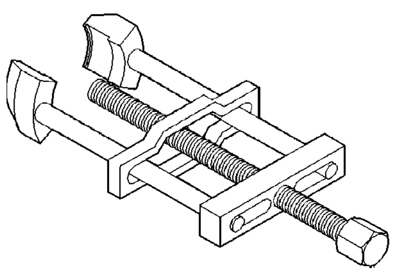
TRANSFER CASE - NV242



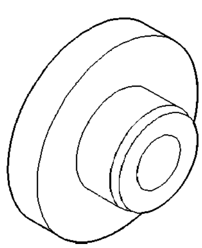
Handle, Universal - C-4171



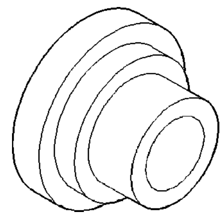
Remover - C-4210



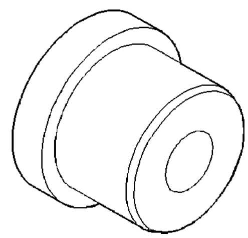
Puller, Slinger - MD-998056-A



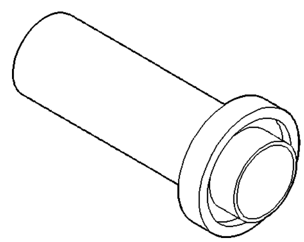
Installer, Bearing - 5064



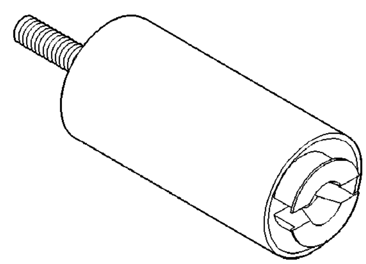
Installer - 8128



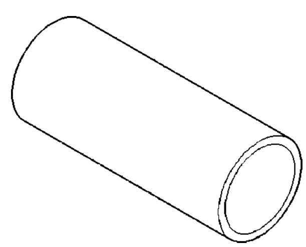
Installer - 5066



Installer - 6952-A

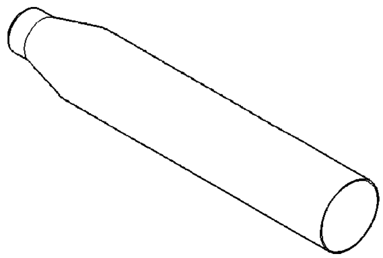


Remover - L-4454

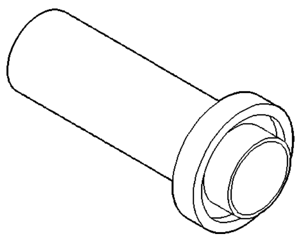


Cup - 8148

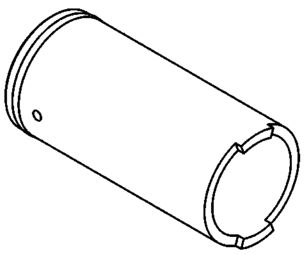
TRANSFER CASE - NV242 (Continued)



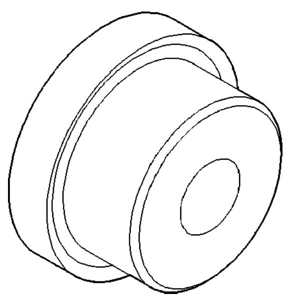
Seal Protector - 8824



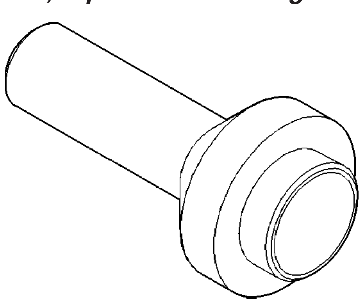
Installer, Seal - 8691



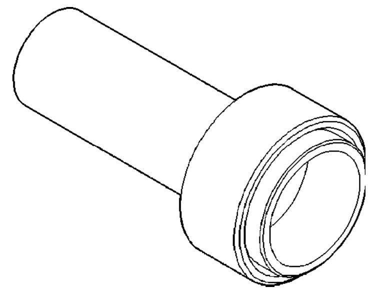
Installer, Output Shaft Slinger - 9023



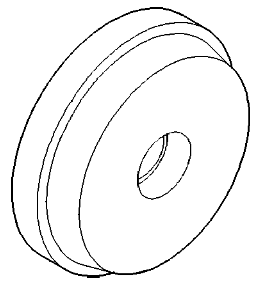
Installer, Input Gear Bearing - 7829-A



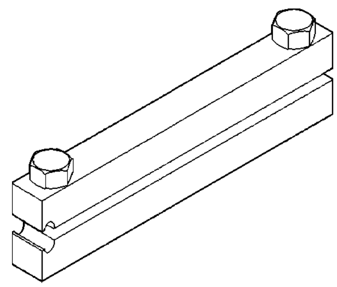
Installer, Seal - 7884



Installer, Pump Housing Seal - 7888



Installer, Bearing - 8033-A



Installer, Boot Clamp - C-4975-A

FLUID

STANDARD PROCEDURE - FLUID DRAIN AND FILL

The fill and drain plugs are both in the rear case (Fig. 95). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

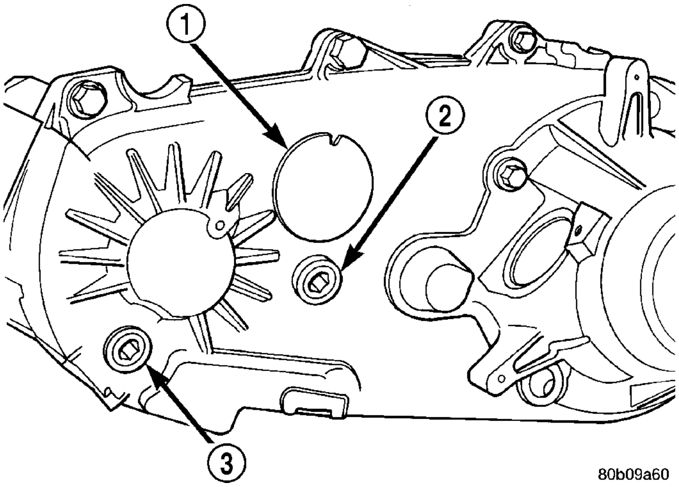


Fig. 95 Fill/Drain Plug and I.D. Tag Location - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(3) Remove front output shaft companion flange.

(4) Remove seal from front case with pry tool (Fig. 96).

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 97). Once seal is started, continue tapping seal into bore until installer tool seats against case.

(2) Install the front output shaft companion flange.

(3) Install the front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

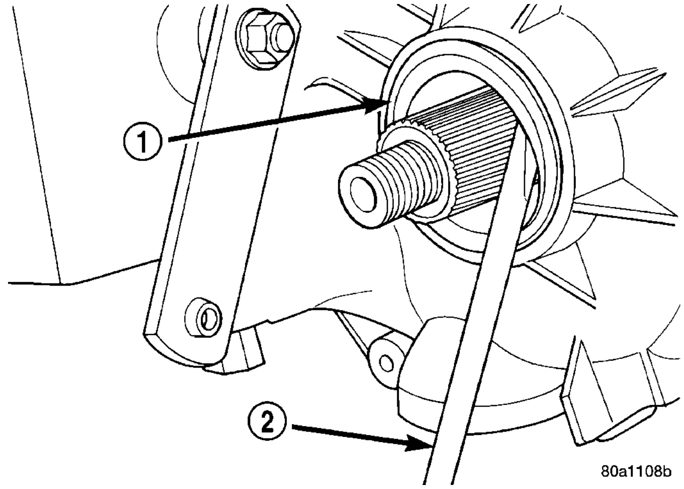


Fig. 96 Remove Front Output Shaft Seal - Typical

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

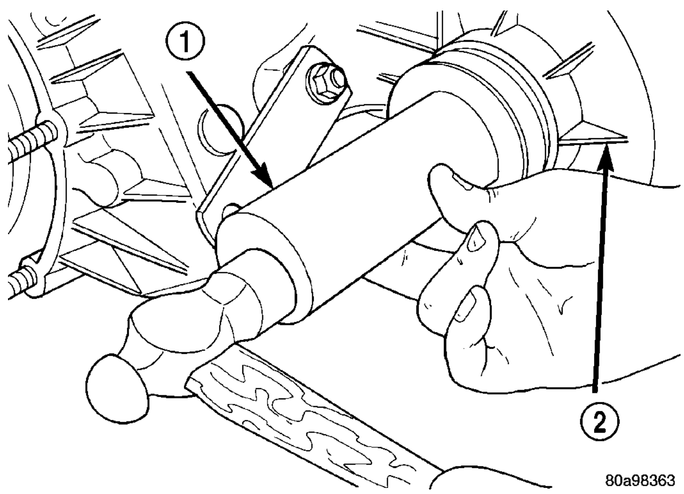


Fig. 97 Front Output Seal Installation - Typical

1 - INSTALLER 6952-A
2 - TRANSFER CASE

POSITION SENSOR

DESCRIPTION

The transfer case position sensor (Fig. 98) is an electronic device whose output can be interpreted to indicate the transfer case's current operating mode. The sensor consists of a five position, resistive multiplexed circuit which returns a specific resistance value to the Powertrain Control Module (PCM) for each transfer case operating mode. The sensor is located on the top of the transfer case, just left of the transfer case centerline and rides against the sector plate roostercomb. The PCM supplies 5VDC (+/-0.5V) to the sensor and monitors the return voltage to determine the sector plate, and therefore the transfer case, position.

POSITION SENSOR (Continued)

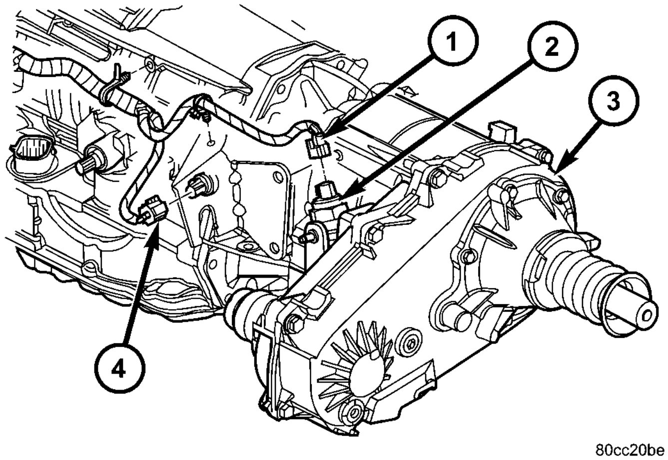


Fig. 98 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

OPERATION

During normal vehicle operation, the Powertrain Control Module (PCM) monitors the transfer case position sensor return voltage to determine the operating mode of the transfer case. Refer to the Operating Mode Versus Resistance table for the correct resistance for each position (Fig. 99).

OPERATING MODE VERSUS RESISTANCE

SENSOR POSITION	OPERATING MODE	SENSOR RESISTANCE (ohms)
1	2WD	1124-1243
2	4WD PART TIME	650-719
3	4WD FULL TIME	389-431
4	NEUTRAL	199-221
5	4WD LOW	57-64

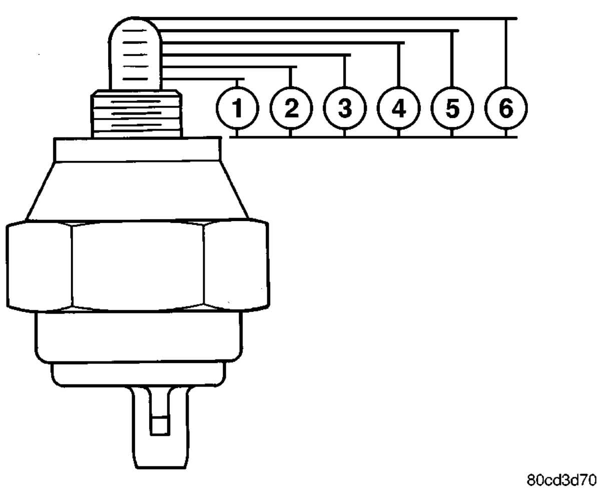


Fig. 99 Position Sensor Linear Movement

1 - POSITION 1 - 10mm ±0.5mm
2 - POSITION 2 - 12mm ±0.5mm
3 - POSITION 3 - 14mm ±0.5mm
4 - POSITION 4 - 16mm ±0.5mm
5 - POSITION 5 - 18mm ±0.5mm
6 - POSITION 6 - 20mm±0.5mm - FULL EXTENSION

POSITION SENSOR (Continued)

REMOVAL

(1) Raise and support the vehicle.

(2) Disengage the transfer case position sensor connector from the position sensor (Fig. 100).

(3) Remove the position sensor from the transfer case.

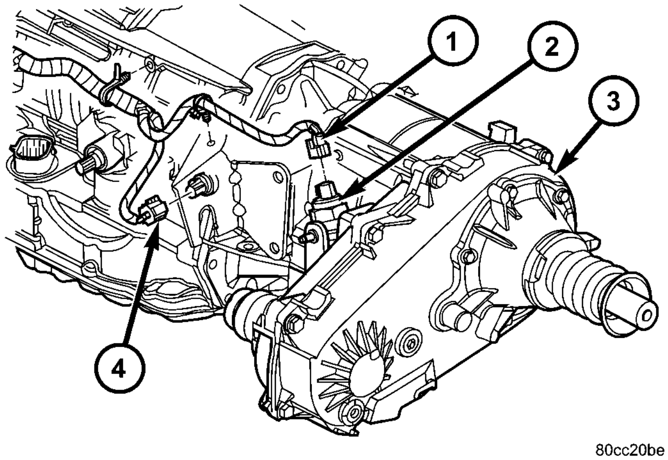


Fig. 100 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

INSTALLATION

(1) Inspect the o-ring seal on the transfer case position sensor. Replace the o-ring if necessary.

(2) Install the transfer case position sensor into the transfer case. Torque the sensor to 20-34 N·m (15-25 ft.lbs.).

(3) Engage the transfer case position sensor connector to the position sensor.

(4) Lower vehicle.

(5) Verify proper sensor operation.

REAR OUTPUT SHAFT SEAL

REMOVAL

(1) Shift the transmission and transfer case into NEUTRAL.

(2) Raise and support vehicle.

(3) Mark a line across the pinion shaft and at each end of the propeller shaft for installation reference.

(4) Remove the U-joint strap bolts at the pinion shaft yoke.

(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 101).

(6) Slide the slip yoke off of the transmission/ transfer case output shaft and remove the propeller shaft.

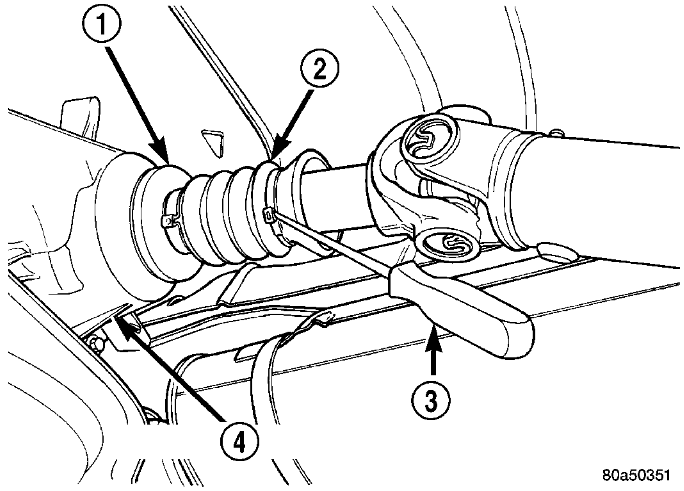


Fig. 101 Dust Boot Clamp

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

(7) Spread band clamp which holds output shaft boot to the output shaft slinger with a suitable awl, or equivalent.

(8) Remove output shaft boot from slinger and output shaft.

(9) Remove the output shaft rear slinger using Puller MD-998056-A (Fig. 102).

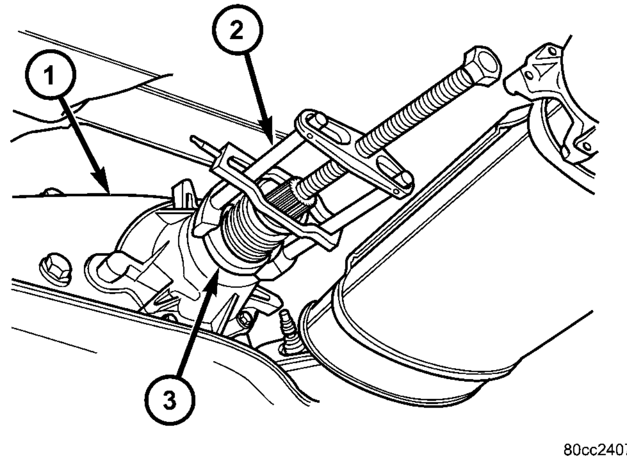


Fig. 102 Rear Slinger Removal

1 - TRANSFER CASE
2 - PULLER MD-998056-A
3 - REAR SLINGER

(10) Use a suitable pry tool, or a slide hammer mounted screw, to remove the seal from the rear retainer (Fig. 103).

REAR OUTPUT SHAFT SEAL (Continued)

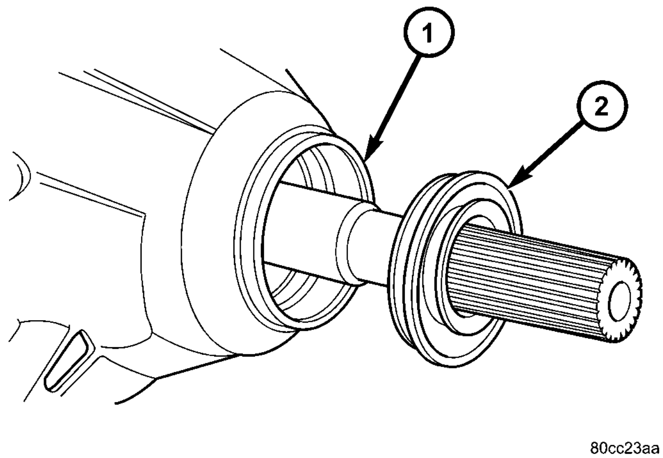


Fig. 103 Rear Retainer Seal

1 - REAR RETAINER
2 - OUTPUT SHAFT SEAL

INSTALLATION

(1) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(2) Slide seal onto Seal Protector 8824 (Fig. 104). Slide seal protector and seal onto output shaft.

(3) Slide Installer 8691 onto seal and mainshaft. Drive seal into rear bearing retainer (Fig. 105).

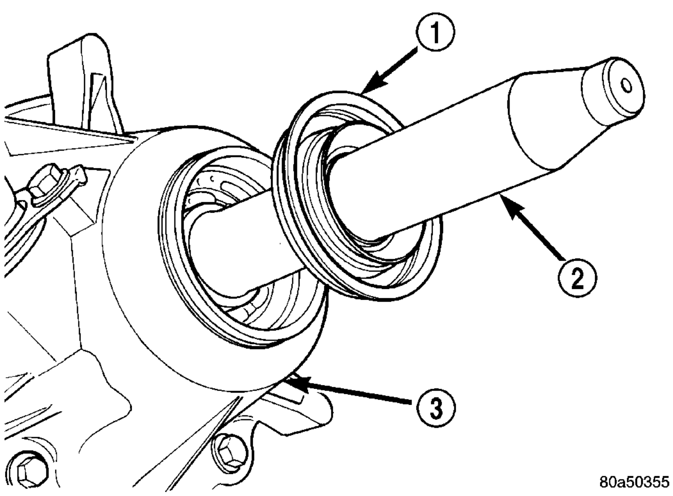


Fig. 104 Output Shaft Seal and Protector

1 - OUTPUT SHAFT SEAL
2 - SPECIAL TOOL 8824
3 - TRANSFER CASE

(4) Install a new output shaft rear slinger with Installer 9023.

(5) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 106).

(6) Slide the slip yoke on the transmission/transfer case output shaft. Align installation reference marks at the axle yoke and install the propeller shaft.

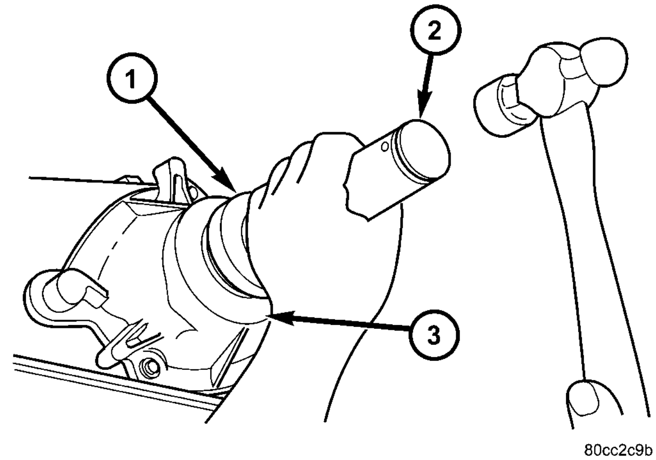


Fig. 105 Rear Seal Installation

1 - SPECIAL TOOL 8691
2 - HANDLE
3 - TRANSFER CASE

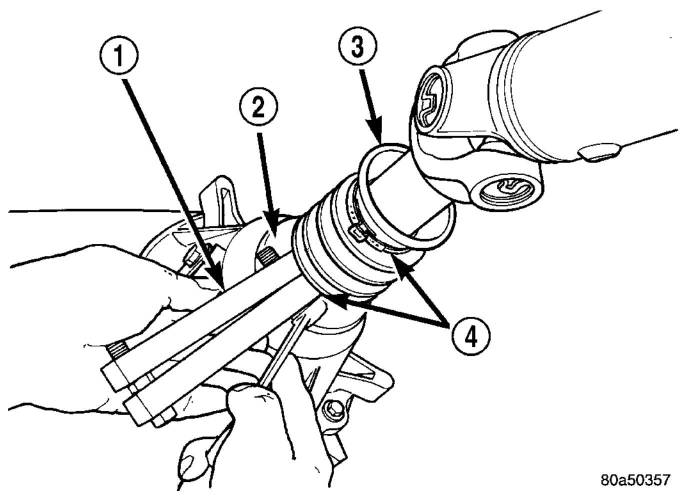


Fig. 106 Slinger Boot Installation - Typical

1 - SPECIAL TOOL C-4975-A
2 - SLINGER
3 - BOOT
4 - CLAMP

(7) Tighten the U-joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.).

(8) Crimp clamp with Clamp Tool C-4975A to hold dust boot to propeller shaft yoke.

(9) Remove support and lower the vehicle.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.

(2) Raise vehicle.

(3) Remove clip securing the transfer case shift cable to the shift cable support bracket (Fig. 107) and (Fig. 108).

SHIFT LEVER (Continued)

(4) Disengage any additional shift cable routing clips, if necessary.

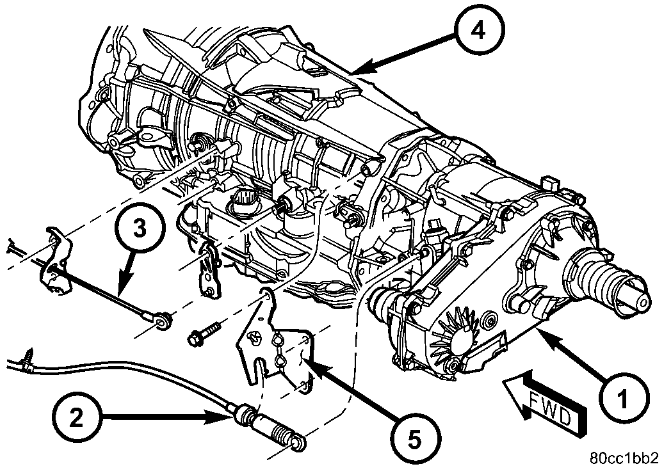


Fig. 107 Transfer Case Shift Cable - Automatic Transmission

1 - TRANSFER CASE
2 - TRANSFER CASE SHIFT CABLE
3 - TRANSMISSION SHIFT CABLE
4 - AUTOMATIC TRANSMISSION
5 - TRANSFER CASE SHIFT CABLE BRACKET

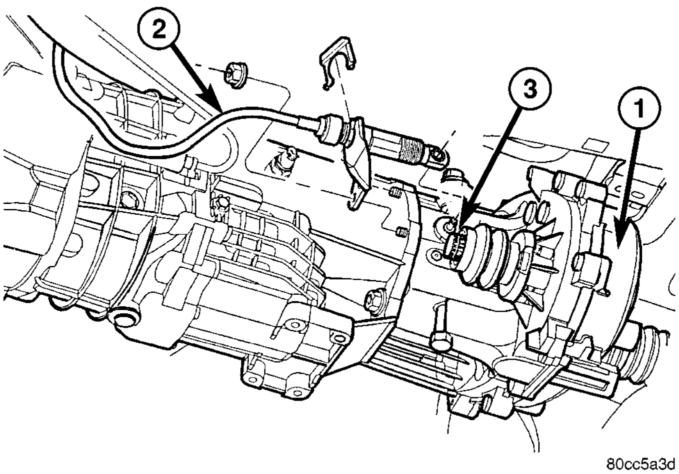


Fig. 108 Transfer Case Shift Cable - Manual Transmission

1 - TRANSFER CASE
2 - SHIFT CABLE
3 - MANUAL LEVER

(5) Disengage the shift cable from the transfer case manual lever.

(6) Lower vehicle.

(7) Remove the floor console as necessary to access the shifter mechanism. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(8) Remove the nuts attaching lever assembly to floorpan and remove assembly and shift cable (Fig. 109).

(9) Remove the shifter mechanism and cable assembly from the vehicle.

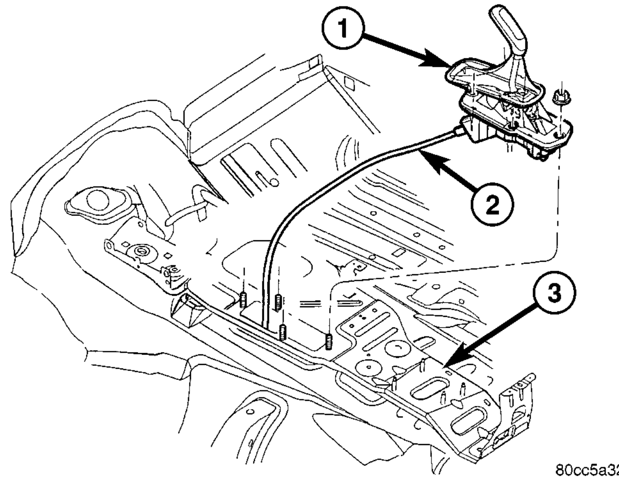


Fig. 109 Transfer Case Shifter Assembly

1 - SHIFTER ASSEMBLY
2 - SHIFT CABLE
3 - FLOOR PAN

INSTALLATION

(1) Route the shift cable through the opening in the floor pan.

(2) Position the shift mechanism over the shifter retaining studs on the floor pan.

(3) Install the nuts to hold the shifter mechanism to the floor pan. Tighten the nuts to 11.86 N·m (105 in.lbs.).

(4) Install any floor console components previously removed. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

(5) Verify that the floor shifter is in the 4L position.

(6) Raise vehicle.

(7) Route the shift cable through the opening in the shift cable support bracket.

(8) Install the cable and a new spring clip into the slot in the support bracket.

(9) Install any additional routing clips on the shift cable.

(10) Verify that the transfer case is in the 4L position. The 4L position for the transfer case is with the manual lever to the full rearward position.

(11) Attach the shift cable to the transfer case manual lever.

(12) Lower vehicle and check for proper transfer case shifter operation.

TIRES/WHEELS

TABLE OF CONTENTS

TIRES/WHEELS

DIAGNOSIS AND TESTING - TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 1).

Lateral runout is the **wobble** of the tire or wheel.

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

METHOD 1 (RELOCATE WHEEL ON HUB)

(1) Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

(2) Check wheel bearings and adjust if adjustable or replace if necessary.

(3) Check the wheel mounting surface.

(4) Relocate wheel on the mounting, two studs over from the original position.

(5) Tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

(6) Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

METHOD 2 (RELOCATE TIRE ON WHEEL)

NOTE: Rotating the tire on wheel is particularly effective when there is runout in both tire and wheel.

TIRES/WHEELS (Continued)

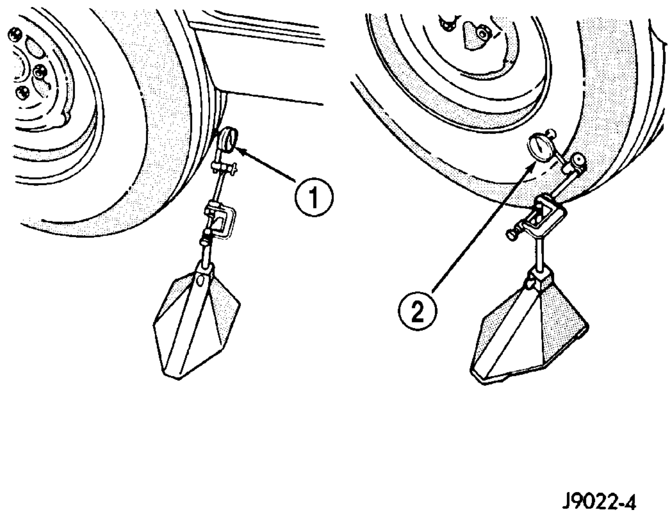


Fig. 1 Checking Tire/Wheel/Hub Runout

1 - RADIAL RUNOUT
2 - LATERAL RUNOUT

(1) Remove tire from wheel and mount wheel on service dynamic balance machine.

(2) Check wheel radial runout (Fig. 2) and lateral runout (Fig. 3).

• STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in. (average-maximum)

• ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in. (average-maximum)

(3) If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout or match mount, (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).

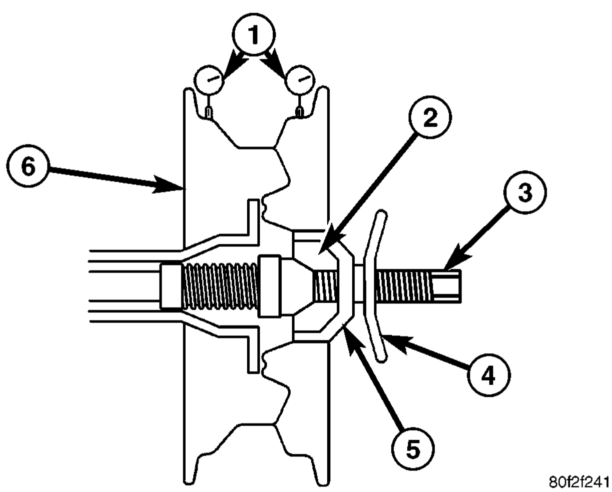


Fig. 2 RADIAL RUNOUT

1 - DIAL INDICATORS
2 - MOUNTING CONE
3 - SPINDLE SHAFT
4 - WING NUT
5 - PLASTIC CUP
6 - WHEEL

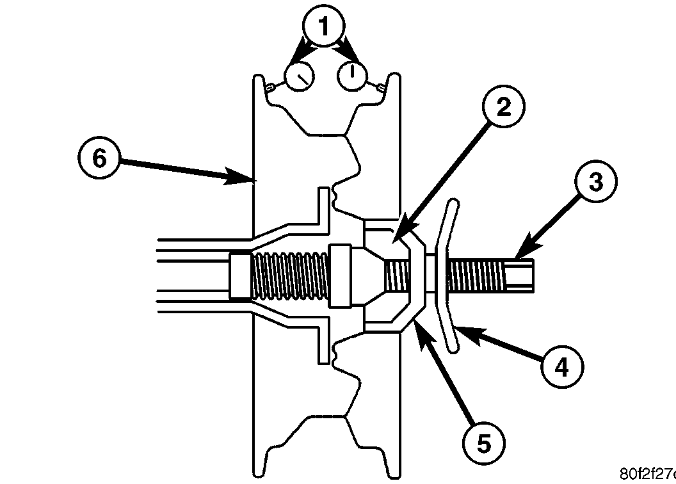


Fig. 3 LATERAL RUNOUT

1 - DIAL INDICATORS
2 - MOUNTING CONE
3 - SPINDLE SHAFT
4 - WING NUT
5 - PLASTIC CUP
6 - WHEEL

STANDARD PROCEDURE

STANDARD PROCEDURE - TIRE ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is (Fig. 4). Other rotation methods can be used, but they will not provide all the tire longevity benefits.

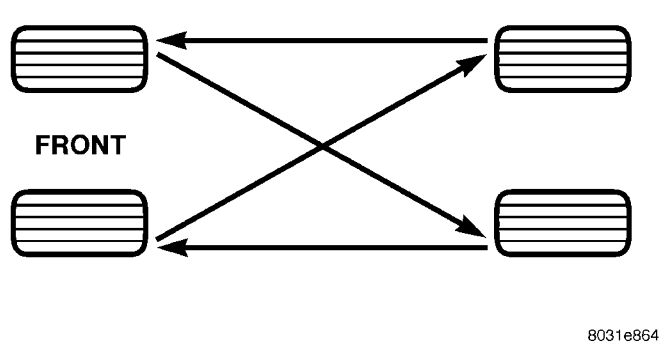


Fig. 4 Tire Rotation Pattern

TIRES/WHEELS (Continued)

STANDARD PROCEDURE - MATCH MOUNTING

Tires and wheels are currently match mounted at the factory. Match mounting is a technique used to reduce runout in the wheel/tire assembly. This means that the high spot of the tire is aligned with the low spot on the wheel rim. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the rim is identified with a label on the outside of the rim and a dot on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot on the inside of the rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve stem location. This reference will ensure that it is remounted in the original position on the wheel.

(1) Use a dial indicator to locate the high spot of the tire on the center tread rib (Fig. 5). Record the indicator reading and mark the high spot on the tire. Place a mark on the tire at the valve stem location (Fig. 6).

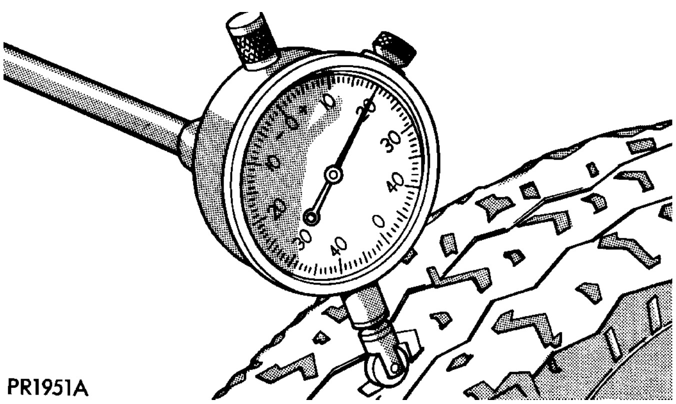


Fig. 5 Dial Indicator

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 7).

(3) Measure the total runout again and mark the tire to indicate the high spot.

(4) If runout is still excessive use the following procedures.

(a) If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.

(b) If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications,(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).

(c) If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 8). This procedure will normally reduce the runout to an acceptable amount.

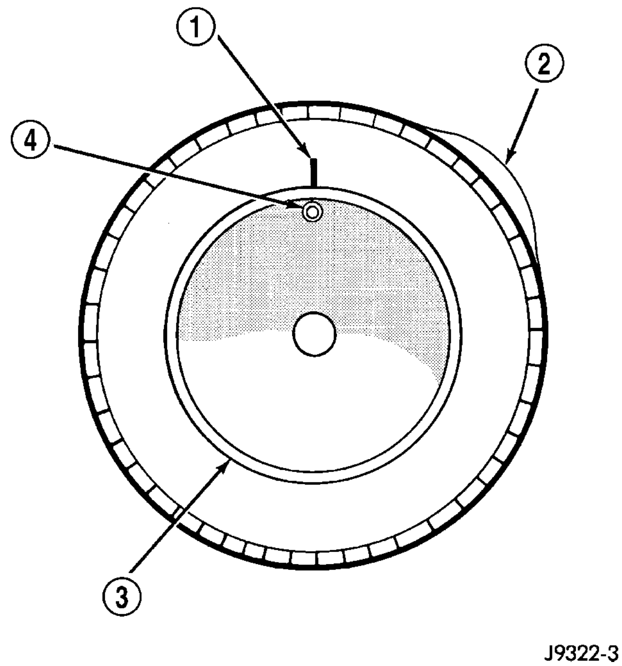


Fig. 6 First Measurement On Tire

1 - REFERENCE MARK
2 - 1ST MEASUREMENT
HIGH SPOT MARK TIRE AND RIM
3 - WHEEL
4 - VALVE STEM

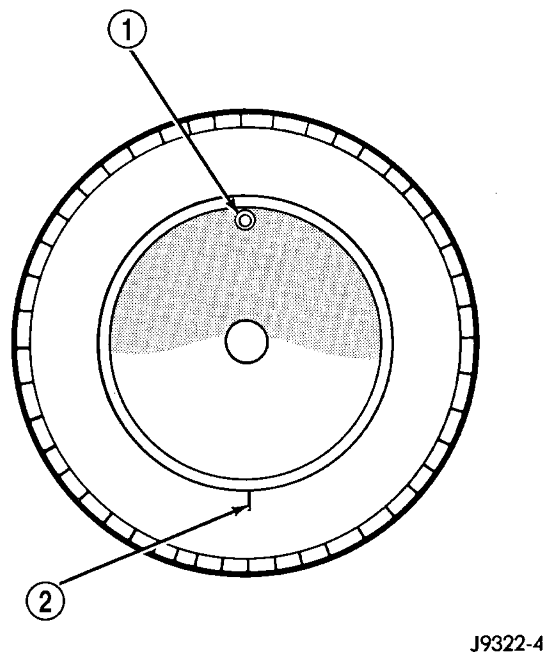


Fig. 7 Remount Tire 180 Degrees

1 - VALVE STEM
2 - REFERENCE MARK

TIRES/WHEELS (Continued)

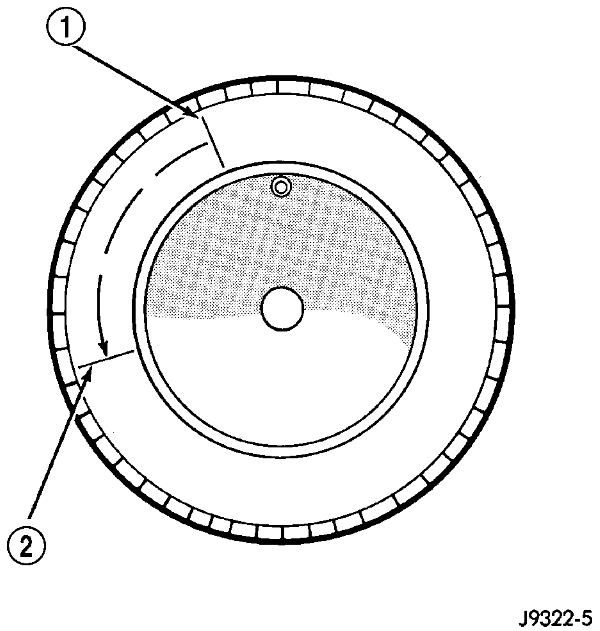


Fig. 8 Remount Tire 90 Degrees In Direction of Arrow

1 - 2ND HIGH SPOT ON TIRE
2 - 1ST HIGH SPOT ON TIRE

STANDARD PROCEDURE - WHEEL BALANCING

It is recommended that a two plane service dynamic balancer be used when a tire and wheel assembly require balancing. Refer to balancer operation instructions for proper cone mounting procedures. Typically use front cone mounting method for steel wheels. For aluminum wheel use back cone mounting method without cone spring.

NOTE: Static should be used only when a two plane balancer is not available.

NOTE: Cast aluminum and forged aluminum wheels require coated balance weights and special alignment equipment.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire. Off-vehicle balancing is recommended.

For static balancing, find location of heavy spot causing the imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight required to counter balance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 9).

For dynamic balancing, the balancing equipment is designed to locate the amount of weight to be applied to both the inner and outer rim flange (Fig. 10).

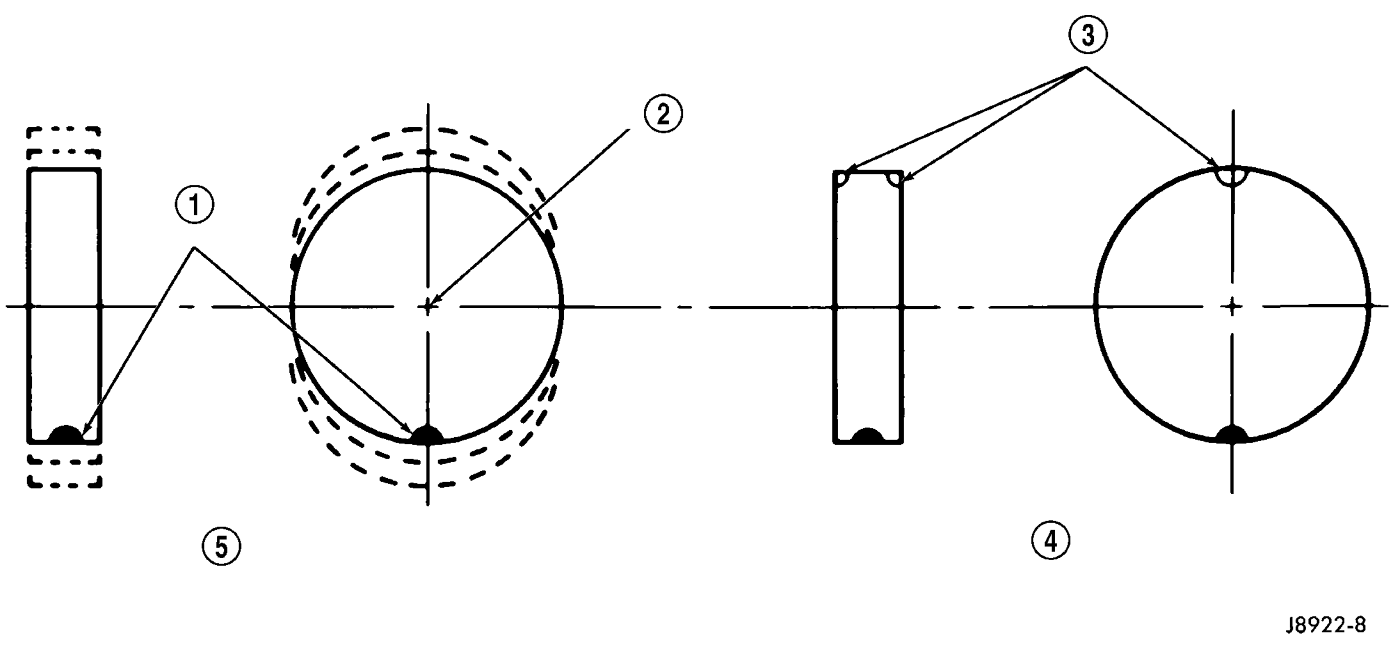


Fig. 9 Static Unbalance & Balance

1 - HEAVY SPOT
2 - CENTER LINE OF SPINDLE
3 - ADD BALANCE WEIGHTS HERE
4 - CORRECTIVE WEIGHT LOCATION
5 - TIRE OR WHEEL TRAMP, OR WHEEL HOP

TIRES/WHEELS (Continued)

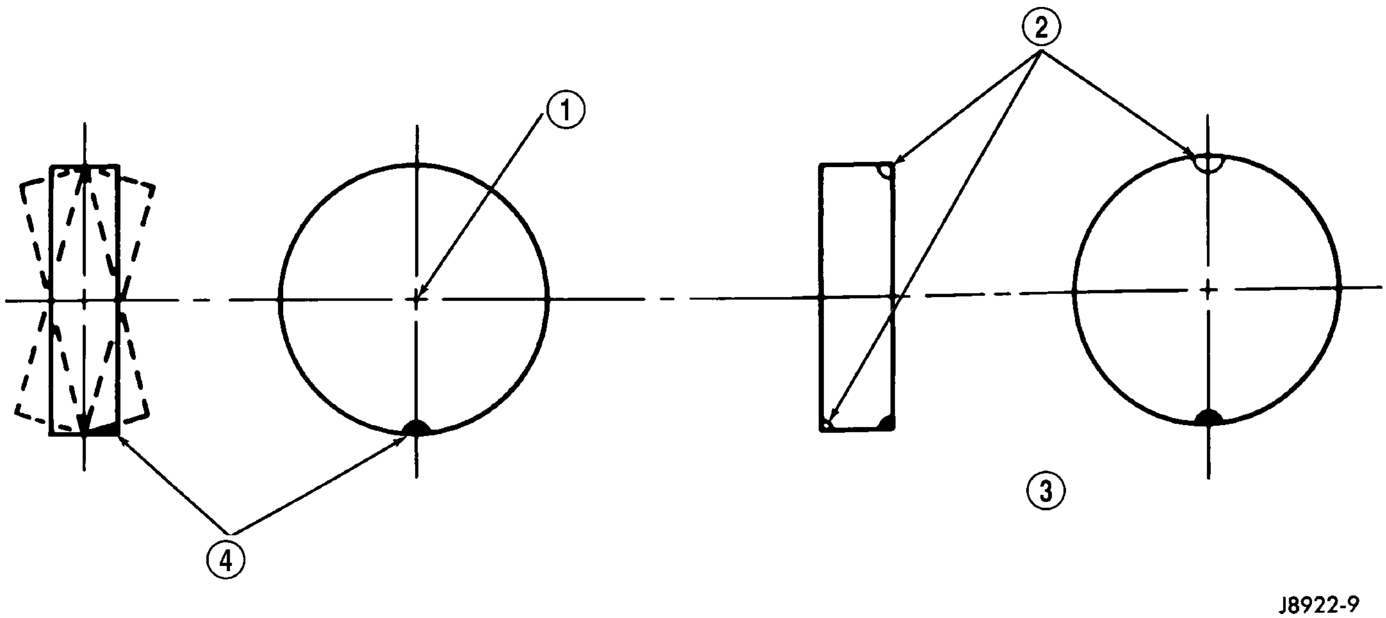


Fig. 10 Dynamic Unbalance & Balance

1 - CENTER LINE OF SPINDLE
2 - ADD BALANCE WEIGHTS HERE
3 - CORRECTIVE WEIGHT LOCATION
4 - HEAVY SPOT WHEEL SHIMMY AND VIBRATION

SPARE TIRE

DESCRIPTION

DESCRIPTION - SPARE / TEMPORARY TIRE

The temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 50 M.P.H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

DESCRIPTION - FULL SIZE, SPARE WHEEL WITH MATCHING TIRE

The spare is a full usage wheel with a matching tire, It can be used within the (posted legal) speed limits or distance limitations as of the rest of the vehicles four tires. Refer to Owner's Manual for complete details.

REMOVAL

(1) Raise the license plate. (Cherokee model)

(2) Remove the two bolts securing the wheel cover to the wheel. (Cherokee model)

(3) Remove the two lug nuts and the one wheel lock (if equipped) securing the tire/wheel to the spare tire carrier.

(4) Remove the spare tire.

INSTALLATION

(1) Install the spare tire onto the studs on the carrier.

(2) Install the two lug nuts and one wheel lock (if equipped). Tighten the nuts to 115 N·m (85 ft.lbs.)

(3) Close the plastic wheel cover and install the two mounting bolts. Tighten the nuts to 115 N·m (85 ft.lbs.) (Cherokee model)

(4) Close the license plate to cover the bolts and latch. (Cherokee model)

TIRES

DESCRIPTION

DESCRIPTION - TIRES

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe brake applications
- High speed driving

TIRES (Continued)

- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval,(Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE). This will help to achieve a greater tread life.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 11).

Performance tires have a speed rating letter after the aspect ratio number.

LETTER	SPEED RATING
S	180 km/h (112 mph)
T	190 km/h (118 mph)
U	200 km/h (124 mph)
H	210 km/h (130 mph)
V	240 km/h (149 mph)
W	270 km/h (168 mph)
Y	300 km/h (186 mph)

The speed rating is not always printed on the tire sidewall.

TIRE CHAINS

Tire snow chains may be used on **certain** models. Refer to the Owner's Manual for more information.

DESCRIPTION - RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life and ride quality, and decrease rolling resistance.

Radial-ply tires must always be used in sets of four. Under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

The use of tires from different manufactures on the same vehicle is NOT recommended. The proper tire pressure should be maintained on all four tires.

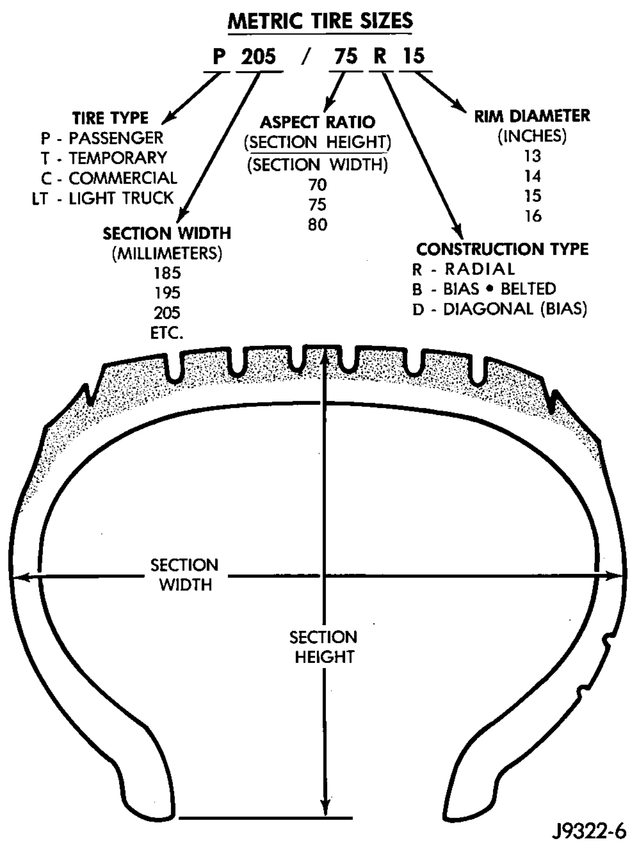


Fig. 11 Tire Identification

DESCRIPTION - SPARE TIRE &TEMPORARY

The temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 50 M.P.H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

DESCRIPTION - TIRE PRESSURE FOR HIGH SPEED

Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. For speeds up to and including 120 km/h (75 mph), tires must be inflated to the pressures shown on the tire placard. For continuous speeds in excess of 120 km/h (75 mph), tires must be inflated to the maximum pressure specified on the tire sidewall.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

For emergency vehicles that are driven at speeds over 90 mph (144 km/h), special high speed tires must be used. Consult tire manufacturer for correct inflation pressure recommendations.

TIRES (Continued)

DESCRIPTION - REPLACEMENT TIRES

NOTE: Equipping the vehicle with replacement tires of a different size than the original equipment requires the BCM to be programmed with the correct tire size using the DRBIII. Refer to the appropriate diagnostic information (Electronic Control Modules Section 8E).

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

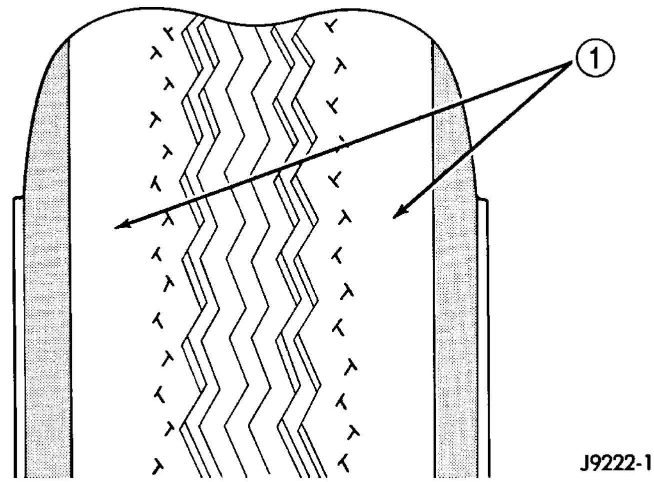


Fig. 12 Under Inflation

1 - THIN TIRE THREAD AREAS

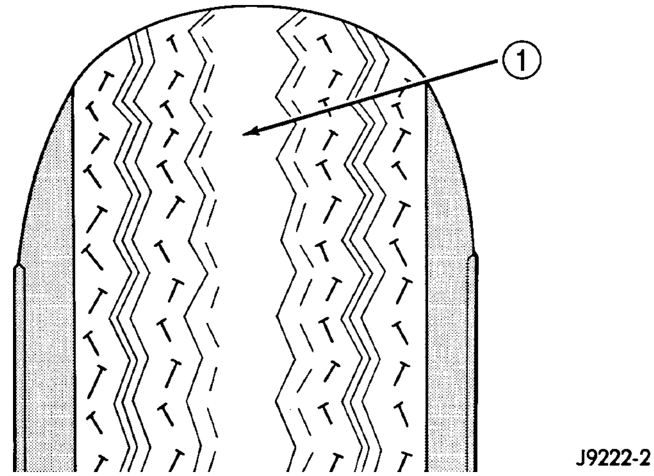


Fig. 13 Over Inflation Wear

1 - THIN TIRE THREAD AREA

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TIRE INFLATION

Under inflation will cause rapid shoulder wear, tire flexing, and possible tire failure (Fig. 12).

Over inflation will cause rapid center wear and loss of the tire's ability to cushion shocks (Fig. 13).

Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- Vehicle drift

For proper tire pressure specification refer to the Tire Inflation Pressure Chart provided with the vehicle.

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once a month. The spare tire pressure should be check at least twice annually. Tire pressure decreases as the ambient temperature drops. Check tire pressure frequently when ambient temperature varies widely.

Inflation pressures specified on the placards are cold inflation pressure. The vehicle must sit for at least 3 hours to obtain the correct cold inflation pressure reading. Or driven less than one mile after sitting for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation, due to increased tire temperature.

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND TREAD WEAR. THIS MAY CAUSE THE TIRE TO FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

TIRES (Continued)

DIAGNOSIS AND TESTING - TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (Fig. 14).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.

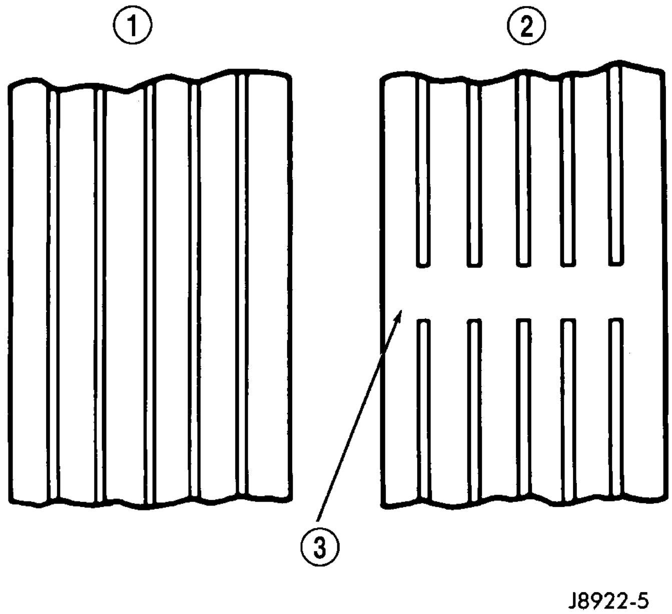


Fig. 14 Tread Wear Indicators

1 - TREAD ACCEPTABLE
2 - TREAD UNACCEPTABLE
3 - WEAR INDICATOR

DIAGNOSIS AND TESTING - PRESSURE GAUGES

A quality air pressure gauge is recommended to check tire pressure. After checking the air pressure, replace valve cap finger tight.

DIAGNOSIS AND TESTING - TIRE/VEHICLE LEAD

Use the following Vehicle Lead Diagnosis And Correction Chart to diagnose and correct a vehicle lead or drift problem (Fig. 15).

DIAGNOSIS AND TESTING - TIRE WEAR PATTERNS

Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other (Fig. 16).

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread (Fig. 16).

DIAGNOSIS AND TESTING - TIRE NOISE OR VIBRATION

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying speeds. Note the noise level during acceleration, deceleration and slight left and right steering inputs.

STANDARD PROCEDURE - REPAIRING LEAKS

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 17). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before removing the tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification.

CLEANING

Remove the protective coating on the tires before delivery of a vehicle. This coating may cause deterioration of the tires.

To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

NOTE: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

TIRES (Continued)

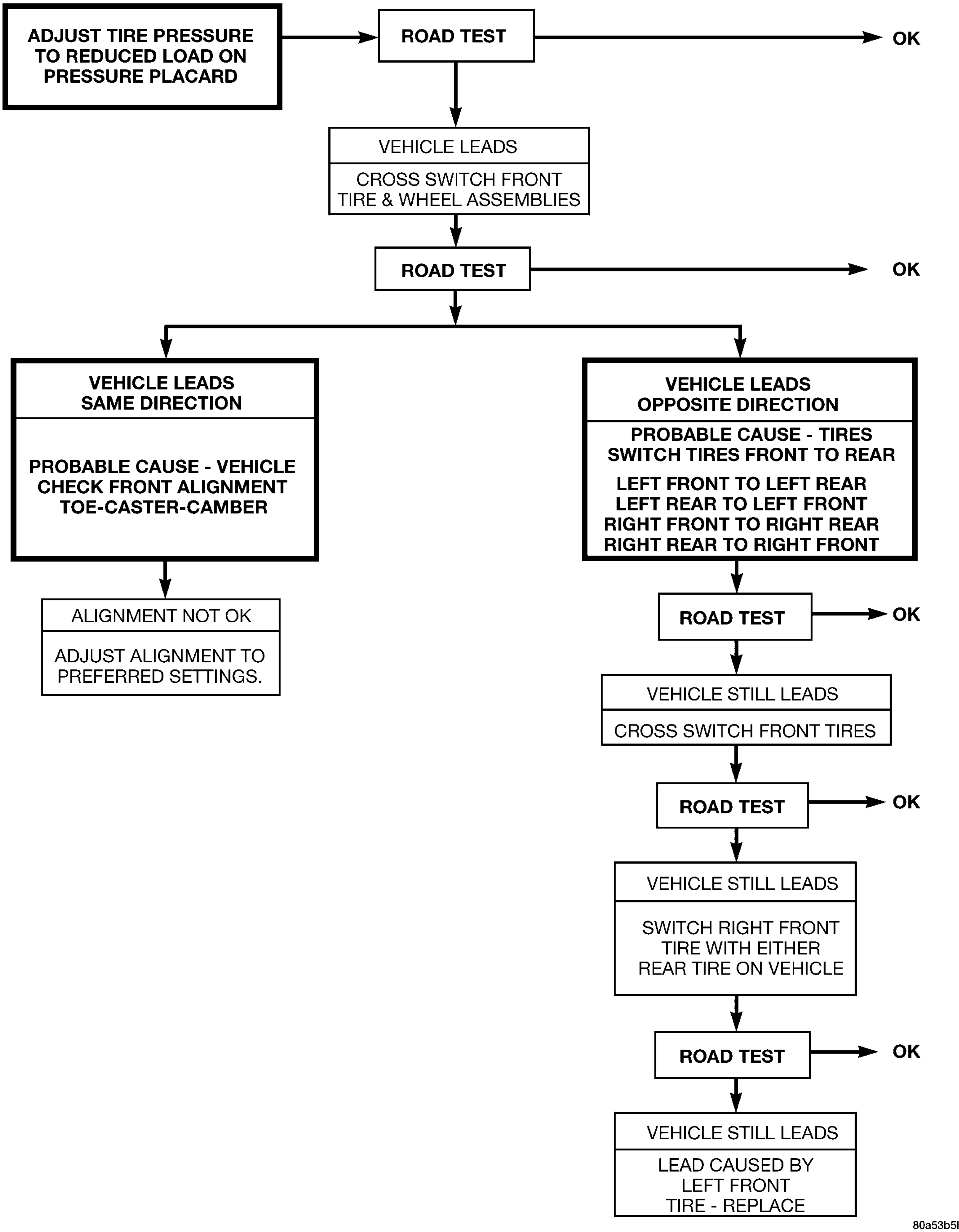


Fig. 15 VEHICLE LEAD DIAGNOSIS AND CORRECTION CHART

TIRES (Continued)

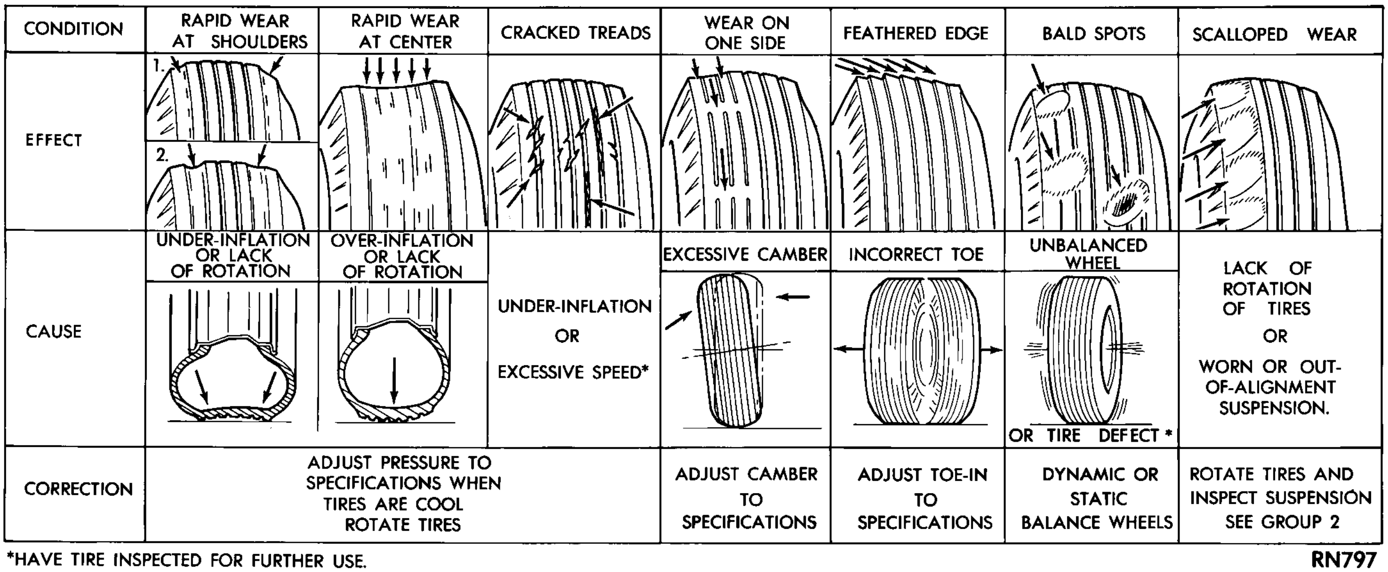


Fig. 16 Tire Wear Patterns

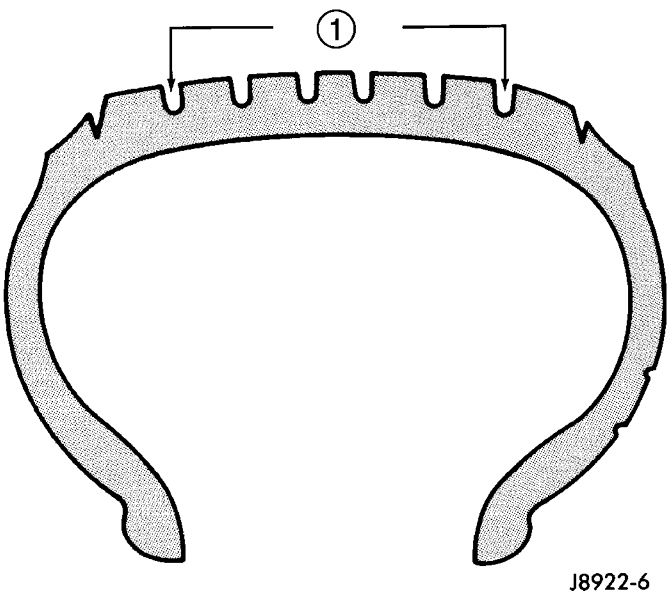


Fig. 17 Tire Repair Area

1 - REPAIRABLE AREA

SPECIFICATIONS

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Tire	P215/75R16
Tire	P235/70R16
Tire	P235/65R17
Spare Tire BUX & MEXICO	P215/75D16 POLYSPARE ONLY ON 16″

WHEELS

DESCRIPTION

The rim size is on the vehicle safety certification label located on the drivers door shut face. The size of the rim is determined by the drivetrain package. Original equipment wheels/rims are designed for operation up to the specified maximum vehicle capacity.

All models use stamped steel, cast aluminum or forged aluminum wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 18).

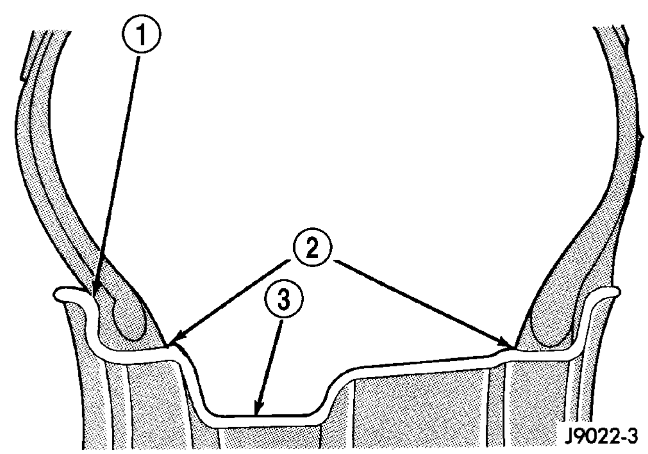


Fig. 18 Safety Rim

1 - FLANGE
2 - RIDGE
3 - WELL

WHEELS (Continued)

Initial inflation of the tire forces the bead over these raised sections. In case of rapid loss of air pressure, the raised sections help hold the tire on the wheel.

The wheel studs and nuts are designed for specific applications. All aluminum and some steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels. Do not use replacement studs or nuts with a different design or lesser quality.

DIAGNOSIS AND TESTING - WHEELS

Inspect wheels for:
- Excessive run out
- Dents or cracks
- Damaged wheel lug nut holes
- Air Leaks from any area or surface of the rim

NOTE: Do not attempt to repair a wheel by hammering, heating or welding.

If a wheel is damaged an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE. USED WHEELS ARE NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

STANDARD PROCEDURE

STANDARD PROCEDURE - WHEEL REPLACEMENT

Wheels must be replaced if they have:
- Excessive runout
- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:
- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

STANDARD PROCEDURE - WHEEL MOUNTING

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

NOTE: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification (Fig. 19). **Never use oil or grease on studs or nuts.**

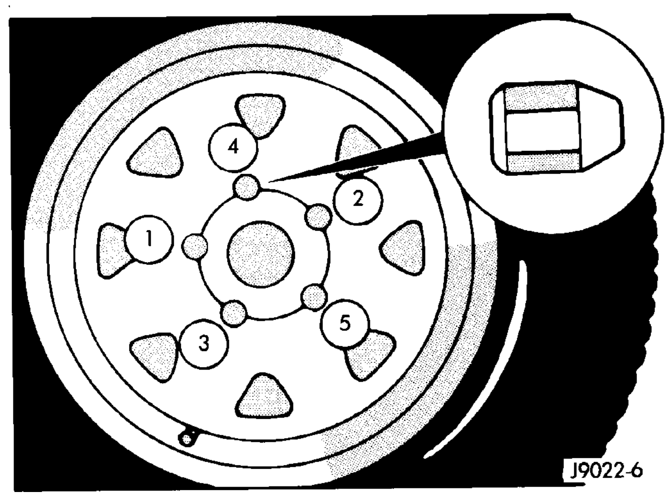


Fig. 19 Lug Nut Tightening Pattern

WHEELS (Continued)

SPECIFICATIONS

SPECIFICATION

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Lug Nut 1/2 X 20 with 60° Cone	115-155	85-115	—

STUDS

REMOVAL

CAUTION: Do not use a hammer to remove wheel studs.

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove brake caliper, caliper adapter and rotor,(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
(4) Remove stud from hub with Remover C-4150A (Fig. 20).

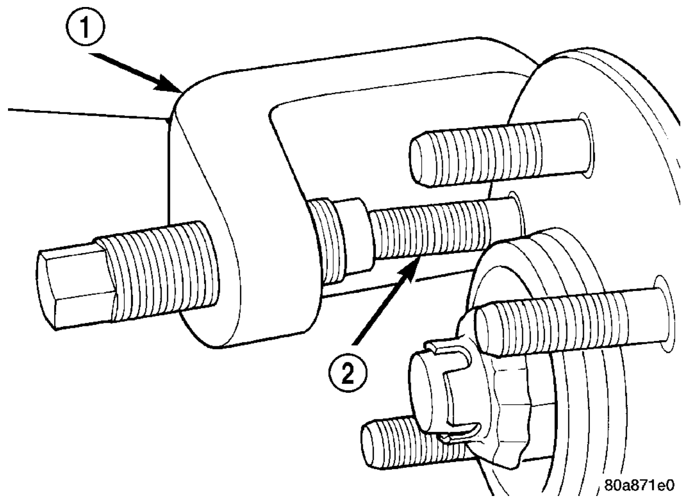


Fig. 20 Wheel Stud Removal

1 - REMOVER
2 - WHEEL STUD

INSTALLATION

CAUTION: Do not use a hammer to remove wheel studs.

(1) Install new stud into hub flange.
(2) Install three washers onto stud, then install lug nut with the flat side of the nut against the washers.
(3) Tighten lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.
(4) Remove lug nut and washers.
(5) Install the brake rotor, caliper adapter, and caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
(6) Install wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE), use new lug nut on stud or studs that were replaced.
(7) Remove support and lower vehicle.

(Continued)

(Continued)

(Continued)

(Continued)

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(Continued)

BODY

TABLE OF CONTENTS

BODY

WARNING

SAFETY PRECAUTIONS AND WARNINGS

WARNING: USE AN OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

- **AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.**
- **DO NOT STAND UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.**

CAUTION: When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

- **Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.**
- **Always have a fire extinguisher ready for use when welding.**
- **Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.**
- **Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.**
- **Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.**
- **Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.**

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

BODY (Continued)

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

DIAGNOSIS AND TESTING - WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

BODY (Continued)

ROAD TESTING WIND NOISE

(1) Drive the vehicle to verify the general location of the wind noise.

(2) Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

STANDARD PROCEDURE

STANDARD PROCEDURE - BODY LUBRICATION

All mechanisms and linkages should be lubricated when necessary, except the door check straps and latches. This will maintain ease of operation and provide protection against rust and excessive wear. The weatherstrip seals should be lubricated to prolong their life as well as to improve door sealing.

All applicable exterior and interior vehicle operating mechanisms should be inspected and cleaned. Pivot/sliding contact areas on the mechanisms should then be lubricated.

(1) When necessary, lubricate the operating mechanisms with the specified lubricants.

(2) Apply silicone lubricant to a cloth and wipe it on door seals to avoid over-spray that can soil passenger's clothing.

(3) Before applying lubricant, the component should be wiped clean. After lubrication, any excess lubricant should be removed.

(4) The hood latch, latch release mechanism, latch striker, and safety latch should be lubricated periodically.

(5) The door lock cylinders should be lubricated twice each year (preferably autumn and spring).

- Spray a small amount of lock cylinder lubricant directly into the lock cylinder.
- Apply a small amount to the key and insert it into the lock cylinder.
- Rotate it to the locked position and then back to the unlocked position several times.
- Remove the key. Wipe the lubricant from it with a clean cloth to avoid soiling of clothing.

(6) Door and swing gate check straps should be wiped clean but not lubricated.

Component	Fluid, Lubricant, and Genuine Part
Hinges:	
Door & Hood	Mopar® Engine Oil
Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Latches: Hood/Safety Catch	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Seat Regulator & Track	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Lock Cylinders	Mopar® Lock Cylinder Lube

STANDARD PROCEDURE - HEAT STAKING

(1) Remove trim panel.

(2) Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and/or component seams for looseness.

(3) Heat stake the components.

(a) If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

(b) If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

(4) Allow the repaired area to cool and verify the repair.

(5) Install trim panel.

STANDARD PROCEDURE - PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively on DaimlerChrysler Motors vehicles. Always follow repair material manufacturer's plastic identification and repair procedures.

Rigid Plastics:

Examples of rigid plastic use: Fascias, Hoods, Doors, and other Body Panels, which include SMC, ABS, and Polycarbonates.

BODY (Continued)

Semi-Rigid Plastics:

Examples of semi-rigid plastic use: Interior Panels, Under Hood Panels, and other Body Trim Panels.

Flexible Plastics:

Examples of flexible plastic use: Fascias, Body Moldings, and upper and lower Fascia Covers.

Repair Procedure:

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

Adhesion Promoter/Surface Modifier:

Adhesion Promoters/Surface Modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/ surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

SAFETY PRECAUTION AND WARNINGS

WARNING:
- **EYE PROTECTION SHOULD BE USED WHEN SERVICING COMPONENTS. PERSONAL INJURY CAN RESULT.**
- **USE AN OSHA APPROVED BREATHING MASK WHEN MIXING EPOXY, GRINDING, AND SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.**
- **AVOID PROLONGED SKIN CONTACT WITH RESIN, PETROLEUM, OR ALCOHOL BASED SOLVENTS. PERSONAL INJURY CAN RESULT.**
- **DO NOT VENTURE UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.**

NOTE:
- **When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.**
- **Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.**

RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	ACRYLONITRILE STYRENE ACRYLITE	LURAN S	CONSOLES, GRILLES
ABS	ACRYLONITRILE BUTADIENE STYRENE	TERLURAN	″A″ PILLARS, CONSOLES, GRILLES
ABS/PC	ABS/PC ALLOY	PULSE, PROLOY, BAYBLEND	DOORS, INSTRUMENT PANELS
ABS/PVC	ABS/PV ALLOY	PROLOY, PULSE, LUSTRAN, CYCLOVIN	DOOR PANELS, GRILLES, TRIM
BMC	BULK MOLDING COMPOUND	BMC	FENDER EXTENSIONS
EMA	EHTYLENE METHYL ACRYLATE/IONOMER	SURLYN, EMA, IONOMER	BUMPER GUARDS, PADS
METTON	METTON	METTON	GRILLES, KICK PANELS, RUNNING BOARDS
MPPO	MODIFIED POLYPHENYLENE OXIDE	MPPO	SPOILER ASSEMBLY
PA	POLYAMID	ZYTEL, VYDYNE, PA, MINLON	FENDERS, QUARTER PANELS
PET	THERMOPLASTIC POLYESTER	RYNITE	TRIM
PBT/PPO	PBT/PPO ALLOY	GERMAX	CLADDINGS

BODY (Continued)

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
PBTP	POLYBUTYLENE THEREPTHALATE	PBT, PBTP, POCAN, VALOX	WHEEL COVERS, FENDERS, GRILLES
PBTP/EEBC	POLYBUTYLENE THEREPTHALATE/EEBC ALLOY	BEXLOY, ″M″, PBTP/EEBC	FASCIAS, ROCKER PANEL, MOLDINGS
PC	POLYCARBONATE	LEXAN, MERLON, CALIBRE, MAKROLON PC	TAIL LIGHT LENSES, IP TRIM, VALANCE PANELS
PC/ABS	PC/ABS ALLOY	GERMAX, BAY BLENDS, PULSE	DOORS, INSTRUMENT PANELS
PPO	POLYPHENYLENE OXIDE	AZDEL, HOSTALEN, MARLEX, PRFAX, NORYL, GTX, PPO	INTERIOR TRIM, DOOR PANELS, SPLASH SHIELDS, STEERING COLUMN SHROUD
PPO/PA	POLYPHENYLENE/ POLYAMID	PPO/PA, GTX 910	FENDERS, QUARTER PANELS
PR/FV	FIBERGLASS REINFORCED PLASTIC	FIBERGLASS, FV, PR/FV	BODY PANELS
PS	POLYSTYRENE	LUSTREX, STYRON, PS	DOOR PANELS, DASH PANELS
RTM	RESIN TRANSFER MOLDING COMPOUND	RTM	BODY PANELS
SMC	SHEET MOLDED COMPOUND	SMC	BODY PANELS
TMC	TRANSFER MOLDING COMPOUND	TMC	GRILLES
UP	UNSATURATED POLYESTER (THERMOSETTING)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	GRILLE OPENING PANEL, LIFTGATES, FLARESIDE FENDERS, FENDER EXTENSIONS
EEBC	ETHER/ESTER BLOCKED CO-POLYMER	EEBC	BUMPERS
EEBC/PBTP	EEBC/POLYBUTYLENE TEREPTHALATE	EEBC, PBTP, BEXLOY	BUMPER, ROCKER PANELS
EMPP	ETHYLENE MODIFIED POLYPROPYLENE	EMPP	BUMPER COVERS
EPDM	ETHYLENE/ PROPROPYLENE DIENE MONOMER	EPDM, NORDEL, VISTALON	BUMPERS
EPM	ETHYLENE/ PROPROPYLENE CO-POLYMER	EPM	FENDERS
MPU	FOAM POLYURETHANE	MPU	SPOILERS
PE	POLYETHYLENE	ALATHON, DYLAN, LUPOLEN, MARLEX	-
PP	POLYPROPYLENE (BLENDS)	NORYL, AZDEL, MARLOX, DYLON, PRAVEX	INNER FENDER, SPOILERS, KICK PANELS
PP/EPDM	PP/EPDM ALLOY	PP/EPDM	SPOILERS, GRILLES
PUR	POLYURETHANE	COLONELS, PUR, PU	FASCIAS, BUMPERS
PUR/PC	PUR/PC ALLOY	TEXIN	BUMPERS

BODY (Continued)

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
PVC	POLYVINYL CHLORIDE	APEX, GEON, VINYLITE	BODY MOLDINGS, WIRE INSULATION, STEERING WHEELS
RIM	REACTION INJECTED MOLDED POLYURETHANE	RIM, BAYFLEX	FRONT FASCIAS, MODULAR WINDOWS
RRIM	REINFORCED REACTION INJECTED MOLDED	PUR, RRIM	FASCIAS, BODY PANELS, BODY TRIMS
TPE	THERMO POLYETHYLENE	TPE, HYTREL, BEXLOY-V	FASCIAS, BUMPERS, CLADDINGS
TPO	THERMOPOLYOLEFIN	POLYTROPE, RENFLEX, SANTOPRENE, VISAFLEX, ETA, APEX, TPO, SHIELDS, CLADDINGS	BUMPERS, END CAPS, TELCAR, RUBBER, STRIPS, SIGHT, INTERIOR B POST
TPP	THERMO-POLYPROPYLENE	TPP	BUMPERS
TPU	THERMOPOLYURETHANE, POLYESTER	TPU, HYTREL, TEXIN, ESTANE	BUMPERS, BODY SIDE, MOLDINGS, FENDERS, FASCIAS

PANEL SECTIONING

If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel (Fig. 1). To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be "V'd" at a 20 degree angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

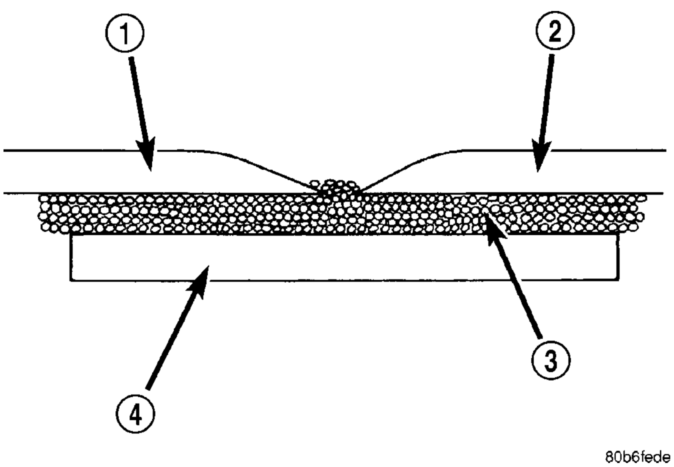


Fig. 1 PANEL SECTIONING

1 - EXISTING PANEL
2 - NEW PANEL
3 - PANEL ADHESIVE
4 - BONDING STRIP

When bonding plastic panels, Follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

PANEL REINFORCEMENT

Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement (Fig. 2) and (Fig. 3). Open meshed fiberglass dry wall tape can be used to form a reinforcement. The dry wall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more dry wall tape used, the stronger the repair.

BODY (Continued)

Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first "V'd" out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 degree angle will increase the bonding surface for a repair (Fig. 4). It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.

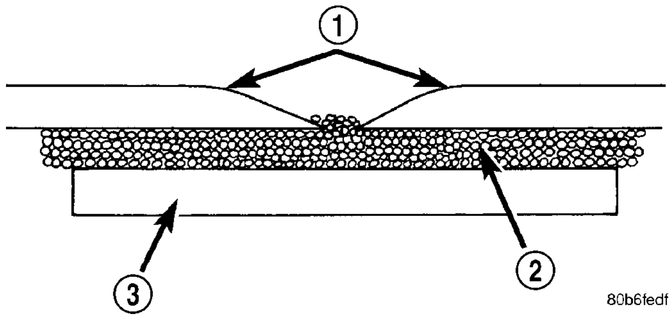


Fig. 2 SOFTENED EDGES

1 - SOFTENED EDGES
2 - PANEL ADHESIVE
3 - BONDING STRIP

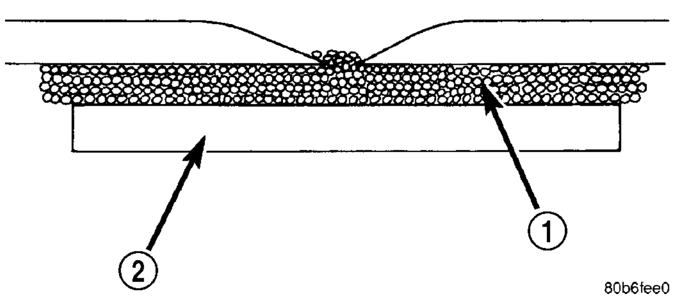


Fig. 3 PANEL REINFORCEMENT

1 - PANEL ADHESIVE
2 - REINFORCEMENT

- Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used (Fig. 5).
- The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damage part to its original strength and appearance without exceeding the value of the replacement part.
- When plastic repairs are required, it is recommended that the part be left on the vehicle when every possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.

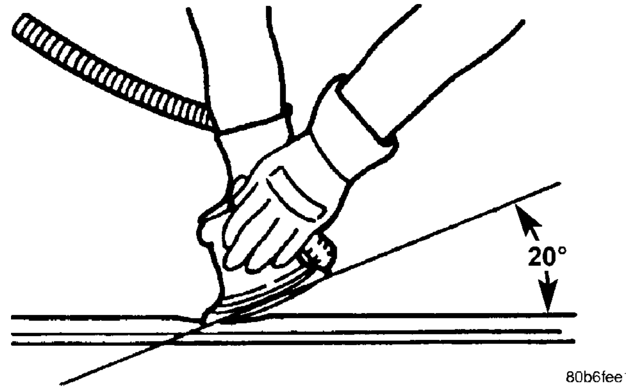


Fig. 4 BEVELING ANGLE - 20 DEGREE

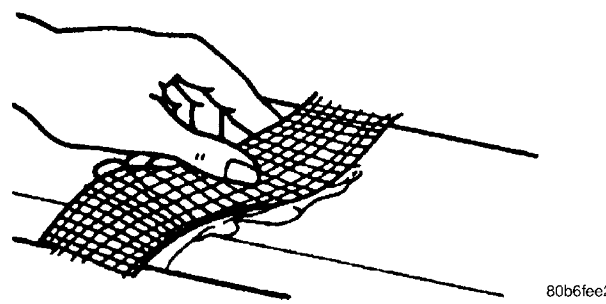


Fig. 5 FIBERGLASS TAPE

VISUAL INSPECTION

Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind (Fig. 7) (Fig. 6).

PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel would require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to assure adhesion of repair materials.

BODY (Continued)

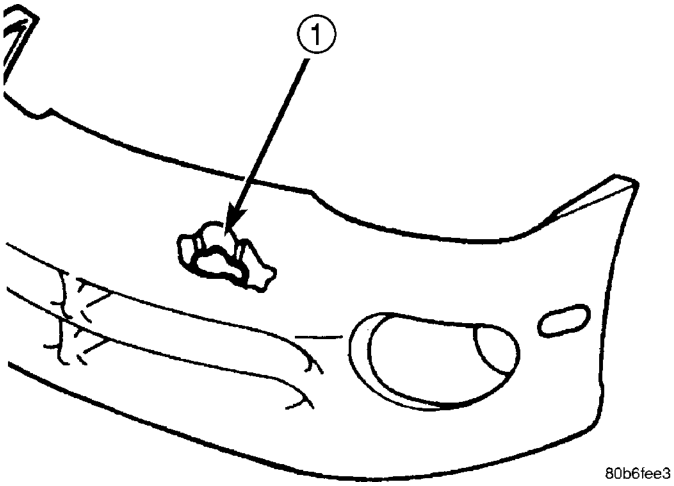


Fig. 6 DAMAGE COMPONENT

1 - PUNCTURE

PATCHING PANELS

An panel that has extensive puncture type damage can be repaired by cutting out the damaged material (Fig. 7). Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20 degrees to expose a larger bonding area on the outer side. This will allow for an increased reinforcement areas.

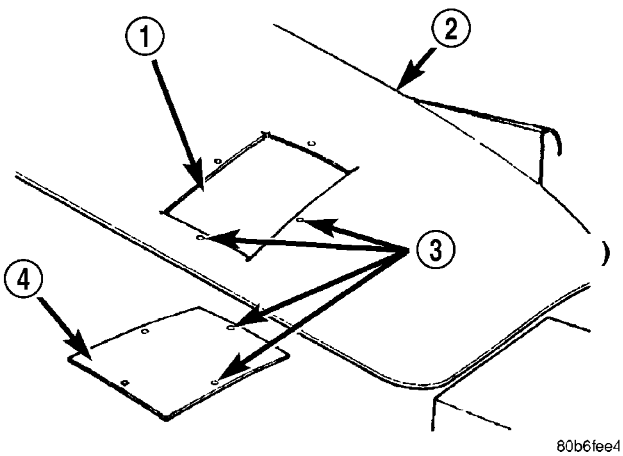


Fig. 7 DAMAGED PANEL CUTOUT AND PATCH

1 - CUTOUT
2 - DAMAGED BODY PANEL
3 - 4 MM (0.160 IN.) HOLES
4 - PATCH CUT TO SIZE

PANEL PATCH FABRICATIONS

A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. Lift gates and fenders can be used to supply patch material. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (dry wall tape). Perform the following operation if required:

(1) Cover waxed paper or plastic with adhesive backed nylon mesh (dry wall tape) larger than the patch required (Fig. 8).

(2) Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.

(3) Apply a liberal coat of adhesive over the reinforcement mesh (Fig. 8). If necessary apply a second or third coat of adhesive and mesh after firs coat has cured. The thickness of the patch should be the same as the repair area.

(4) After patch has cured, peel waxed paper or plastic from the back of the patch.

(5) If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.

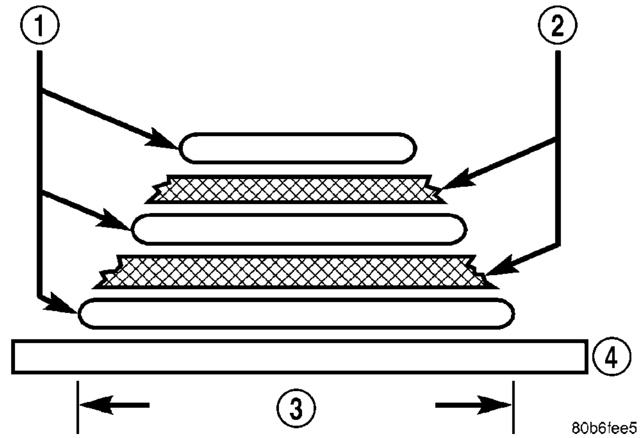


Fig. 8 FABRICATED PANEL

1 - STRUCTURAL ADHESIVE
2 - FIBERGLASS CLOTH OR FIBERGLASS MESH TAPE
3 - WIDTH OF V-GROOVE
4 - WAXED PAPER

PANEL PATCH INSTALLATION

(1) Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.

(2) Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.

(3) Using the pattern as a guide, cut the patch to size.

(4) Cut scrap pieces of patch material into 50 mm (2 in.) squares to use as patch supports to sustain the patch in the cutout.

(5) Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole (Fig. 7).

(6) Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.

(7) Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.

BODY (Continued)

(8) Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.

(9) Mix enough adhesive to cover one side of all support squares.

(10) Apply adhesive to cover one side of all support squares.

(11) Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares (Fig. 9).

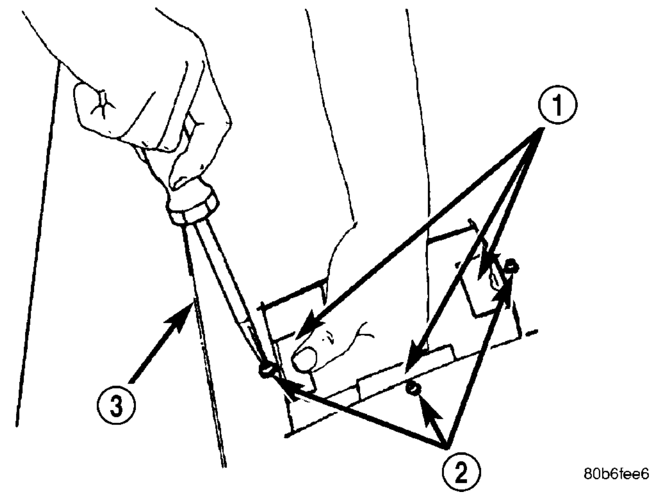


Fig. 9 SECURE SUPPORT SQUARES TO BODY PANEL

1 - SUPPORT SQUARES
2 - SCREWS
3 - DAMAGED BODY PANEL

(12) Position patch in cutout against support squares and adjust patch until the gap is equal along all sides (Fig. 10).

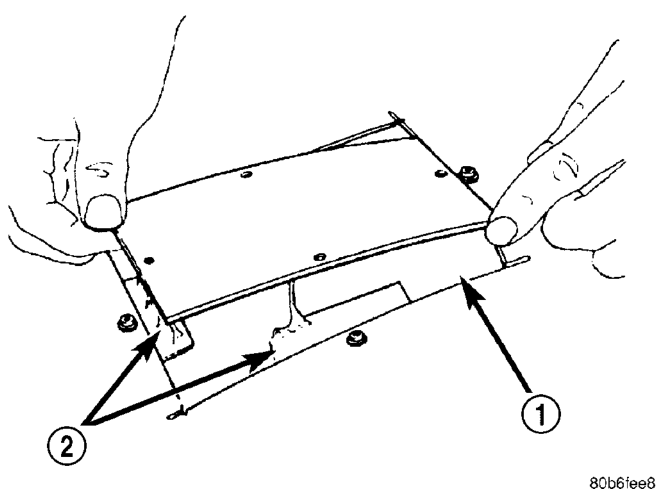


Fig. 10 POSITION PATCH IN CUTOUT AND ALIGN

1 - CUTOUT
2 - SUPPORT SQUARES

(13) Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.

(14) Apply a coat of adhesive to the exposed ends of the support squares (Fig. 11).

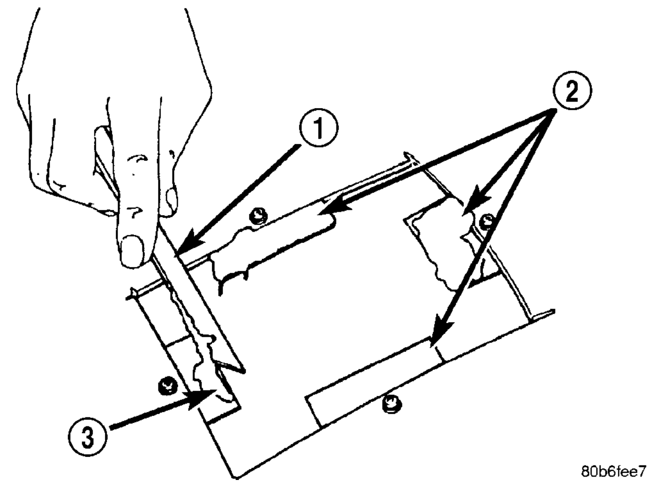


Fig. 11 APPLY ADHESIVE TO SUPPORT SQUARES

1 - APPLICATOR
2 - SUPPORT SQUARES
3 - ADHESIVE

(15) Install screws to hold the patch to support squares (Fig. 12). Tighten screws until patch surface is flush with panel surface.

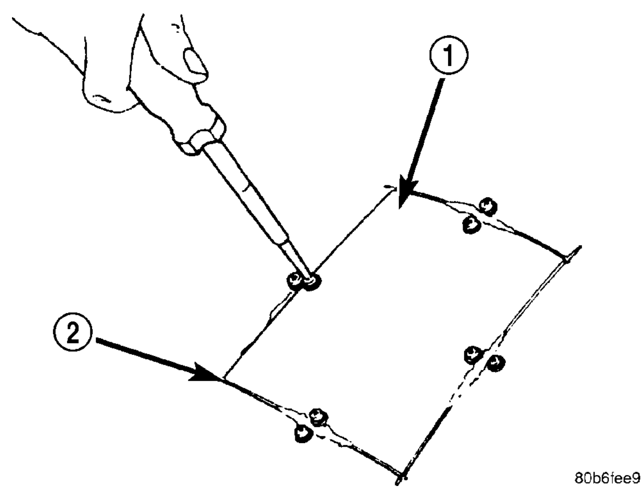


Fig. 12 INSTALL SCREWS

1 - PATCH
2 - GAP

(16) Allow adhesive to cure, and remove all screws.

(17) Using a 125 mm (5 in.) 24 grit disc grinder, grind a 50 mm (2 in.) to 75 mm (3 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch (Fig. 13). With compressed air, blow dust from around patch.

(18) Apply adhesive backed nylon mesh (dry wall tape) over gaps around patch (Fig. 14).

BODY (Continued)

(19) Mix enough adhesive to cover the entire patch area.

(20) Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair (Fig. 15).

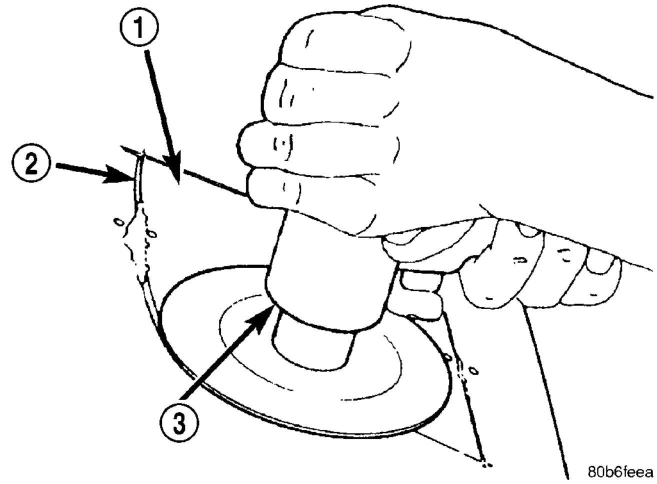


Fig. 13 GRIND SURFACE

1 - PATCH
2 - GAP
3 - DISC GRINDER

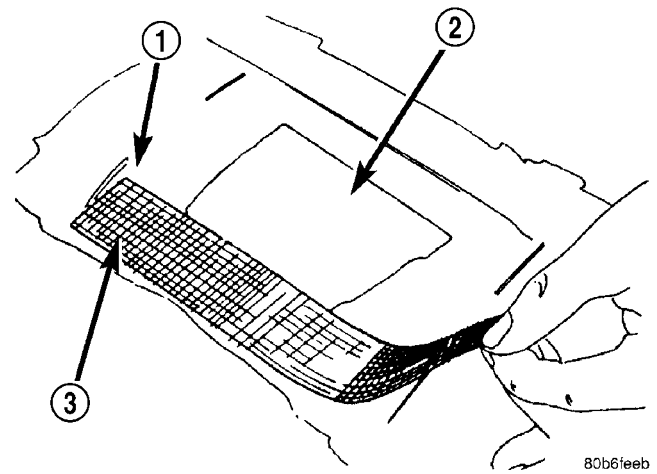


Fig. 14 COVER GAPS WITH MESH

1 - GROUND DOWN AREA
2 - PATCH
3 - MESH

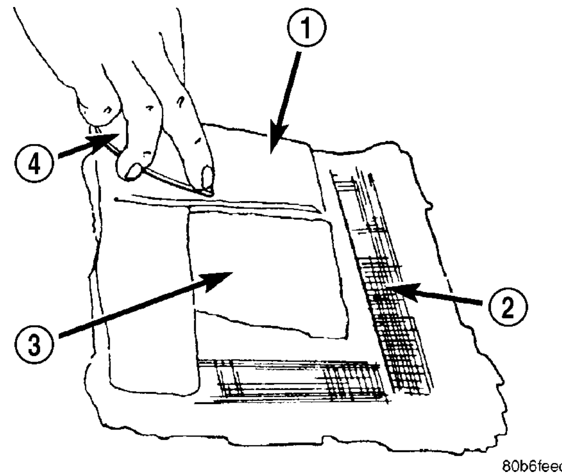


Fig. 15 COVER MESH WITH ADHESIVE

1 - ADHESIVE
2 - MESH
3 - PATCH
4 - SPREADER

PATCHED PANEL SURFACING

After patch panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

STANDARD PROCEDURE - BUZZ, SQUEAK & RATTLE

Buzz, Squeak & Rattles (BSR) may be caused by any one or more of the following and may be corrected as indicated:

- Loose fasteners should be tightened to specifications.
- Damaged or missing clips should be replaced.
- Damaged trim panels should be replaced.
- Incorrectly installed trim panels should be reinstalled properly.

Many BSR complaints such as loose trim, can be serviced using the Mopar® Parts BSR Noise Reduction Kit. This kit contains various tapes including foam, flock and anti-squeak used to eliminate noises caused by metal, plastic and vinyl components. Long life lubricants and greases can also be used on a variety of components. Refer to the Buzz, Squeak & Rattle Kit table for material contents and usage.

BODY (Continued)

BUZZ, SQUEAK & RATTLE KIT

ITEM	FEATURES	APPLICATIONS	SERVICE TEMP
Itch And Squeak Tape	An abrasion resistant material thin enough to conform to most irregular surfaces. Stops most itches and squeaks.	Between metal and metal, metal and plastic, metal and vinyl, vinyl and plastic. Interior. Examples: Trim panels and bezels.	-40° to 225° Fahrenheit (-40° to 107° Celsius)
Black Nylon Flock	Nylon Flock with an aggressive acrylic adhesive. Provides for cushioning and compression fit, also isolates components. Water-resistant.	Between metal and metal, metal and plastic, vinyl and plastic. Examples: Pull cups, bezels, clips, ducts, top cover to glass, cowl panel.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
High Density Urethane Foam	Tear resistant, highly resilient and durable.	Between metal and metal, metal and plastic. Water-resistant. Examples: I/P, heavy metal rattles, isolating brackets.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
Open Cell Foam Tape	Soft foam conforms to irregular surfaces.	Wire harness and connector wrap. Examples: Seals, gasket, wiring, heat ducts.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
Closed Cell Low Density Foam Tape	Soft, conformable. Water-resistant.	Wherever bulk is needed. Prevents closing flutters and rattles when applied to door watershield. Examples: Door, I/P.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
NYE® Grease 880	Long life.	Suspensions. Examples: Strut busings, sway bars.	-40° to 390° Fahrenheit (-40° to 200° Celsius)
Krytox® Oil	Long life. Will not dry out or harm plastics or rubber.	When access is not possible, oil will migrate to condition. Vinyl, rubber, plastic, metal. Examples: Convertible top bushings, pull cups trim panel inserts.	-30° to 400° Fahrenheit (-34° to 205° Celsius)
Krytox® Grease	Long life. Will not dry out or harm plastics or rubber.	Vinyl, rubber, plastic, metal, glass. Examples: Weather-strips, backlite and windshield moldings.	-30° to 400° Fahrenheit (-34° to 205° Celsius)

BODY (Continued)

SPECIFICATIONS

TORQUE SPECIFICATIONS

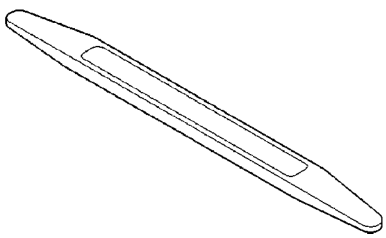
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
FENDER BOLTS	12	9	—
FLIP-UP GLASS HINGE TO BODY BOLTS	7	—	60
FLIP-UP GLASS HINGE TO GLASS BOLTS	10	—	90
FRONT DOOR CHECK STRAP NUTS	12	9	—
FRONT DOOR CHECK STRAP TO A-PILLAR BOLTS	12	9	—
FRONT DOOR GLASS RUN CHANNEL BOLTS	9	—	80
FRONT DOOR HINGE TO A-PILLAR BOLTS	28	21	—
FRONT DOOR HINGE TO DOOR NUTS	23	17	—
FRONT DOOR LATCH SCREW	11	8	—
FRONT DOOR LATCH STRIKER SCREWS	28	21	—
FRONT DOOR LOCK CYLINDER SCREW	6	—	55
FRONT DOOR OUTSIDE HANDLE NUTS	6	—	55
FRONT DOOR REGULATOR BOLTS	9	—	80
FRONT SEAT BACK RECLINER BOLTS	28	21	—
FRONT SEAT BOLTS/NUT	43	32	—
FRONT SEAT RISER BOLTS	28	21	—
FRONT SEAT TRACK BOLTS	28	21	—
HOOD HINGE TO BODY BOLTS	28	21	—
HOOD HINGE TO HOOD BOLTS	12	9	—
HOOD LATCH NUTS	12	9	—
HOOD LATCH SUPPORT BOLTS	10	—	85
INSTRUMENT PANEL CENTER SUPPORT BRACKET BOLTS	23	17	—
INSTRUMENT PANEL HVAC NUTS/BOLTS	6	—	55
INSTRUMENT PANEL ROLL DOWN BOLTS	54	40	—
INSTRUMENT PANEL TOP BOLTS	28	21	—
OUTSIDE MIRROR NUTS	7	—	65
RADIATOR CROSSMEMBER BOLTS	12	9	—
REAR DOOR CHECK STRAP NUTS	12	9	—
REAR DOOR CHECK STRAP TO B-PILLAR BOLTS	12	9	—
REAR DOOR GLASS RUN CHANNEL BOLTS	9	—	80
REAR DOOR HINGE TO B-PILLAR BOLTS	28	21	—
REAR DOOR HINGE TO DOOR NUTS	23	17	—
REAR DOOR LATCH SCREW	11	8	—
REAR DOOR LATCH STRIKER SCREWS	28	21	—
REAR DOOR OUTSIDE HANDLE NUTS	6	—	55
REAR SEAT BACK HINGE BOLTS	28	21	—
REAR SEAT LATCH/LOCK ASSEMBLY BOLTS	28	21	—
REAR SEAT OUTBOARD NUTS	43	32	—

BODY (Continued)

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
REAR SEAT OUTER SEAT CUSHION LEG BOLTS	35	26	—
ROOF RACK BOLTS	8	—	75
SIDE VIEW MIRROR NUTS	7	—	65
SWING GATE EXTERIOR HANDLE NUTS	6	—	55
SWING GATE HINGE BOLTS	31	23	—
SWING GATE HINGE TO D-PILLAR BOLTS	31	23	—
SWING GATE LATCH SCREWS	11	8	—
SWING GATE LATCH STRIKER SCREWS	28	21	—
WASHER BOTTLE BOLT	10	—	85

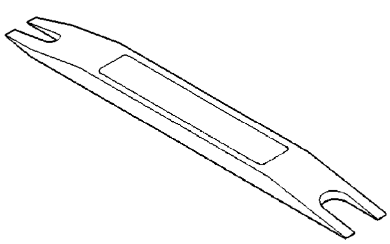
SPECIAL TOOLS

BODY

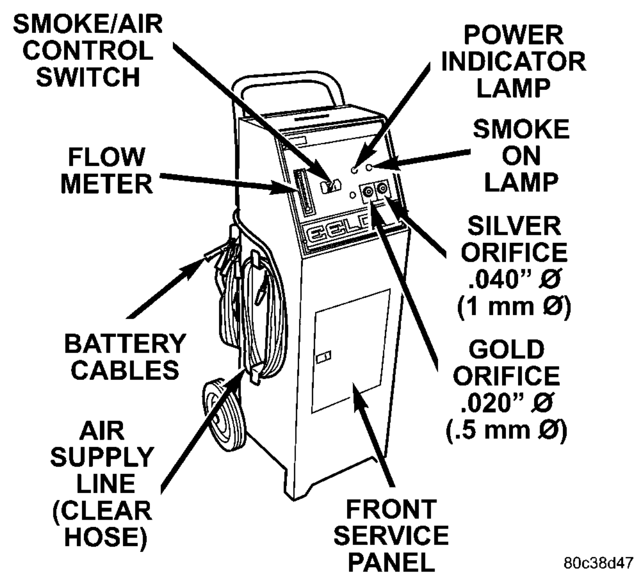


Trim Stick C-4755

Torx Bit Set C-4794-B



Molding Remover C-4829



EVAPORATIVE EMISSIONS LEAK DETECTOR 8404

HOOD

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HINGE

REMOVAL

NOTE: It is not necessary to remove the hood to replace one or both hinges. The hinges can be replaced one at a time.

(1) Raise and support hood.
(2) Using a grease pencil or equivalent, mark position of hinge.
(3) Remove hood support cylinder. (Refer to 23 - BODY/HOOD/SUPPORT CYLINDER - REMOVAL)
(4) Remove nuts attaching hinge to hood.
(5) Remove bolts attaching hinge to body.
(6) Separate hinge from vehicle.

INSTALLATION

(1) Position hinge on vehicle and align reference marks.
(2) Install bolts attaching hinge to body and tighten to 28 N·m (21 ft. lbs.).
(3) Install nuts attaching hinge to hood 12 N·m (9 ft. lbs.).
(4) Install hood hinge support cylinder. (Refer to 23 - BODY/HOOD/SUPPORT CYLINDER - INSTALLATION)

HOOD

REMOVAL

(1) Raise hood.
(2) Using a grease pencil or equivalent, mark location of hood hinges on hood for installation alignment.
(3) Remove bolts attaching hinges to hood.
(4) With the aid of a helper, remove hood from vehicle.

INSTALLATION

(1) Position hood on hinges.
(2) Install bolts finger-tight.
(3) Align hinges with installation reference marks and tighten bolts to 12 N·m (9 ft. lbs.).
(4) Inspect hood for proper alignment and adjust as necessary.

ADJUSTMENTS

ADJUSTMENT

(1) If hood is low in relation to cowl panel, insert shims between hinge and hood.
(2) Adjust hood bumper in or out to adjust hood-to-fender height alignment.
(3) Adjust the hood latch as necessary. Tighten the nuts to 11 N·m (8 ft. lbs.).
(4) Align the latch striker so that striker enters the latch squarely and without binding.

LATCH

REMOVAL

(1) Remove the three bolts from the top of the grille opening reinforcement. (Fig. 1)
(2) Carefully pull the grille opening reinforcement foward and remove the two latch nuts.

LATCH (Continued)

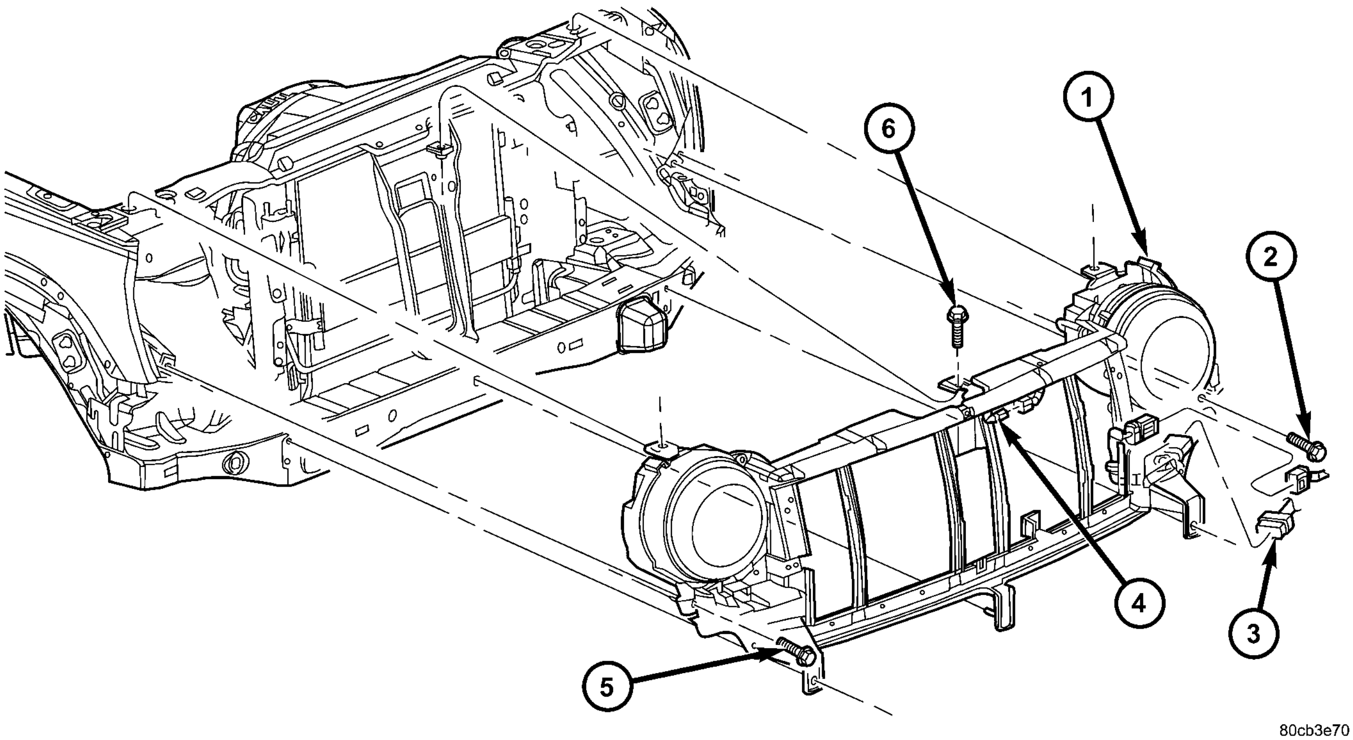

Fig. 1 GRILLE OPENING REINFORCEMENT

1 - GRILLE OPENING REINFORCEMENT
2 - BOLTS (3)
3 - ELECTRICAL CONNECTORS
4 - ELECTRICAL CONNECTOR
5 - BOLTS (3)
6 - BOLT (1)

(3) Disconnect the release cable.

INSTALLATION

(1) Connect the release cable and install the latch onto the support bracket.

(2) Install the two nuts and tighten to 12 N·m (9 ft. lbs.).

(3) Install the support bracket and the bolts.

(4) Tighten the bolts to 12 N·m (9 ft. lbs.).

(5) Install the grill. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)

LATCH RELEASE CABLE

REMOVAL

(1) Remove the battery. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL)

(2) Remove the hood latch. (Refer to 23 - BODY/HOOD/LATCH - REMOVAL)

(3) Remove the powertrain control module. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

(4) Remove the hood release handle. (Refer to 23 - BODY/HOOD/LATCH RELEASE HANDLE - REMOVAL)

(5) Disconnect the attaching clips and remove the cable from the inside.

INSTALLATION

(1) Install the cable from the inside and attach the retaining clips.

(2) Install the hood latch release handle. (Refer to 23 - BODY/HOOD/LATCH RELEASE HANDLE - INSTALLATION)

(3) Install the powertrain control module. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - INSTALLATION)

(4) Install the hood latch. (Refer to 23 - BODY/HOOD/LATCH - INSTALLATION)

(5) Install the battery. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION)

SUPPORT CYLINDER

REMOVAL

(1) Open the hood and support.
(2) Release the upper and lower clips.
(3) Remove the support cylinder.

INSTALLATION

(1) Install the support cylinder over the ball studs with the thin end down.
(2) Install the retaining clips and remove the support from the hood.

LATCH RELEASE HANDLE

REMOVAL

(1) Remove the cowl trim panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL)
(2) Remove the three screws and remove the handle.
(3) Disconnect the hood release cable.

INSTALLATION

(1) Connect the hood release cable to the handle.
(2) Install the handle and install the three screws.
(3) Install the cowl trim cover. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION)

DOOR - FRONT

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CHECK STRAP

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL)

(2) Remove screws attaching door check to A-pillar.

(3) Remove the two nuts and remove the door check strap. (Fig. 1)

INSTALLATION

NOTE: Make sure the proper orientation of the check strap is maintained using the part number printed on the side. The part number should face inboard toward the interior of the vehicle.

(1) Install the check strap through the speaker hole.

(2) Install the nuts and tighten to 12 N·m (9 ft. lbs.).

(3) Connect the strap to the A-pillar and tighten the bolts to 12 N·m (9 ft. lbs.).

(4) Install the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION)

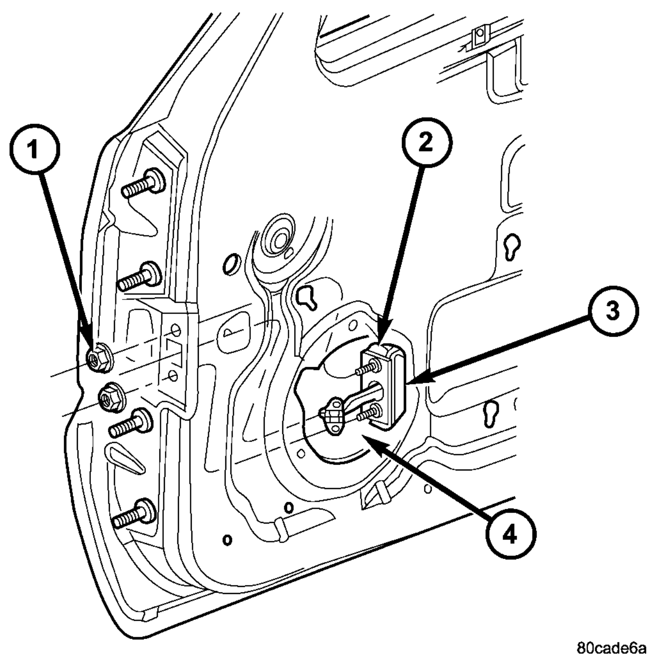

Fig. 1 CHECK STRAP

1 - NUTS
2 - CHECK STRAP
3 - PART NUMBER (FACES INBOARD)
4 - SPEAKER OPENING

DOOR

REMOVAL

(1) Disconnect the door wire harness electrical connector at the A-pillar.
(2) Support the door with a suitable lifting device.
(3) Remove the bolts attaching the check strap to the a-pillar.

NOTE: The epoxy washers should not be removed from the hinge. If the washers are removed the door may have to be re-adjusted.

(4) Remove the nuts attaching the door hinges to the door. (Fig. 2)

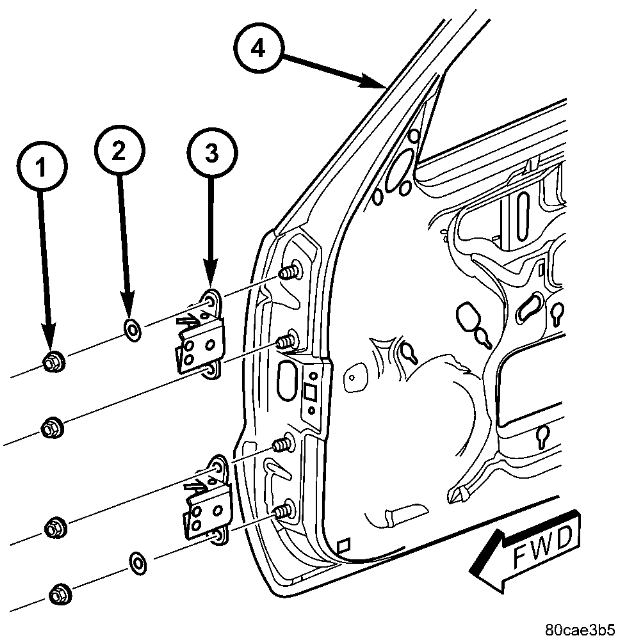

Fig. 2 HINGES

1 - NUTS (4)
2 - EPOXY WASHERS (2) (NOT REMOVABLE)
3 - HINGES
4 - DOOR

INSTALLATION

(1) Support the door with a suitable lifting device and install the door onto the hinges.
(2) Install the nuts and washers if they were removed previously and tighten to 23 N·m (17 ft. lbs.).
(3) Connect the door wire harness electrical connector.
(4) Connect the check strap to the a-pillar and install the bolts.
(5) Tighten the check strap bolts to 12 N·m (9 ft. lbs.).
(6) Adjust the door as necessary. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

ADJUSTMENTS

ADJUSTMENT

NOTE: For vehicles with four doors, it is recommended that you adjust the rear door before adjusting the front door. (Refer to 23 - BODY/DOORS - REAR/DOOR - ADJUSTMENTS)

- **Door adjustment measurements should be taken from stationary or welded body panels like the roof, rocker or quarter panels.**
- **During adjustment procedures, it is recommended that all the hinge fasteners be loosened except for the upper most fasteners. Adjustments can be made using the upper bolts to hold the door with final torque of the fasteners occurring after correct door positioning is achieved.**
- **A suitable body sealant should be used when removing or moving the hinges.**

FORE/AFT

NOTE: Fore/aft (lateral) door adjustment is done by loosening the hinge to the hinge pillar fasteners one hinge at a time and moving the door to the correct position.

(1) Support the door with a suitable lifting device.
(2) Loosen the hinge to hinge pillar fasteners. (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL)
(3) Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
(4) Tighten the hinge pillar fasteners to 28 N·m (21 ft. lbs.).

UP/DOWN

NOTE: Up/down door adjustment is done by loosening either the hinge to the hinge pillar fasteners or the hinge to door fasteners and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the epoxy bonded washers with a chisel or other suitable tool.

DOOR (Continued)

NOTE: When the up/down adjustments are done correctly, the top of the door is positioned over flush to the roof. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(1) Support the door with a suitable lifting device.
(2) Remove the latch striker. (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)
(3) Loosen the hinge to door fasteners (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL) or loosen the hinge to hinge pillar fasteners (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL).
(4) Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
(5) Tighten the hinge pillar fasteners or the door to hinges fasteners to 28 N·m (21 ft. lbs.).
(6) Install the latch striker. (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)

IN/OUT

NOTE: In/out door adjustment is done by loosening the hinge to door fasteners one hinge at a time and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the epoxy bonded washers with a chisel or other suitable tool.

(1) Support the door with a suitable lifting device.
(2) Remove the latch striker. (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)
(3) Loosen the hinge to door fasteners. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
(4) Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
(5) Tighten the door to hinges fasteners to 28 N·m (21 ft. lbs.).
(6) Install the latch striker. (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)

DOOR GLASS

REMOVAL

(1) Remove the outer belt molding. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FRONT DOOR OUTER BELT MOLDING - REMOVAL)
(2) Remove the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL)
(3) Raise the glass to the position shown and using a long flat blade or hook type tool, disengage clips attaching glass retainer to regulator lift plate. (Fig. 3)
(4) Disconnect the glass from the regulator lift plate and re-install the clips.
(5) Rotate the top of the glass toward the front and remove the glass from the window opening.

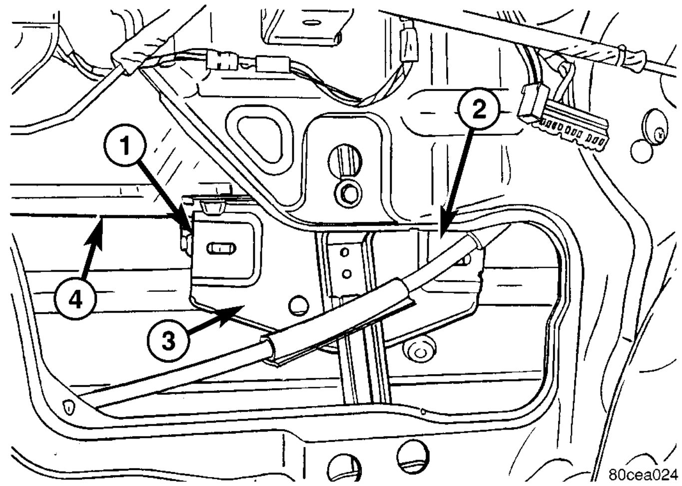

Fig. 3 DOOR GLASS/REGULATOR

1 - DOOR GLASS ATTACHMENT CLIP (2)
2 - DOOR OPENING
3 - REGULATOR LIFT PLATE
4 - DOOR GLASS

INSTALLATION

(1) Install the glass through the window opening and align the mounting plate to the lift plate.
(2) Engage the glass to the regulator lift plate.
(3) Install the outer belt molding. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FRONT DOOR OUTER BELT MOLDING - INSTALLATION)
(4) Install the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION)

EXTERIOR HANDLE

REMOVAL

(1) Remove the door glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL)

(2) Disconnect the lock switch electrical connector, if equipped. (Fig. 4)

(3) Disconnect the handle rod at the handle and the key cylinder rod at the latch.

(4) Remove the screws.

(5) Remove the nuts and remove the handle.

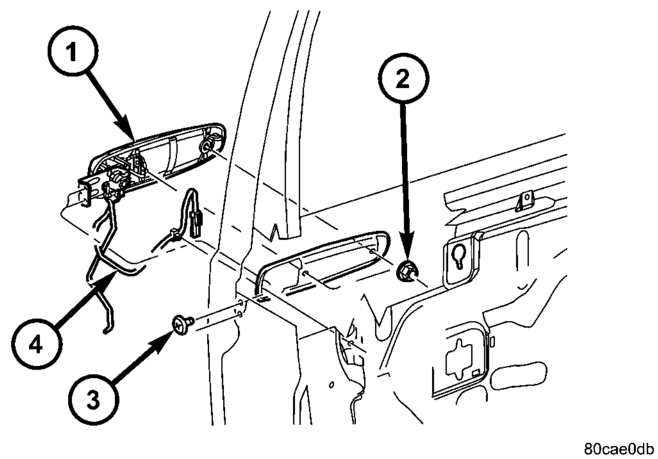

Fig. 4 EXTERIOR HANDLE

1 - EXTERIOR HANDLE
2 - NUTS
3 - SCREWS
4 - ELECTRICAL CONNECTOR

INSTALLATION

(1) Position the handle on the door and slide fully toward the rear of the door.

(2) Install the nuts and tighten to 6 N·m (55 in. lbs.).

(3) Install the screws and tighten to 6 N·m (55 in. lbs.).

(4) Connect the handle rod at the handle and the key cylinder rod at the latch.

(5) Connect the lock switch electrical connector, if equipped.

(6) Install the door glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - INSTALLATION)

GLASS RUN CHANNEL

REMOVAL

(1) Remove the door glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL)

(2) Remove the front and rear bolts. (Fig. 5)

(3) Peal the weatherstrip out of the door frame and remove the run channel through the window opening.

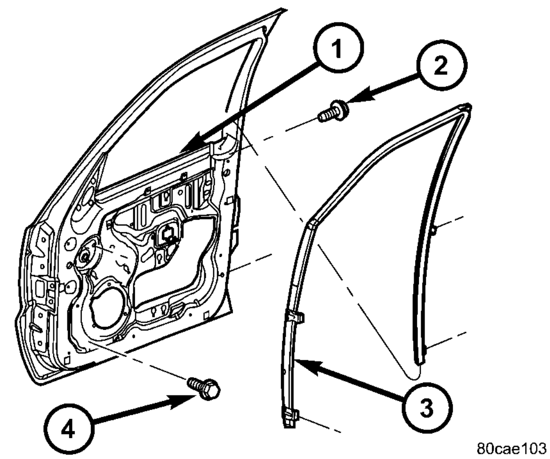

Fig. 5 GLASS RUN CHANNEL

1 - WINDOW OPENING
2 - REAR BOLTS (2)
3 - GLASS RUN CHANNEL
4 - FRONT BOLTS (2)

INSTALLATION

(1) Install the run channel through the window opening and into the door frame.

(2) Install the front, rear bolts and tighten to 9 N·m (80 in. lbs.).

(3) Install the door glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - INSTALLATION)

HINGE

REMOVAL

(1) Remove the door. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)

(2) Using a grease pencil or equivalent, mark the hinge location and remove the bolts.

INSTALLATION

(1) Install the hinges and bolts.

(2) Tighten bolts to 28 N·m (21 ft. lbs.).

(3) Install the door. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)

LATCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the waterdam as necessary to gain access to the latch. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL)

(3) Disconnect the exterior handle rod at the handle.

(4) Disconnect the lock knob rod and lock cylinder link rod at the latch.

(5) Remove rear glass run channel bolts and position the channel aside. (Fig. 5)

(6) Remove the screws and remove the latch assembly. (Fig. 6)

(7) Disconnect the electrical connectors.

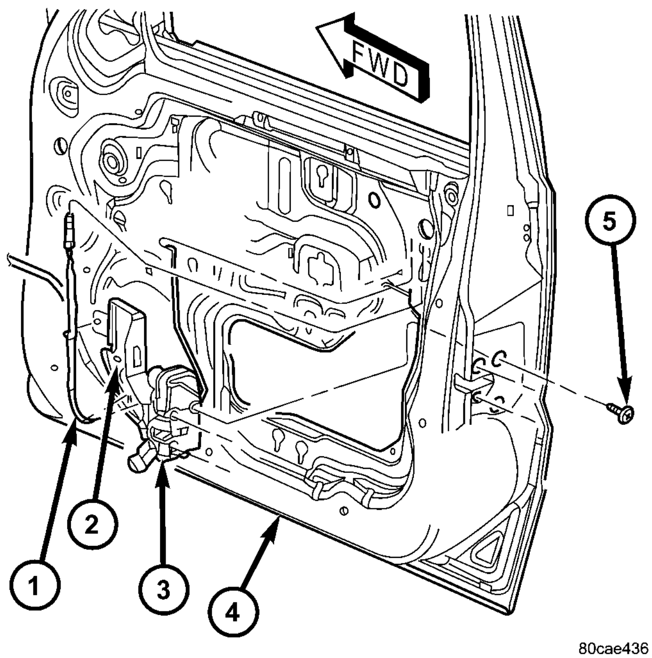

Fig. 6 LATCH

1 - LOCK ACTUATOR ROD
2 - PLASTIC COVER
3 - LATCH ASSEMBLY
4 - DOOR
5 - SCREWS

INSTALLATION

(1) Connect the latch electrical connectors.

(2) Install the latch assembly into the door and install the screws.

(3) Tighten the latch screws to 11 N·m (95 in. lbs.).

(4) Install the rear glass run channel bolts and tighten to 9 N·m (80 in. lbs.).

(5) Connect the lock cylinder link rod and lock knob rod at the latch.

(6) Connect the exterior handle actuator rod at the handle.

(7) Install the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION)

(8) Reconnect the battery ground cable.

LATCH STRIKER

REMOVAL

(1) Remove the bolts. (Fig. 7)

(2) Remove the latch striker and the spacer, if equipped.

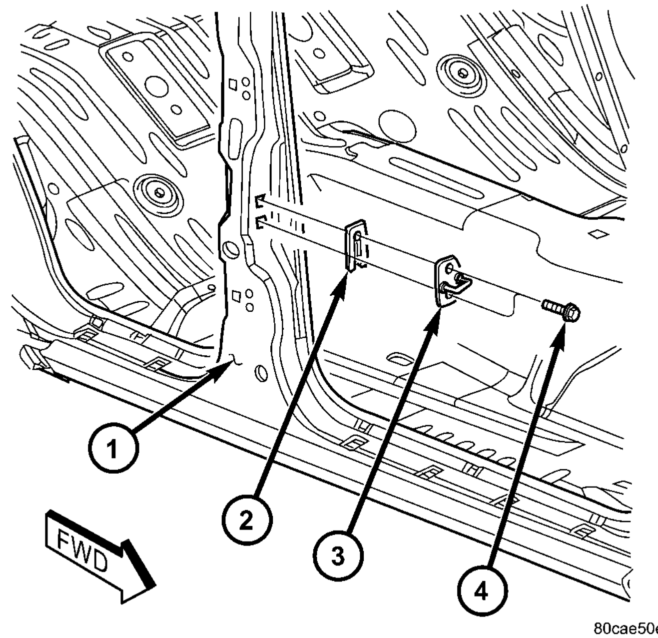

Fig. 7 LATCH STRIKER

1 - B-PILLAR
2 - SPACER
3 - STRIKER
4 - BOLTS (2)

INSTALLATION

(1) Install the striker and spacer, if equipped.

(2) Install the bolts and tighten to 28 N·m (21 ft. lbs.).

(3) Adjust the door as necessary. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

LOCK CYLINDER

REMOVAL

(1) Remove the exterior handle. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL)

(2) Remove the screw and remove the lock cylinder. (Fig. 8)

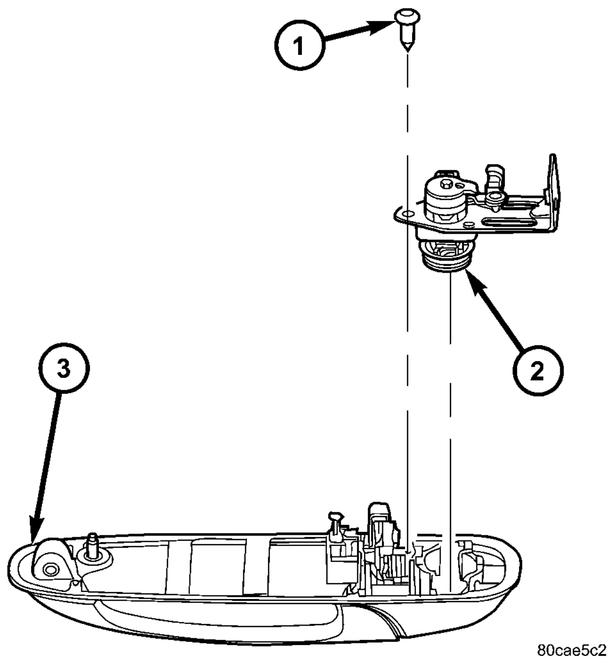

Fig. 8 LOCK CYLINDER

1 - SCREW
2 - LOCK CYLINDER ASSEMBLY
3 - EXTERIOR HANDLE

INSTALLATION

(1) Install the lock cylinder, the retaining screw and tighten to 6 N·m (55 in. lbs.).

(2) Install the exterior handle. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION)

TRIM PANEL

REMOVAL

(1) Remove the inside handle screw plug and remove the screw. (Fig. 9)

(2) Remove the pull handle screw.

(3) Using a trim stick C-4755 or equivalent, disengage the trim panel clips and remove the trim panel.

(4) Disconnect the electrical connectors and the inside handle actuator rod. (Fig. 10)

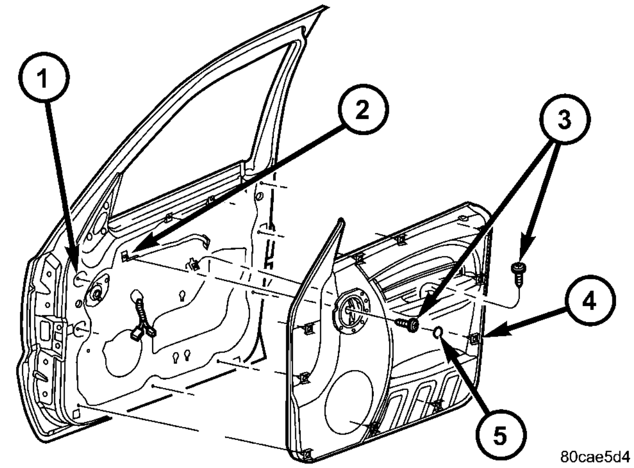

Fig. 9 TRIM PANEL

1 - ALIGNMENT PIN HOLES
2 - LATCH ACTUATOR ROD
3 - SCREWS (2)
4 - TRIM PANEL CLIPS
5 - INSIDE HANDLE SCREW PLUG

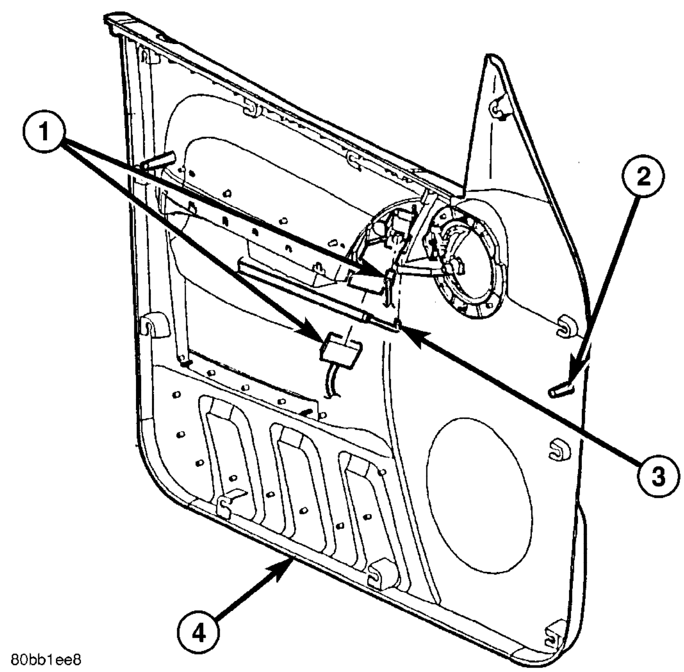

Fig. 10 TRIM PANEL CONNECTIONS

1 - ELECTRICAL CONNECTORS
2 - ALIGNMENT PINS
3 - LATCH ACTUATOR ROD
4 - TRIM PANEL

INSTALLATION

(1) Connect the inside handle actuator rod and the electrical connectors.

(2) Position the trim panel and seat the clips fully.

(3) Instal the screws and install the screw plug.

WATERDAM

REMOVAL

CAUTION: Do not allow the waterdam or adhesive to become contaminated with dirt or other foreign substances.
Do not damage the waterdam during removal and installation.
If the waterdam becomes contaminated or damaged, replace the waterdam.

(1) Remove the door speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)
(2) Separate the waterdam from the inner door panel and off of the latch linkages. (Fig. 11)

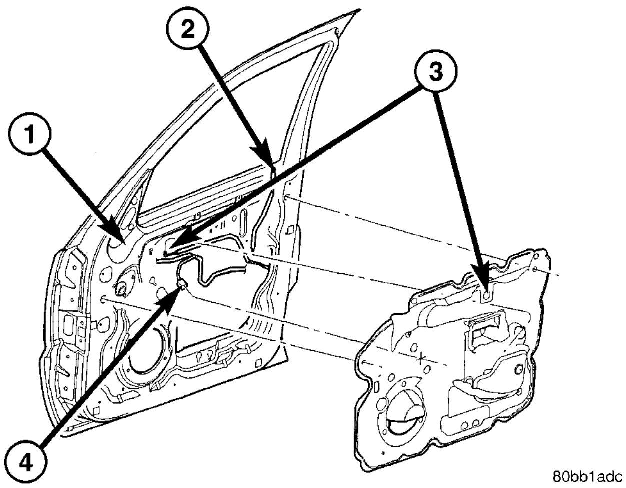

Fig. 11 FRONT DOOR WATERDAM

1 - DOOR
2 - LOCK KNOB ROD
3 - INSIDE HANDLE ACTUATOR ROD AND HOLE
4 - ELECTRICAL CONNECTOR

INSTALLATION

CAUTION: Do not allow the waterdam or adhesive to become contaminated with dirt or other foreign substances.
Do not damage the waterdam during removal and installation.
If the waterdam becomes contaminated or damaged, replace the waterdam.

(1) Position the wire harness and actuator rods through the holes in the waterdam.
(2) Place waterdam onto the door and pressurize at the butyl bead to seal completely, starting with the top rear locating indent and then moving to the top front locating indent followed by the remaining portion of the waterdam.
(3) Run a hard plastic squeegee firmly around the perimeter of the waterdam making sure that the drain holes at the bottom of the inner door panel are fully covered by the waterdam.
(4) Install the speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION)

WINDOW REGULATOR - MANUAL

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL)
(2) Raise the glass to the position shown and using a long flat blade or hook type tool, disengage clips attaching glass retainer to regulator lift plate. (Fig. 12)
(3) Disconnect the glass from the regulator lift plate and re-install the clips.
(4) Secure the glass in the up position using a wood wedge, tape or equivalent.
(5) Loosen the bolts. (Fig. 13)
(6) Disconnect the runout tube clip and remove the regulator.

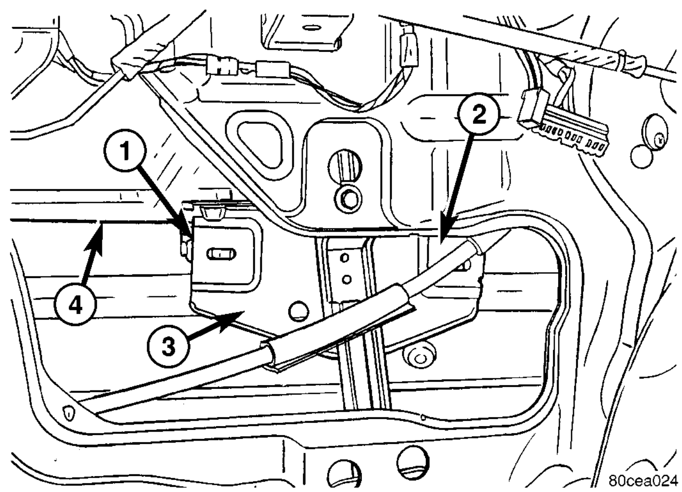

Fig. 12 DOOR GLASS/REGULATOR

1 - DOOR GLASS ATTACHMENT CLIP (2)
2 - DOOR OPENING
3 - REGULATOR LIFT PLATE
4 - DOOR GLASS

WINDOW REGULATOR - MANUAL (Continued)

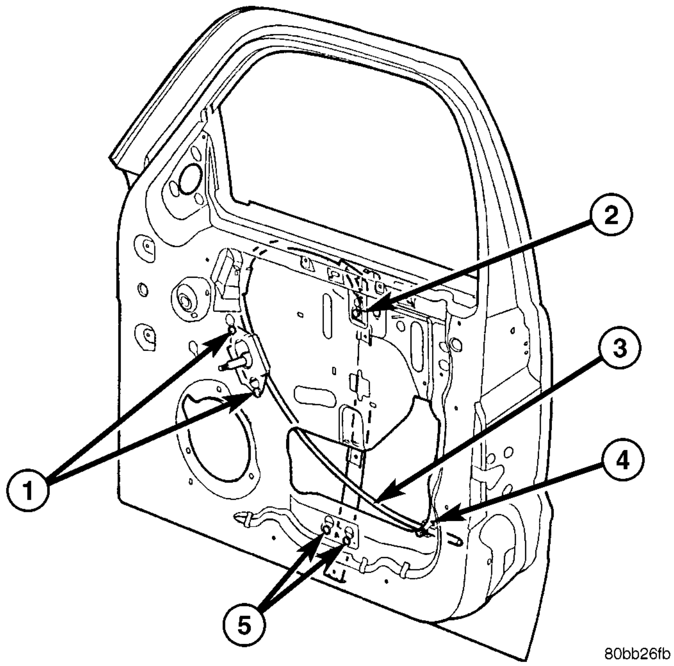

Fig. 13 FRONT DOOR REGULATOR - MANUAL

1 - BOLTS
2 - BOLTS
3 - RUNOUT TUBE
4 - RUNOUT TUBE CLIP
5 - BOLTS

INSTALLATION

(1) Install the regulator assembly.

(2) Tighten the bolts to 9 N·m (80 in. lbs.) using the sequence shown. (Fig. 14)

(3) Remove the glass support and connect to the regulator lift plate.

(4) Install the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION)

WINDOW REGULATOR - POWER

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL)

(2) Raise the glass to the position shown and using a long flat blade or hook type tool, disengage clips attaching glass retainer to regulator lift plate. (Fig. 15)

(3) Disconnect the glass from the regulator lift plate and re-install the clips.

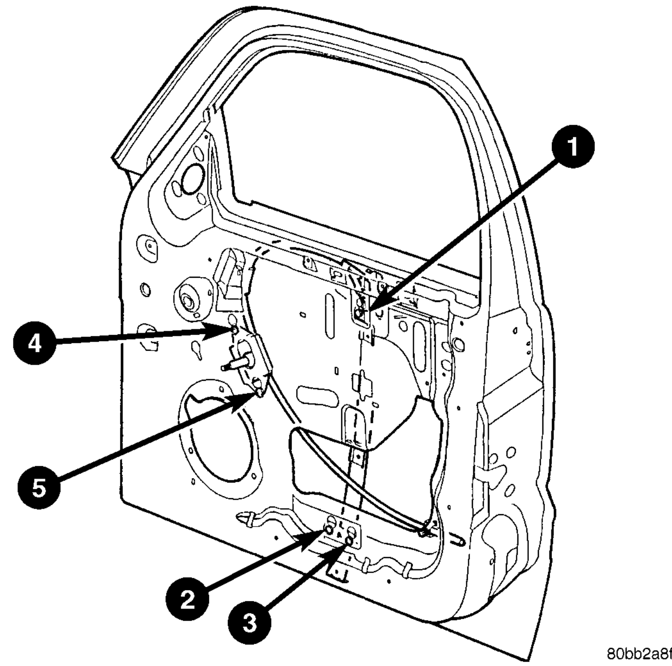

Fig. 14 REGULATOR TIGHTENING SEQUENCE - MANUAL

(4) Secure the glass in the up position using a wood wedge, tape or equivalent.

(5) Loosen the bolts. (Fig. 16)

(6) Disconnect the runout tube clip.

(7) Disconnect the electrical connector and remove the regulator.

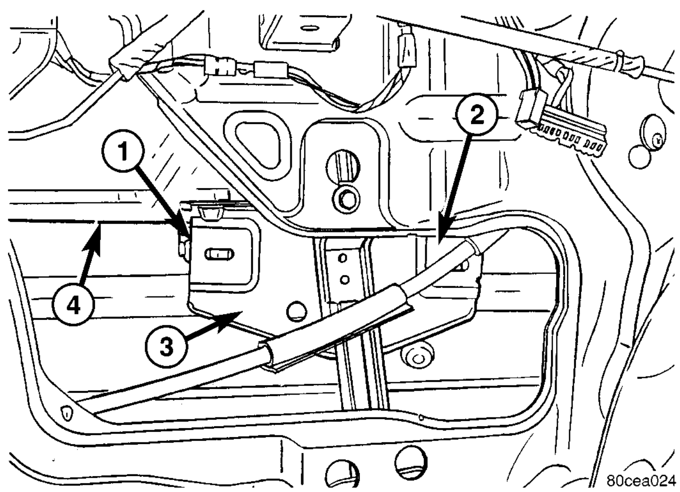

Fig. 15 DOOR GLASS/REGULATOR

1 - DOOR GLASS ATTACHMENT CLIP (2)
2 - DOOR OPENING
3 - REGULATOR LIFT PLATE
4 - DOOR GLASS

WINDOW REGULATOR - POWER (Continued)

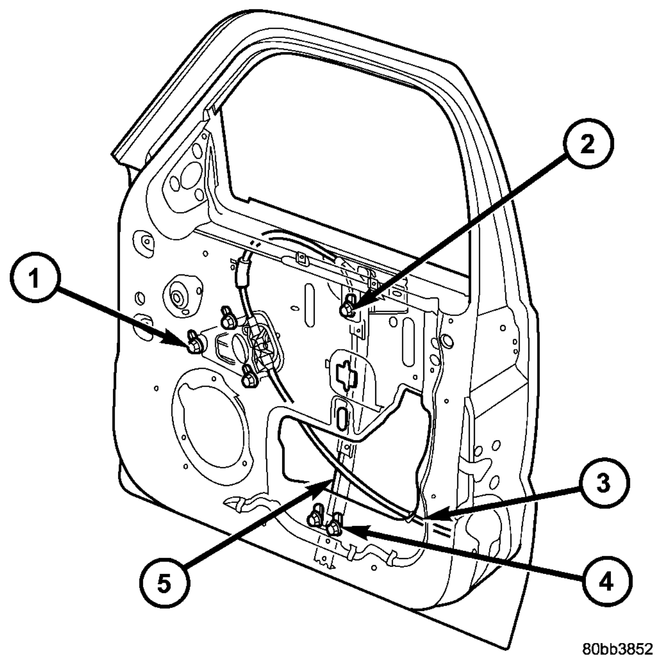

Fig. 16 WINDOW REGULATOR - ELECTRIC

1 - BOLTS (3)
2 - BOLT
3 - RUNOUT TUBE CLIP
4 - BOLTS (2)
5 - REGULATOR ASSEMBLY

INSTALLATION

(1) Install the regulator assembly.

(2) Connect the electrical connector.

(3) Tighten the bolts to 9 N·m (80 in. lbs.) using the sequence shown. (Fig. 17)

(4) Connect the runout tube clip.

(5) Remove the glass support and connect to the regulator lift plate.

(6) Install the waterdam. (Refer to 23 - BODY/ DOOR - FRONT/WATERDAM - INSTALLATION)

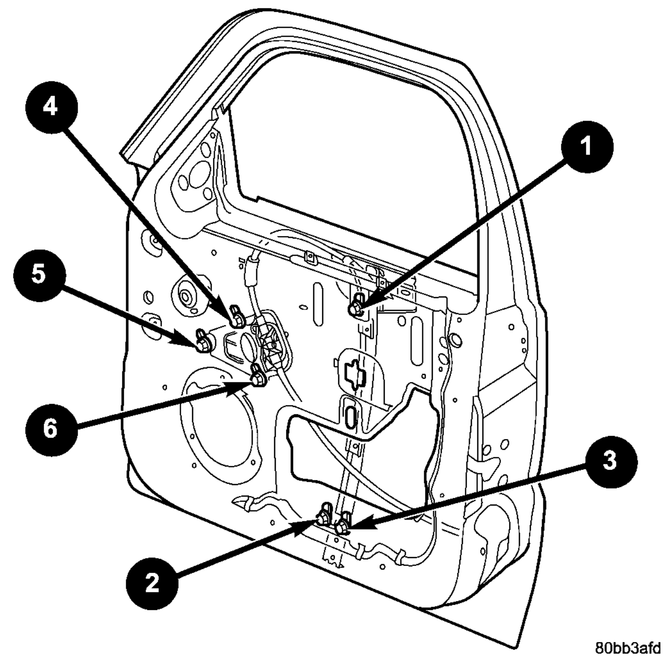

Fig. 17 REGULATOR TIGHTENING SEQUENCE - POWER

DOORS - REAR

TABLE OF CONTENTS

CHECK STRAP

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)
(2) Remove screws attaching door check to b-pillar.
(3) Remove the two nuts and remove the door check strap. (Fig. 1)

INSTALLATION

NOTE: Make sure the proper orientation of the check strap is maintained using the part number printed on the side. The part number should face inboard toward the interior of the vehicle.

(1) Install the check strap through the speaker hole.
(2) Install the nuts and tighten to 12 N·m (9 ft. lbs.).
(3) Connect the strap to the b-pillar and tighten the bolts to 12 N·m (9 ft. lbs.).
(4) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

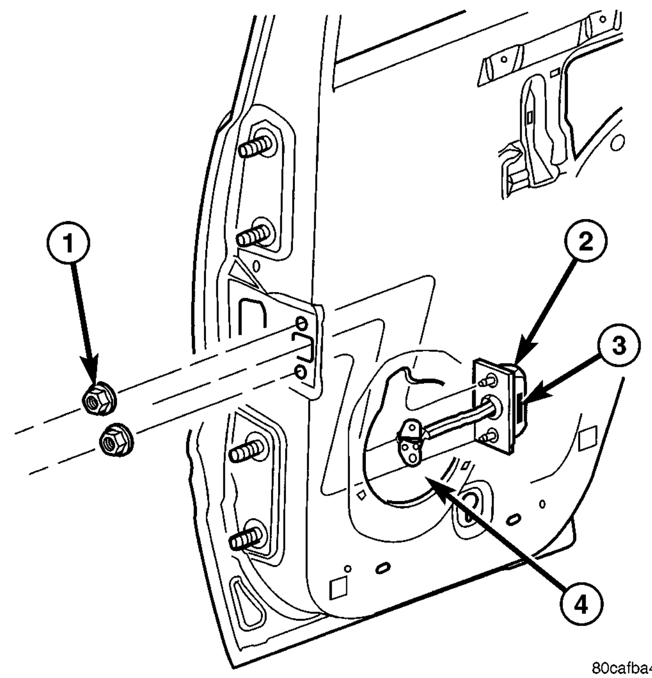

Fig. 1 CHECK STRAP

1 - NUTS
2 - CHECK STRAP
3 - PART NUMBER (FACES INBOARD)
4 - SPEAKER OPENING

DOOR

REMOVAL

(1) Disconnect the door wire harness electrical connector at the b-pillar.

(2) Disconnect the check strap from the b-pillar. (Refer to 23 - BODY/DOORS - REAR/CHECK STRAP - REMOVAL)

(3) Support the door with a suitable lifting device.

NOTE: The epoxy washers should not be removed from the hinge. If the washers are removed the door may have to be re-adjusted.

(4) Remove the nuts attaching the door hinges to the door. (Fig. 2)

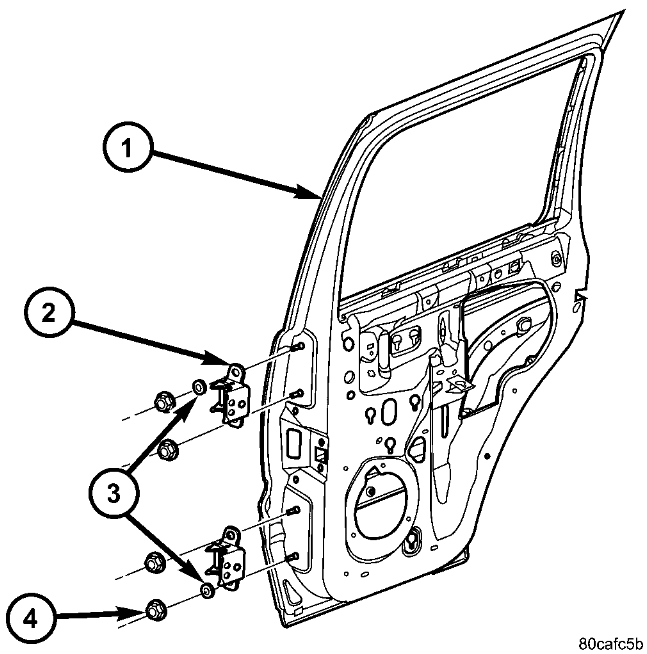

Fig. 2 HINGES

1 - DOOR
2 - HINGES
3 - EPOXY WASHERS (2) (NOT REMOVABLE)
4 - NUTS

INSTALLATION

(1) Support the door with a suitable lifting device and install the door onto the b-pillar.

(2) Install the nuts, washers and tighten to 23 N·m (17 ft. lbs.).

(3) Connect the door wire harness electrical connector.

(4) Connect the check strap to the b-pillar. (Refer to 23 - BODY/DOORS - REAR/CHECK STRAP - INSTALLATION)

(5) Adjust the door as necessary. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

ADJUSTMENTS

ADJUSTMENT

NOTE: For vehicles equipped with four doors, it is recommended that you adjust the rear door before adjusting the front door.

- **Door adjustment measurements should be taken from stationary or welded body panels like the roof, rocker or quarter panels.**
- **During adjustment procedures, it is recommended that all the hinge fasteners be loosened except for the upper most fasteners. Adjustments can be made using the upper fasteners to hold the door with final torque of the fasteners occurring after correct door positioning is achieved.**

FORE/AFT

NOTE: Fore/aft (lateral) door adjustment is done by loosening the hinge to the hinge pillar fasteners one hinge at a time and moving the door to the correct position.

(1) Support the door with a suitable lifting device.

(2) Loosen the hinge to hinge pillar fasteners. (Refer to 23 - BODY/DOORS - REAR/HINGE - REMOVAL)

(3) Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(4) Tighten to hinge pillar fasteners to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/DOORS - REAR/HINGE - INSTALLATION)

UP/DOWN

NOTE: Up/down door adjustment is done by loosening either the hinge to the hinge pillar fasteners or the hinge to door fasteners and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the epoxy bonded washers with a chisel or other suitable tool.

DOOR (Continued)

NOTE: When the up/down adjustments are done correctly, the top of the door is positioned over flush to the roof. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(1) Support the door with a suitable lifting device.

(2) Remove the latch striker. (Refer to 23 - BODY/DOORS - REAR/LATCH STRIKER - REMOVAL)

(3) Loosen the hinge to hinge pillar fasteners (Refer to 23 - BODY/DOORS - REAR/HINGE - REMOVAL) or loosen the hinge to door fasteners (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL).

(4) Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Tighten to hinge pillar fasteners or the door to hinges fasteners and fasteners to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/DOORS - REAR/HINGE - INSTALLATION)

(6) Install the latch striker. (Refer to 23 - BODY/DOORS - REAR/LATCH STRIKER - INSTALLATION)

IN/OUT

NOTE: In/out door adjustment is done by loosening the hinge to door fasteners one hinge at a time and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the epoxy bonded washers with a chisel or other suitable tool.

(1) Support the door with a suitable lifting device.

(2) Remove the latch striker. (Refer to 23 - BODY/DOORS - REAR/LATCH STRIKER - REMOVAL)

(3) Loosen the hinge to door fasteners. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)

(4) Adjust the front of the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Tighten the door to hinges fasteners to 28 N·m (21 ft. lbs.).

(6) Install the latch striker. (Refer to 23 - BODY/DOORS - REAR/LATCH STRIKER - INSTALLATION)

DOOR GLASS

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)

(2) Raise the glass and line up the lift plate clip with the hole in the door panel shown. (Fig. 3)

(3) Using a long flat blade or hook type tool, disengage the clip attaching glass retainer to regulator lift plate.

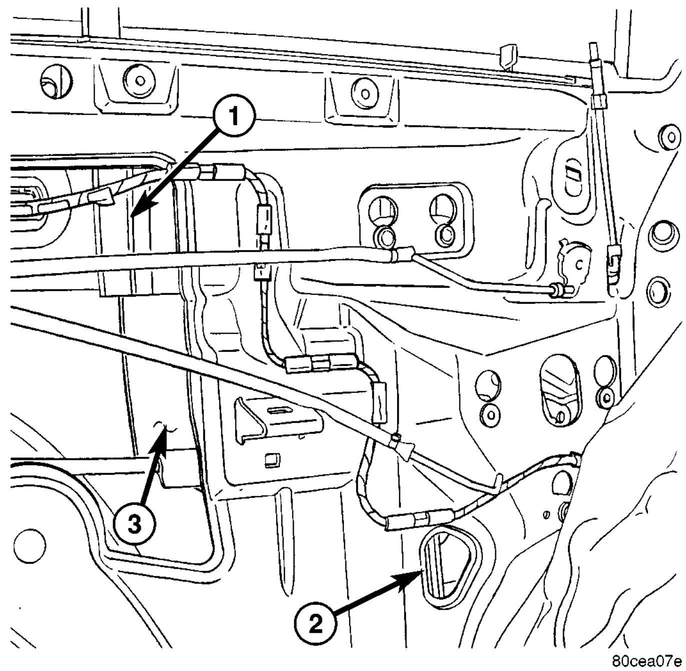

Fig. 3 DOOR GLASS POSITION

1 - GLASS DIVISION BAR
2 - DOOR PANEL SIGHT HOLE
3 - DOOR GLASS

(4) Disconnect the glass from the regulator lift plate and re-install the clip.

(5) Position the glass into the bottom of the door.

(6) Remove the glass division bar bolt. (Fig. 4)

(7) Twist the division bar towards the inside of the door and disengage the door glass.

(8) Remove the glass from the window opening.

DOOR GLASS (Continued)

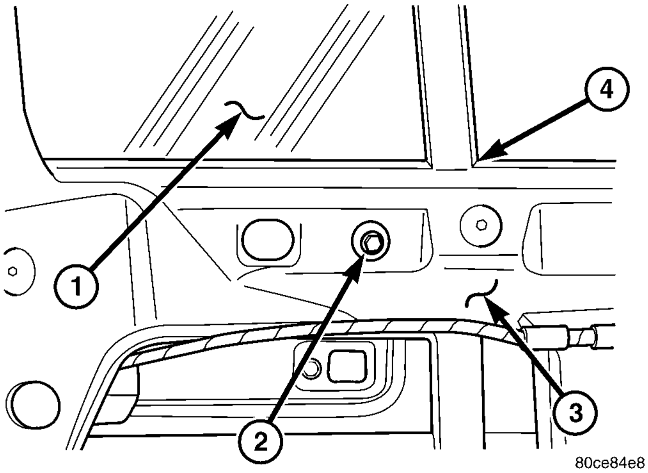

Fig. 4 GLASS DIVISION BAR

1 - STATIONARY DOOR GLASS
2 - DIVISION BAR BOLT (1)
3 - DOOR
4 - GLASS DIVISION BAR

INSTALLATION

(1) Install the glass through the window opening.

(2) Position the front of the glass into the glass run channel and as low as possible in the door.

(3) Twist the glass division bar towards the inside of the door and position the door glass into the rear run channel.

(4) Lift glass up in the window and engage the pin into the regulator lift plate.

(5) Raise the glass into the closed position and install the division bar bolt.

(6) Tighten the bolt to 9 N·m (80 in. lbs.).

(7) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

EXTERIOR HANDLE

REMOVAL

(1) Remove the waterdam as necessary to gain access to the handle. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)

(2) Disconnect the handle rod at the handle.

(3) Remove the nuts and remove the handle. (Fig. 5)

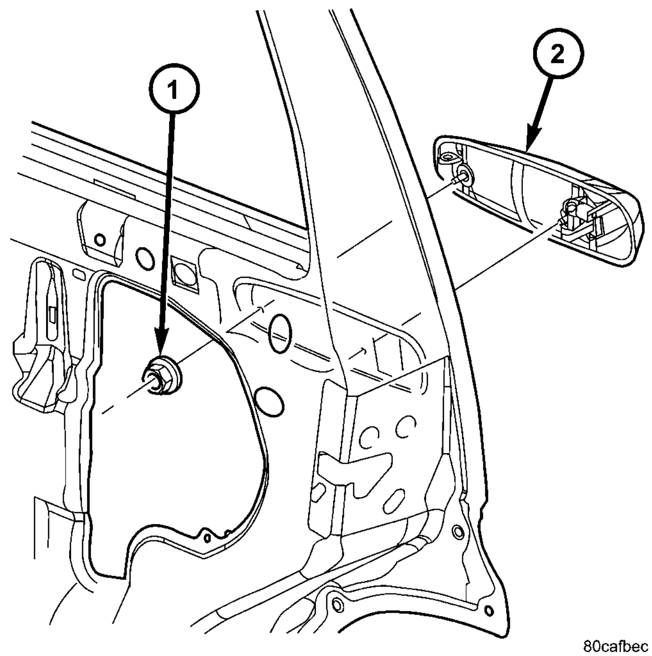

Fig. 5 EXTERIOR HANDLE

1 - NUTS (2)
2 - EXTERIOR HANDLE

INSTALLATION

(1) Install the handle.

(2) Install the nuts and tighten to 6 N·m (55 in. lbs.).

(3) Connect the handle rod at the handle.

(4) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

GLASS RUN CHANNEL

REMOVAL

(1) Remove the outer belt molding. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/REAR DOOR OUTER BELT MOLDING - REMOVAL)

(2) Remove the door glass. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - REMOVAL)

(3) Remove the front and rear bolts. (Fig. 6)

(4) Peal the weatherstrip and quarter glass out of the door frame and remove the run channel through the window opening as an assembly.

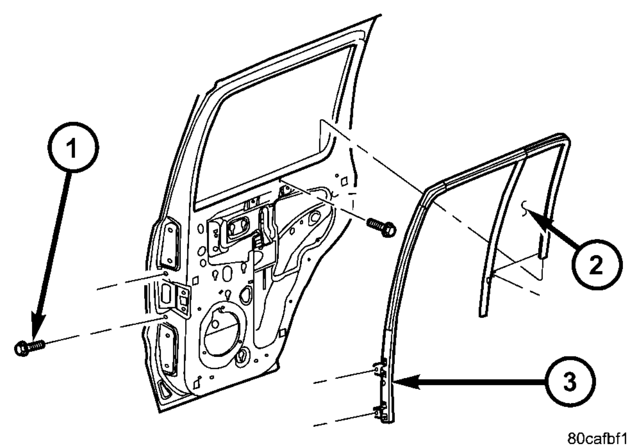

Fig. 6 GLASS RUN CHANNEL

1 - BOLTS (3)
2 - QUARTER GLASS
3 - GLASS RUN CHANNEL ASSEMBLY

INSTALLATION

(1) Install the run channel and quarter glass assembly through the window opening and into the door frame.

(2) Install the front, rear bolts and tighten to 9 N·m (80 in. lbs.).

(3) Install the door glass. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - INSTALLATION)

(4) Install the outer belt molding. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/REAR DOOR OUTER BELT MOLDING - INSTALLATION)

HINGE

REMOVAL

(1) Remove the door. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)

(2) Remove the upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL)

(3) Remove the two door hinge bolts from the inside of the b-pillar.

(4) Remove the exterior bolts attaching the door hinges to the b-pillar.

INSTALLATION

(1) Install the hinges.

(2) Install the exterior bolts and tighten to 28 N·m (21 ft. lbs.).

(3) Install the two inner hinge bolts and tighten to 28 N·m (21 ft. lbs.).

(4) Install the door. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)

(5) Adjust the door as necessary. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(6) Install the upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION)

LATCH

REMOVAL

(1) Remove the waterdam as necessary to gain access to the latch. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)

(2) Disconnect the lock knob rod at the bell crank and the outside handle rod at the outside door handle.

(3) Remove the screws and remove the latch assembly. (Fig. 7)

(4) Disconnect the electrical connectors.

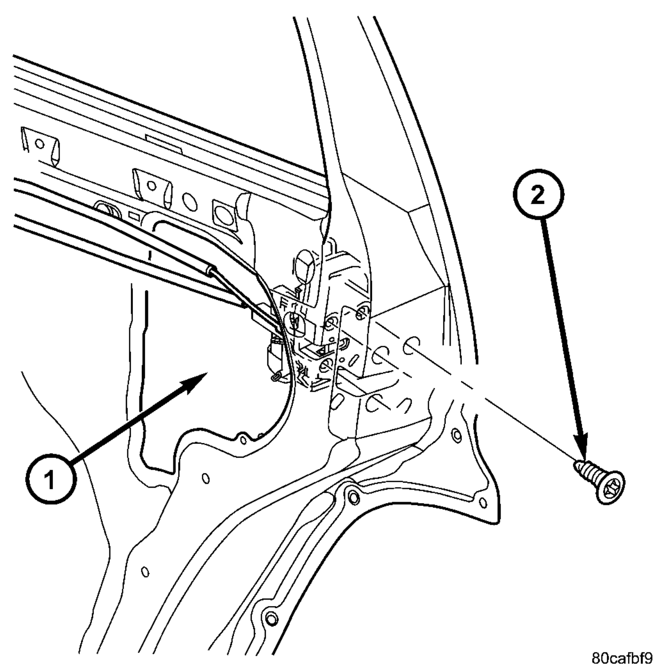

Fig. 7 LATCH

1 - LATCH
2 - SCREWS (3)

LATCH (Continued)

INSTALLATION

(1) Connect the latch electrical connectors.

(2) Install the latch assembly into the door and install the screws.

(3) Tighten the latch screws to 11 N·m (95 in. lbs.).

(4) Connect the outside door handle rod at the outside door handle.

(5) Connect the lock knob rod at the bell crank and the inside handle rod when installing the trim panel.

(6) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

(7) Adjust the latch as needed. (Refer to 23 - BODY/DOORS - REAR/LATCH - ADJUSTMENTS)

ADJUSTMENTS

ADJUSTMENT

(1) Locate access hole and remove the mylar tape covering it. (Fig. 8)

(2) Insert a 5/32-inch hex-wrench through hole and into adjustment screw. Loosen screw.

(3) Operate outside handle several times to release any restriction because of mis-alignment.

(4) Tighten adjustment screw to 3 N·m (30 in. lbs.).

(5) Test handle for proper operation.

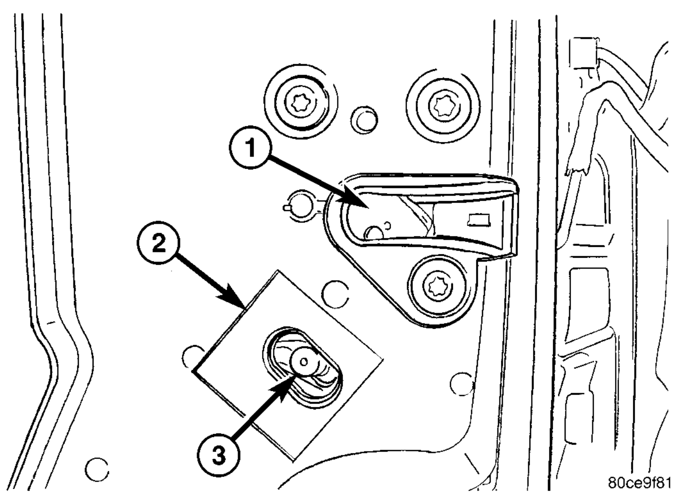

Fig. 8 LATCH ADJUSTMENT SCREW - TYPICAL

1 - DOOR LATCH
2 - MYLAR TAPE
3 - ADJUSTMENT SCREW

LATCH STRIKER

REMOVAL

(1) Remove the bolts. (Fig. 9)

(2) Remove the latch striker and the spacer, if equipped.

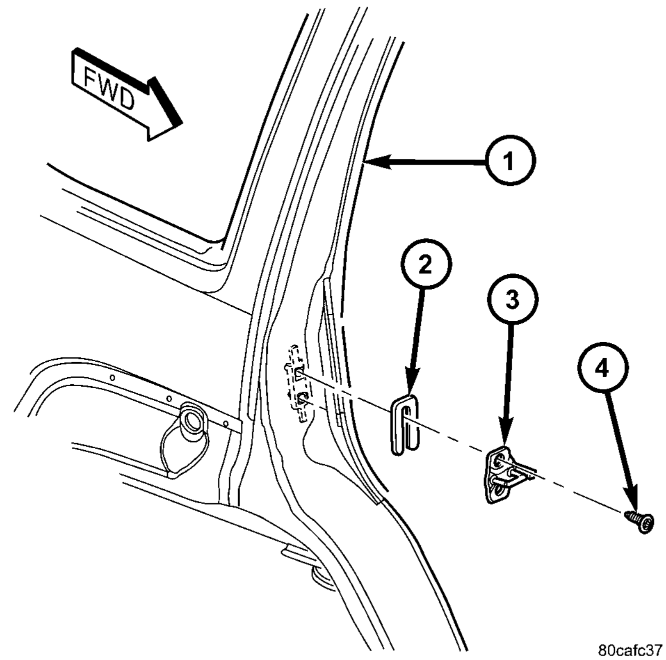

Fig. 9 LATCH STRIKER

1 - C-PILLAR
2 - SPACER
3 - STRIKER
4 - SCREWS

INSTALLATION

(1) Install the striker and spacer, if required.

(2) Install the bolts and tighten to 28 N·m (21 ft. lbs.).

(3) Adjust the door as necessary. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

TRIM PANEL

REMOVAL

(1) Remove the inside handle screw plug and remove the screw. (Fig. 10)

(2) Remove the pull handle screw.

(3) Using a trim stick C-4755 or equivalent, disengage the trim panel clips and remove the trim panel.

(4) Disconnect the electrical connectors and the inside handle actuator rod. (Fig. 11)

TRIM PANEL (Continued)

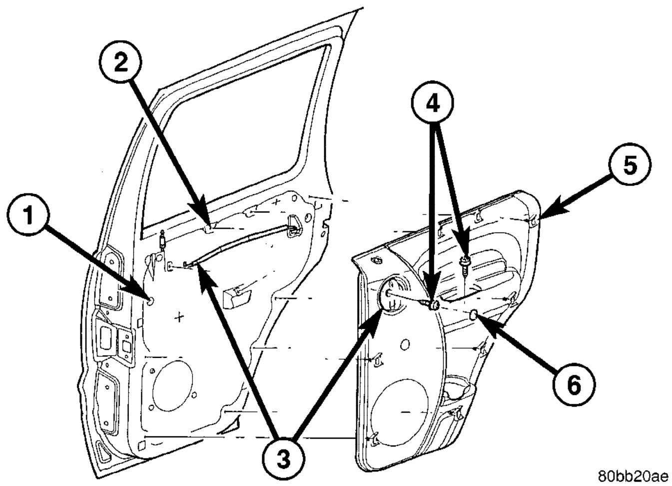

Fig. 10 A REAR TRIM PANEL

1 - WATERDAM
2 - TRIM PANEL CLIP HOLES
3 - INTERIOR HANDLE AND ACTUATOR ROD
4 - SCREWS (2)
5 - TRIM PANEL CLIPS
6 - INTERIOR HANDLE SCREW PLUG

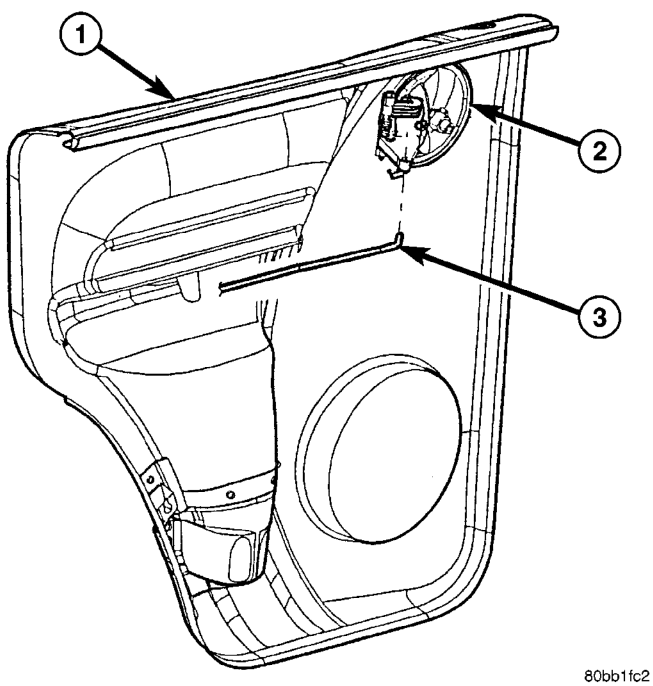

Fig. 11 A REAR DOOR TRIM PANEL CONNECTIONS

1 - TRIM PANEL
2 - INTERIOR LATCH HANDLE
3 - LATCH ACTUATOR ROD

INSTALLATION

(1) Connect the inside handle actuator rod and the electrical connectors.

(2) Position the trim panel and seat the clips fully.

(3) Instal the screws and install the screw plug.

WATERDAM

REMOVAL

CAUTION: Do not allow the waterdam or adhesive to become contaminated with dirt or other foreign substances.
Do not damage the waterdam during removal and installation.
If the waterdam becomes contaminated or damaged, replace the waterdam.

(1) Remove the door speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)

(2) Separate the waterdam from the inner door panel and off of the latch linkages. (Fig. 12)

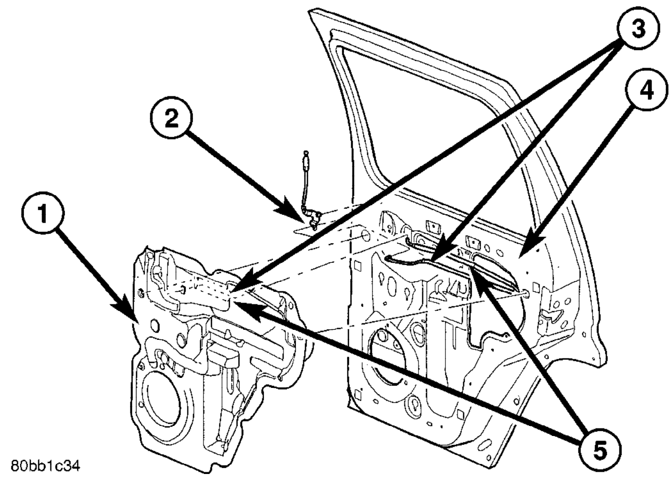

Fig. 12 REAR DOOR WATERDAM

1 - WATERDAM
2 - LOCK ACTUATOR RODS
3 - LOCK ACTUATOR ROD AND HOLES
4 - DOOR
5 - INSIDE HANDLE ACTUATOR ROD AND HOLES

INSTALLATION

CAUTION: Do not allow the waterdam or adhesive to become contaminated with dirt or other foreign substances.
Do not damage the waterdam during removal and installation.
If the waterdam becomes contaminated or damaged, replace the waterdam.

(1) Position the actuator rods through the holes in the waterdam.

(2) Place waterdam onto the door and pressurize at the butyl bead to seal completely, starting with the top rear locating indent and then moving to the top front locating indent followed by the remaining portion of the waterdam.

WATERDAM (Continued)

(3) Run a hard plastic squeegee firmly around the perimeter of the waterdam making sure that the drain holes at the bottom of the inner door panel are fully covered by the waterdam.

(4) Install the door speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION)

WINDOW REGULATOR - MANUAL

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)

(2) Raise the glass and line up the lift plate clip with the hole in the door panel shown. (Fig. 13)

(3) Using a long flat blade or hook type tool, disengage the clip attaching glass retainer to regulator lift plate.

(4) Disconnect the glass from the regulator lift plate and re-install the clip.

(5) Secure the glass in the up position using a wood wedge, tape or equivalent.

(6) Remove the bolts. (Fig. 14)

(7) Disconnect the runout tube clip and remove the regulator.

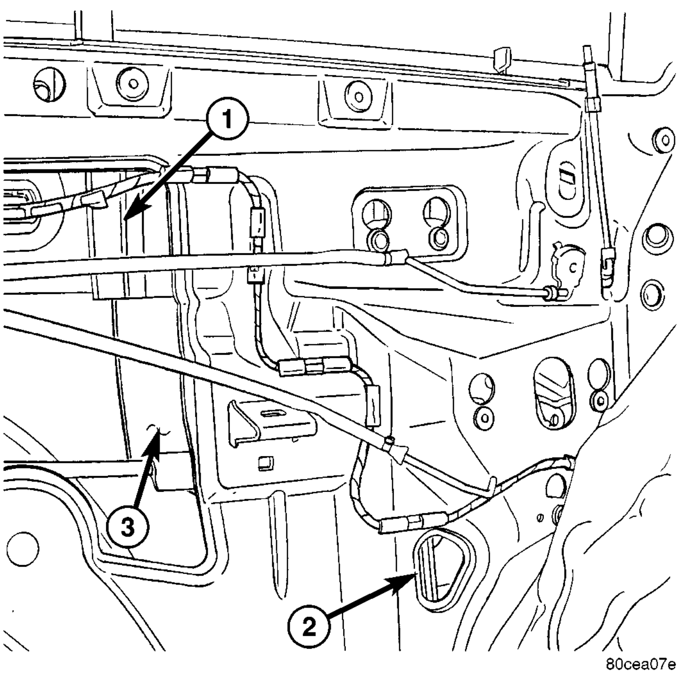

Fig. 13 DOOR GLASS POSITION

1 - GLASS DIVISION BAR
2 - DOOR PANEL SIGHT HOLE
3 - DOOR GLASS

INSTALLATION

(1) Loosely install the bolts onto the regulator assembly.

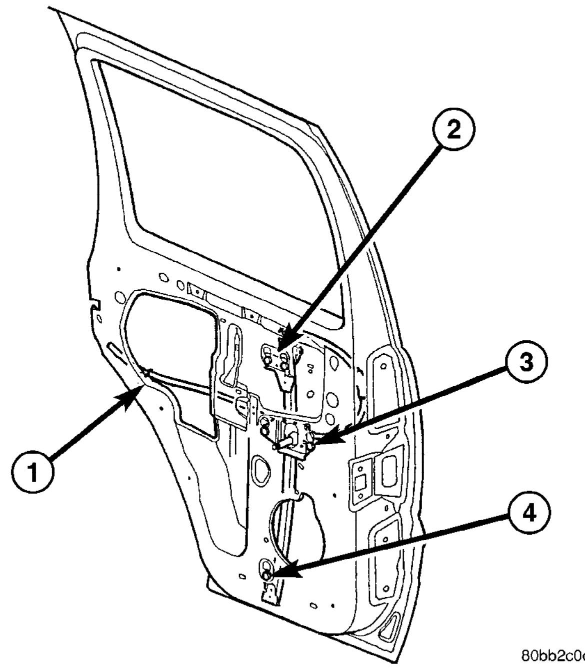

Fig. 14 WINDOW REGULATOR - MANUAL

1 - RUNOUT TUBE CLIP
2 - BOLTS (2)
3 - BOLTS (2)
4 - BOLT (1)

(2) Install the regulator assembly.

(3) Install the runout tube clip.

(4) Tighten the bolts to 9 N·m (80 in. lbs.) using the sequence shown. (Fig. 15)

(5) Remove the glass support and connect to the regulator lift plate.

(6) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

WINDOW REGULATOR - POWER

REMOVAL

(1) Remove the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL)

(2) Raise the glass and line up the lift plate clip with the hole in the door panel shown. (Fig. 16)

(3) Using a long flat blade or hook type tool, disengage the clip attaching glass retainer to regulator lift plate.

(4) Disconnect the glass from the regulator lift plate and re-install the clip.

(5) Secure the glass in the up position using a wood wedge, tape or equivalent.

(6) Remove the bolts. (Fig. 17)

(7) Disconnect the runout tube clip and remove the regulator.

(8) Disconnect the electrical connector.

WINDOW REGULATOR - POWER (Continued)

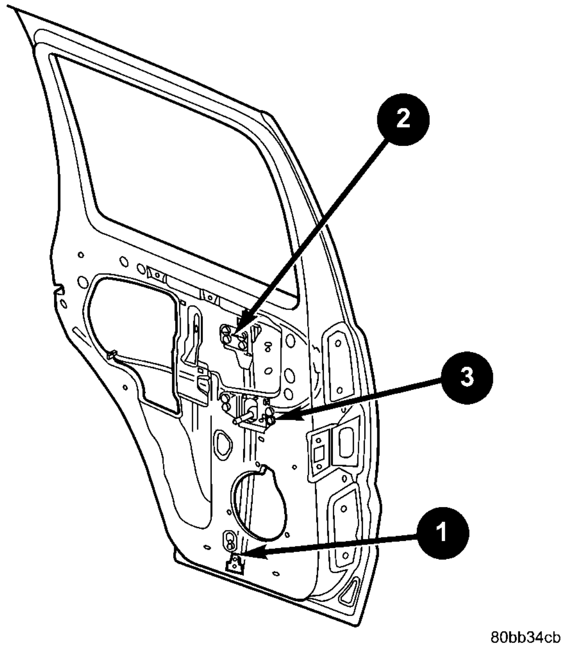

Fig. 15 REGULATOR TIGHTEN SEQUENCE - MANUAL

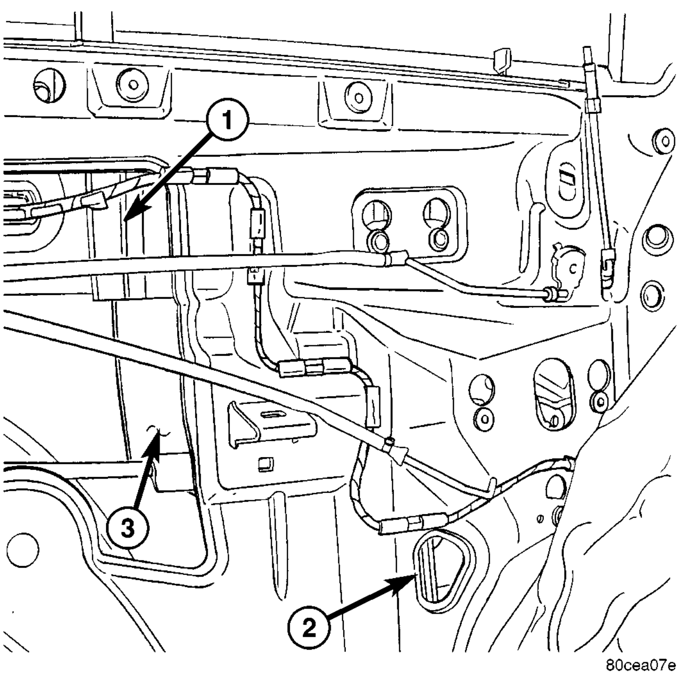

Fig. 16 DOOR GLASS POSITION

1 - GLASS DIVISION BAR
2 - DOOR PANEL SIGHT HOLE
3 - DOOR GLASS

INSTALLATION

(1) Connect the electrical connector.

(2) Loosely install the bolts onto the regulator assembly.

(3) Install the regulator assembly.

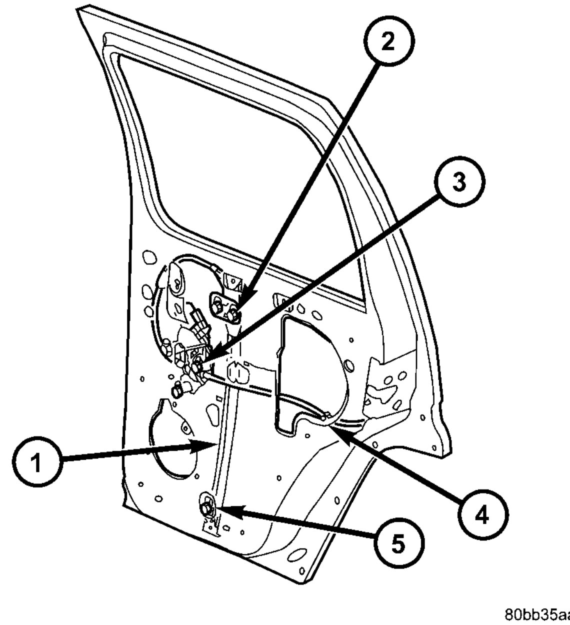

Fig. 17 WINDOW REGULATOR - REAR

1 - REGULATOR ASSEMBLY
2 - BOLTS (2)
3 - BOLTS (2)
4 - RUNOUT TUBE CLIP
5 - BOLT

(4) Tighten the bolts to 9 N·m (80 in. lbs.) using the sequence shown. (Fig. 18)

(5) Remove the glass support and connect to the regulator lift plate.

(6) Install the waterdam. (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION)

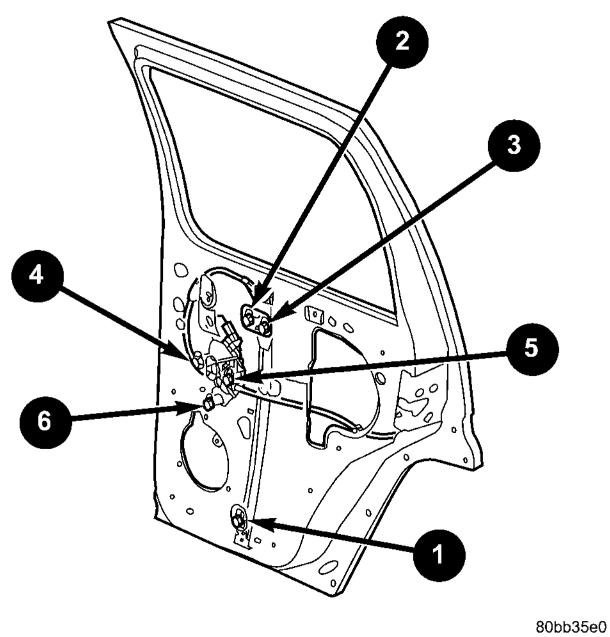

Fig. 18 REGULATOR TIGHTENING SEQUENCE - POWER

SWING GATE

TABLE OF CONTENTS

FLIP-UP GLASS

REMOVAL

(1) Open the flip-up glass and disconnect the electrical connectors.

(2) Remove the support cylinders. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS SUPPORT CYLINDER - REMOVAL)

(3) Open the glass to the full travel with the support cylinders off.

(4) Remove the bolts and remove the glass. (Fig. 1)

INSTALLATION

(1) Install the flip-up glass, pushing it as far up as it can go and loosely install the hinge bolts.

(2) Adjust flip-up glass fit if necessary, making sure there are equal gaps on both sides of the glass while pushing up on the glass and tighten the hinge bolts to 7 N·m (60 in. lbs.). (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS - ADJUSTMENTS)

(3) Install the support cylinders. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS SUPPORT CYLINDER - INSTALLATION)

(4) Connect the electrical connectors.

ADJUSTMENTS

ADJUSTMENT

(1) Verify that the flip-up glass is correctly centered in it's opening. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(2) Confirm the flip-up glass to swing gate adjustment. Hold a straight edge flush against the glass as indicated, and record the gap/space between the straight edge and the swing gate outer vertical panel. (Fig. 2)

FLIP-UP GLASS (Continued)

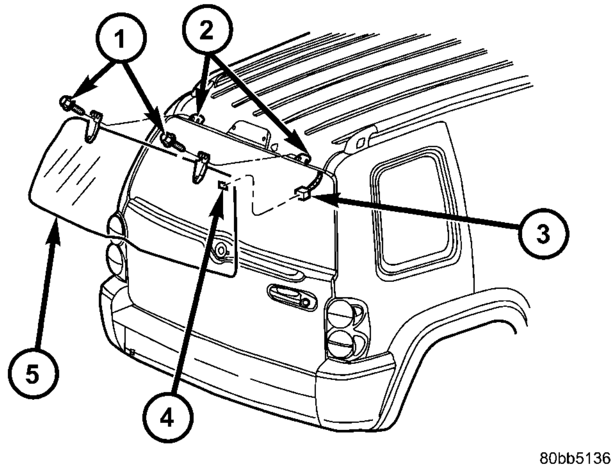

Fig. 1 FLIP-UP GLASS

1 - BOLTS (4)
2 - HINGE MOUNTING HOLES
3 - DEFROSTER WIRE HARNESS
4 - DEFROSTER ELECTRICAL CONNECTOR
5 - FLIPPER GLASS

NOTE: The flush specification for the flip-up glass to the swing gate outer panel is 0mm - 2mm over flush.

(3) If the flip-up glass needs to be adjusted, loosen the two latch attaching fasteners and move the latch for or aft in small increments until desired measurement is achieved. (Fig. 3)

(4) Tighten the flip-up glass fasteners to 12 N·m (9 ft. lbs.).

(5) Verify correct flip-up glass closing efforts and operation.

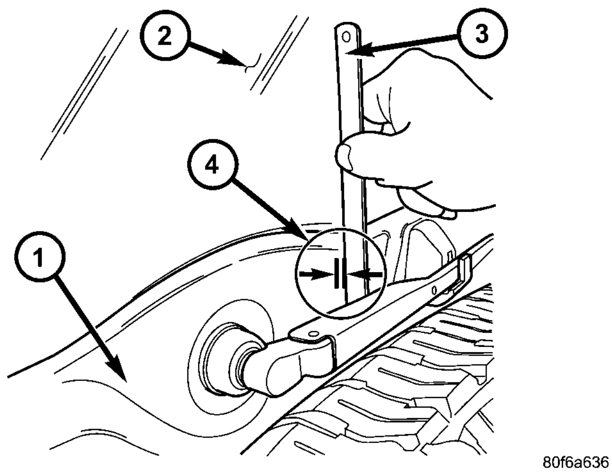

Fig. 2 FLIP-UP GLASS ADJUSTMENT TO GATE

1 - SWING GATE
2 - FLIP-UP GLASS
3 - STRAIGHT EDGE HELD FLUSH AGAINST GLASS
4 - LOCATION WHERE MEASUREMENT IS TO BE TAKEN

FLIP-UP GLASS LATCH

REMOVAL

(1) Remove the trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL)

(2) Disconnect the electrical connectors. (Fig. 3)

(3) Using a grease pencil or equivalent, mark the location of the latch assembly for installation.

(4) Remove the nuts and remove the latch assembly.

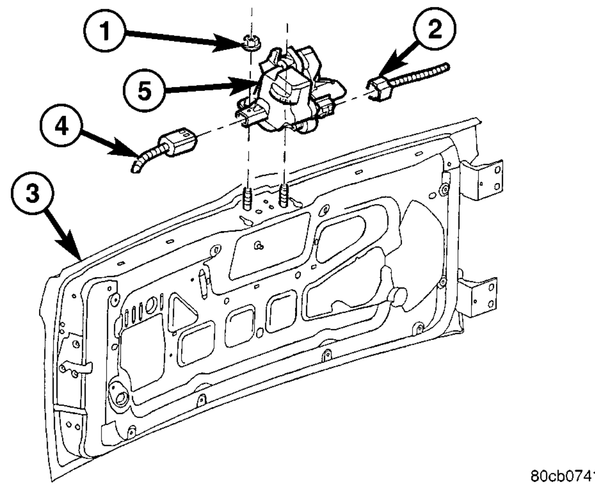

Fig. 3 FLIP-UP GLASS LATCH

1 - NUTS (2)
2 - ELECTRICAL CONNECTOR
3 - SWING GATE
4 - ELECTRICAL CONNECTOR
5 - FLIP-UP GLASS LATCH

INSTALLATION

(1) Install the latch assembly.

(2) Install the nuts and tighten to 12 N·m (9 ft. lbs.).

(3) Connect the electrical connectors.

(4) Adjust the latch to achieve the best glass fit. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS - ADJUSTMENTS)

(5) Install the trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION)

FLIP-UP GLASS - HINGE

REMOVAL

NOTE: It is not necessary to remove the glass to replace one or both hinges. The hinges can be replaced one at a time.

(1) Open the flip up glass.

(2) Using a grease pencil or equivalent, mark the position of the hinge on the body to aid installation.

FLIP-UP GLASS - HINGE (Continued)

(3) Remove the support cylinders and support glass. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS SUPPORT CYLINDER - REMOVAL)

(4) Remove the bolts and remove the hinge. (Fig. 4)

(5) Using a trim stick C-4755 or equivalent, release the lower locking tabs and remove the hinge cover. (Fig. 5)

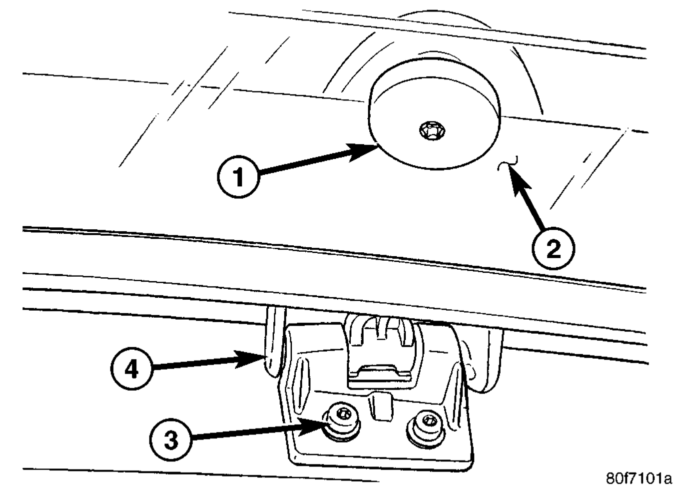

Fig. 4 FLIP-UP GLASS - HINGE

1 - GLASS BOLT
2 - FLIP-UP GLASS
3 - BODY BOLTS
4 - HINGE

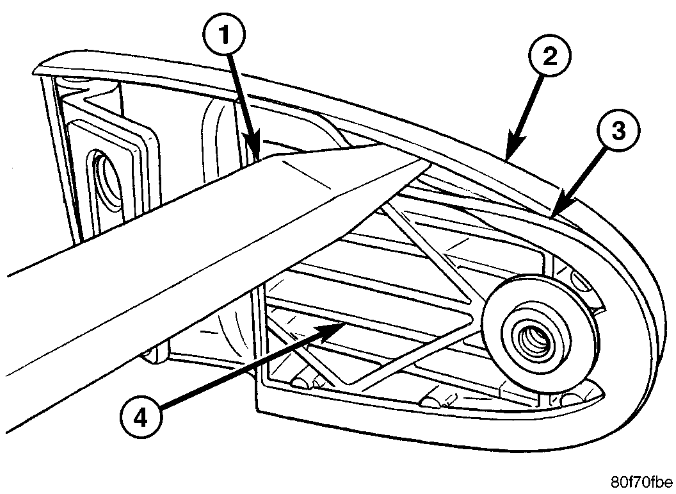

Fig. 5 HINGE COVER REMOVAL

1 - TRIM STICK
2 - HINGE COVER
3 - HINGE GASKET
4 - HINGE

INSTALLATION

NOTE: Inspect the hinge cover retention tabs. If they are damaged or cracked, discard the cover and replace with a new one.

(1) Position the top of the hinge cover over the hinge and engage the cover tab. (Fig. 7)

(2) Rock the hinge cover down over the hinge and seat fully. Ensure both lower tabs snap into place.

(3) Install the hinge onto the vehicle and align with marks made previously.

(4) Install the hinge to glass bolt and tighten to 10 N·m (90 in. lbs.).

(5) Install the bolts and tighten to 7 N·m (60 in. lbs.).

(6) Install the support cylinders. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS SUPPORT CYLINDER - INSTALLATION)

(7) Adjust the flip-up glass as necessary. (Refer to 23 - BODY/SWING GATE/FLIP-UP GLASS - ADJUSTMENTS)

FLIP-UP GLASS - HINGE COVER

REMOVAL

(1) Using a small flat bladed tool or equivalent, insert the tool under the cover and release the locking tabs as shown. (Fig. 6)

(2) Remove the hinge cover from the hinge.

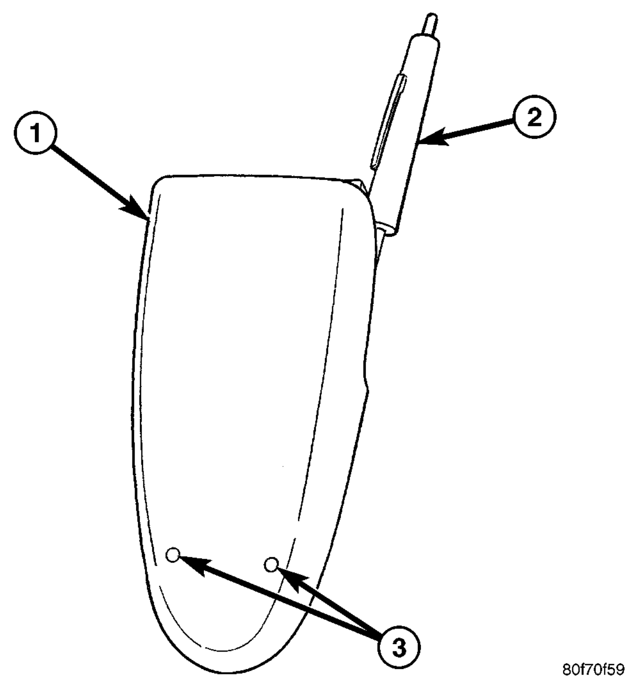

Fig. 6 HINGE COVER REMOVAL

1 - HINGE COVER
2 - FLAT BLADED TOOL
3 - LOCKING TAB LOCATIONS

INSTALLATION

(1) Position the top of the hinge cover over the hinge and engage the cover tab. (Fig. 7)

FLIP-UP GLASS - HINGE COVER (Continued)

(2) Rock the hinge cover down over the hinge and seat fully. Ensure both lower locking tabs snap into place.

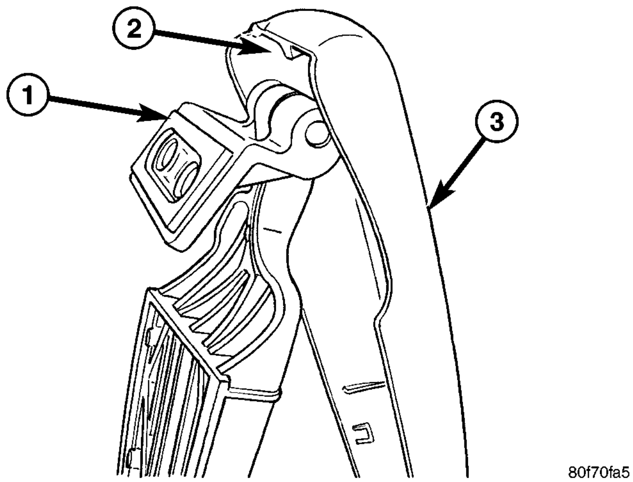

Fig. 7 HINGE COVER INSTALLATION

1 - HINGE
2 - HINGE COVER TAB
3 - HINGE COVER

FLIP-UP GLASS SUPPORT CYLINDER

REMOVAL

(1) Open the flip-up glass and support.

(2) Using a small flat bladed tool, or equivalent, release the retaining clips while pulling the ball socket away from the ball stud. (Fig. 8)

NOTE: Lift the clips only enough to release the ball studs. (Fig. 9)

(3) Remove the support cylinder.

INSTALLATION

(1) Make sure the retaining clips are seated into the ball socket fully.

(2) Install the support cylinder over the ball studs with the thin end connected to the glass and the retaining clips snapping into place.

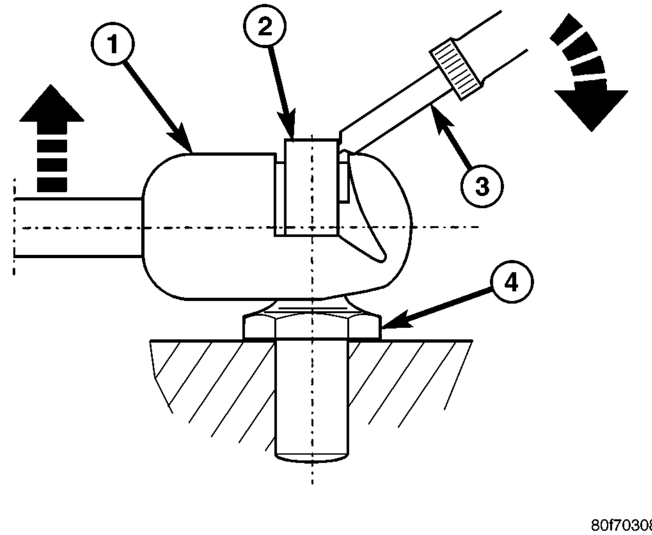

Fig. 8 SUPPORT CYLINDER REMOVAL

1 - BALL SOCKET
2 - RETAINING CLIP
3 - FLAT BLADED TOOL
4 - BALL STUD

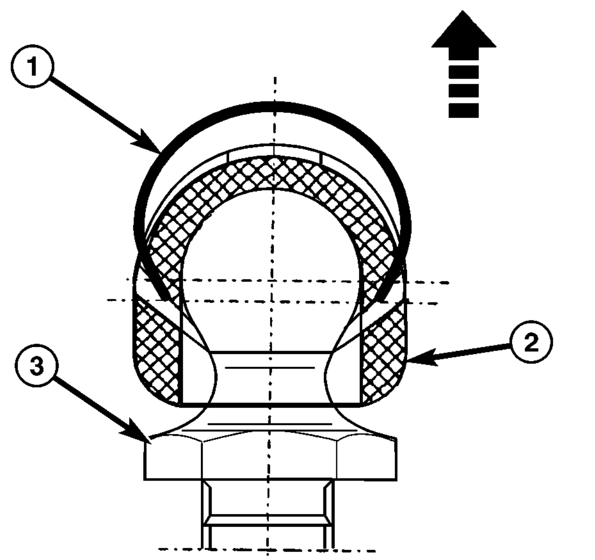

Fig. 9 SUPPORT CYLINDER RETAINING CLIP

1 - RETAINING CLIP
2 - BALL SOCKET
3 - BALL STUD

TRIM PANEL

REMOVAL

(1) Using a trim stick C-4829 or equivalent, release the push pin fasteners. (Fig. 10)

(2) Lift trim panel up off of the upper trim panel clips

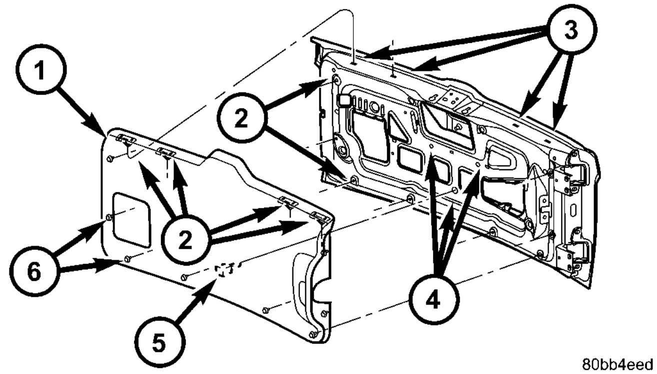

Fig. 10 SWING GATE TRIM PANEL

1 - TRIM PANEL
2 - UPPER TRIM PANEL CLIPS
3 - UPPER TRIM CLIP HOLES
4 - TRIM PANEL LOCATOR HOLES
5 - SWING GATE LOCATOR PINS
6 - PUSH IN FASTENERS

INSTALLATION

(1) Position the trim panel and seat the upper clips.

(2) Fully seat the lower trim panel clips

LATCH

REMOVAL

(1) Remove the trim panel and waterdam. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL)

(2) Disconnect the electrical connector and actuator rod at the threaded clip. (Fig. 11)

(3) Remove the screws and remove the latch.

INSTALLATION

(1) Connect the electrical connector and install the latch.

(2) Install the screws and tighten to 11 N·m (8 ft. lbs.).

NOTE: Do not pre-load the latch rod when attaching. The latch and handle must be in a relaxed state when making the connection.

(3) Connect the actuator rod.

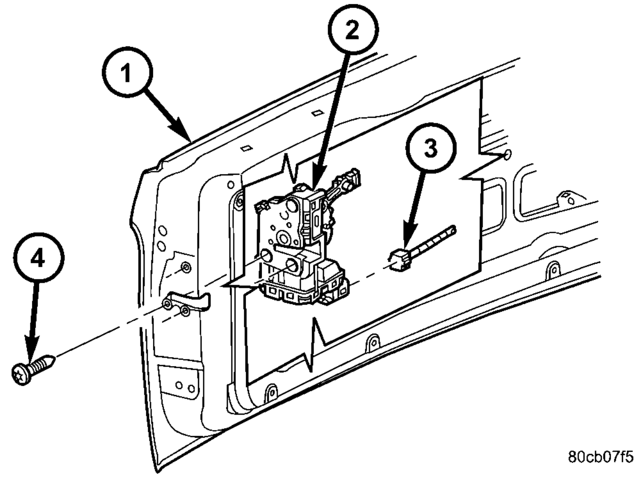

Fig. 11 LATCH

1 - SWING GATE
2 - LATCH ASSEMBLY
3 - ELECTRICAL CONNECTOR
4 - SCREWS

(4) Install the trim panel and waterdam. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION)

LATCH STRIKER

REMOVAL

(1) Open the gate and using a grease pencil or equivalent, mark the position of the striker to aid installation.

(2) Remove the bolts attaching the striker to the d-pillar.

INSTALLATION

(1) Adjust the swing gate as necessary. (Refer to 23 - BODY/SWING GATE/SWING GATE - ADJUSTMENTS)

NOTE: If the spare tire is removed then add 3 mm on the right side to compensate for sag after the spare tire is installed.

(2) Install the striker and install the bolts.

(3) Adjust the striker.

ADJUSTMENTS

ADJUSTMENT

NOTE: Stabilizer insert must be off when adjusting the striker.

LATCH STRIKER (Continued)

(1) Remove the stabilizer insert. (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE/INSERT - REMOVAL)

(2) Loosen the striker bolts.

(3) Adjust the striker up/down so that it is centered within the latch opening.

(4) Adjust the striker fore/aft so the swing gate is under flush to the body -0.5 mm (+/- 1.0 mm).

(5) Adjust the striker cross-car engagement to the latch by adding 2.0 mm shims as necessary.

NOTE: Make sure the striker is not twisted within the latch opening. Striker should be parallel to the opening.

(6) Tighten the striker bolts to 28 N·m (21 ft. lbs.).

(7) Install the stabilizer insert. (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE/INSERT - INSTALLATION)

LATCH - ACCESS PANEL

DESCRIPTION

This panel provides access to the gate latch if gate power fails. The gate can be unlocked by reaching in and pushing the lock lever down.

REMOVAL

(1) Using a trim stick C-4755 or equivalent, remove the access panel.

INSTALLATION

(1) Position and install the access panel.

EXTERIOR HANDLE

REMOVAL

(1) Remove the trim panel and waterdam as necessary to gain access to the handle. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL)

(2) Disconnect the lock switch and flip-up glass release electrical connectors.

(3) Unclip the threaded clips and disconnect the actuator rods.

(4) Remove the screws. (Fig. 12)

(5) Remove the nuts and remove the handle.

INSTALLATION

(1) Install the handle and hold tightly against the gate and support bracket.

(2) Install the nuts and tighten to 6 N·m (55 in. lbs.).

(3) Install the screws and tighten to 6 N·m (55 in. lbs.).

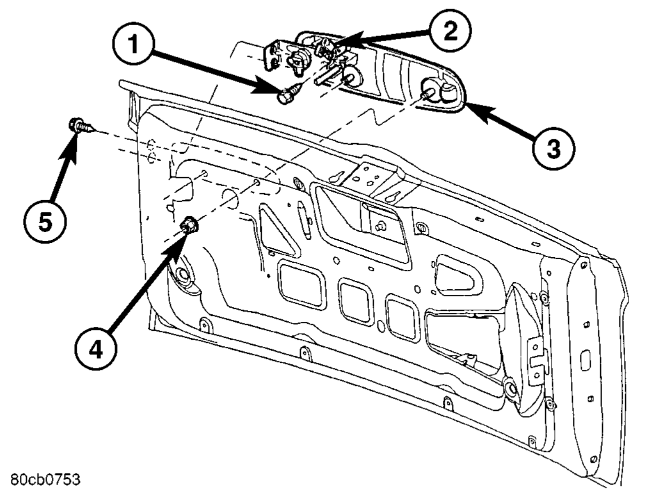

Fig. 12 EXTERIOR HANDLE

1 - LOCK CYLINDER SCREW
2 - LATCH ACTUATOR ROD CONNECTOR
3 - EXTERIOR HANDLE
4 - NUTS (2)
5 - SCREWS (2)

NOTE: Do not pre-load the latch rod when attaching. The latch and handle must be in a relaxed state when making the connection.

(4) Connect the actuator rod by first pushing the rod into the stationary half of the threaded clip, then close the moving half ensuring the two halves snap together fully.

(5) Connect the lock switch and flip-up glass release electrical connectors.

(6) Install the trim panel and waterdam. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION)

LOCK CYLINDER

REMOVAL

(1) Remove the exterior handle. (Refer to 23 - BODY/SWING GATE/EXTERIOR HANDLE - REMOVAL)

(2) Remove the clip and remove the lock cylinder switch.

(3) Remove the screw and remove the lock cylinder. (Fig. 13)

INSTALLATION

(1) Install the lock cylinder.

(2) Install the screw and tighten to 6 N·m (50 in. lbs.).

(3) Install the lock cylinder switch and retaining clip.

LOCK CYLINDER (Continued)

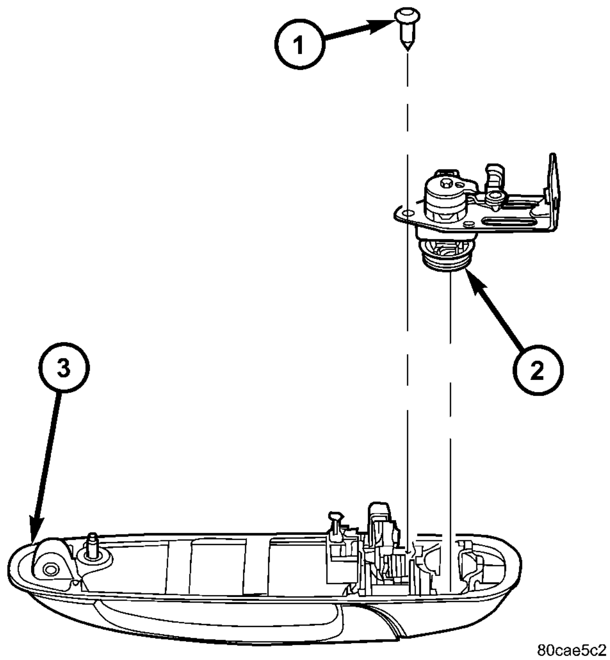

Fig. 13 LOCK CYLINDER

1 - SCREW
2 - LOCK CYLINDER
3 - EXTERIOR HANDLE

(4) Install the exterior handle. (Refer to 23 - BODY/SWING GATE/EXTERIOR HANDLE - INSTALLATION)

CHECK STRAP

REMOVAL

(1) Remove the swing gate trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL)

(2) Remove the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL)

(3) Remove the bolts attaching the check strap to the d-pillar. (Fig. 14)

(4) Peel back the waterdam.

(5) Remove the nuts and remove the check strap from the swing gate.

INSTALLATION

(1) Install the check strap.

(2) Install the nuts and tighten to 10 N·m (89 in. lbs.).

(3) Reposition the waterdam.

(4) Install the trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION)

(5) Install the bolts attaching the check strap to the d-pillar and tighten to 11 N·m (8 ft. lbs.).

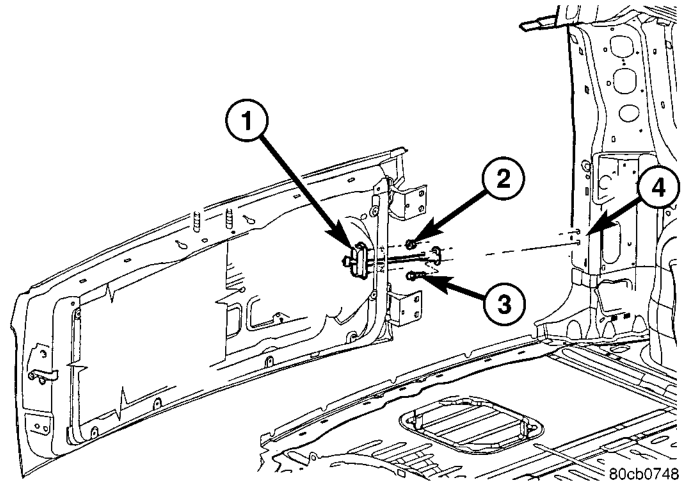

Fig. 14 CHECK STRAP

1 - CHECK STRAP
2 - NUTS (2)
3 - BOLTS (2)
4 - D-PILLAR

(6) Install the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION)

STABILIZER WEDGE/INSERT

REMOVAL

(1) Open the swing gate.

(2) Using a grease pencil or equivalent, mark the location of the stabilizer cup and insert to aid installation.

(3) Remove the bolts for the stabilizer cup and remove the cup. (Fig. 15)

(4) Remove the bolts for the insert and remove the insert and shim, if equipped. (Fig. 16)

INSTALLATION

(1) Install the stabilizer insert with the narrow end toward the rear of the vehicle and install the bolts.

(2) Tighten the bolts to 9 N·m (80 in. lbs.).

(3) Install the stabilizer cup and loosely install the bolts.

(4) Adjust the stabilizer and tighten the bolts to 9 N·m (80 in. lbs.). (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE/INSERT - ADJUSTMENTS)

ADJUSTMENTS

ADJUSTMENT

(1) Adjust the insert up/down to that it is centered within the stabilizer cup.

STABILIZER WEDGE/INSERT (Continued)

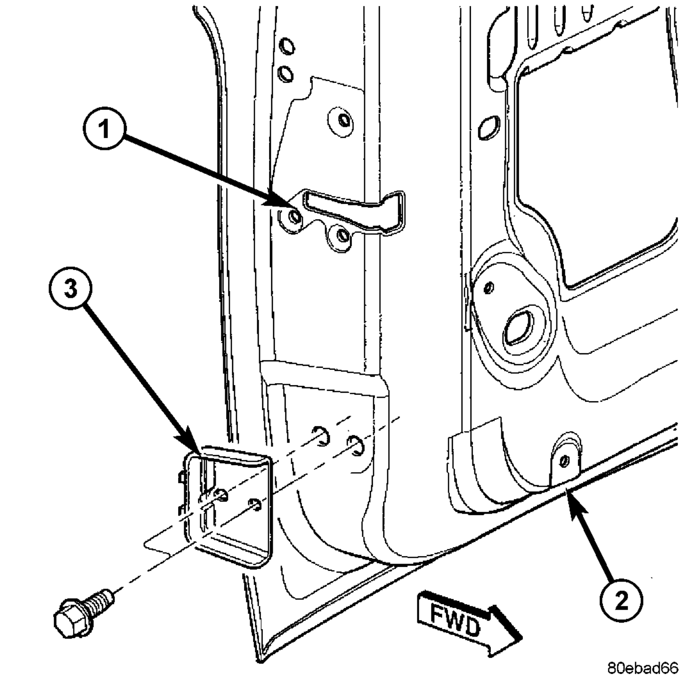

Fig. 15 STABILIZER CUP

1 - SWING GATE LATCH
2 - SWING GATE
3 - STABILIZER CUP

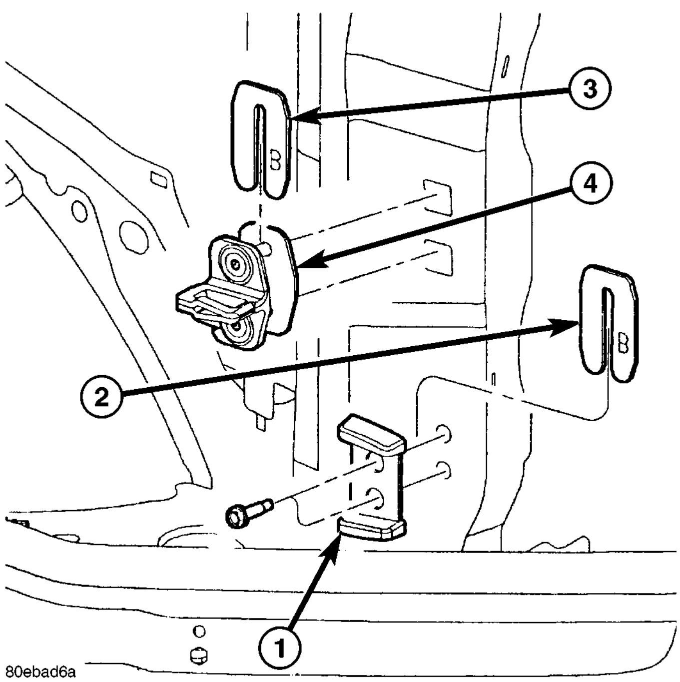

Fig. 16 STABILIZER INSERT

1 - STABILIZER INSERT
2 - SHIM
3 - STRIKER SHIM
4 - SWING GATE LATCH STRIKER

(2) Adjust the insert for/aft so the swing gate is 1.0 mm over flush to the d-pillar when the insert contacts the rubber bumper in the stabilizer cup.

(3) Open the swing gate and tighten the bolts to 9 N·m (80 in. lbs.).

NOTE: Make sure the stabilizer cup and insert are parallel to each other and not twisted.

(4) Close the swing gate and grab the beltline. Confirm minimal for/aft movement and that closing effort is not excessive. Readjust as required.

HINGE

REMOVAL

(1) Remove the swing gate. (Refer to 23 - BODY/SWING GATE/SWING GATE - REMOVAL)

(2) Using a grease pencil or equivalent, mark the original location of the hinges to aid installation.

(3) Remove the bolts from inside the quarter panel. (Fig. 17)

(4) Remove the outer hinge bolts and remove the hinges. (Fig. 18)

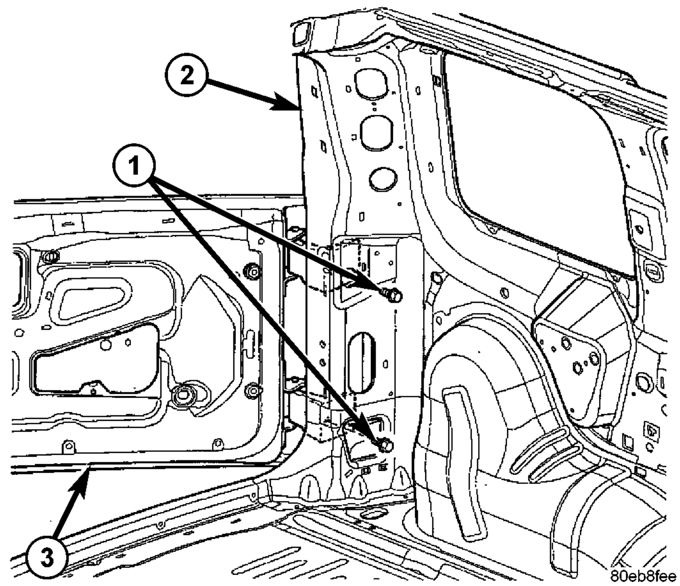

Fig. 17 HINGE FASTENERS/INNER

1 - INNER BOLTS
2 - D-PILLAR
3 - SWING GATE

INSTALLATION

(1) Install the hinges and install the inner and outer fasteners.

(2) Tighten the outer fasteners to 31 N·m (23 ft. lbs.) using the sequence indicated. (Fig. 19)

(3) Tighten the inner fasteners to 31 N·m (23 ft. lbs.) using the sequence indicated. (Fig. 20)

HINGE (Continued)

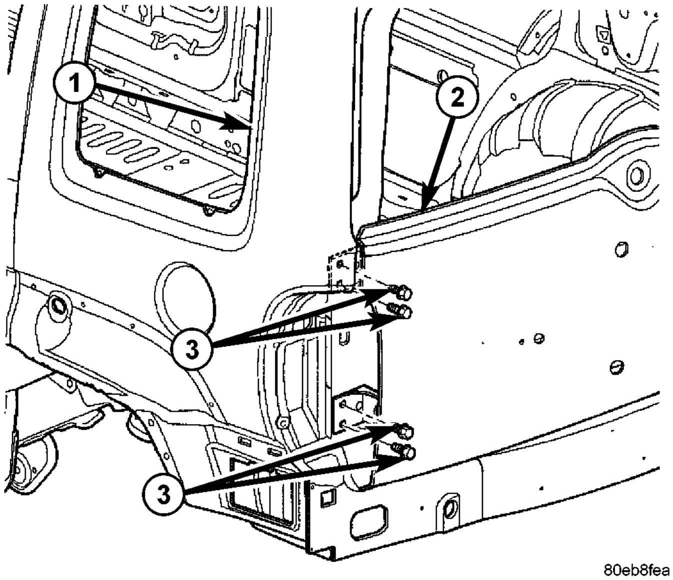

Fig. 18 HINGE FASTENERS/OUTER

1 - D-PILLAR
2 - SWING GATE
3 - OUTER BOLTS (4)

(4) Install the swing gate. (Refer to 23 - BODY/SWING GATE/ SWING GATE - INSTALLATION)

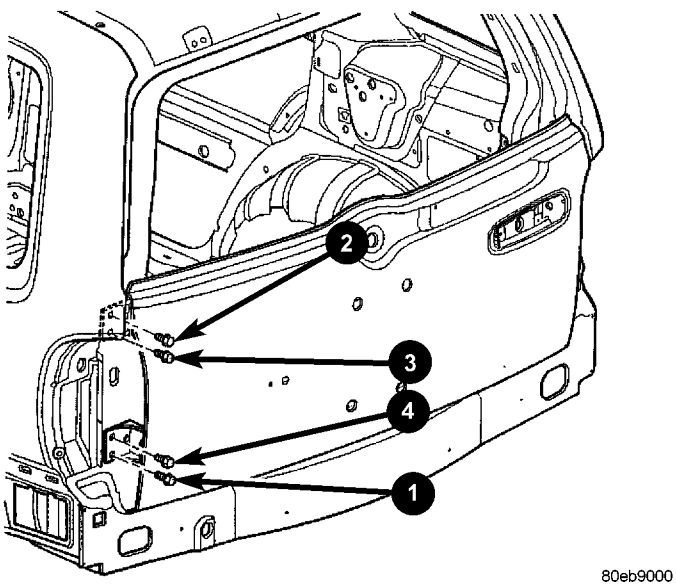

Fig. 19 HINGE FASTENERS/OUTER TORQUE SEQUENCE

SWING GATE

REMOVAL

(1) Remove the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - REMOVAL)

(2) Remove the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL)

(3) Support the swing gate with a suitable lifting device.

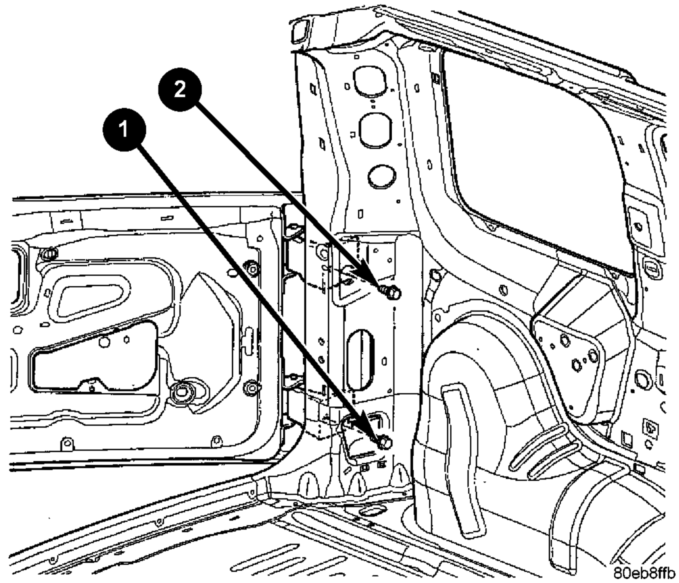

Fig. 20 HINGE FASTENERS/INNER TORQUE SEQUENCE

(4) Disconnect the wire harness.

(5) Disconnect the check strap from the d-pillar. (Refer to 23 - BODY/SWING GATE/CHECK STRAP - REMOVAL)

(6) Remove the bolts and remove the swing gate. (Fig. 21)

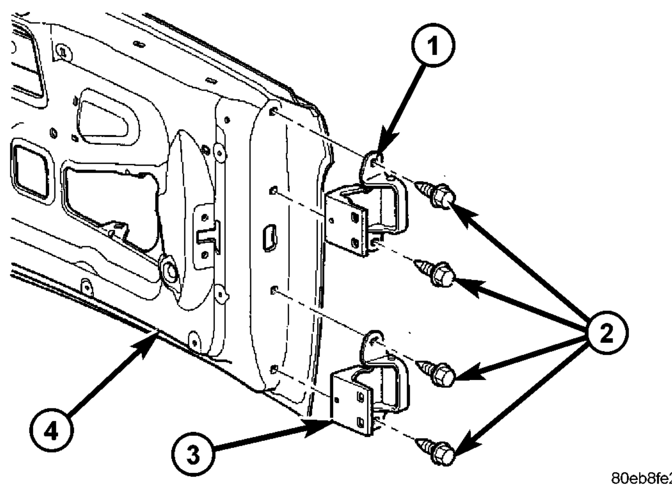

Fig. 21 SWING GATE/HINGE

1 - UPPER HINGE
2 - BOLTS
3 - LOWER HINGE
4 - SWING GATE

INSTALLATION

(1) Install the swing gate and install the bolts.

(2) Tighten the bolts to 31 N·m (23 ft. lbs.).

(3) Adjust the swing gate as needed adding 3 mm on the right side to compensate for sag after the spare tire is installed. (Refer to 23 - BODY/SWING GATE/SWING GATE - ADJUSTMENTS)

(4) Connect the wire harness electrical connector.

SWING GATE (Continued)

(5) Connect the check strap. (Refer to 23 - BODY/SWING GATE/CHECK STRAP - INSTALLATION)

(6) Install the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION)

(7) Install the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - INSTALLATION)

ADJUSTMENTS

ADJUSTMENT

NOTE: Swing gate adjustment measurements should be taken from stationary or welded body panels like the roof, rocker or quarter panels.

- **During adjustment procedures, it is recommended that all the hinge fasteners be loosened except for the upper most fasteners. Adjustments can be made using the upper bolts to hold the door with final torque of the fasteners occurring after correct door positioning is achieved.**
- **A suitable body sealant should be used when removing or moving the hinges.**

(1) Remove the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - REMOVAL)

IN/OUT

NOTE: In/out swing gate adjustment is done by loosening the hinge to gate fasteners one hinge at a time and moving the door to the correct position.

NOTE: With the spare tire removed add 3 mm on the right side to compensate for sag after the spare tire is installed.

(1) Remove the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - REMOVAL)

(2) Remove the stabilizer wedge/striker. (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE - REMOVAL)

(3) For hinge side adjustments, loosen the hinge bolts and leave one upper hinge bolt hand tight. (Refer to 23 - BODY/SWING GATE/HINGE - REMOVAL)

(4) Adjust the swing gate to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Tighten the fasteners. (Refer to 23 - BODY/SWING GATE/HINGE - INSTALLATION)

(6) Install the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - INSTALLATION)

(7) Install the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - INSTALLATION)

UP/DOWN

NOTE: Up/down swing gate adjustment is done by loosening the hinge to gate fasteners or the hinge to body fasteners, one hinge at a time and moving the door to the correct position.

NOTE: With the spare tire removed add 3 mm on the right side to compensate for sag after the spare tire is installed.

(1) Remove the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - REMOVAL)

(2) Remove the stabilizer wedge/striker. (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE - REMOVAL)

(3) For hinge side adjustments, loosen the hinge bolts and leave one upper hinge bolt hand tight. (Refer to 23 - BODY/SWING GATE/HINGE - REMOVAL)

(4) Adjust the swing gate to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Tighten the fasteners. (Refer to 23 - BODY/SWING GATE/HINGE - INSTALLATION)

(6) Install the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - INSTALLATION)

(7) Install the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - INSTALLATION)

LEFT/RIGHT

NOTE: Left/right swing gate adjustment is done by loosening the hinge to body fasteners one hinge at a time and moving the door to the correct position.

NOTE: With the spare tire removed add 3 mm on the right side to compensate for sag after the spare tire is installed.

(1) Remove the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - REMOVAL)

(2) Remove the stabilizer wedge/striker. (Refer to 23 - BODY/SWING GATE/STABILIZER WEDGE - REMOVAL)

(3) Loosen the hinge to body bolts and leave one upper hinge bolt hand tight. (Refer to 23 - BODY/SWING GATE/HINGE - REMOVAL)

(4) Adjust the swing gate to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Tighten the fasteners. (Refer to 23 - BODY/SWING GATE/HINGE - INSTALLATION)

(6) Install the latch striker. (Refer to 23 - BODY/SWING GATE/LATCH STRIKER - INSTALLATION)

(7) Install the spare tire. (Refer to 22 - TIRES/WHEELS/TIRES/SPARE TIRE - INSTALLATION)

EXTERIOR

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BODY SIDE MOLDINGS

REMOVAL

(1) Using a trim stick C-4755 or equivalent, remove and discard the molding from the outside of the door.

INSTALLATION

(1) Thoroughly clean all residue from the body side molding attachment area of the door.

(2) Wipe area clean with a 50% solution of water and alcohol and wipe dry.

(3) Apply new body side molding using the locators in the door and apply pressure of approximately 40 p.s.i. over the entire surface of the molding.

COWL GRILLE

REMOVAL

(1) Remove the hood seal.

(2) Remove the wiper arms. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL)

(3) Remove the four plastic retainers and remove the cowl grill.

INSTALLATION

(1) Position the cowl grill and engage the nine clips to the bottom of the windshield.

(2) Install the four plastic retainers.

(3) Install the wiper arms. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION)

(4) Install the hood seal.

EXTERIOR NAME PLATES

REMOVAL

NOTE: Exterior nameplates are attached to body panels with adhesive tape.

(1) Apply a length of masking tape on the body, parallel to the top edge of the nameplate to use as a guide, if necessary.

(2) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun. Do not exceed 52°C (120°F) when heating emblem.

(3) Using a trim stick C-4755 or equivalent, behind the emblem to separate the adhesive backing from the body.

(4) Clean adhesive residue from body with MOPAR Super Clean solvent or equivalent.

INSTALLATION

(1) Remove protective cover from adhesive tape on back of emblem.

(2) Position emblem properly on body.

(3) Press emblem firmly to body with palm of hand.

(4) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun to assure adhesion. Do not exceed 52°C (120°F) when heating emblem.

FRONT FENDER

REMOVAL

(1) Remove the wheel opening splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - REMOVAL)

(2) Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)

(3) Raise and support vehicle.

(4) Release the inner support clips from within the fascia between the lights. (Fig. 1)

(5) Release the support tabs beneath the headlamps and postition the fascia assembly aside to access the fender support bracket bolts. (Fig. 2)

(6) Remove the front wheel opening flare moldings. (Refer to 23 - BODY/EXTERIOR/FRONT WHEEL OPENING FLARE MOLDINGS - REMOVAL)

(7) Remove the fender support bracket bolts. (Fig. 3)

(8) Remove the bolts and remove the fender. (Fig. 4)

(9) Remove the antenna body, if equipped. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - REMOVAL)

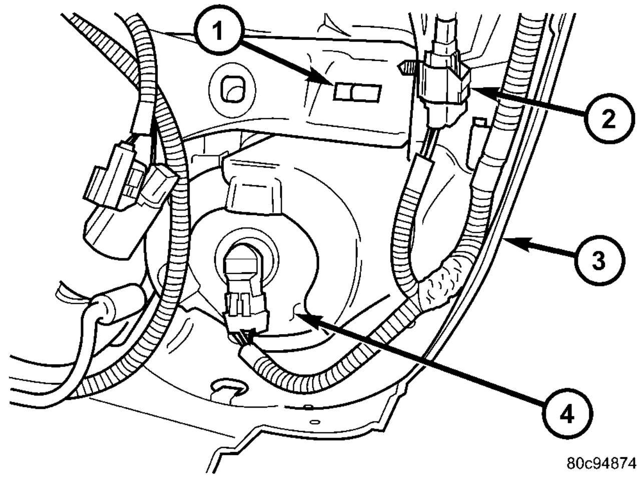

Fig. 1 FASCIA INNER SUPPORT

1 - INNER SUPPORT CLIP
2 - SIDE REPEATER CONNECTOR (IF EQUIPPED)
3 - FASCIA ASSEMBLY
4 - FOG LAMP

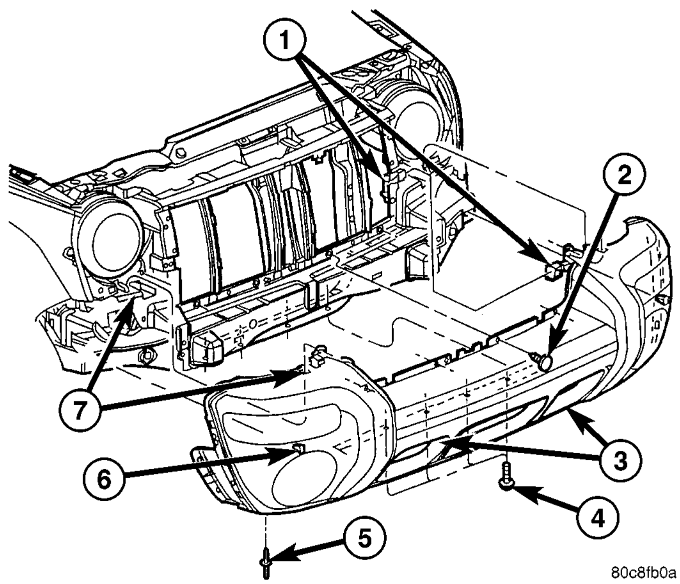

Fig. 2 FRONT FASCIA

1 - ELECTRICAL CONNECTOR
2 - PUSH PINS
3 - FRONT FASCIA ASSEMBLY
4 - LOWER SCREWS
5 - PLASTIC RIVETS (2)
6 - INNER SUPPORT CLIPS
7 - SUPPORT TABS

INSTALLATION

(1) Install the antenna body, if equipped. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - INSTALLATION)

(2) Install the fender assembly and install the bolts.

(3) Install the fender support bracket and install the bolts.

FRONT FENDER (Continued)

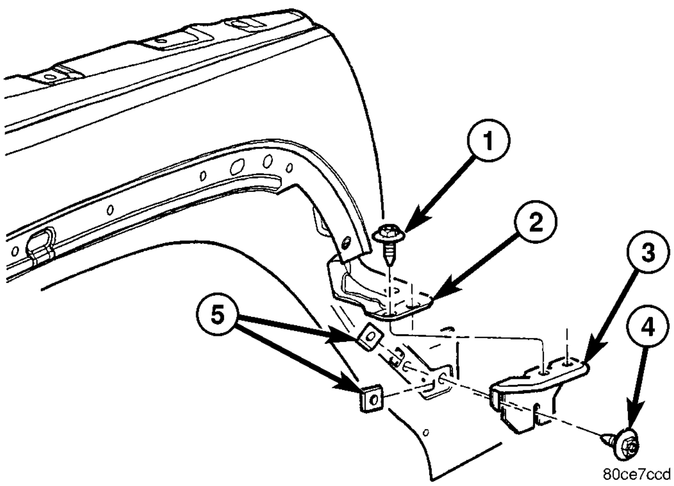

Fig. 3 FENDER SUPPORT BRACKET

1 - FENDER BOLTS (2)
2 - FENDER
3 - FENDER SUPPORT BRACKET
4 - SUPPORT BRACKET BOLTS (2)
5 - U-NUTS (2)

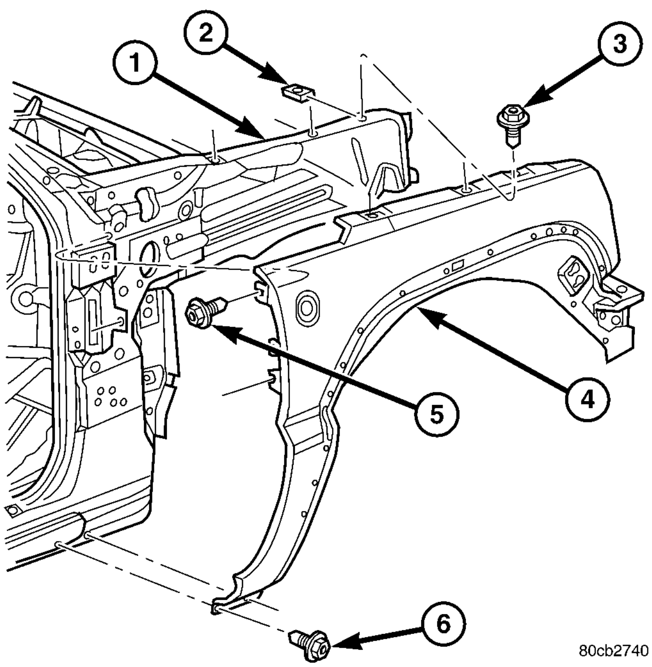

Fig. 4 FRONT FENDER

1 - HYDRAFORM
2 - U-NUTS
3 - BOLTS (3)
4 - FENDER
5 - BOLTS (2)
6 - BOLTS (2)

(4) Align the fender with adjacent body parts and tighten the bolts to 12 N·m (9 ft. lbs.). (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

(5) Install the fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)

(6) Install the wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - INSTALLATION)

FUEL FILL DOOR/HOUSING

REMOVAL

(1) Remove the fuel cap.

(2) Remove the three screws connecting the fuel door/housing to the filler neck.

(3) Reach in through the opening and depress the tabs at the upper and bottom right of the door/housing. (Fig. 5)

(4) Remove the fuel door/housing from the vehicle.

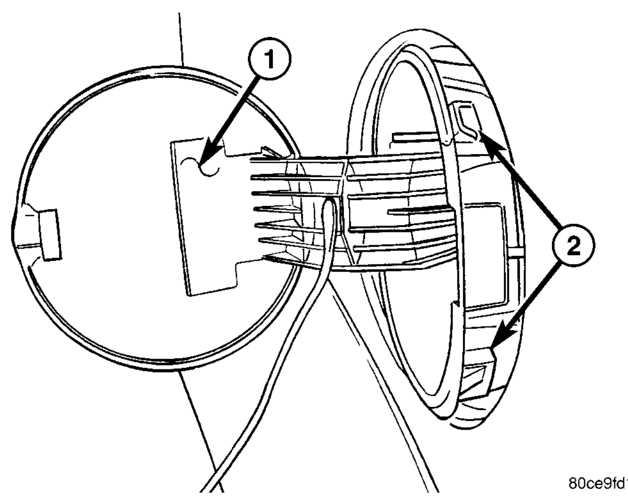

Fig. 5 FUEL FILL DOOR/HOUSING

1 - FUEL FILL DOOR
2 - HOUSING TABS

INSTALLATION

(1) Position the fuel filler door/housing into the vehicle and fully seat the tabs.

(2) Install the three screws.

(3) Install the fuel cap.

GRILLE

REMOVAL

(1) Remove the upper screws. (Fig. 6)

(2) Roll the grille forward and disengage the two grille hooks under the headlamp units.

(3) Lift the grille forward and up off of the location tabs at the bottom and remove.

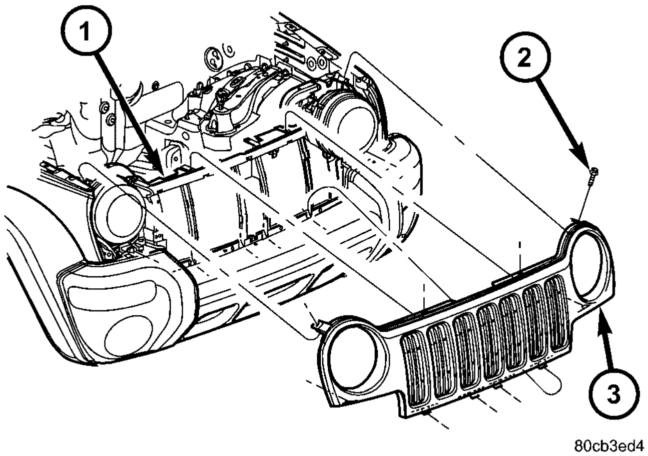

Fig. 6 GRILLE

1 - GRILLE OPENING REINFORCEMENT
2 - SCREWS (4)
3 - GRILLE CLIPS

INSTALLATION

(1) Install the grille onto the locating tabs at the bottom.

(2) Push the grille back and snap into the hooks in the grille opening reinforcement.

(3) Check that the outboard ends of the grille have a uniform appearance relative to the fender and install the screws.

GRILLE OPENING REINFORCEMENT

REMOVAL

(1) Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)

(2) Remove the front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL)

(3) Disconnect the electrical connectors. (Fig. 7)

(4) Disconnect the rubber side flap push pin connectors.

(5) Remove the seven bolts and remove the grille opening reinforcement.

(6) Disconnect the headlamp units electrical connectors.

(7) Remove the headlamp units. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL)

INSTALLATION

(1) Install the headlamp units. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION)

(2) Connect the headlamp unit electrical connectors.

(3) Install the grille opening reinforcement and install the seven bolts.

(4) Connect the rubber side flap and install the push pin connectors.

(5) Connect the electrical connectors. (Fig. 7)

(6) Install the front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)

(7) Install the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)

GRILLE OPENING REINFORCEMENT (Continued)

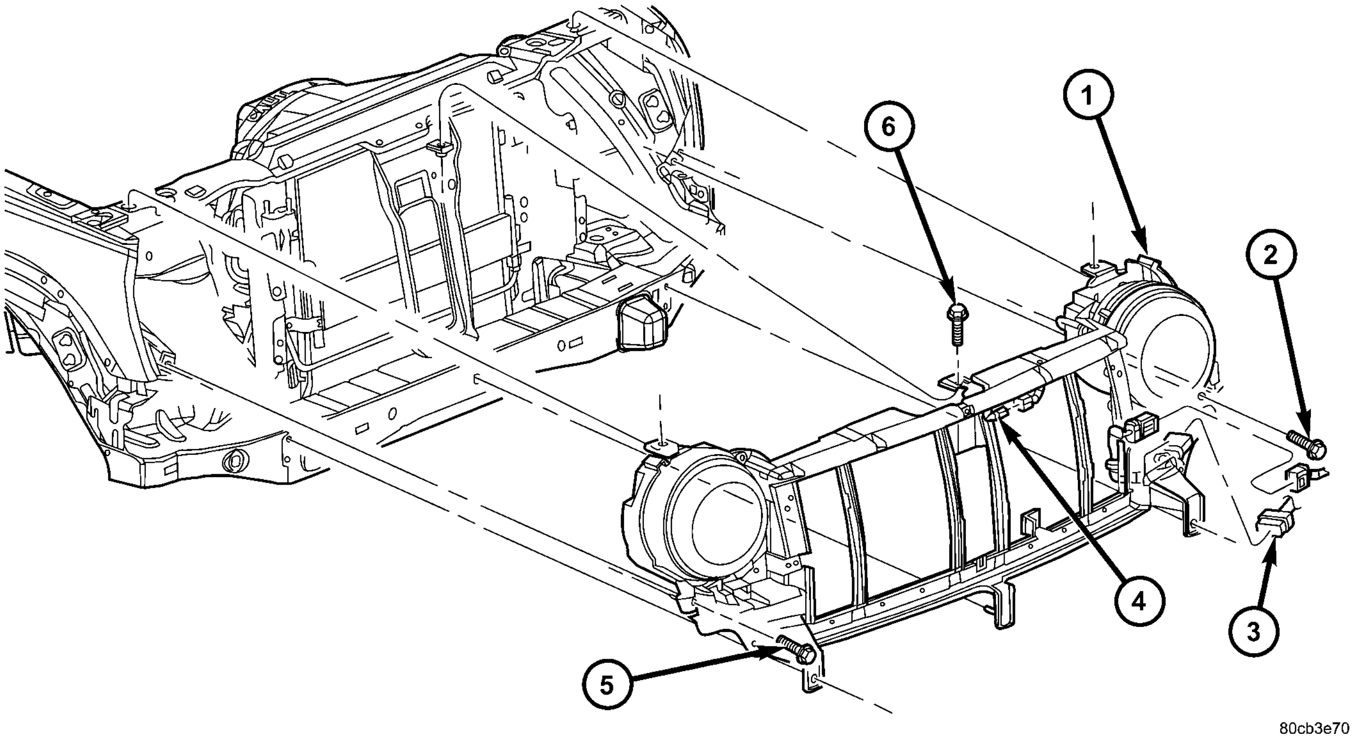

Fig. 7 GRILLE OPENING REINFORCEMENT

1 - GRILLE OPENING REINFORCEMENT
2 - BOLTS (3)
3 - ELECTRICAL CONNECTORS
4 - ELECTRICAL CONNECTOR
5 - BOLTS (3)
6 - BOLT (1)

FRONT WHEELHOUSE SPLASH SHIELD

REMOVAL

(1) Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Turn wheel as necessary to gain access to fasteners.

(3) Using a trim stick C-4755 or equivalent, separate the clips attaching the flare molding to the fascia and fender.

(4) Remove the rivet connecting the flare to the fascia.

(5) Remove the rivet connecting the splash shield to the air dam.

(6) Remove the four push pin fasteners and remove the splash shield. (Fig. 8)

(7) Remove the remaining rivets and remove the flare from the splash shield.

INSTALLATION

(1) Install the splash shield and install the four push pin fasteners.

(2) Position flare molding and seat clips into the fascia.

(3) Seat the remaining clips into the fender.

(4) Install eight new rivets securing the flare molding to the splash shield, flare brackets, fascia and air dam.

(5) Install a new rivet connecting the splash shield to the air dam.

FRONT WHEELHOUSE SPLASH SHIELD (Continued)

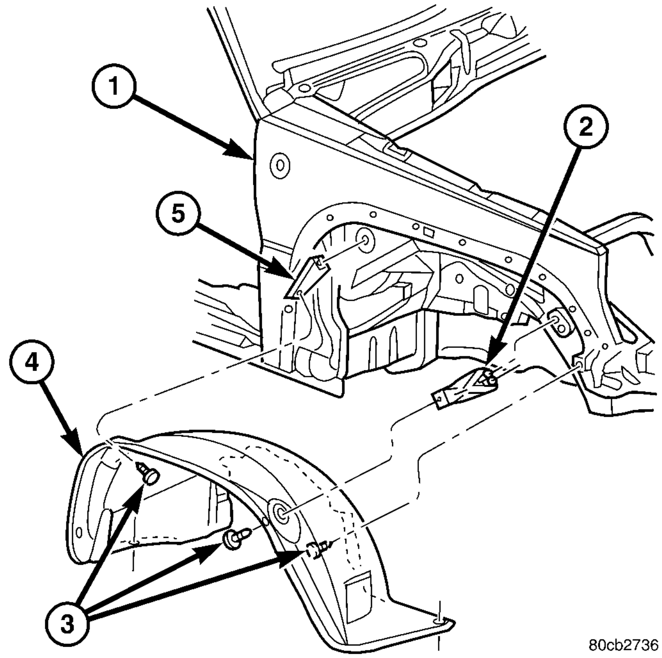

Fig. 8 FRONT WHEELHOUSE SPLASH SHIELD

1 - FENDER
2 - FLARE BRACKET
3 - PUSH PIN FASTENERS (4)
4 - SPLASH SHIELD
5 - FLARE BRACKET

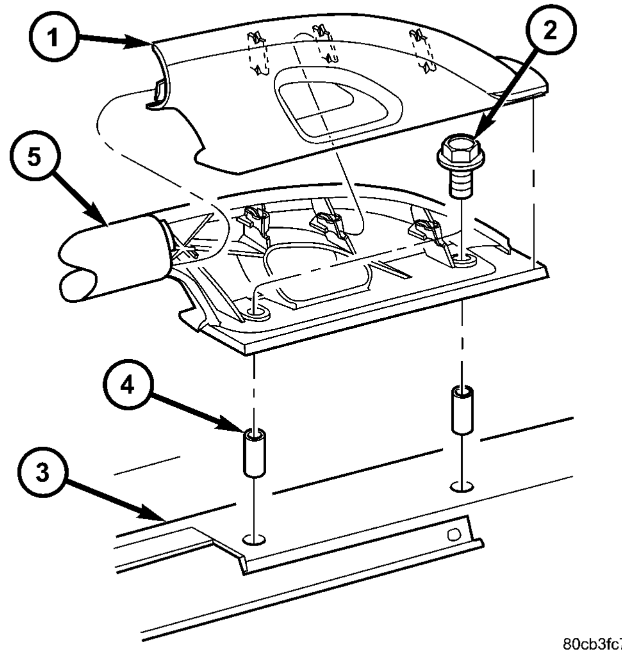

Fig. 10 RACK COVERS

1 - COVER
2 - BOLTS
3 - ROOF PANEL
4 - KNURLED NUT
5 - ROOF RACK

LUGGAGE RACK

REMOVAL

(1) Using a trim stick C-4755 or equivalent, remove the roof rack covers. (Fig. 10)

(2) Remove the bolts and remove the roof rack. (Fig. 9)

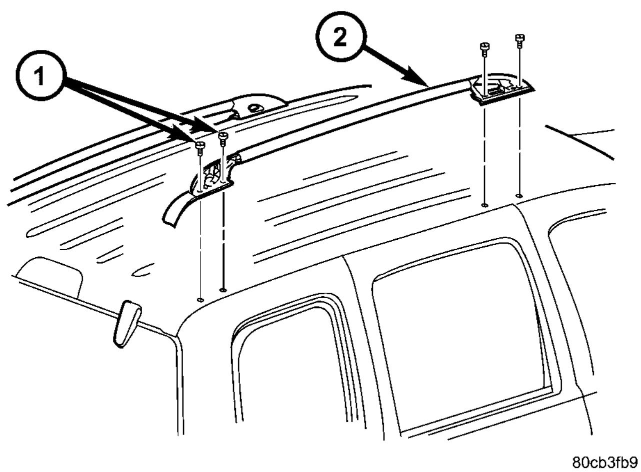

Fig. 9 LUGGAGE RACK

1 - BOLTS (4)
2 - RACK RAIL

INSTALLATION

(1) Install the roof rack and install the bolts.

(2) Tighten the bolts to 8 N·m (75 in. lbs.).

(3) Snap on the roof rack covers.

REAR WHEELHOUSE SPLASH SHIELD

REMOVAL

(1) Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the wheel.

(3) Using a trim stick C-4755 or equivalent, separate the clips attaching the flare molding to the fascia and fender.

(4) Remove the three push pin fasteners and remove the splash shield and wheel flare. (Fig. 11)

(5) Remove the 5 rivets from the rear flare and splash shield.

INSTALLATION

(1) Install the splash shield and install the three push pin fasteners.

(2) Position the rear flare molding and seat the clips attaching it to the body and the rear fascia.

REAR WHEELHOUSE SPLASH SHIELD (Continued)

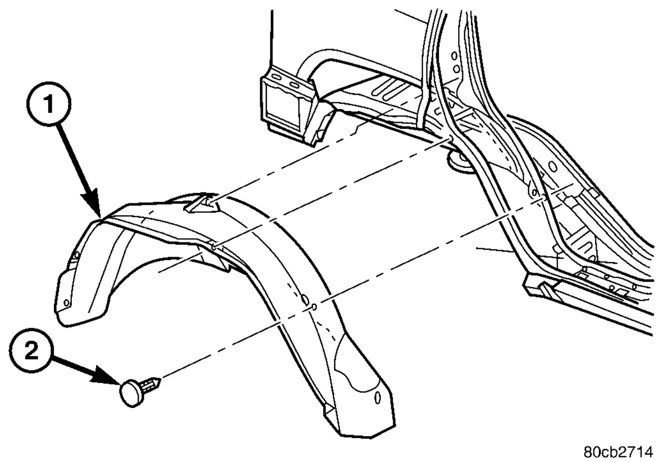

Fig. 11 WHEELHOUSE SPLASH SHIELD

1 - SPLASH SHIELD
2 - PUSH PIN FASTENERS (3)

(3) Install five new rivets attaching the flare to the splash shield.

(4) Install the wheel. (Refer to 22 - TIRES/ WHEELS/WHEELS - STANDARD PROCEDURE - WHEEL MOUNTING)

SIDE VIEW MIRROR

REMOVAL

(1) Remove the trim panel. (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - REMOVAL)

(2) Disconnect the electrical connector. (Fig. 12)

(3) Remove the three nuts and remove the mirror assembly.

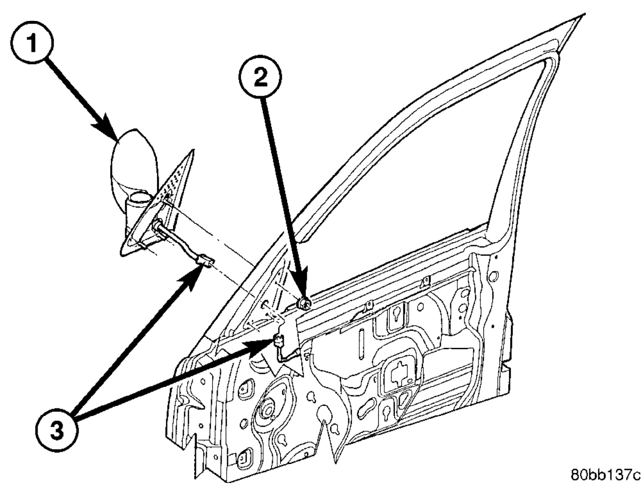

Fig. 12 SIDE VIEW MIRROR

1 - MIRROR ASSEMBLY
2 - NUTS (3)
3 - ELECTRICAL CONNECTOR

INSTALLATION

(1) Install the mirror assembly.

(2) Install the three nuts and tighten to 7 N·m (65 in. lbs.).

(3) Connect the electrical connector.

(4) Install the trim panel. (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - INSTALLATION)

FRONT WHEEL OPENING FLARE MOLDINGS

REMOVAL

(1) Remove the eight rivets connecting the flare to the splash shield, flare brackets, fascia and air dam. (Fig. 13)

(2) Using a trim stick C-4755 or equivalent, separate the clips attaching the molding to the fascia and fender.

(3) Remove the flare molding.

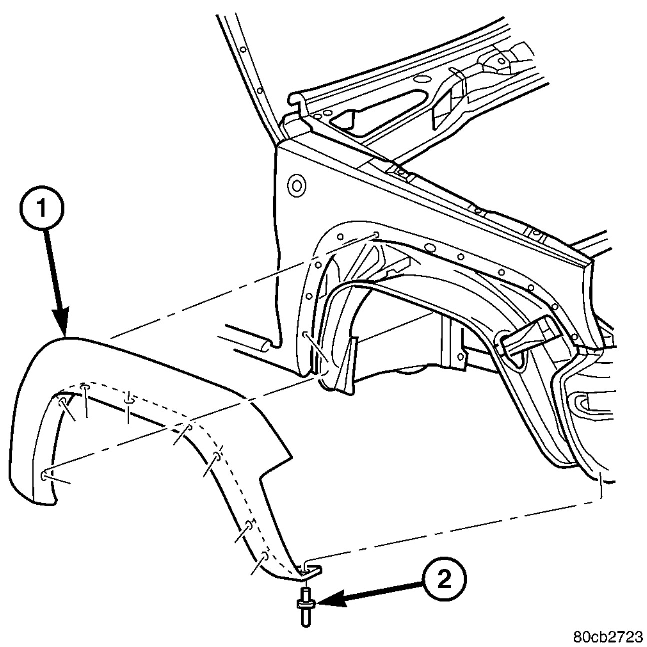

Fig. 13 FRONT WHEEL OPENING FLARE MOLDING

1 - FLARE MOLDING
2 - RIVETS (10)

INSTALLATION

(1) Position flare molding and seat clips into the fascia.

(2) Seat the remaining clips into the fender.

(3) Install eight new rivets securing the flare molding to the splash shield, flare brackets, fascia and air dam.

REAR WHEEL OPENING FLARE MOLDINGS

REMOVAL

(1) Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

(2) Remove the wheel.

(3) Open the rear door and remove the five rivets from the inside surface of the door. (Fig. 14)

(4) Using a trim stick C-4755 or equivalent, separate the clips attaching the molding to the door and remove the molding.

(5) Remove the 5 rivets from the rear flare and splash shield.

(6) Using a trim stick C-4755 or equivalent, separate the clips attaching the molding to the body and the rear fascia and remove the molding.

(7) Remove the two rivets and remove the flare extension. (Fig. 15)

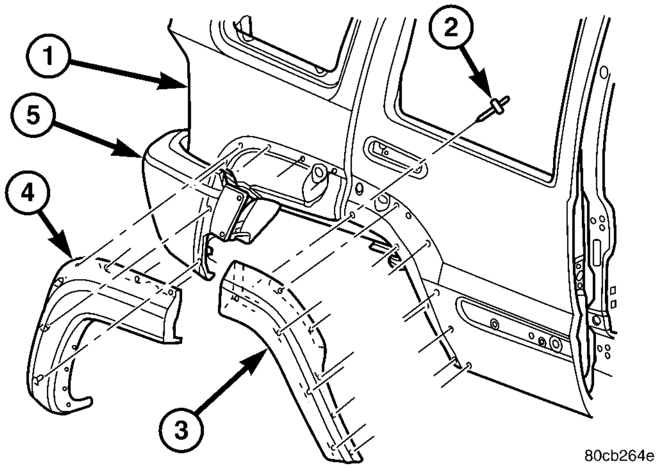

Fig. 14 REAR WHEEL OPENING FLARE MOLDINGS

1 - D-PILLAR
2 - RIVETS (10)
3 - REAR DOOR FLARE MOLDING
4 - REAR FLARE MOLDING
5 - REAR FASCIA

INSTALLATION

(1) Install the flare extension and install two new rivets.

(2) Position the rear flare molding and seat the clips attaching it to the body and the rear fascia.

(3) Install five new rivets attaching the flare to the splash shield.

(4) Position the door flare and seat the clips.

(5) Install five new rivets through the inside surface of the door attaching the flare to the door.

(6) Install the wheel. (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE - WHEEL MOUNTING)

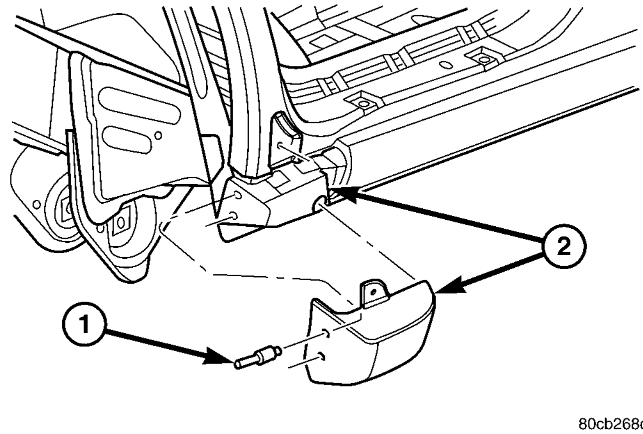

Fig. 15 FLARE EXTENSION

1 - RIVETS (3)
2 - FLARE EXTENSION AND DOOR SILL

RADIATOR CROSSMEMBER

REMOVAL

(1) Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)

(2) Remove the hood latch. (Refer to 23 - BODY/HOOD/LATCH - REMOVAL)

(3) Remove the rivet securing the washer bottle to the crossmember.

(4) Remove the rivets attaching the hood latch support to the crossmember. (Fig. 16)

(5) Remove the bolts and remove the hood latch support.

(6) Remove the bolts and remove the crossmember.

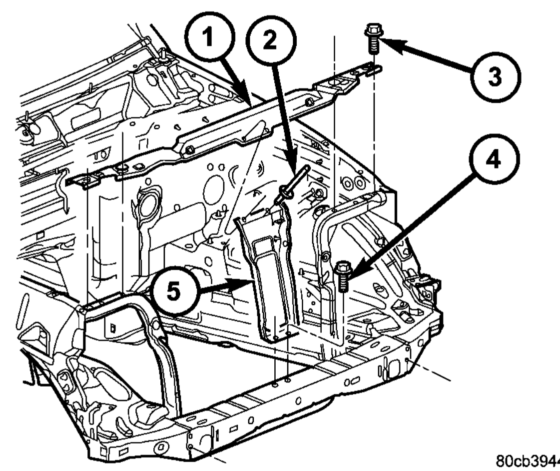

Fig. 16 RADIATOR CROSSMEMBER

1 - CROSSMEMBER
2 - RIVETS
3 - BOLTS (4)
4 - BOLTS (2)
5 - HOOD LATCH SUPPORT

RADIATOR CROSSMEMBER (Continued)

INSTALLATION

(1) Install the crossmember and install the bolts.
(2) Tighten the bolts to 10 N·m (85 in. lbs.).
(3) Install the hood latch support and install the bolts.
(4) Tighten the bolts to 10 N·m (85 in. lbs.).
(5) Install new rivets attaching the hood latch support to the crossmember.
(6) Install the hood latch. (Refer to 23 - BODY/HOOD/LATCH - INSTALLATION)
(7) Install the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)
(8) Install a new rivet securing the washer bottle to the crossmember.

SIDE VIEW MIRROR GLASS

REMOVAL

WARNING: ALWAYS WEAR EYE AND HAND PROTECTION WHEN SERVICING THE MIRROR ASSEMBLY. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY FROM BROKEN GLASS.

(1) Carefully pull/pry the broken glass holder from the mirror assembly.
(2) Disconnect the heated mirror electrical connectors from the terminals on the mirror glass holder, if equipped.

INSTALLATION

CAUTION: It is important to make sure the motor is square to the glass holder (attaching fingers) prior to glass holder attachment, otherwise the glass holder could be installed incorrectly causing poor retention and possible repeat failure.

(1) Position the new mirror glass holder to the mirror assembly.

NOTE: Position the mirror glass holder so that the moisture drain hole on the mirror glass holder assembly is facing downward.

(2) Align the mirror glass holder's attaching fingers to the mirror motor housing.

NOTE: Ensure that the protective rubber cover of the mirror motor housing is positioned correctly around the bottom of the fingers area.

(3) Using one hand, firmly press the mirror glass holder assembly into place while at the same time supporting the housing assembly from the backside with the other hand.

NOTE: Pressure must be applied equally over the center portion of the mirror to engage the mirror glass holder's attaching fingers to the corresponding fingers on the housing assembly. One or more clicks may be heard when finger engagement takes place.

(4) Verify retention of the mirror glass holder assembly by gently pulling outward on the mirror glass holder.

INSTRUMENT PANEL

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CLUSTER BEZEL

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the drives side trim bezels. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DRIVER SIDE BEZEL - REMOVAL)
(2) Remove the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
(3) Remove the seven screws and remove the cluster bezel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Install the cluster bezel and the seven screws.
(2) Install the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION)
(3) Install the drives side trim bezels. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DRIVER SIDE BEZEL - INSTALLATION)

GLOVE BOX

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Open the glove box.
(2) Squeeze the stop tabs located on the sides of the box and allow the box to open fully.
(3) With box in the full down position slide the box to the right off of the hinges and remove.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the box on and slide the box to the left to engage the hinges.
(2) Close the glove box.

GLOVE BOX LATCH

REMOVAL

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(1) Remove the glove box. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL)
(2) Remove the nine screws and remove the glove box skin.
(3) Remove the latch from the locators.

INSTALLATION

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(1) Position the latch onto the locators.
(2) Install the glove box skin onto the glove box and install the nine screws.
(3) Install the glove box. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION)

GLOVE BOX LATCH STRIKER

REMOVAL

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GLOVE BOX LATCH STRIKER (Continued)

(1) Open the glove box.
(2) Remove the two striker screws and remove the latch striker.

INSTALLATION

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(1) Install the striker and install the two screws.
(2) Loosen the screws to adjust if necessary.

INSTRUMENT PANEL ASSEMBLY

REMOVAL

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NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Disconnect and isolate the battery negative cable.
(2) Remove the instrument panel speakers. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)
(3) Remove the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
(4) Remove the radio. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL)
(5) Remove the four nuts and remove the center support bracket. (Fig. 10)
(6) Remove the ground strap bolt and disconnect the restraint module electrical connector. (Fig. 6)
(7) Position front wheels **straight ahead.**
(8) Remove knee blocker cover and knee blocker. (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL)
(9) Remove screws from the lower column shroud and remove both the upper and lower shrouds. (Fig. 1)

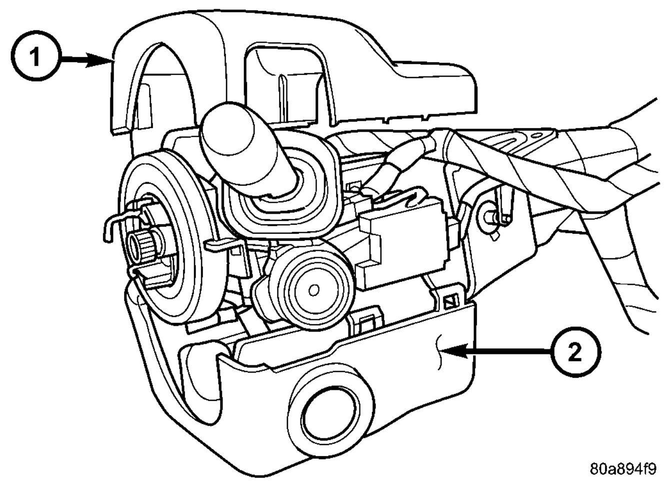

Fig. 1 SHROUD REMOVAL/INSTALL

1 - UPPER SHROUD
2 - LOWER SHROUD

(10) Turn ignition key to the on position.
(11) Disconnect the automatic transmission shifter interlock cable from the column, if equipped.

CAUTION: Do not turn the clockspring more than 90° or damage to the clockspring may occur.

(12) Using a grease pencil or equivalent, mark the position of the steering wheel.
(13) Remove the steering coupler bolt and column mounting nuts and bolts then lower column off the mounting studs. (Fig. 2)
(14) Disconnect and remove the wiring harness from the column. (Fig. 3)
(15) Slide the shifter interlock cable from the tie straps.
(16) Remove the steering column.

CAUTION: Do not remove the brake lamp switch. This is a one time component and is not intended for reinstallation. If the brake lamp switch is removed it must be discarded and replaced with a new switch.

INSTRUMENT PANEL ASSEMBLY (Continued)

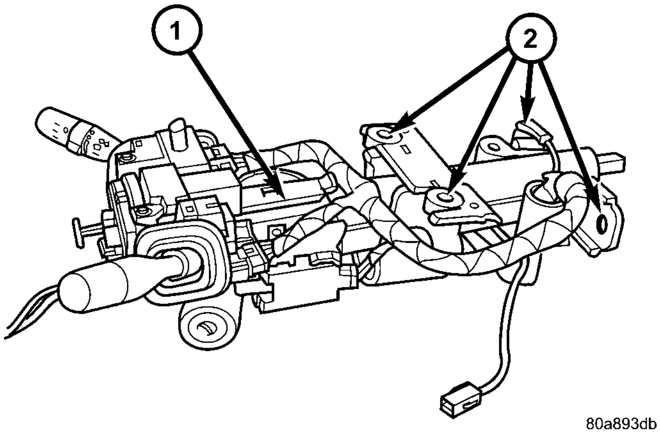

Fig. 2 STEERING COLUMN MOUNTING

1 - STEERING COLUMN
2 - MOUNTING HOLES

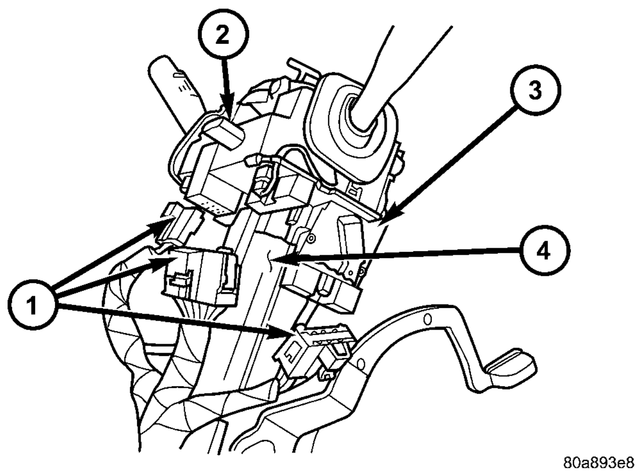

Fig. 3 WIRING HARNESS COLUMN

1 - COLUMN WIRING HARNESS
2 - MULTI-FUNCTION SWITCH
3 - IGNITION SWITCH
4 - STEERING COLUMN

(17) Disconnect the brake lamp switch electrical connector.

(18) Remove the drivers side cowl trim cover. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL)

(19) Disconnect the wire harness connector behind the drivers side cowl trim cover.

(20) Disconnect the green and light blue wire harness bulk connectors at the junction block. (Fig. 4)

(21) Disconnect the electrical connector at the inner side of the pedal support bracket. (Fig. 5)

(22) Remove the two bolts at the front of the pedal support bracket. (Fig. 5)

(23) Remove the two bolts from the bottom side of the pedal support bracket. (Fig. 5)

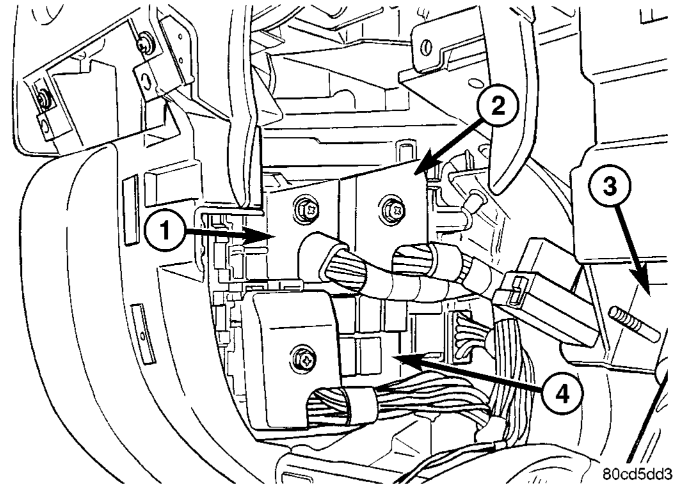

Fig. 4 JUNCTION BLOCK CONNECTORS

1 - ELECTRICAL CONNECTOR
2 - ELECTRICAL CONNECTOR
3 - PEDAL SUPPORT BRACKET
4 - JUNCTION BLOCK

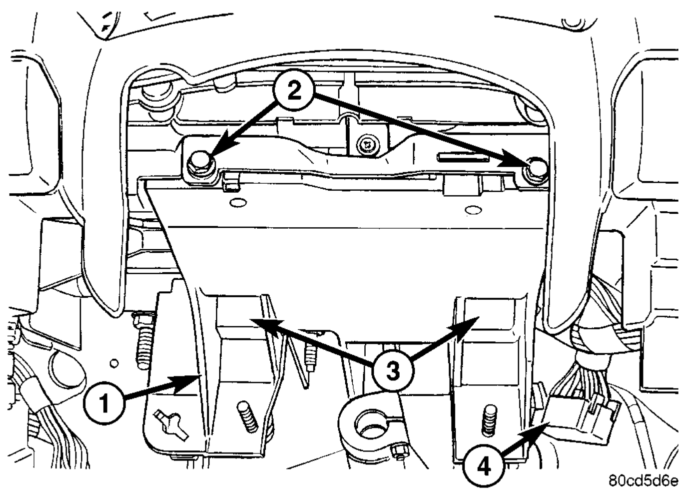

Fig. 5 PEDAL SUPPORT BRACKET

1 - PEDAL SUPPORT BRACKET
2 - BOLTS
3 - BOLTS
4 - ELECTRICAL CONNECTOR

(24) Remove the two roll down bracket bolts at the drivers cowl side panel. (Fig. 10)

(25) Remove the glove box. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL)

(26) Remove the two HVAC mounting bolts behind the center trim. (Fig. 6)

(27) Remove the passenger side trim bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL PASSENGER SIDE BEZEL - REMOVAL)

(28) Remove the HVAC mounting bolt above the glove box striker. (Fig. 7)

(29) Remove the HVAC bolt at the lower outside corner of the glove box opening. (Fig. 8)

INSTRUMENT PANEL ASSEMBLY (Continued)

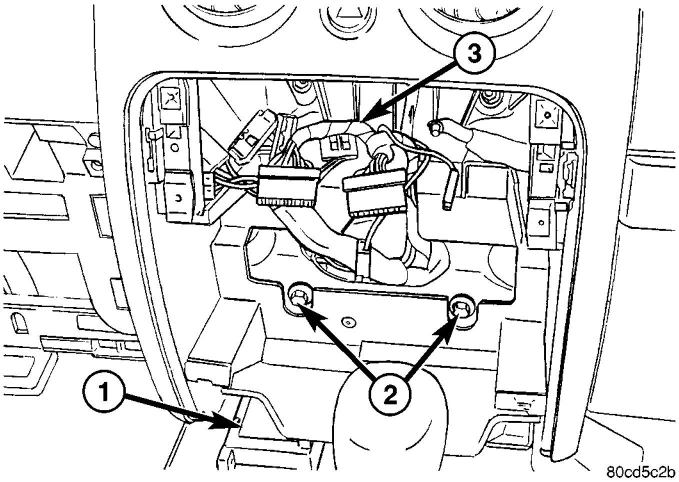

Fig. 6 HVAC BOLTS

1 - RESTRAINT MODULE
2 - HVAC BOLTS
3 - RADIO WIRE HARNESS

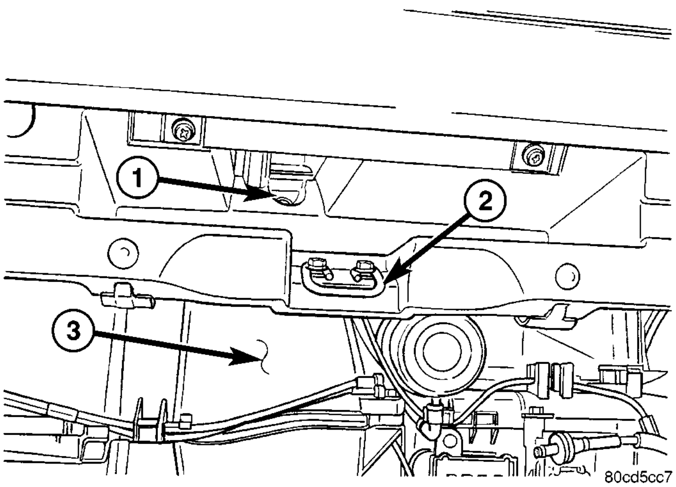

Fig. 7 HVAC UPPER BOLT

1 - BOLT
2 - GLOVE BOX STRIKER
3 - HVAC UNIT

(30) Remove the passenger side cowl trim cover. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL)

(31) Disconnect the blower resistor electrical connector. (Fig. 8)

(32) Remove the two roll down bracket bolts at the passenger cowl side panel.

(33) Disconnect the vacuum check valve and the vacuum reservoir. (Fig. 8)

(34) Disconnect the blower motor electrical connector.

(35) Disconnect the blend door connector. (Fig. 9)

(36) Remove the four bolts at the top of the instrument panel connecting to the cowl front panel.

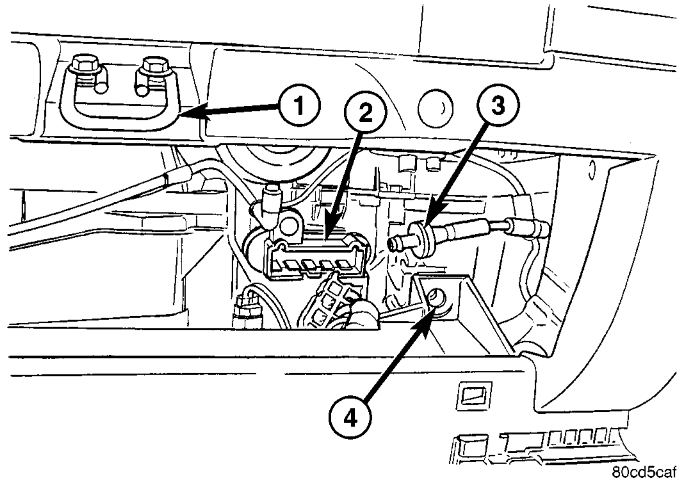

Fig. 8 HVAC CONNECTIONS

1 - GLOVE BOX STRIKER
2 - BLOWER RESISTOR
3 - VACUUM CHECK VALVE
4 - BOLT

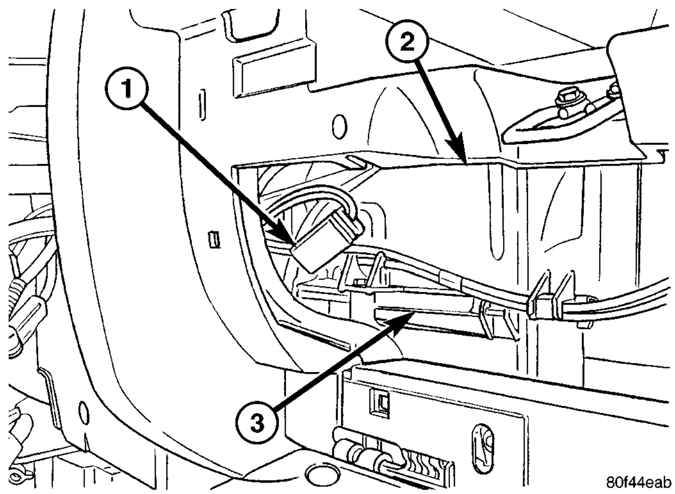

Fig. 9 BLEND DOOR CONNECTOR (TYPICAL)

1 - ELECTRICAL CONNECTOR
2 - GLOVE BOX OPENING
3 - HVAC

(37) Roll the instrument panel rearward and remove the wire harness from routing channel in the rear.

(38) Disconnect the push pin fastener and position aside the radio wire harness. Note the location of the harness for installation.

(39) Remove the instrument panel.

INSTRUMENT PANEL ASSEMBLY (Continued)

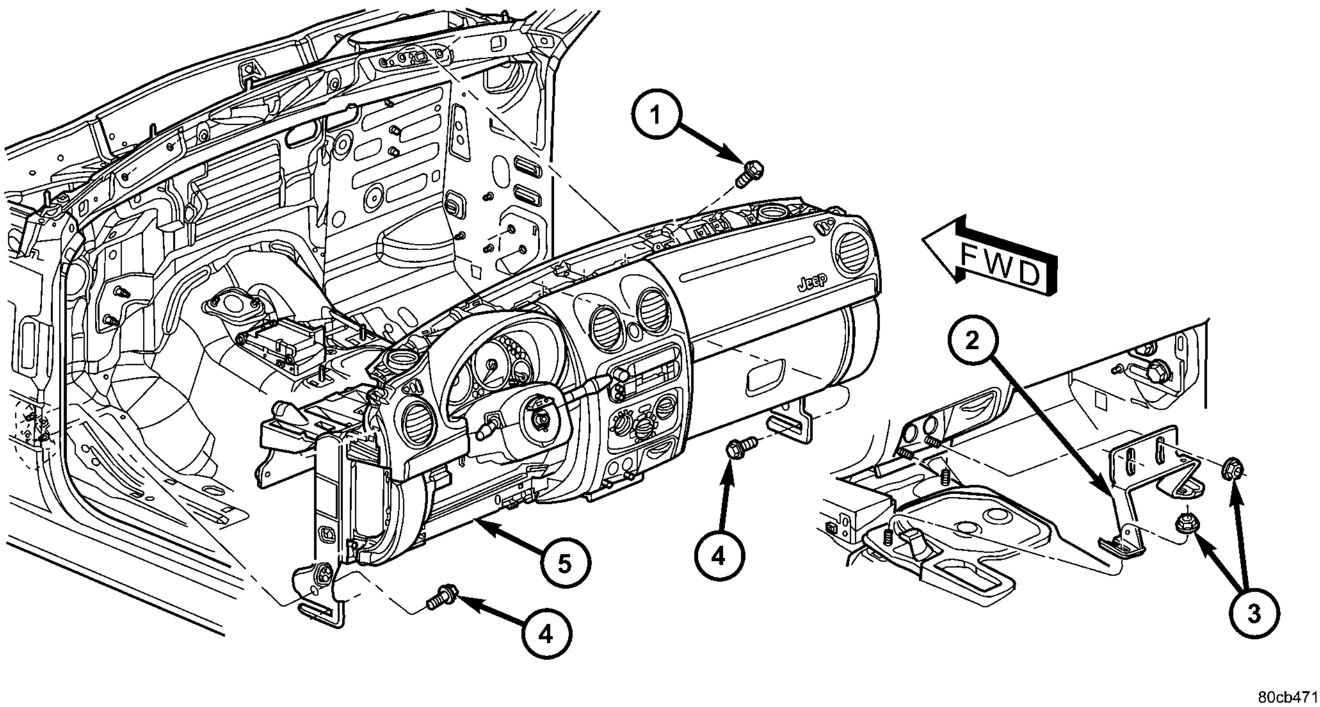

Fig. 10 INSTRUMENT PANEL ASSEMBLY

1 - TOP BOLTS (4)
2 - CENTER SUPPORT BRACKET
3 - NUTS (4)
4 - ROLL DOWN BOLTS (4)
5 - INSTRUMENT PANEL ASSEMBLY

INSTALLATION

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(1) Position the instrument panel into the vehicle.

(2) Position the wire harness into the rear routing channel and roll the instrument panel back against the cowl.

(3) Position the radio wire harness and seat the push pin fastener.

NOTE: Position the speaker wires through the speaker openings.

(4) Install the four bolts at the top of the instrument panel connecting to the cowl front panel and tighten to 28 N·m (21 ft. lbs.).

(5) Connect the blend door electrical connector.

(6) Connect the blower motor electrical connector.

(7) Connect the vacuum check valve and the vacuum reservoir.

(8) Connect the blower resister electrical connector.

NOTE: Do not push or pull bracket. Tighten at the rest position.

(9) Install the two roll down bracket bolts at the passenger cowl side panel and tighten to 54 N·m (40 ft. lbs.).

(10) Install the HVAC mounting bolt at the lower outside corner of the glove box opening and tighten to 6 N·m (55 in. lbs.).

(11) Install the HVAC mounting bolt above the glove box striker.

(12) Install the passenger side trim bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL PASSENGER SIDE BEZEL - INSTALLATION)

INSTRUMENT PANEL ASSEMBLY (Continued)

(13) Install the passenger side cowl trim cover. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION)

(14) Install the two HVAC mounting bolts behind the center trim.

(15) Install the glove box. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION)

NOTE: Do not push or pull bracket. Tighten at the rest position.

(16) Install the two roll down bracket bolts at the drivers cowl side panel and tighten to 54 N·m (40 ft. lbs.).

(17) Install the two bolts at the bottom side of the pedal support bracket.

(18) Install the two bolts at the front of the pedal support bracket.

(19) Connect the electrical connector at the inner side of the pedal support bracket.

(20) Connect the wiring harness electrical connectors at the junction block.

(21) Connect the wire harness electrical connector behind the drivers side cowl trim cover.

(22) Install the drivers side cowl trim cover. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION)

CAUTION: Do not remove the brake lamp switch. This is a one time component and is not intended for reinstallation. If the brake lamp switch is removed it must be discarded and replaced with a new switch.

(23) Connect the bake lamp switch electrical connector.

(24) Install the steering column into the vehicle.

(25) Slide the shifter interlock cable into the tie straps.

(26) Install and connect the wire harness for the column.

(27) Install the two mounting nuts and the two mounting bolts all finger tight.

CAUTION: Lower nuts must be installed and tightened first then the upper nuts in order to prevent damage to the capsules.

(28) Tighten the lower mounting nuts to 17 N·m (13 ft. lbs.).

(29) Tighten the upper mounting nuts to 17 N·m (13 ft. lbs.).

(30) Install the steering column coupler bolt and tighten to 49 N·m (36 ft. lbs.).

(31) Install the upper and lower shrouds and install the screws.

(32) Install the knee blocker cover and knee blocker. (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - INSTALLATION)

(33) Install the ground strap and bolt and connect the restraint module electrical connector.

(34) Install the center support bracket and hold it tight against the instrument panel.

(35) Tighten the lower nuts to 23 N·m (17 ft. lbs.).

(36) Tighten the upper bracket nuts to 23 N·m (17 ft. lbs.).

(37) Install the radio. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION)

(38) Install the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

(39) Install the speakers. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION)

(40) Reconnect the battery ground cable.

INSTRUMENT PANEL TOP COVER

REMOVAL

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(1) Remove the a-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM AND GRAB HANDLE - REMOVAL)

(2) Using a trim stick C-4755 or equivalent, release the attachment clips and remove the top cover. (Fig. 11)

INSTRUMENT PANEL TOP COVER (Continued)

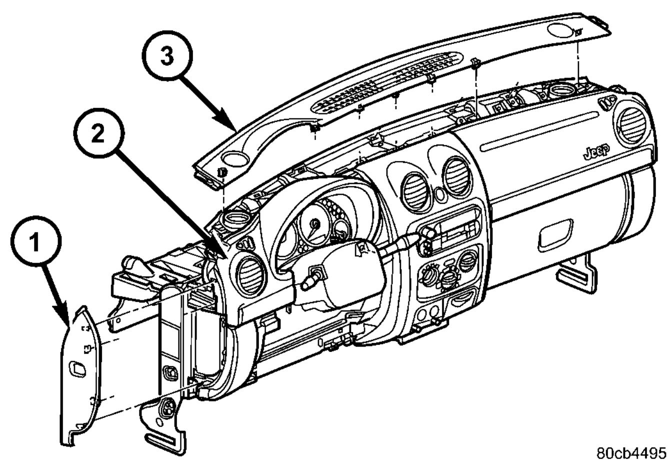

Fig. 11 INSTRUMENT PANEL COVERS

1 - SIDE COVER
2 - INSTRUMENT PANEL ASSEMBLY
3 - TOP COVER

INSTALLATION

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(1) Position the top cover and seat the clips fully.
(2) Install the a-pillar trim panels. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM AND GRAB HANDLE - INSTALLATION)

INSTRUMENT PANEL END CAP

REMOVAL

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(1) Open the door.
(2) Using the finger indent, grasp and remove the side cover. (Fig. 11)

INSTALLATION

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(1) Position the side panels and seat the clips fully.

INSTRUMENT PANEL DRIVER SIDE BEZELS

REMOVAL

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(1) Using a trim stick C-4755 or equivalent, disengage the bezels on either side of the steering column. (Fig. 12)

INSTRUMENT PANEL DRIVER SIDE BEZELS (Continued)

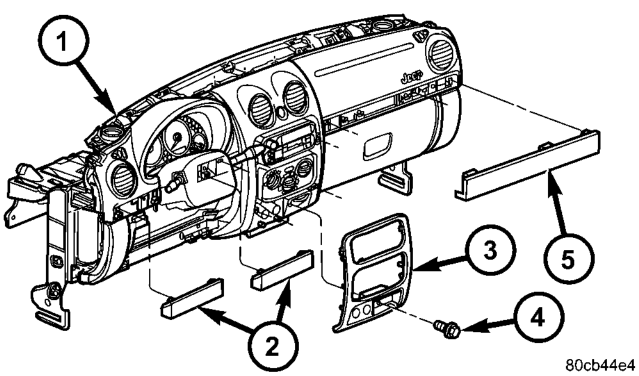

Fig. 12 INSTRUMENT PANEL TRIM BEZELS

1 - INSTRUMENT PANEL
2 - DRIVERS SIDE TRIM BEZELS
3 - CENTER TRIM BEZEL
4 - SCREW
5 - PASSENGER SIDE TRIM BEZEL

INSTALLATION

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(1) Position the appropriate divers side bezels on either side of the steering column and seat the attachment clips.

INSTRUMENT PANEL CENTER BEZEL

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the screw from inside the cubby bin next to the power outlet.

(2) Using a trim stick C-4755 or equivalent, remove the center bezel from the instrument panel assembly. (Fig. 12)

(3) Disconnect the electrical and vacuum connectors.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Connect the electrical and vacuum connectors.

(2) Position the center bezel and seat the retaining clips starting with the lower clips first.

(3) Install the screw in the cubby bin next to the power outlet.

INSTRUMENT PANEL PASSENGER SIDE BEZEL

REMOVAL

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(1) Remove the two screws.

INSTRUMENT PANEL PASSENGER SIDE BEZEL (Continued)

(2) Using a trim stick C-4755 or equivalent, release the retaining clips and remove the passenger side bezel. (Fig. 12)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the passenger side bezel and seat the retaining clips.
(2) Install the two screws.

KNEE BLOCKER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Reach into the steering column opening at the top of the knee blocker and pull the top rearward to disengage upper knee blocker clips.
(2) Gently swing the knee blocker open.
(3) Slide the knee blocker toward the driver side door and disengage the hinges from the molded in hinge pins in the instrument panel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) With the knee blocker close to a horizontal position, align both knee blocker hinges to the tabs at the bottom edge of the instrument panel.
(2) engage the hinges by sliding them toward the center of the vehicle as far as they can go.
(3) Gently swing the knee blocker upward until the clips touch the corresponding slots in the instrument panel and engage fully.

INTERIOR

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4WD FLOOR SHIFT BOOT

REMOVAL

(1) Remove the shift lever and remove the boot from the lever. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE/SHIFT LEVER - REMOVAL)

INSTALLATION

(1) Install the shift boot onto the shift lever and install the lever. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE/SHIFT LEVER - INSTALLATION)

A-PILLAR TRIM AND GRAB HANDLE

REMOVAL

(1) Using a small pry tool or equivalent, remove the grab handle trim plugs.

(2) Remove the two grab handle screws.

(3) Remove the grab handle and a-pillar trim from the a-pillar.

INSTALLATION

(1) Snap a-pillar trim and grab handle into the a-pillar.

(2) Install the two screws and install the grab handle trim plugs.

COWL TRIM COVER

REMOVAL

(1) Using a trim stick C-4755 or equivalent, lift up the front edge of the lower b-pillar trim and position aside.(Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)

(2) Remove the cowl trim cover by pulling it away from the a-pillar and releasing the clips.

INSTALLATION

(1) Install the cowl trim cover and seat the retaining clips.

(2) Position the b-pillar trim panel and seat the retaining clips.

DOOR SILL SCUFF PLATE

REMOVAL

(1) Using a trim stick C-4755 or equivalent, pry up the scuff plate releasing the retaining clips.

INSTALLATION

(1) Position the scuff plate and seat the retaining clips.

ASSIST HANDLE

REMOVAL

(1) Using a small pry tool or equivalent, release the assist handle by prying out the clips at either end. (Fig. 1)

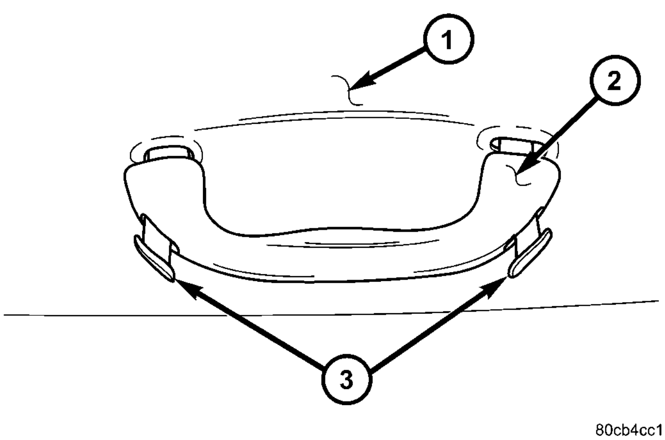

Fig. 1 ASSIST HANDLE

1 - HEADLINER
2 - ASSIST HANDLE
3 - RETAINING CLIPS

INSTALLATION

(1) Position the assist handle and seat the retaining clips.

B-PILLAR LOWER TRIM

REMOVAL

(1) Using a trim stick C-4755 or equivalent, pry up the trim panel, releasing the retaining clips. (Fig. 2)

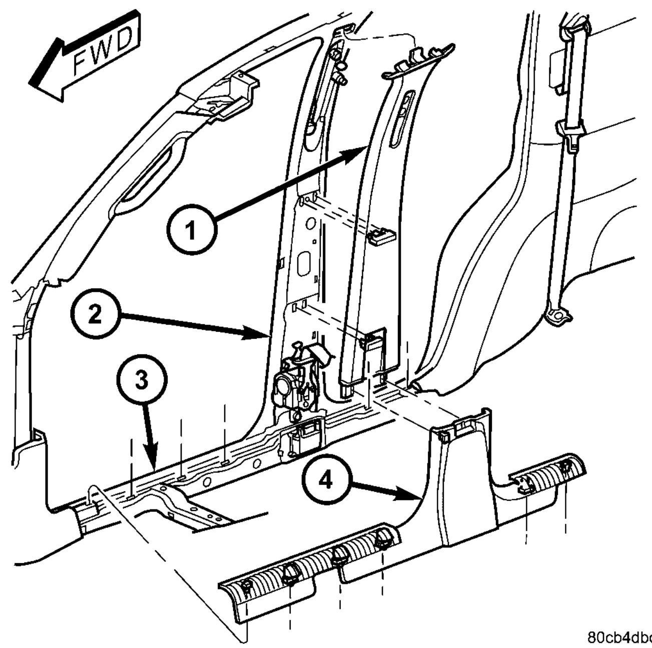

Fig. 2 B-PILLAR TRIM PANELS

1 - UPPER B-PILLAR TRIM
2 - B-PILLAR
3 - DOOR SILL
4 - LOWER B-PILLAR

INSTALLATION

(1) Position the trim panel and seat the retaining clips.

B-PILLAR UPPER TRIM

REMOVAL

(1) Remove the lower b-pillar trim panel. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)

(2) Remove the shoulder belt turning loop. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(3) Using a trim stick C-4755 or equivalent, release the trim retaining clips and remove. (Fig. 2)

INSTALLATION

(1) Position the trim panel and seat the retaining clips.

(2) Install the seat belt turning loop. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

(3) Install the b-pillar lower trim panel. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)

CARPETS AND FLOOR MATS

REMOVAL

Front Carpet

(1) Remove front seats. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)

(2) Remove the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(3) Remove the rear seats. (Refer to 23 - BODY/SEATS/SEAT - REAR - REMOVAL)

(4) Remove the cowl trim panels. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL)

(5) Remove the b-pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)

(6) Remove the jack assembly.

(7) Remove the carpet.

Rear Cargo Carpet

(1) Remove the rivets attaching the cargo hooks to the floor.

(2) Remove the carpet.

INSTALLATION

Front Carpet

(1) Install the carpet.

(2) Install the jack assembly.

(3) Install the b-pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)

(4) Install the cowl trim panels. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION)

(5) Install the rear seats. (Refer to 23 - BODY/SEATS/SEAT - REAR - INSTALLATION)

(6) Install the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

(7) Install the front seats. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION)

Rear Cargo Carpet

(1) Install the carpet and slide under the trim panels.

(2) Install new rivets securing the carpet and cargo hooks to the floor.

SHIFT BEZEL

REMOVAL

(1) Using a trim stick C-4755 or equivalent, pry shift bezel out of the floor console.

INSTALLATION

(1) Position the shift bezel and seat the retaining clips into the floor console.

FLOOR CONSOLE

REMOVAL

(1) Remove the shift bezel, if equipped. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL)

(2) Set park brake lever in the up position.

(3) Using a trim stick C-4755 or equivalent, disconnect the manual trans shifter boot, if equipped.

(4) Using a trim stick C-4755 or equivalent, disconnect the transfer case shifter boot, if equipped.

(5) Remove the four bolts. (Fig. 3)

(6) Lift the console at the back and remove.

FLOOR CONSOLE (Continued)

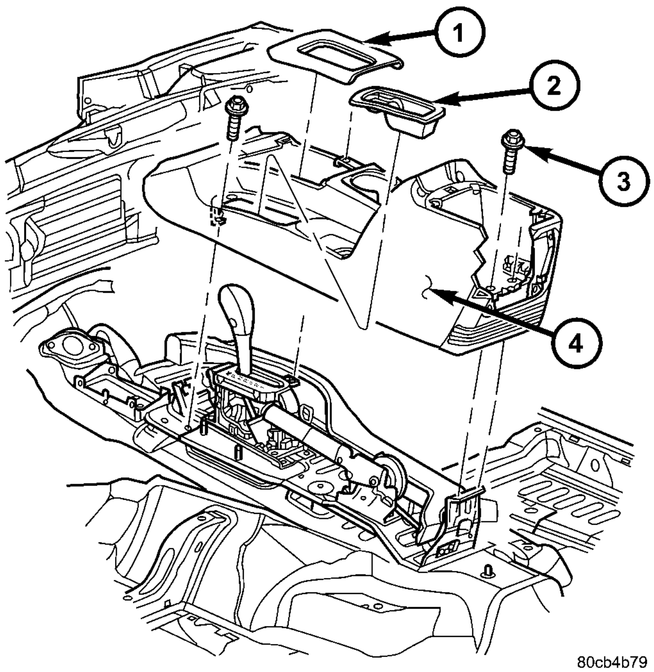

Fig. 3 FLOOR CONSOLE

1 - SHIFT BEZEL
2 - ACCESSORY CUP
3 - BOLTS (4)
4 - FLOOR CONSOLE

INSTALLATION

(1) Position the front of the console and lower the rear over the shifter and brake levers.

(2) Install the bolts.

(3) Install the shift boots and seat the retainer clips.

(4) Install the shift bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION)

FLOOR CONSOLE LID LATCH

REMOVAL

(1) Remove the screws and remove the lid.

(2) Remove the screws attaching the lid cover and remove the latch.

INSTALLATION

(1) Install the latch and the lid cover.

(2) Install the screws attaching the lid cover.

(3) Install the console lid onto the console and install the screws.

HEADLINER

REMOVAL

(1) Remove the a-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM AND GRAB HANDLE - REMOVAL)

(2) Remove the visors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL)

(3) Remove the sun visor support. (Refer to 23 - BODY/INTERIOR/SUN VISOR SUPPORT - REMOVAL)

(4) Remove the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL)

(5) Cut rear washer hose at the mark about half-way up the a-pillar.

(6) Remove the upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL)

(7) Remove the assist handles. (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - REMOVAL)

(8) Remove the quarter trim. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL)

(9) Disconnect the electrical connector along the left d-pillar and remove the ground wire.

(10) Remove the dome light in the rear.

(11) Remove the sunroof opening trim lace, if equipped. (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - REMOVAL)

(12) Remove the rear washer nozzle.

(13) Remove the headliner.

INSTALLATION

(1) Install the headliner.

(2) Install the assist handles. (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - INSTALLATION)

(3) Install the visors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - INSTALLATION)

(4) Install the visor supports. (Refer to 23 - BODY/INTERIOR/SUN VISOR SUPPORT - INSTALLATION)

(5) Install the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION)

(6) Connect the rear washer hose, previously cut, with a hose junction.

(7) Install the a-pillar trim and grab handles. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)

(8) Install the upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION)

(9) Install the rear washer nozzle.

(10) Connect the electrical connector and ground wire at the left d-pillar.

HEADLINER (Continued)

(11) Install the quarter trim panels. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION)

(12) Install the rear dome light.

(13) Install the sunroof opening trim lace, if equipped. (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - INSTALLATION)

QUARTER TRIM PANEL

REMOVAL

(1) Using a trim stick C-4755 or equivalent, remove the rear header trim.

(2) Using a trim stick C-4755 or equivalent, remove the rear sill plate.

(3) Remove the hook pin type connector.

(4) Fold down the rear seat.

(5) Remove the seat belt anchor and pivot. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(6) Remove the belt access panel. (Fig. 4)

(7) Remove the storage cover.

(8) Disconnect the 12v power supply electrical connector, if equipped.

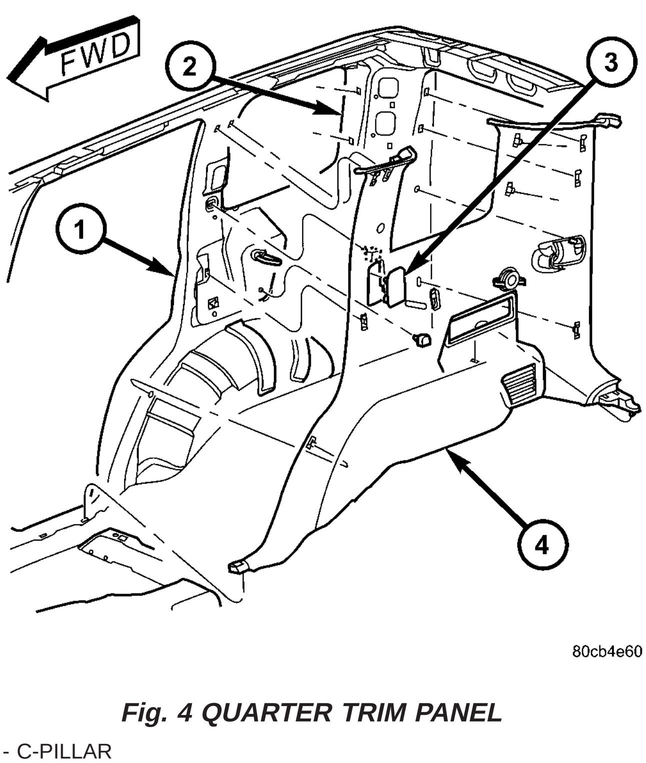

Fig. 4 QUARTER TRIM PANEL

1 - C-PILLAR
2 - D-PILLAR
3 - BELT ACCESS PANEL
4 - QUARTER TRIM PANEL

INSTALLATION

(1) Position the 12v power supply electrical connector, if equipped.

(2) Install the storage cover.

(3) Install the belt access panel.

(4) Install the seat belt anchor and pivot. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

(5) Install the hook pin type connector.

(6) Position the rear sill plate and seat the retaining clips.

(7) Position the rear header trim and seat the retaining clips.

REAR DOOR SCUFF PLATE

REMOVAL

(1) Using a trim stick C-4755 or equivalent, release the retaining clips and remove the scuff plate.

INSTALLATION

(1) Position the scuff plate and seat the retaining clips.

SUN VISOR

REMOVAL

(1) Remove the screws at the visor pivot.

(2) Disconnect the electrical connector and remove the visor.

INSTALLATION

(1) Connect the electrical connector and install the visor.

(2) Install the screws at the visor pivots.

SUN VISOR SUPPORT

REMOVAL

(1) Using a small pry tool or equivalent, release the support retaining clip by prying out and remove the support. (Fig. 5)

INSTALLATION

(1) Position the visor support and seat the retaining clip.

SUN VISOR SUPPORT (Continued)

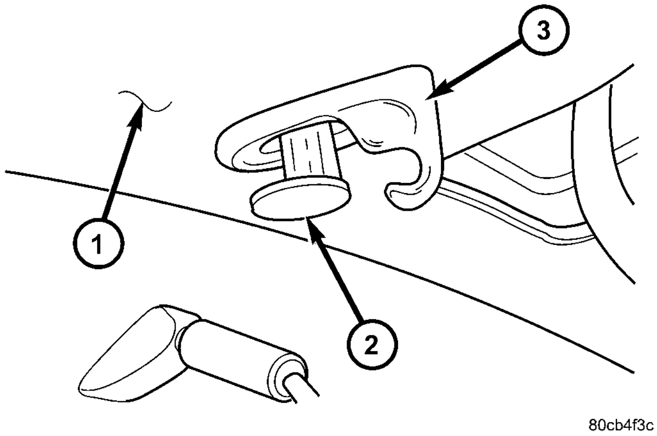

Fig. 5 SUN VISOR SUPPORT

1 - HEADLINER
2 - RETAINER CLIP
3 - SUN VISOR SUPPORT

REAR VIEW MIRROR

REMOVAL

(1) If equipped, disconnect mirror harness connector.

(2) Loosen the mirror base setscrew (Fig. 6).

(3) Slide the mirror base upward and off the bracket.

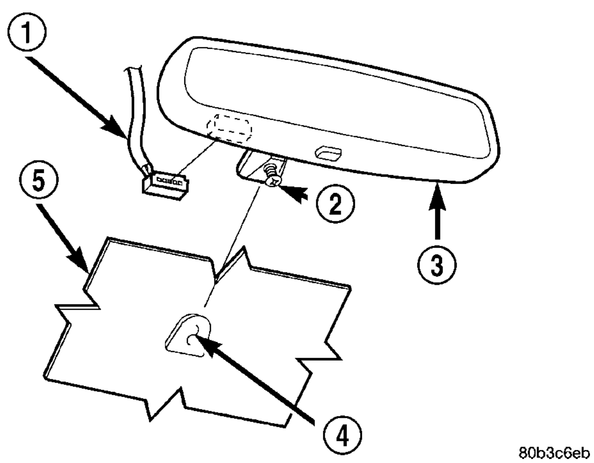

Fig. 6 REAR VIEW MIRROR

1 - CONNECTOR
2 - SCREW
3 - REAR VIEW MIRROR
4 - SUPPORT BUTTON
5 - WINDSHIELD

INSTALLATION

INSTALLATION

(1) Position the mirror base at the bracket and slide it downward onto the support bracket (Fig. 6).

(2) Tighten the setscrew 1 N·m (15 in. lbs.) torque.

(3) If equipped, connect mirror harness connector.

INSTALLATION - REARVIEW MIRROR SUPPORT BRACKET

(1) Mark the position for the mirror bracket on the outside of the windshield glass with a wax pencil.

(2) Clean the bracket contact area on the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.

(3) Sand the surface on the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.

(4) Apply accelerator to the surface on the bracket according to the following instructions:

(a) Crush the vial to saturate the felt applicator.

(b) Remove the paper sleeve.

(c) Apply accelerator to the contact surface on the bracket.

(d) Allow the accelerator to dry for five minutes.

(e) Do not touch the bracket contact surface after the accelerator has been applied.

(5) Apply adhesive accelerator to the bracket contact surface on the windshield glass. Allow the accelerator to dry for one minute. Do not touch the glass contact surface after the accelerator has been applied.

(6) Install the bracket according to the following instructions:

(a) Apply one drop of adhesive at the center of the bracket contact-surface on the windshield glass.

(b) Apply an even coat of adhesive to the contact surface on the bracket.

(c) Align the bracket with the marked position on the windshield glass.

(d) Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

(7) Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.

(8) Allow the adhesive to cure for an additional 8-10 minutes before installing the mirror.

PAINT

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PAINT

SPECIFICATIONS - PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE
Dark Garnet Red Pearlcoat	XRV
Flame Read Clearcoat	PR4
Cactus Green Pearlcoat	AFM
Light Khaki Metallic Clearcoat	AJC
Salsa Red Pearlcoat	WE5
Atlantic Blue Pearlcoat	ZBJ
Patriot Blue Pearlcoat	WB7
Bright Silver Metallic Clearcoat	WS2
Black Clearcoat	DX8
Stone White Clearcoat	SW1

INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER CODE
Taupe	L5
Dark Slate Gray	DV
Dark Slate Gray/Light Taupe	D2
Taupe/Light Taupe	L2

ACCESSORY COLORS

PART	COLOR	DAIMLERCHRYSLER CODE
Renegade Roof Rack/Light Bar	Deep Gray	ZSP
Sport Fascia/ Wheel Flare	Dark Neutral Gray	HS5
Renegade Wheel	Graphite Metallic	ZDR
Renegade Wheel	Cactus Green	AFM

PAINT CODE

DESCRIPTION

Exterior vehicle body colors are identified on the Vehicle Safety Certification Label (Refer to VEHICLE DATA/VEHICLE INFORMATION/VEHICLE SAFETY CERTIFICATION LABEL - DESCRIPTION) or the Body Code Plate (Refer to VEHICLE DATA/VEHICLE INFORMATION/BODY CODE PLATE - DESCRIPTION). The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat. The color names provided in the Paint and Trim Code Description chart are the color names used on most repair product containers. (Refer to 23 - BODY/ PAINT - SPECIFICATIONS)

BASE COAT/CLEAR COAT FINISH

DESCRIPTION

The original equipment finish is a multi step process that involves cleaning, applying electro de-position (E-coat), anti-chip primer, basecoat, and clearcoat steps.

On most vehicles a two-part paint application (basecoat/clearcoat) is used. Color paint that is applied to primer is called basecoat. The clearcoat protects the basecoat from ultraviolet light and provides a durable high-gloss finish.

CAUTION: Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.
Do not use harsh alkaline based cleaning solvents on painted surfaces. Damage to finish or color can result.

PAINT TOUCH-UP

DESCRIPTION

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use Mopar® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat. Refer to Introduction group of this manual for Body Code Plate information.

WARNING: USE AN OSHA APPROVED RESPIRATOR AND SAFETY GLASSES WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

OPERATION

(1) Scrape loose paint and corrosion from inside scratch or chip.

(2) Clean affected area with Mopar® Tar/Road Oil Remover, and allow to dry.

(3) Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the scratch or chip without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.

(4) Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.

(5) On vehicles without clearcoat, the touch-up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.

(6) On vehicles with clearcoat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.
AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

FINESSE SANDING/BUFFING & POLISHING

DESCRIPTION

CAUTION: Do not remove more than .5 mils of clearcoat finish, if equipped. Basecoat paint must retain clearcoat for durability.
Use a Paint Thickness Gauge #PR-ETG-2X or equivalent to determine film thickness before and after the repair.

Minor acid etching, orange peel, or smudging in clear coat or single-stage finishes can be reduced with light finesse sanding, hand buffing, and polishing. **If the finish has been finesse sanded in the past, it cannot be repeated. Finesse sanding operation should be performed by a trained automotive paint technician.**

SEATS

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HEADREST

REMOVAL

(1) Depress head restraint release button and lift head restraint to full up position.

(2) Using a small flat blade, depress tab on right side head restraint release button and using your hand, simultaneously press tab on left side head restraint release button and pull head restraint up to separate from seat back.

INSTALLATION

(1) Position head restraint in seat back, press tab on left side head restraint release button and push down head restraint to secure.

HEADREST SLEEVE

REMOVAL

(1) Remove the headrest. (Refer to 23 - BODY/SEATS/HEADREST - REMOVAL)

(2) Remove the headrest sleeve cover.

(3) Rotate head restraint sleeve 1/4 turn counter-clockwise to release retaining tab.

(4) Pull sleeve from seat back frame.

INSTALLATION

(1) Position sleeve in seat back frame.

(2) Rotate head restraint sleeve 1/4 turn clockwise to engage retaining tab.

(3) Install the headrest sleeve cover.

(4) Install the headrest. (Refer to 23 - BODY/SEATS/HEADREST - INSTALLATION)

SEAT - FRONT

REMOVAL

WARNING: DISABLE THE SUPPLEMENTAL RESTRAINTS SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINTS SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Remove the seat belt anchor bolt. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(2) Slide seat back and remove the front bolts. (Fig. 1)

(3) Slide seat to forward position and remove the rear bolt/nut.

(4) Disconnect the electrical connectors and remove the seat.

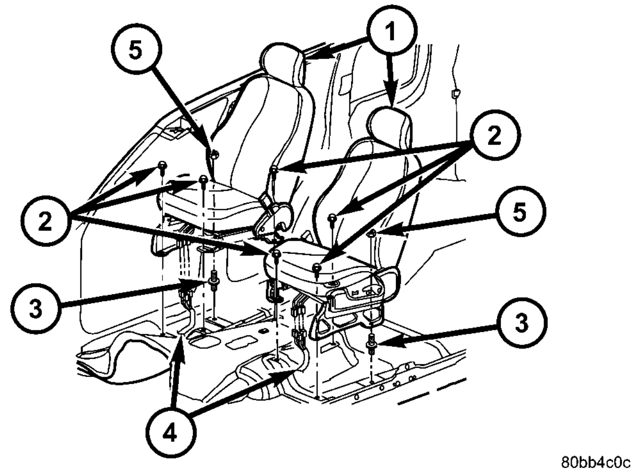

Fig. 1 FRONT SEATS

1 - FRONT SEATS
2 - BOLTS
3 - STUDS
4 - ELECTRICAL CONNECTORS
5 - NUTS

INSTALLATION

WARNING: DISABLE THE SUPPLEMENTAL RESTRAINTS SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SEAT BELT TENSIONER, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINTS SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

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(1) Install the seats and connect the electrical connectors.

(2) Slide the seat to the rearward position and install the bolts.

(3) Tighten the outboard bolt to 43 N·m (32 ft. lbs.) and then tighten the inboard bolt to 43 N·m (32 ft. lbs.).

(4) Slide the seat to the forward position and install the rear bolt and nut.

SEAT - FRONT (Continued)

(5) Tighten the fasteners to 43 N·m (32 ft. lbs.).

(6) Install the seat belt anchor and bolt. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

SEAT BACK - FRONT

REMOVAL

(1) Remove the seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)

(2) Remove the seat cushion side shields. (Refer to 23 - BODY/SEATS/SEAT CUSHION SIDE SHIELDS - REMOVAL)

(3) Disconnect the lock out cable from both recliners. (Fig. 2)

(4) Remove the bolts and remove the seat back.

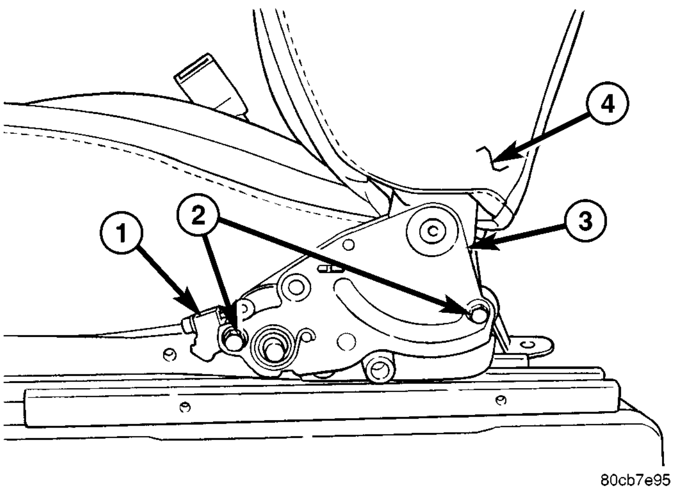

Fig. 2 SEAT BACK RECLINER

1 - LOCK OUT CABLE
2 - BOLTS
3 - RECLINER
4 - SEAT BACK

INSTALLATION

(1) Install the seat back and install the bolts.

(2) Tighten the bolts to 28 N·m (21 ft. lbs.).

(3) Connect the lock out cable to both recliners.

(4) Install the belt buckle. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - INSTALLATION)

(5) Install the side shields. (Refer to 23 - BODY/SEATS/SEAT CUSHION SIDE SHIELDS - INSTALLATION)

(6) Install the seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION)

SEAT BACK RECLINER - FRONT

REMOVAL

(1) Remove the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - REMOVAL)

(2) Position the seat back cover out of the way and remove the bolts. (Fig. 3)

(3) Remove the recliners from the seat back frame.

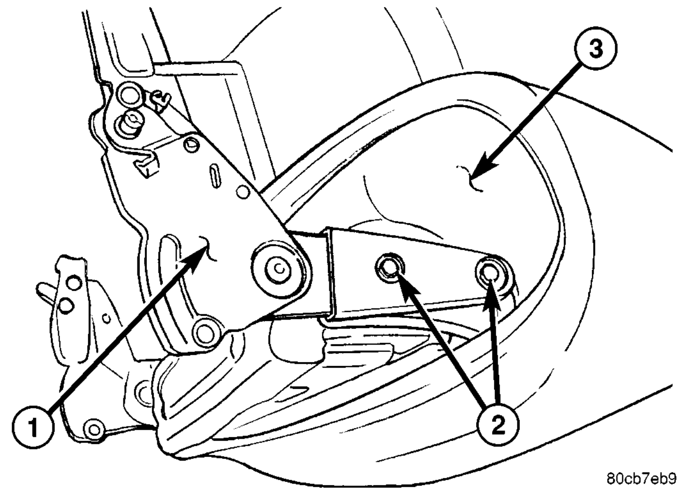

Fig. 3 SEAT BACK RECLINER

1 - SEAT BACK RECLINER
2 - BOLTS
3 - SEAT BACK

INSTALLATION

(1) Install the recliners onto the seat back.

(2) Position the seat back cover aside and install the recliner bolts.

(3) Tighten the bolts to 28 N·m (21 ft. lbs.).

(4) Install the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - INSTALLATION)

SEAT BACK COVER - FRONT

REMOVAL

(1) Remove the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - REMOVAL)

(2) Remove the head rest and remove the trim caps. (Refer to 23 - BODY/SEATS/HEADREST - REMOVAL)

(3) Disconnect the j-straps.

(4) Remove the two lower hog rings.

(5) Partially remove the seat back cover and remove the two upper hog rings.

(6) Remove the seat back cover.

SEAT BACK COVER - FRONT (Continued)

INSTALLATION

(1) Partially install the seat back cover and replace the two top hog rings.

(2) Pull cover down and replace the two lower hog rings.

(3) Connect the j-straps.

(4) Install trim caps and the head rest. (Refer to 23 - BODY/SEATS/HEADREST - INSTALLATION)

(5) Install the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - INSTALLATION)

SEAT BACK CUSHION - FRONT

REMOVAL

(1) Remove the seat back cover. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - FRONT - REMOVAL)

(2) Separate the cushion from the seat back frame.

INSTALLATION

(1) Position the cushion onto the seat back frame.

(2) Install the seat back cover. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - FRONT - INSTALLATION)

SEAT CUSHION - FRONT

REMOVAL

(1) Remove the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - REMOVAL)

(2) Remove the two outer front track bolts and remove the track.

INSTALLATION

(1) Install the seat cushion onto the seat track assembly and install the front two bolts.

(2) Tighten the bolts to 28 N·m (21 ft. lbs.).

(3) Install the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - INSTALLATION)

SEAT CUSHION COVER - FRONT

REMOVAL

(1) Remove the seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - REMOVAL)

(2) Disconnect the j-straps.

(3) Remove the hog rings and remove the cushion cover.

INSTALLATION

(1) Position the seat cushion cover and install new hog rings.

(2) Connect the j-straps.

(3) Install the seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - INSTALLATION)

SEAT CUSHION SIDE SHIELDS

REMOVAL

(1) Remove the screw and remove the recliner handle.

(2) Remove the screws and remove the seat side shields.

INSTALLATION

(1) Install the shields and install the screws.

(2) Install the recliner handle and install the screw.

MANUAL SEAT RISER

REMOVAL

(1) Remove the seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)

(2) Remove the bolts and remove the rivet from the release handle. (Fig. 4)

(3) Remove the riser.

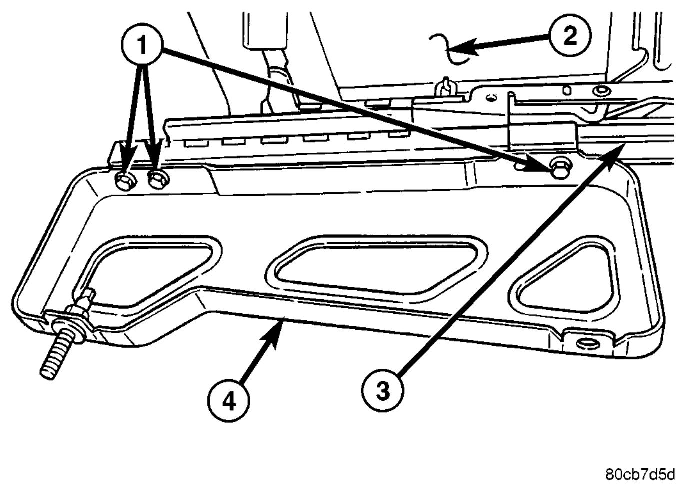

Fig. 4 FRONT SEAT RISER

1 - BOLTS (3)
2 - SEAT CUSHION
3 - SEAT TRACK
4 - SEAT RISER

INSTALLATION

(1) Install the seat riser and install the bolts.

(2) Tighten the bolts to 28 N·m (21 ft. lbs.).

MANUAL SEAT RISER (Continued)

(3) Install a new release handle rivet.

(4) Install the seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION)

SEAT TRACK

REMOVAL

(1) Remove the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - REMOVAL)

(2) Remove the outer riser. (Refer to 23 - BODY/SEATS/SEAT RISER - REMOVAL)

(3) Remove the front outer bolts and remove the tracks.

INSTALLATION

(1) Install the seat track onto the seat cushion and install the front outer bolts.

(2) Tighten the bolts to 28 N·m (21 ft. lbs.).

(3) Install the seat riser. (Refer to 23 - BODY/SEATS/SEAT RISER - INSTALLATION)

(4) Install the seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - INSTALLATION)

SEAT - REAR

REMOVAL

(1) Remove the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(2) Remove the inner seat belt buckles. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - REMOVAL)

(3) Remove the center seat belt anchor. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(4) Remove the remaining rear seat fasteners. (Fig. 5)

(5) Remove the front bolts. (Fig. 6)

(6) Fold down the seat backs and remove the seat assembly through the rear door.

INSTALLATION

(1) Install the seat assembly and position over the studs.

(2) Open the seat back and engage the latches onto the latch strikers.

(3) Install the rear outboard nuts and tighten to 43 N·m (32 ft. lbs.).

(4) Install the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

(5) Install the inner seat belt buckles. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - INSTALLATION)

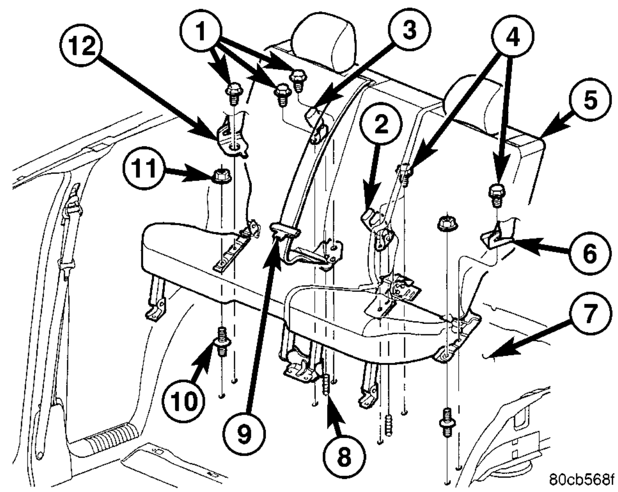

Fig. 5 REAR SEAT ASSEMBLY

1 - SEAT BELT ANCHOR BOLTS
2 - BELT BUCKLES
3 - BELT BUCKLE
4 - SEAT BELT ANCHOR BOLTS
5 - REAR SEAT ASSEMBLY
6 - SEAT BELT ANCHOR
7 - FLOOR PAN
8 - STUDS
9 - CENTER SEAT BELT
10 - FRONT STUDS
11 - NUTS (2)
12 - SEAT BELT ANCHOR

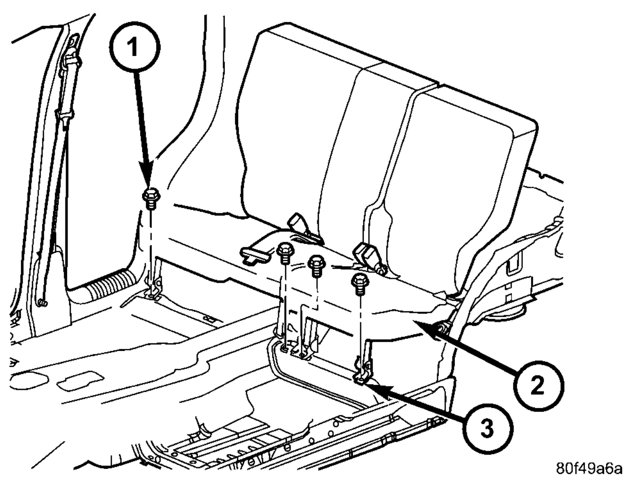

Fig. 6 REAR SEAT - FRONT ATTACHMENTS

1 - BOLTS (4)
2 - REAR SEAT ASSEMBLY
3 - SEAT LEGS

(6) Install the center seat belt anchor. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

(7) Install the front outer seat cushion leg bolts and tighten to 35 N·m (26 ft. lbs.)

SEAT BACK - REAR

REMOVAL

60/40 Split Seat - Left

(1) Remove the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(2) Remove the outer seat anchor nut. (Fig. 5)

(3) Remove the front seat cushion hinge bolt. (Fig. 7)

(4) Remove the center seat back hinge bolts and separate the rear seat assembly. (Fig. 8)

(5) Release the clips and remove the seat back hinge covers.

(6) Lift the seat cushion cover and remove the hinge bolts. (Fig. 9)

(7) Remove the seat back.

60/40 Split Seat - Right

(1) Remove the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(2) Remove the outer seat anchor nut. (Fig. 5)

(3) Remove the inner seat belt buckles. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - REMOVAL)

(4) Remove the front seat cushion hinge bolt. (Fig. 7)

(5) Remove the center seat back hinge bolts and separate the rear seat assembly. (Fig. 8)

(6) Remove the center seat belt anchor. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - REMOVAL)

(7) Remove the remaining outer and inner seat anchor bolts. (Fig. 5)

(8) Release the clips and remove the seat back hinge covers.

(9) Lift the seat cushion cover and remove the hinge bolts. (Fig. 9)

(10) Remove the seat back.

INSTALLATION

60/40 Split Seat - Left

(1) Install the seat back.

(2) Install the seat back hinge bolt and tighten to 8 N·m (71 in. lbs.).

(3) Position the seat back hinge covers and fully seat the clips.

(4) Connect the seat halves and install the center seat back hinge bolts.

(5) Tighten the bolts to 28 N·m (21 ft. lbs.).

(6) Install the front seat cushion hinge bolt and tighten to 28 N·m (21 ft. lbs.).

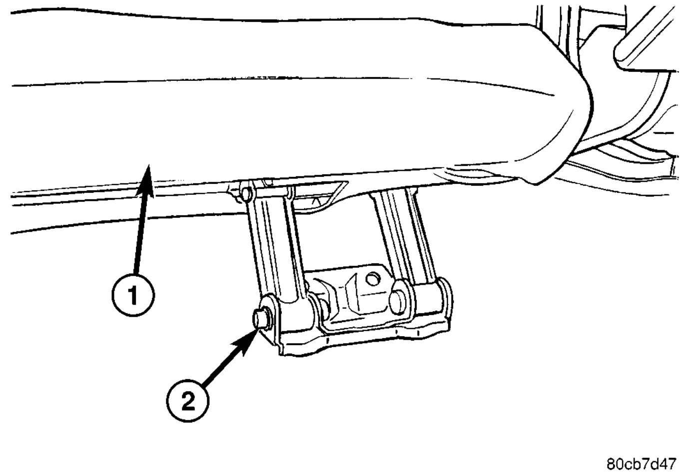

Fig. 7 CENTER CUSHION HINGE

1 - SEAT CUSHION
2 - BOLT

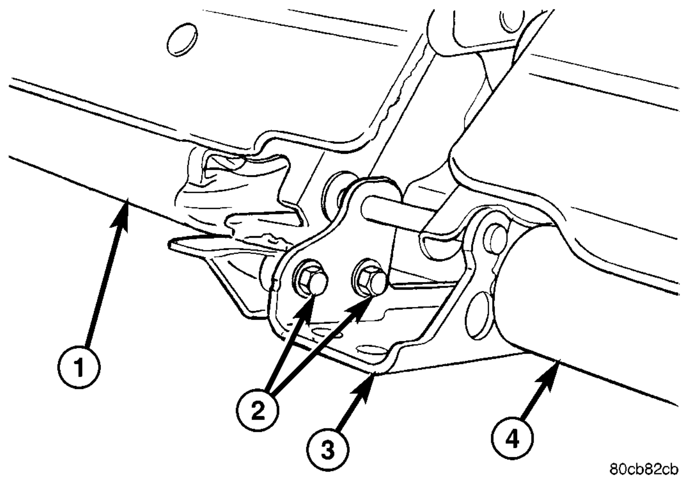

Fig. 8 CENTER SEAT BACK HINGE

1 - SEAT CUSHION
2 - BOLTS
3 - SEAT BACK HINGE
4 - SEAT CUSHION

(7) Install the outer seat anchor nut and tighten to 35 N·m (26 ft. lbs.).

(8) Install the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

60/40 Split Seat - Right

(1) Install the seat back.

(2) Install the seat back hinge bolt and tighten to 8 N·m (71 in. lbs.).

(3) Position the seat back hinge covers and fully seat the clips.

(4) Connect the seat halves and install the center seat back hinge bolts.

(5) Tighten the bolts to 28 N·m (21 ft. lbs.).

SEAT BACK - REAR (Continued)

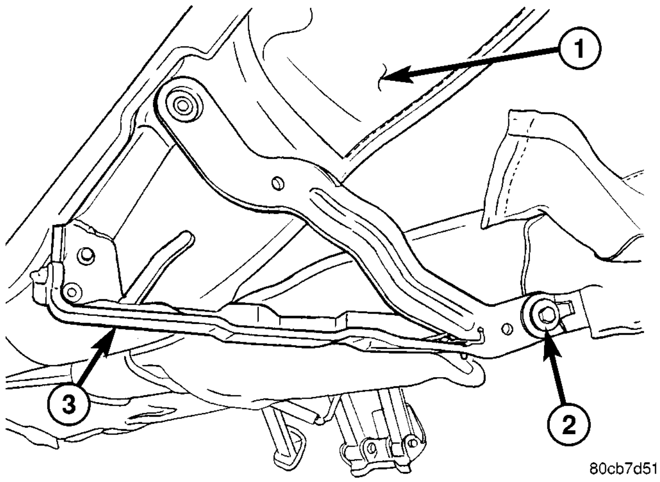

Fig. 9 SEAT BACK HINGE

1 - SEAT BACK
2 - BOLT
3 - SEAT BACK HINGE

(6) Install the front seat cushion hinge bolt and tighten to 28 N·m (21 ft. lbs.).

(1) Install the outer and inner seat anchor bolts/nuts and tighten to 35 N·m (26 ft. lbs.).

(2) Install the inner seat belt buckles. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT BUCKLE - INSTALLATION)

(3) Install the center seat belt anchor. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

(4) Install the outer seat belt anchors. (Refer to 8 - ELECTRICAL/RESTRAINTS/SEAT BELT & RETRACTOR - INSTALLATION)

SEAT BACK COVER - REAR

REMOVAL

(1) Remove the rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - REMOVAL)

(2) Remove the screws and remove the center seat belt guide.

(3) Remove the screws and push pin fasteners and remove the latch handle bezel.

(4) Remove the head rest and remove the guide covers. (Refer to 23 - BODY/SEATS/HEADREST - REMOVAL)

(5) Remove the screws and remove the grocery hooks.

(6) Remove the push pin fasteners and remove the seat back panel.

(7) Disconnect the j-straps.

(8) Remove the seat back cover.

INSTALLATION

(1) Install the seat back cover and connect the j-straps.

(2) Install the seat back panel and install the push pin fasteners.

(3) Install the grocery hooks and install the screws.

(4) Install the head rest guide covers and install the head rest. (Refer to 23 - BODY/SEATS/HEAD-REST - INSTALLATION)

(5) Install the latch handle bezel and install the screws and push pin fasteners.

(6) Install the center seat belt guide and screws.

(7) Install the rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - INSTALLATION)

SEAT BACK CUSHION - REAR

REMOVAL

(1) Remove the seat back cover. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - REMOVAL)

(2) Separate the cushion from the seat back frame.

INSTALLATION

(1) Position the seat back cushion onto the seat back frame.

(2) Install the seat back cover. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - INSTALLATION)

FOLDING REAR SEAT BACK LATCH / LOCK

REMOVAL

(1) Remove the rear seat back cushion. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - REAR - REMOVAL)

(2) Disconnect the shoulder belt release cable. (Fig. 10)

(3) Remove the bolts and remove the latch/lock assembly. (Fig. 11)

INSTALLATION

(1) Install the latch/lock assembly and install the bolts.

(2) Tighten the bolts to 28 N·m (21 ft. lbs.).

(3) Connect the shoulder belt release cable.

(4) Install the rear seat back cushion. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - REAR - INSTALLATION)

FOLDING REAR SEAT BACK LATCH / LOCK (Continued)

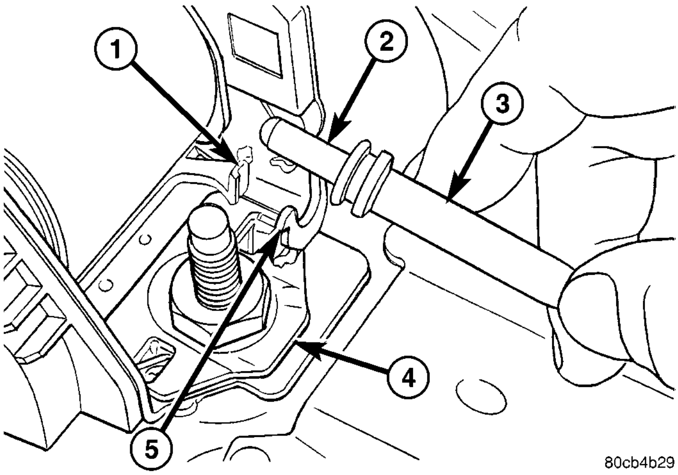

Fig. 10 Seat Back Latch Cable Disengage/Engage

1 - LEVER
2 - PLUNGER
3 - LATCH CABLE FITTING
4 - REAR CENTER RETRACTOR
5 - SUPPORT

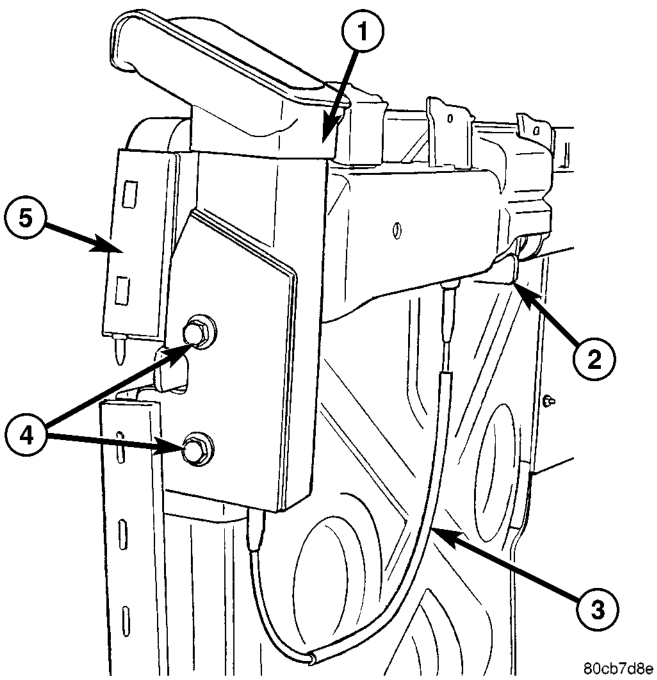

Fig. 11 LATCH/LOCK ASSEMBLY

1 - LATCH/LOCK ASSEMBLY
2 - SEAT BELT RETRACTOR
3 - RETRACTOR RELEASE CABLE
4 - BOLTS
5 - REAR SEAT BACK FRAME

REAR SEAT BACK LATCH STRIKER

REMOVAL

(1) Remove the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL)

(2) Remove the bolts and remove the striker. (Fig. 12)

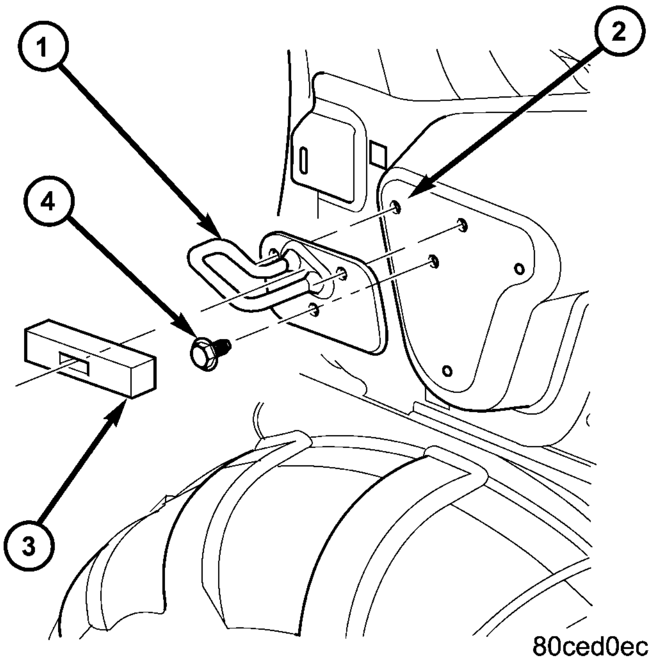

Fig. 12 REAR SEAT BACK LATCH STRIKER

1 - LATCH STRIKER
2 - BODY SIDE PANEL
3 - STRIKER CLOSE-OUT
4 - BOLTS (3)

INSTALLATION

(1) Position the striker and install the bolts.

(2) Tighten the bolts to 35 N·m (26 ft. lbs.).

(3) Install the quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION)

SEAT BACK FRAME - REAR

REMOVAL

(1) Remove the center seat belt retractor, if equipped. (Refer to 8 - ELECTRICAL/RESTRAINTS/ SEAT BELT & RETRACTOR - REMOVAL)

(2) Remove the seat back latch/lock assembly. (Refer to 23 - BODY/SEATS/FOLDING REAR SEAT BACK LATCH / LOCK - REMOVAL)

INSTALLATION

(1) Install the seat back latch/lock assembly. (Refer to 23 - BODY/SEATS/FOLDING REAR SEAT BACK LATCH / LOCK - INSTALLATION)

(2) Install the center seat belt retractor, if equipped. (Refer to 8 - ELECTRICAL/RESTRAINTS/ SEAT BELT & RETRACTOR - INSTALLATION)

SEAT CUSHION - REAR

REMOVAL

(1) Remove the seat back. (Refer to 23 - BODY/ SEATS/SEAT BACK - REAR - REMOVAL)

(2) Disconnect the j-straps and remove the seat cushion and cover.

INSTALLATION

(1) Position the seat cushion and cushion cover onto the seat frame.

(2) Connect the j-straps.

(3) Install the seat back. (Refer to 23 - BODY/ SEATS/SEAT BACK - REAR - INSTALLATION)

STATIONARY GLASS

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DOOR GLASS

REMOVAL

(1) Remove the rear door glass run channel. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - REMOVAL)

INSTALLATION

(1) Install the rear door glass run channel. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION)

QUARTER WINDOW

REMOVAL

(1) Remove the headliner as necessary to gain access to the glass seal from the inside. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(2) Cut urethane bonding from around quarter window glass using a suitable sharp cold knife. A pneumatic cutting device can be used if available.

(3) Separate glass from vehicle.

INSTALLATION

CAUTION: Open a window before installing glass. This will avoid pressurizing the passenger compartment. If a door or swing gate flip-up glass is slammed before urethane is cured, water leaks can result.

The window opening fence should be cleaned of old urethane bonding material.

(1) Install the headliner as necessary. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

(2) Clean inside of glass with Mopar Glass Cleaner and lint-free cloth.

(3) Apply PVC (vinyl) primer 25 mm (1 in.) wide around edge of glass. Wipe with clean/dry lint-free cloth.

(4) Apply fence primer around edge of fence. Allow at least eighteen minutes drying time.

(5) Apply a 10 mm (0.4 in.) bead of urethane around window vinyl border location.

(6)

Position glass into window opening and lock clips into place.

WINDSHIELD

WARNING

WINDSHIELD SAFETY PRECAUTIONS

WARNING: DO NOT OPERATE THE VEHICLE WITHIN 24 HOURS OF WINDSHIELD INSTALLATION. IT TAKES AT LEAST 24 HOURS FOR URETHANE ADHESIVE TO CURE. IF IT IS NOT CURED, THE WINDSHIELD MAY NOT PERFORM PROPERLY IN AN ACCIDENT.

- **URETHANE ADHESIVES ARE APPLIED AS A SYSTEM. USE GLASS CLEANER, GLASS PREP SOLVENT, GLASS PRIMER, PVC (VINYL) PRIMER AND PINCH WELD (FENCE) PRIMER PROVIDED BY THE ADHESIVE MANUFACTURER. IF NOT, STRUCTURAL INTEGRITY COULD BE COMPROMISED.**
- **DAIMLERCHRYSLER DOES NOT RECOMMEND GLASS ADHESIVE BY BRAND. TECHNICIANS SHOULD REVIEW PRODUCT LABELS AND TECHNICAL DATA SHEETS, AND USE ONLY ADHESIVES THAT THEIR MANUFACTURES WARRANT WILL RESTORE A VEHICLE TO THE REQUIREMENTS OF FMVSS 212. TECHNICIANS SHOULD ALSO INSURE THAT PRIMERS AND CLEANERS ARE COMPATIBLE WITH THE PARTICULAR ADHESIVE USED.**
- **BE SURE TO REFER TO THE URETHANE MANUFACTURER'S DIRECTIONS FOR CURING TIME SPECIFICATIONS, AND DO NOT USE ADHESIVE AFTER ITS EXPIRATION DATE.**
- **VAPORS THAT ARE EMITTED FROM THE URETHANE ADHESIVE OR PRIMER COULD CAUSE PERSONAL INJURY. USE THEM IN A WELL-VENTILATED AREA.**
- **SKIN CONTACT WITH URETHANE ADHESIVE SHOULD BE AVOIDED. PERSONAL INJURY MAY RESULT.**
- **ALWAYS WEAR EYE AND HAND PROTECTION WHEN WORKING WITH GLASS.**

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers. Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

REMOVAL

(1) Remove inside rear view mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL)

(2) Remove cowl cover. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL)

(3) Remove screws attaching windshield side molding to A-pillar.

(4) Remove upper windshield molding.

(5) Cut urethane bonding from around windshield using a suitable sharp cold knife. A pneumatic cutting device can be used if available.

(6) Separate windshield from vehicle.

INSTALLATION

WARNING: REVIEW ALL WARNINGS AND CAUTIONS IN THIS GROUP BEFORE PRECEDING WITH INSTALLATION.

CAUTION: Open a window before installing windshield. This will avoid pressurizing the passenger compartment. If a door or swing gate flip-up glass is slammed before urethane is cured, water leaks can result.

The windshield fence should be cleaned of old urethane bonding material. Support spacers should be cleaned and properly installed on weld studs or repair screws at bottom of windshield opening.

(1) Place replacement windshield into windshield opening. Position glass in the center of the opening against the support spacers. Mark the glass at the support spacers with a grease pencil or masking tape and ink pen to use as a reference for installation. Remove replacement windshield from windshield opening.

(2) Position the windshield inside up on a suitable work surface with two padded, wood 10 cm by 10 cm by 50 cm (4 in. by 4 in. by 20 in.) blocks, placed parallel 75 cm (2.5 ft.) apart.

(3) Clean inside of windshield with Mopar Glass Cleaner and lint-free cloth.

(4) Apply clear glass primer 25 mm (1 in.) wide around edge of windshield. Wipe with clean/dry lint-free cloth.

(5) Apply black-out primer 15 mm (.75 in.) wide on top and sides of windshield and 25 mm (1 in.) on bottom of windshield. Allow at least three minutes drying time.

WINDSHIELD (Continued)

(6) Position windshield spacers on lower fence above support spacers at the edge of the windshield opening.

(7) Align the dot on the upper molding to the tick mark in the center of the glass and install upper molding onto windshield.

(8) Apply a 10 mm (0.4 in.) bead of urethane around perimeter of windshield along the inside of the moldings. Apply two beads along the bottom edge.

(9) Apply fence primer around the perimeter of the windshield opening fence. Allow at least 18 minutes drying time.

(10) With aid of a helper, position windshield over windshield opening. Align reference marks at bottom of windshield to support spacers.

(11) Slowly lower windshield glass to windshield opening fence. Guide top molding into proper position if necessary. Push windshield inward to fence spacers at bottom and until top molding is flush to roof line.

(12) Clean excess urethane from exterior with Mopar Super Clean or equivalent.

(13) Install windshield side moldings. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/WINDSHIELD A-PILLAR WEATHERSTRIP - INSTALLATION)

(14) Install cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION)

(15) Install inside rear view mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)

(16) After urethane has cured, water test windshield to verify repair.

SUNROOF

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SUNROOF

DESCRIPTION

WARNING: Keep fingers and other body parts out of sunroof opening at all times.

The sunroof features a power sliding glass panel and a sunshade which can be manually positioned anywhere along its travel, rearward of glass panel front edge.

The sunroof is electrically operated from two switches located on the windshield header, rearward of the map lamp. To operate the sunroof the ignition switch must be in either the Accessory or On/Run position. One switch (vent) is a push button type and opens the sunroof to the vent position only. The other switch (open/close) is a rocker type for opening and closing the sunroof. Pressing and releasing the open button once the sunroof will express open and the wind deflector will raise. If the button is pressed a second time the sunroof will stop in that position. Pressing and holding the close button will close the sunroof. If the close button is released the sunroof will stop in that position.

SUNROOF (Continued)

SUNROOF OPERATION INSTRUCTIONS

SWITCH INPUTS			
	OPEN	CLOSE	VENT
FULL VENT	Push and hold switch until glass stops in flush closed position glass will then express open	Push and hold switch until glass stops in flush closed position.	No action
VENT RANGE	Push and hold switch until glass passes through flush closed position. Glass will then open	Push and hold switch until glass stops in flush closed position.	Push and hold switch until glass stops in full vent position.
FLUSH	1. Press switch for less than 0.65 seconds for express to comfort stop. 2. Press switch for more than 0.65 seconds and glass will stop when switch is released	No action	Press and hold switch. Glass will travel through flush closed to full vent. Glass will stop when switch is released or when fully vented.
FULL OPEN	Press switch for less than 0.65 seconds for express to full open.	Press and hold switch until glass stops in flush closed position or anywhere in between.	Press and hold switch. Glass will travel through flush closed to full vent. Glass will stop when switch is released.

DIAGNOSIS AND TESTING

WATER DRAINAGE AND WIND NOISE DIAGNOSIS

The sliding glass panel is designed to seal water entry with a snug fit between the roof and the seal. The fit can be checked by inserting a piece of paper between the roof and the seal. The piece of paper should have some resistance when pulled out when the glass panel is in the closed position. The sunroof housing will drain off a minimum amount of water. Excessive wind noise could result if the gap clearances are exceeded. The sunroof glass panel may need to be adjusted. Refer to Sunroof Glass Panel Adjustment for proper procedures.

Adequate drainage is provided by a drain trough in the sunroof housing which encircles the sliding glass panel and leads to drain hoses. If a wet headliner or other water leak complaints are encountered, before performing any adjustments, first ensure that the drainage system is not plugged or disconnected. Use a pint container to pour water into the sunroof housing drain trough. If water flow is restricted, use compressed air to blow out any material plugging the drain system. Retest system again.

To further check for a disconnected drain hose:

(1) Remove A-pillar trim, sun visors, and map lamps/mini console.

(2) Remove sunroof opening trim lace. Refer to Sunroof Opening Trim Lace.

(3) Lower headliner as necessary to gain access to sunroof housing drain tubes. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(4) Repair as necessary.

DIAGNOSTIC PROCEDURES

Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. Refer to Sunroof Diagnostic Chart for possible causes. If not, a common electrical problem may exist. Refer to Wiring Diagrams, in this publication for circuit, splice and component descriptions. Check the condition of the circuit protection (20 amp circuit breaker in cavity 19 of the Junction Block). Inspect all wiring connector pins for proper engagement and continuity. Check for battery voltage at the power sunroof controller, refer to Wiring Diagrams, for circuit information. If battery voltage of more than 10

SUNROOF (Continued)

volts is detected at the controller, proceed with the following tests (the controller will not operate at less than 10 volts).

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. If however, the sunroof glass is in a partial closed position, high pressure water may be forced beyond the water management system boundaries and onto the headlining.

SUNROOF DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE
Sunroof motor inoperative.	Faulty control switch. Faulty circuit ground between sunroof electronics module, control switch, and body harness. Faulty power circuit between sunroof electronics module, control switch, and body harness. Faulty drive motor. Faulty electronics module. Faulty drive motor electrical connector.
Audible whine when switch is depressed, sunroof does not operate.	Faulty drive motor. Binding cable.
Audible clicking or ratcheting when switch is pressed, sunroof does not operate.	Broken or worn drive cable. Worn drive motor gear. Mechanisms not synchronized.
Sunroof vents and opens, but does not close.	Binding cable. Faulty circuit. Faulty control switch. Faulty electronic module. Faulty drive motor.
Sunroof vents, but does not open.	Binding cable or mechanism. Faulty circuit. Faulty switch. Faulty electronic module.
Sunroof does not vent	Binding cable or mechanism. Faulty circuit. Faulty control switch. Faulty sunroof electronic module.
Sunroof water leak.	Drain tubes clogged or kinked or disconnected from the sunroof. Glass panel improperly adjusted. Faulty glass panel seal.
Gurgling sound from sunroof	Low spot in drain hose routing, allowing water to stand.
Wind noise from sunroof.	Front of glass panel too high or rear too low. Wind deflector not deploying. Glass not centered in opening. Faulty glass panel seal.
Rattles from open sunroof while driving	Loose or broken attaching hardware. Worn or broken mechanism.

GLASS PANEL

REMOVAL

(1) Slide sunshade rearward to the open position.
(2) Move the glass panel to the closed position.
(3) Remove the four glass panel screws (Fig. 1).
(4) Lift off glass panel and remove from vehicle.

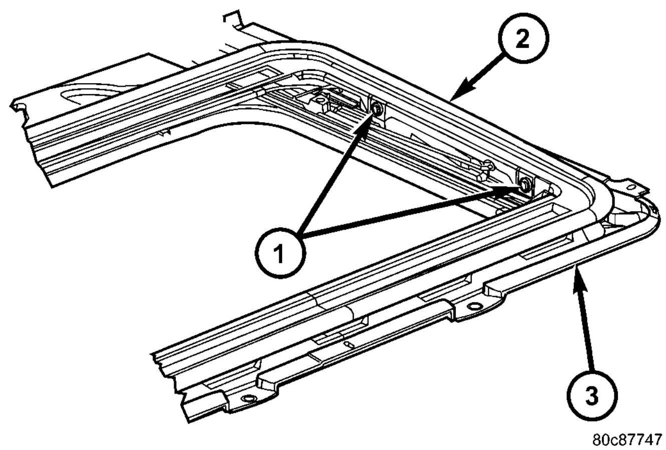

Fig. 1 GLASS PANEL

1 - SCREWS
2 - GLASS PANEL
3 - MODULE ASSEMBLY

INSTALLATION

(1) Position glass panel on to mechanism lift arm.
(2) Start the four attaching screws.
(3) Center glass in opening by running a business card around the glass.
(4) Adjust glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

ADJUSTMENTS

SUNROOF GLASS PANEL ADJUSTMENT

(1) Move the sunshade rearward to the open position.
(2) Move the sunroof glass panel to the fully closed position.
(3) Adjust the glass one corner at a time.
(a) Loosen four glass screws (Fig. 2).
(b) Lift glass assembly and align the top of the glass panel to the top of the roof panel.
(c) Tighten screw to 3.5 N·m (31 in. lbs.).
(d) Repeat steps a. and b. for each corner of the glass panel.
(e) When properly adjusted, the front of the glass panel is 1.75 mm (0.07 in.) to 2.75 mm (0.11 in.) lower than the roof surface and the rear edge of the glass panel is 1.75mm (0.07 in.) to .75 mm (0.03 in.) lower than the roof surface.

NOTE: Glass assembly seal is 2.5mm (0.1 in) higher than the glass panel. Measure at 300mm (11.8 in) outboard of the centerline of the vehicle.

(4) Verify sunroof operation and alignment. Check fit and re-adjust as necessary.

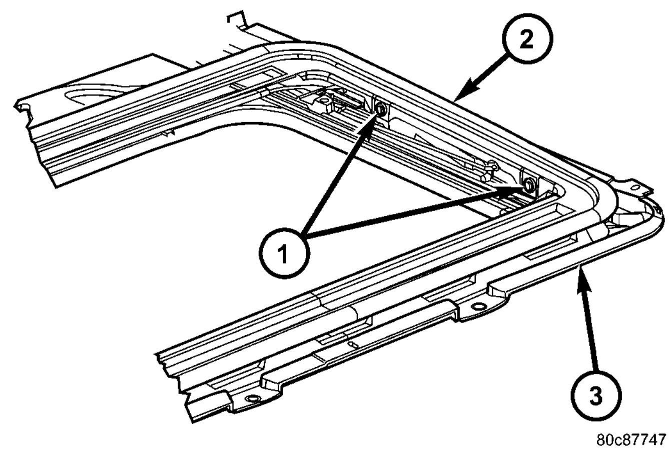

Fig. 2 GLASS PANEL

1 - SCREWS
2 - GLASS PANEL
3 - MODULE ASSEMBLY

GLASS PANEL SEAL

REMOVAL

(1) Remove sunroof glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)
(2) Place glass panel on clean work area with the top side up. Support the glass assembly from underside to avoid bending or otherwise damaging the mounting tabs.
(3) Grasp the seal and pull seal away from the glass panel. The seal is a one piece seal.

INSTALLATION

NOTE: Always position seal seam on center of the passenger side of glass panel.

(1) Place seal into position.
(2) Install seal on glass. Using care working the seal around the glass, being careful not to over stretch the seal while installing.
(3) Install the glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION)

SUNSHADE

REMOVAL

(1) Remove glass assembly from the sunroof assembly. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)

(2) Remove two screws from trough assembly (Fig. 3).

(3) Remove trough assembly.

(4) Slide the sunshade forward to disengage the guide feet from the tracks through the cutouts at the front of the tracks.

CAUTION: Use care not to crease the sunshade when removing or installing.

INSTALLATION

(1) Place sunshade into position, through the cut-outs at the front of the tracks and slide the sunshade back.

(2) Place trough assembly into position on sunroof module and install the screws.

(3) Install the glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION)

GUIDE ASSEMBLY

REMOVAL

(1) Remove the glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)

(2) Place sunroof into the vent position.

(3) Remove two screws from trough assembly (Fig. 3).

(4) Remove trough assembly.

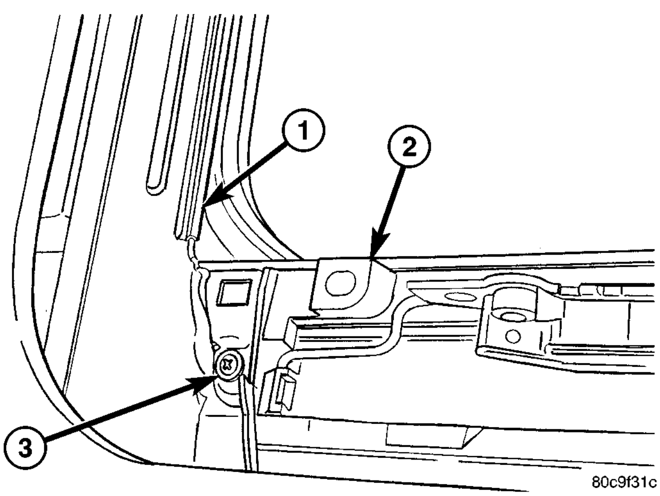

Fig. 3 GUIDE ASSEMBLY TROUGH

1 - TROUGH
2 - TROUGH GUIDE
3 - SCREW

(5) Disconnect the guide link (Fig. 4).

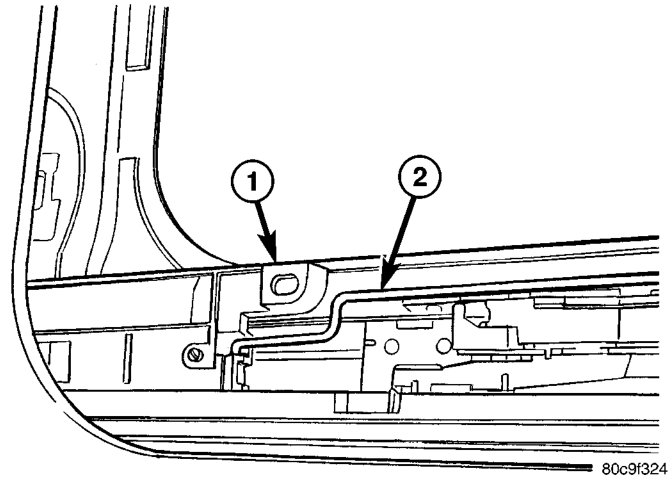

Fig. 4 TROUGH GUIDES

1 - TROUGH GUIDE
2 - GUIDE LINK

(6) Slide trough guide forward and disengage the sliders through the notches in the guide channels (Fig. 5).

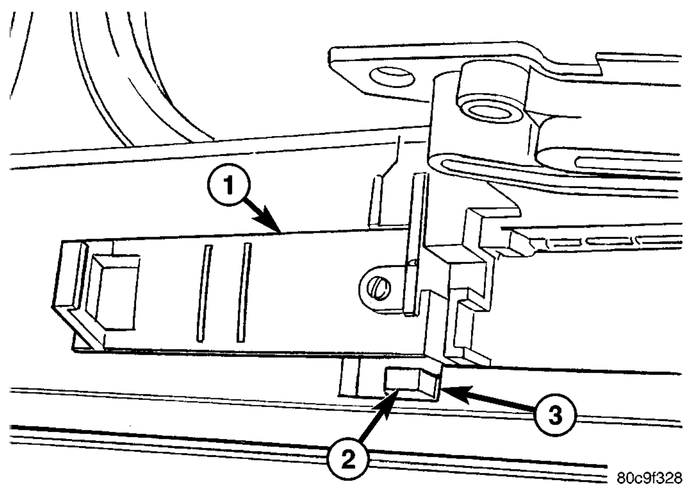

Fig. 5 TROUGH GUIDE REMOVAL

INSTALLATION

(1) Install the trough guide and engage the sliders into the guide channels through the notches.

(2) Connect the guide link.

(3) Install the trough and install the two screws.

(4) Install the glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION)

WIND DEFLECTOR

REMOVAL

(1) Open sunroof glass panel to the full open position.

(2) Remove screws attaching wind deflector straps to front crossmember (Fig. 6).

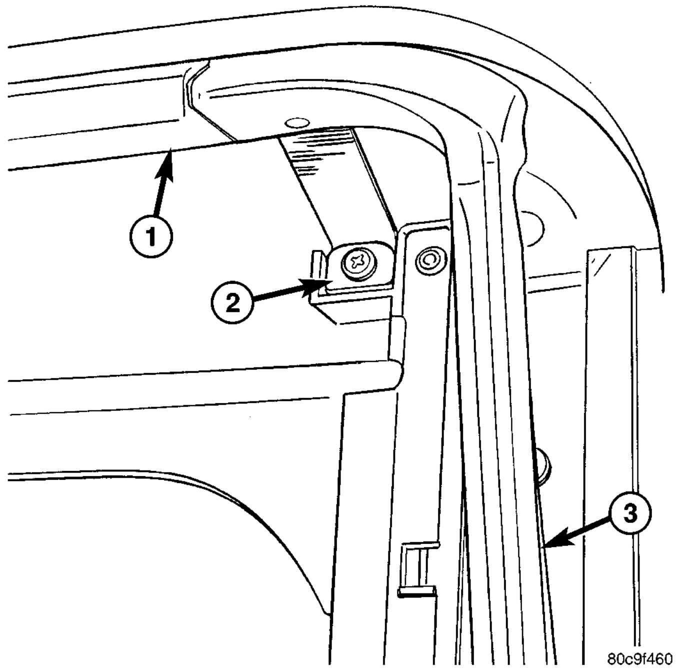

Fig. 6 SUNSHADE

1 - WIND DEFLECTOR
2 - SCREW
3 - SPRING

(3) Rotate wind deflector back about 110° and slide backwards to disengage from the spring hook.

INSTALLATION

(1) Place wind deflector in position 110° to roof.

(2) Push arms down and forward to engage spring hooks.

(3) Rotate wind deflector forward into correct position. Depress wind deflector down onto front crossmember to check spring function.

(4) Install fasteners attaching wind deflector straps to front crossmember.

(5) Test sunroof operation.

OPENING TRIM LACE

REMOVAL

(1) Remove lace by starting at the joint center of the opening on driver's side.

(2) Pull one end of the lace away from the headliner until the entire lace is removed.

INSTALLATION

(1) Place end of trim lace into position starting at center of the opening on driver's side.

(2) Push lace into position.

(3) Ensure that the corner radii is fully engage.

(4) Once trim lace is attached to sunroof module begin tucking the headline under the lip on the trim lace working all the way around the opening.

DRAIN TUBE

REMOVAL

FRONT DRAIN TUBES

(1) Move glass panel to the fully closed position.

(2) Remove sunroof opening trim lace.

(3) Remove the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(4) Disconnect the drain hose from the sunroof housing (Fig. 7).

(5) Drain any liquid from hose connection, if necessary.

(6) Remove the instrument panel top panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)

(7) Disconnect the grommet, attachment clips and remove the drain tube.

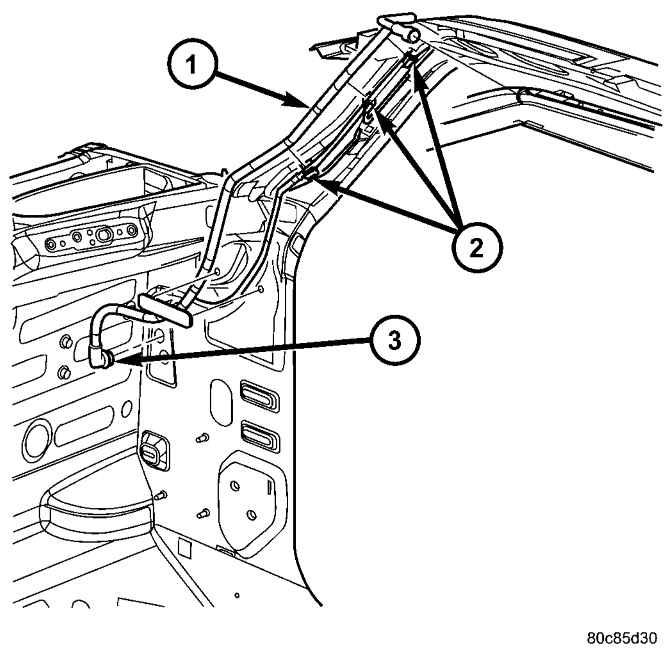

Fig. 7 FRONT DRAIN TUBE

1 - TUBE
2 - CLIPS
3 - GROMMET

DRAIN TUBE (Continued)

REAR DRAIN TUBES

(1) Move glass panel to the fully closed position.

(2) Remove sunroof opening trim lace.

(3) Remove headliner.

(4) Disconnect the drain hose from the sunroof housing (Fig. 8).

(5) Drain any liquid from hose connection, if necessary.

(6) Disconnect the grommet, attachment clips and remove the drain tube.

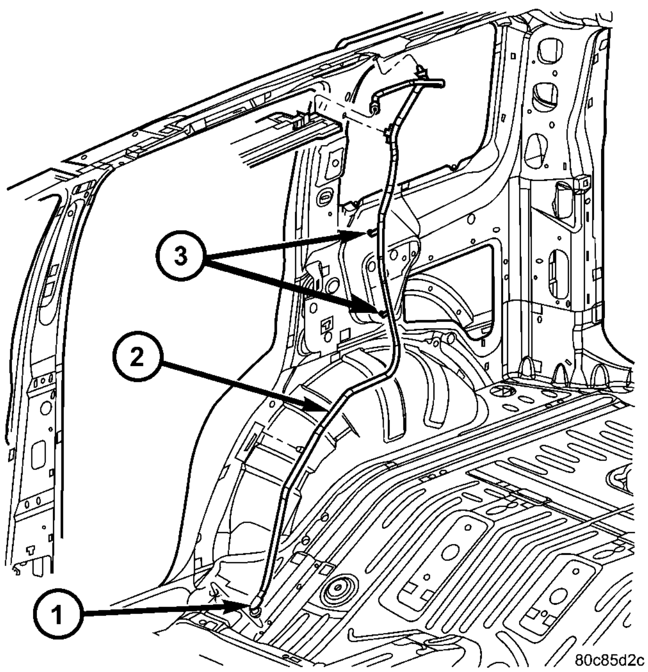

Fig. 8 REAR DRAIN TUBE

1 - GROMMET
2 - TUBE
3 - CLIPS

INSTALLATION

FRONT DRAIN TUBES

(1) Connect the drain hose to the sunroof housing and test drainage.

(2) Connect the body grommet and attachment clips.

(3) Install the instrument panel top panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION)

(4) Install the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

(5) Install sunroof opening trim lace. (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - INSTALLATION)

REAR DRAIN TUBES

(1) Connect the drain hose to the sunroof housing and test drainage.

(2) Connect the body grommet and attachment clips.

(3) Install the headliner.

(4) Install sunroof opening trim lace.

MODULE ASSEMBLY

REMOVAL

(1) Move glass panel to the fully closed position.

(2) Disconnect and isolate the negative battery cable.

(3) Remove sunroof opening trim lace.

(4) Remove headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(5) Disconnect wire harness push in fasteners and electrical connector. (Fig. 9)

(6) Disconnect the drain tubes from sunroof housing.

(7) Loosen fasteners attaching sunroof module assembly.

(8) With the aid of a helper, remove fasteners attaching sunroof module assembly to roof panel (Fig. 10).

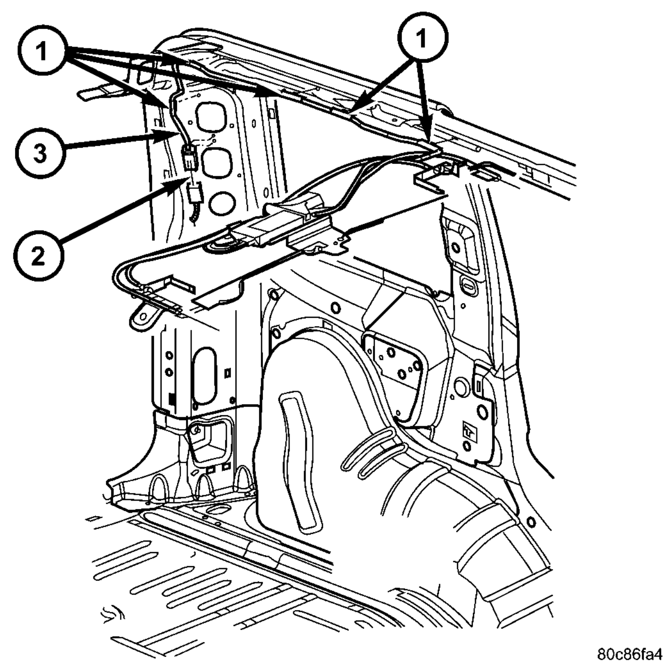

Fig. 9 WIRE HARNESS

1 - CLIPS
2 - ELECTRICAL CONNECTOR
3 - WIRE HARNESS

INSTALLATION

(1) With the Glass panel in the fully closed position.

(2) Raise rear end of sunroof module assembly and guide into position and start fasteners.

MODULE ASSEMBLY (Continued)

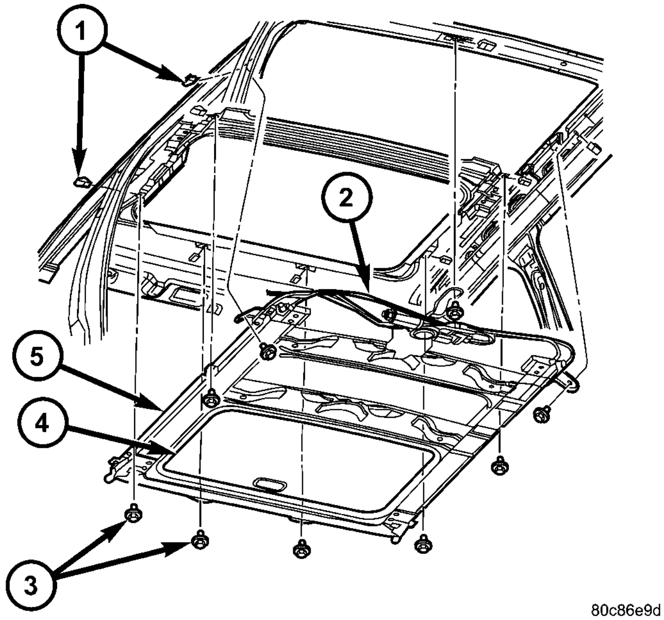

Fig. 10 MODULE ASSEMBLY

1 - U-NUTS
2 - DRIVE MOTOR
3 - BOLTS
4 - GLASS OPENING
5 - MODULE ASSEMBLY

(3) Tighten the fasteners to 9 N·m (80 in. lbs.).
(4) Connect the drain tubes.
(5) Connect wire harness.
(6) Install the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)
(7) Install the opening trim lace. (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - INSTALLATION)
(8) Connect battery negative cable.
(9) Test sunroof operation, adjust as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

DRIVE MOTOR

REMOVAL

(1) Remove headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
(2) Cut wire retaining tape being careful not to cut wires.
(3) Disconnect the electrical connector (Fig. 11).
(4) Remove three motor assembly attaching screws from bottom side of motor assembly and remove motor assembly from the motor bracket.

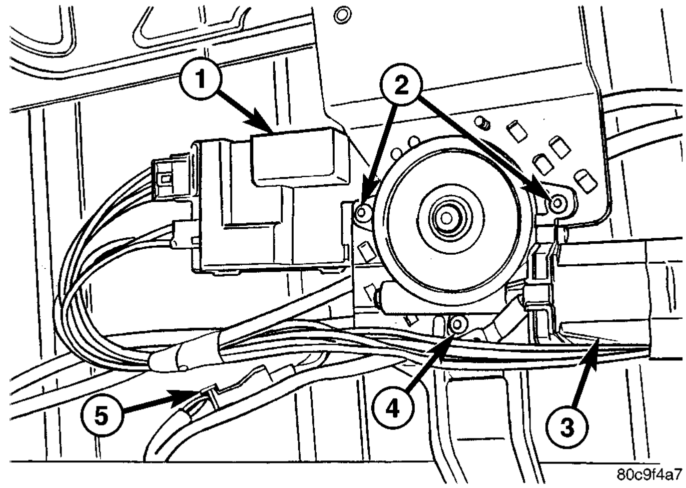

Fig. 11 DRIVE MOTOR ASSEMBLY

1 - CONTROL MODULE
2 - SCREWS
3 - DRIVE MOTOR
4 - SCREW
5 - ELECTRICAL CONNECTOR

INSTALLATION

(1) Place motor into position and install screws attaching motor to bracket.

NOTE: Hold electronics module to motor bracket when inserting motor shaft to avoid disengaging drive cables.

(2) Connect electrical connector.
(3) Tape wires to drive cables to prevent rattles.
(4) Test sunroof operation, adjust as necessary.
(5) Install headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

CONTROL MODULE

REMOVAL

(1) Remove the module assembly. (Refer to 23 - BODY/SUNROOF/MODULE ASSEMBLY - REMOVAL)
(2) Remove three motor assembly retaining screws from bottom side of motor, and remove motor assembly (Fig. 11).
(3) From top side of module assembly, remove one attaching screw from electronics module. (Fig. 12)
(4) Remove old timing module.

INSTALLATION

(1) Check glass assembly position. Adjust to full closed position. Insert pin into holes in lift arm assembly to check position (Fig. 13).

CONTROL MODULE (Continued)

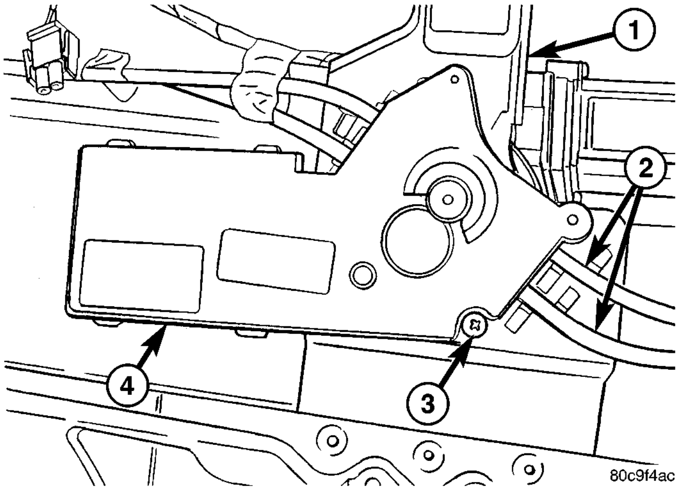

Fig. 12 CONTROL MODULE

1 - MOTOR BRACKET
2 - CABLES
3 - SCREW
4 - CONTROL MODULE

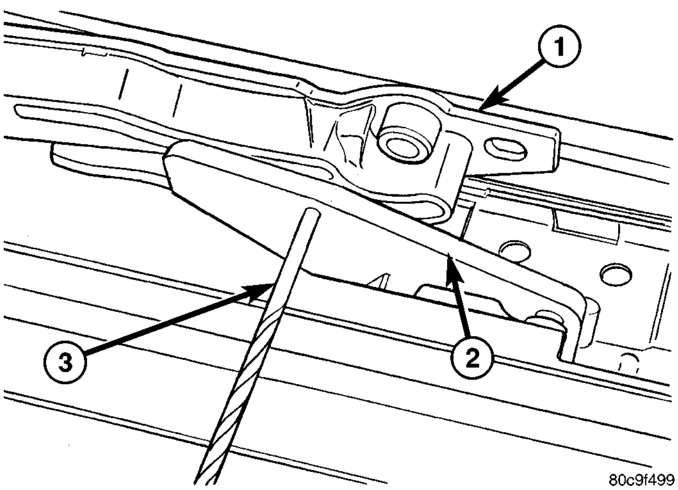

Fig. 13 LIFT ARM POSITIONING

1 - GLASS BRACKET
2 - LIFT ARM
3 - ALIGNMENT PIN

(2) Set new electronic module in position on top side of motor mounting bracket engaging drive cables with pinion gear in electronics module.

(3) Install one screw to attach electronics module to motor bracket. Tighten screw to 3 N·m (27 in. lbs.) torque.

(4) Install motor assembly to motor bracket and electronics module with three screws. Tighten screw to 1.75 N·m (15.5 in. lbs.) torque.

(5) Remove the new module's timing pin and discard. (Fig. 14)

(6) Connect electrical connector to module assembly wire harness. Secure any loose wires.

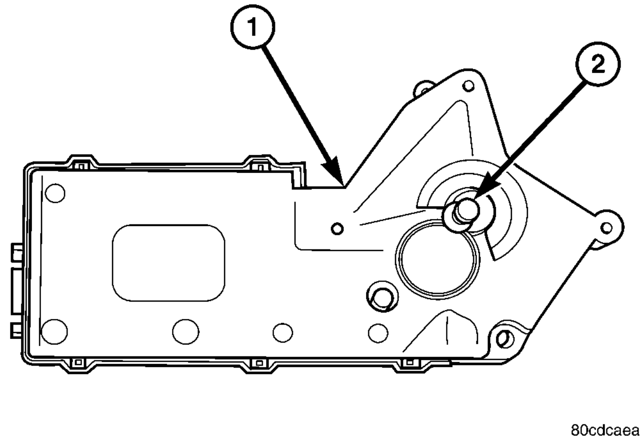

Fig. 14 MODULE TIMING PIN

1 - CONTROL MODULE
2 - TIMING PIN

(7) Install module assembly. (Refer to 23 - BODY/SUNROOF/MODULE ASSEMBLY - INSTALLATION)

(8) Test operation, adjust as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

(9) Install opening trim lace. (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - INSTALLATION)

CONTROL SWITCH

DESCRIPTION

Vehicles equipped with a power sunroof utilize an sunroof control switch. On this model, the sunroof control switch is located in the overhead console, in between the two reading lamps. The switch is mounted in the overhead console with four plastic retaining tabs, molded into the switch housing.

This switch incorporates four selections of operation open, auto open, close and vent. The individual switches in the sunroof control switch unit cannot be repaired. If one switch is damaged or faulty, the entire sunroof control switch unit must be replaced.

OPERATION

With the operation of the sunroof control switch, voltage is directed to the sunroof motor, through the switch contacts or control module. If the control switch is depressed and held depressed the voltage signal is controlled manually through the switch contacts, so when the switch is released the sunroof stops.

Refer to the owners manual for more information on the operation of the sunroof switch and system.

CONTROL SWITCH (Continued)

DIAGNOSIS AND TESTING - CONTROL SWITCH

The following test will determine if the sunroof control switch is operating properly.

(1) Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(2) Remove the sunroof control switch from the overhead console (Refer to 23 - BODY/SUNROOF/CONTROL SWITCH - REMOVAL).

(3) Using an ohmmeter, test the switch terminals for proper continuity using the table below. If any of the terminals do not show proper continuity, replace the sunroof control switch.

SWITCH POSITION (DEPRESSED)	CONTINUITY BETWEEN TERMINALS
VENT (V)	3, 4
OPEN (AUTO)	1, 4
CLOSE	2, 4

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(3) Disconnect the sunroof control switch electrical connector. Depress the connector retaining tab and pull the connector straight out.

(4) To remove the switch from the overhead console, push on the back of the switch until it comes free from the overhead console.

INSTALLATION

(1) Install the switch in the overhead console assembly. Be certain the switch is securely snapped in place.

(2) Connect the sunroof control switch electrical connector. Be certain the switch connector is securely snapped in place.

(3) Install the overhead console (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).

(4) Connect the negative battery cable.

WEATHERSTRIP/SEALS

TABLE OF CONTENTS

A-PILLAR SEAL

REMOVAL

(1) Open the doors and peal the seal away from the a-pillar/windshield and the side rail weather strip flanges.

INSTALLATION

(1) Position the a-pillar seal over the windshield/a-pillar and the side rail weatherstrip flanges and seat fully working rearward.

COWL WEATHERSTRIP

REMOVAL

(1) Open the hood and peal the cowl seal from the cowl panel and cowl flange.

INSTALLATION

(1) Position the weatherstrip over the cowl flange and the cowl grille and seat fully.

DOOR PRIMARY WEATHERSTRIP

REMOVAL

(1) Remove the lower b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)

(2) Peal seal off of the door opening flange.

INSTALLATION

(1) Position the seal to the bottom of the door opening, with bulb facing outboard, starting the installation at the center of the lower flange. Press the seal onto the sill flange and work around the perimeter of the door opening until fully seated. Work ½ the way around and then start at the other end of the seal working back, making sure the splice joint has no gap and smoothing the seal to avoid puckers or wrinkles.

(2) Install the lower b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)

DOOR PRIMARY WEATHERSTRIP (Continued)

(3) When installing a new weatherstrip on the front door opening, remove the tear strip starting at the splice and moving around the front of the door to the back of the opening.

(4) When installing a new weatherstrip on the rear door opening, remove the tear strip starting at the splice and moving around the back of the door to the front of the opening.

DOOR LOWER WEATHERSTRIP

REMOVAL

(1) Carefully disengage the push pin fasteners and remove the seal.

INSTALLATION

(1) Position the seal so that the flat side of the lip faces inboard, and seat the push pin fasteners.

FRONT DOOR OUTER BELT MOLDING

REMOVAL

(1) Lower the window.

(2) Rotate the outer belt molding outboard while pulling up to disengage the retention tabs. (Fig. 1)

INSTALLATION

(1) Press the belt molding onto the outer door window flange starting at the rear and working forward.

SWING GATE BELTLINE WEATHERSTRIP

REMOVAL

(1) Remove the swing gate trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - REMOVAL)

(2) Pull seal away from the corner tabs and remove from the swing gate flange.

INSTALLATION

(1) Install the seal over the swing gate flange and seat the corner tabs.

(2) Install the swing gate trim panel. (Refer to 23 - BODY/SWING GATE/TRIM PANEL - INSTALLATION)

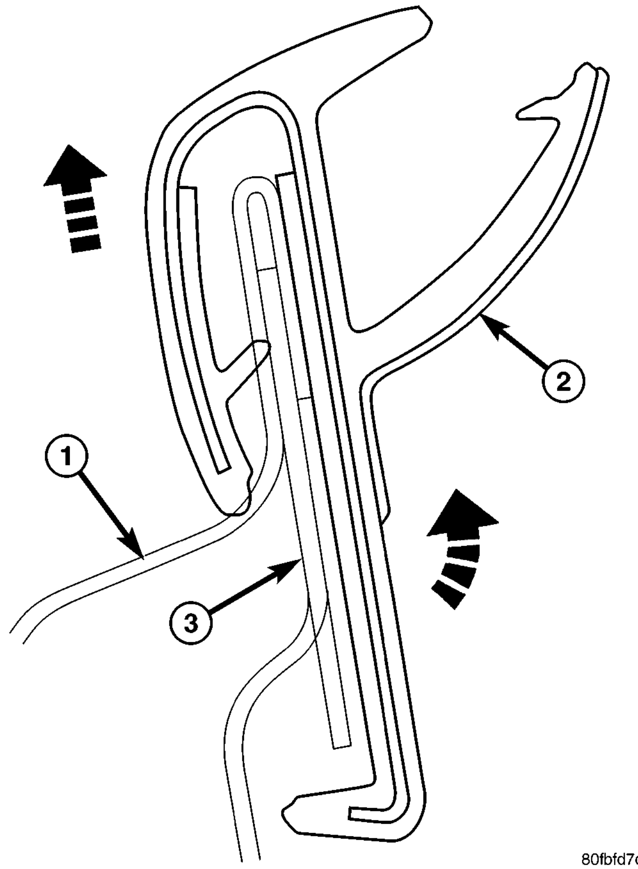

Fig. 1 OUTER BELT MOLDING

1 - DOOR OUTER PANEL
2 - DOOR OUTER REINFORCEMENT
3 - OUT BELT WEATHERSTRIP

SWING GATE OPENING WEATHERSTRIP

REMOVAL

(1) Open the swing gate and using a trim stick C-4755 or equivalent, remove the swing gate lower sill plate.

(2) Peal seal off of the gate opening flange.

INSTALLATION

(1) Position the seal to the bottom of the gate opening starting the installation at the center of the flange with the trim lip facing inboard. Press the seal onto the sill flange and work around the perimeter of the door opening until fully seated. Work in one direction, smoothing the seal to avoid puckers or wrinkles. Pull trim lip cord so that the lip covers the trim edge all around.

(2) Position the lower sill plate and seat the attachment clips fully.

REAR DOOR OUTER BELT MOLDING

REMOVAL

(1) Lower the window.

(2) Rotate the outer belt molding outboard while pulling up to disengage the retention tabs. (Fig. 2)

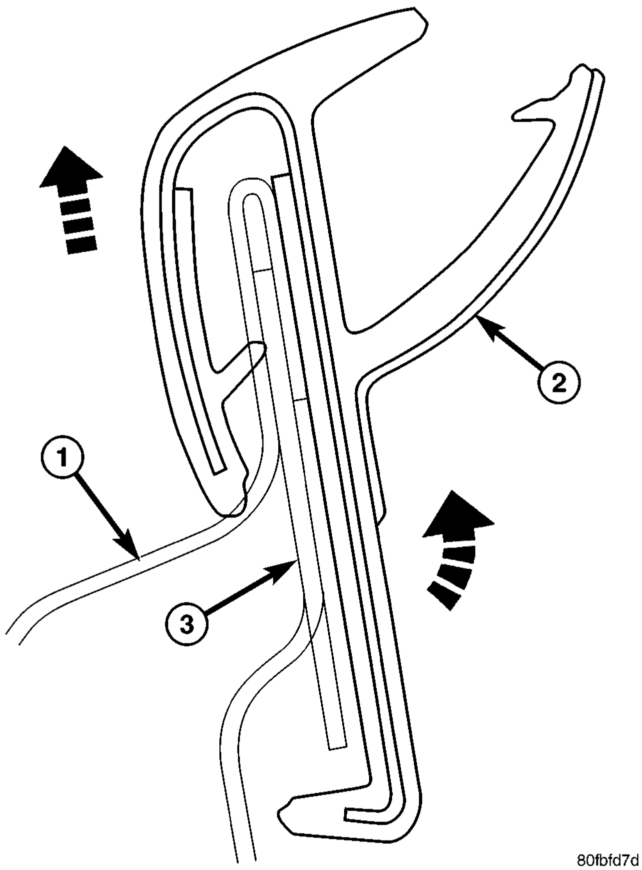

Fig. 2 OUTER BELT MOLDING

1 - DOOR OUTER PANEL
2 - DOOR OUTER REINFORCEMENT
3 - OUT BELT WEATHERSTRIP

INSTALLATION

(1) Press the belt molding onto the outer door window flange starting at the front and working back.

SIDE RAIL WEATHERSTRIP/ RETAINER

REMOVAL

(1) Remove the windshield weatherstrip retainer. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/ WINDSHIELD A-PILLAR WEATHERSTRIP/RETAINER - REMOVAL)

(2) Remove the two screws.

(3) Using a trim stick C-4755 or equivalent, release the push in fasteners and remove the weatherstrip.

INSTALLATION

(1) Position the weatherstrip and seat the push in fasteners.

(2) Install the two screws.

(3) Install the windshield weatherstrip. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/WINDSHIELD A-PILLAR WEATHERSTRIP/RETAINER - INSTALLATION)

WINDSHIELD A-PILLAR WEATHERSTRIP/RETAINER

REMOVAL

(1) Open the doors and peal the a-pillar seal away from the a-pillar/windshield and the side rail weather strip flanges.

(2) Remove the seven screws and remove the weatherstrip.

INSTALLATION

(1) Position the weatherstrip and install the seven screws.

(2) Position the a-pillar seal over the windshield/a-pillar and the side rail weatherstrip flanges and seat fully.

COWL/PLENUM SEAL

REMOVAL

(1) Remove the cowl grille. (Refer to 23 - BODY/ EXTERIOR/COWL GRILLE - REMOVAL)

(2) Remove the seal from the plenum flange above the air inlet duct.

INSTALLATION

NOTE: Seal should not be touching the plenum baffle flange seal.

COWL/PLENUM SEAL (Continued)

(1) Position the seal on the plenum flange and seat fully.

(2) Install the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION)

COWL/PLENUM WINDOW BAFFLE SEAL

REMOVAL

(1) Remove the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL)

(2) Remove the seal from the window below the cowl/plenum seal.

INSTALLATION

(1) Position the seal against the upper flange of the inner plenum window below the cowl/plenum seal and seat fully.

(2) Install the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION)

AIR INLET SEAL

REMOVAL

(1) Open the hood and carefully disengage the push pin fasteners and remove the seal.

INSTALLATION

(1) Position the seal and seat the puch pin fasteners fully.

FRONT DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove the door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL)

(2) Rotate the outer belt molding outboard while pulling up to disengage the retention tabs.

INSTALLATION

(1) Press the belt molding onto the trim panel flange starting at the rear and working forward.

(2) Install the door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION)

REAR DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove the door trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)

(2) Rotate the outer belt molding outboard while pulling up to disengage the retention tabs.

INSTALLATION

(1) Press the belt molding onto the trim panel flange starting at the rear and working forward.

(2) Install the door trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)

BODY STRUCTURE

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SPECIFICATION

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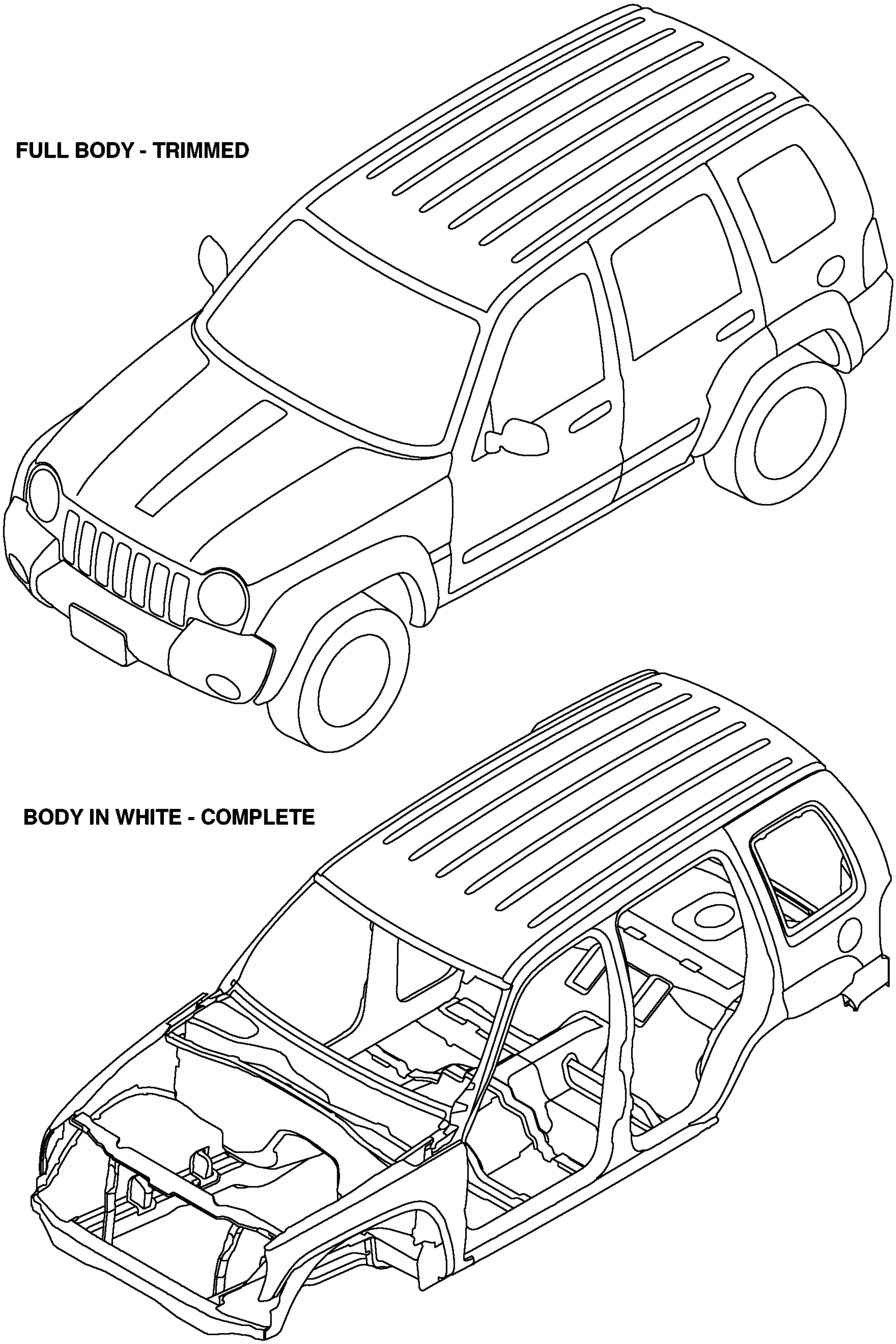


Fig. 1 COMPLETE BODY STRUCTURE VIEWS

ASSEMBLY (Continued)

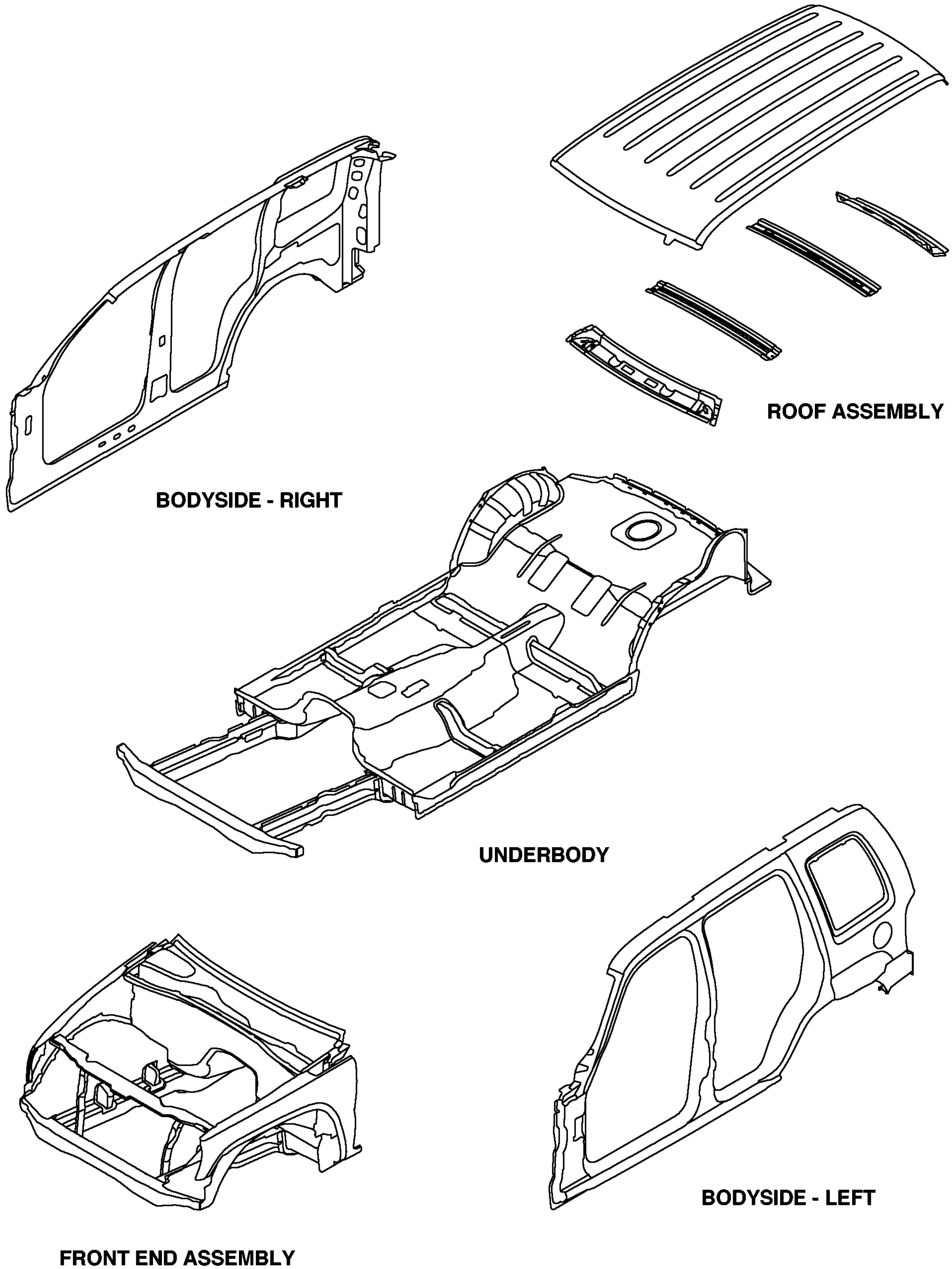
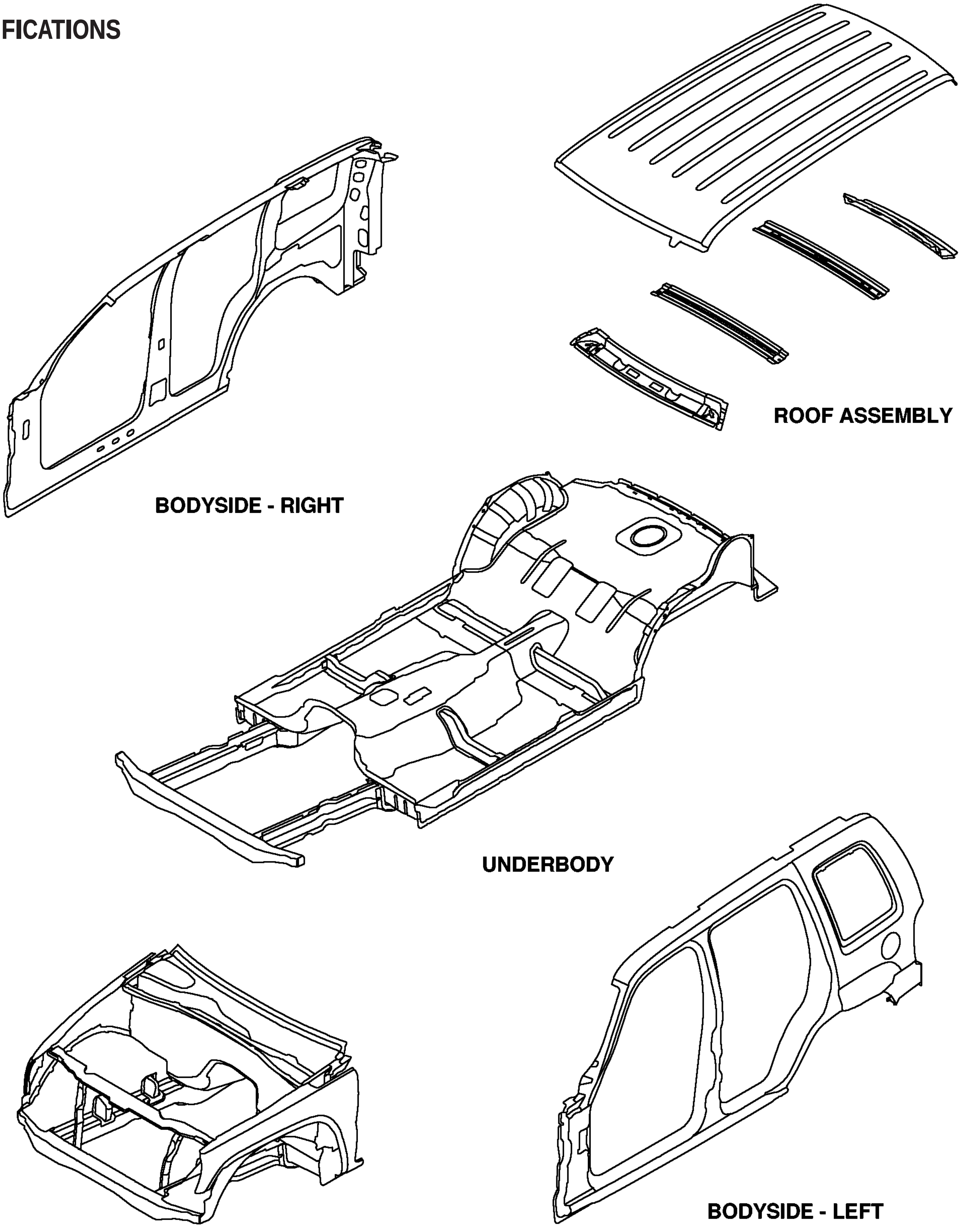


Fig. 2 BODY STRUCTURE - SECTIONS

WELD AND STRUCTURAL ADHESIVE LOCATIONS

SPECIFICATIONS



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WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

FRONT END ASSEMBLY

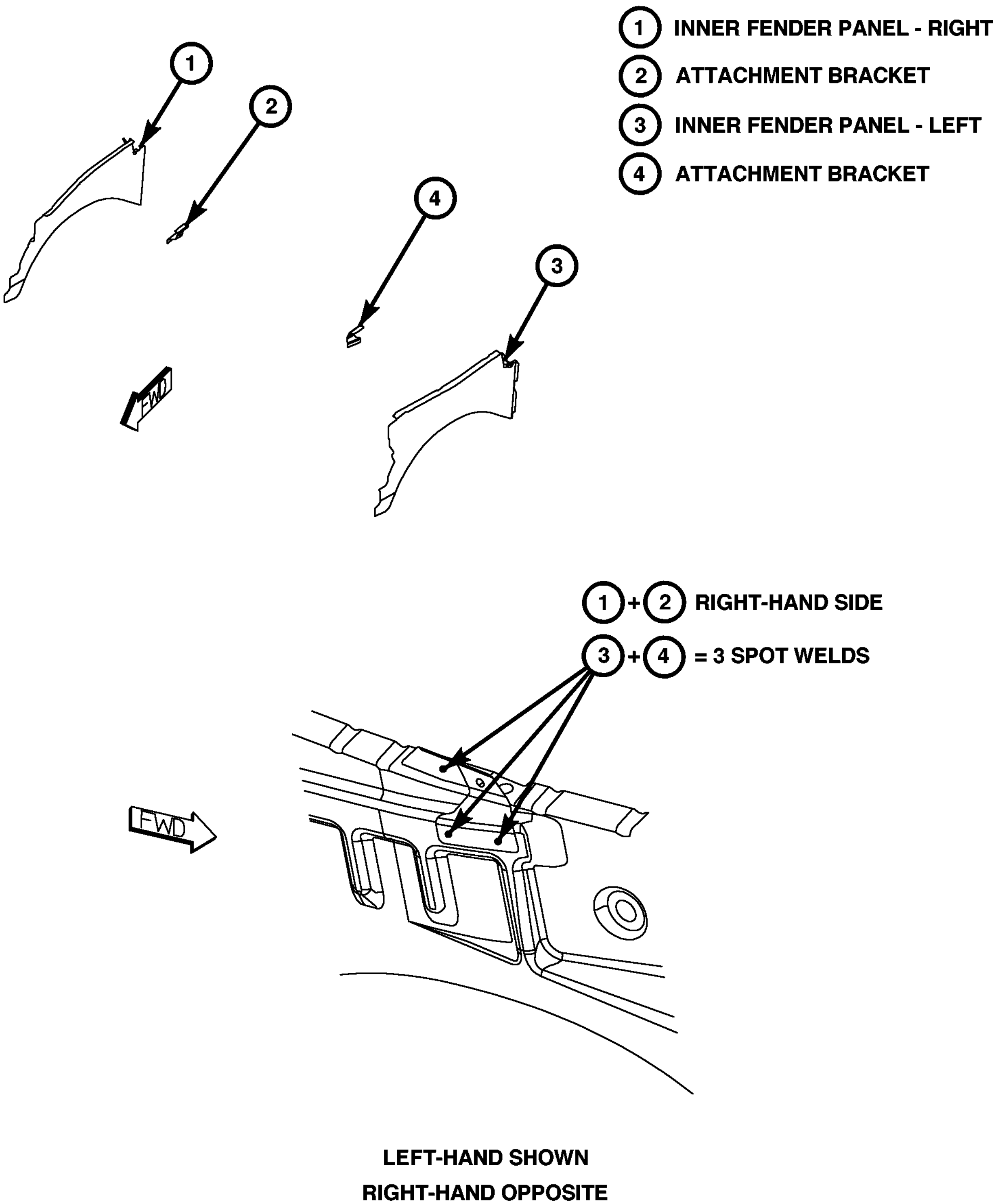


Fig. 4 INNER FRONT PANELS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

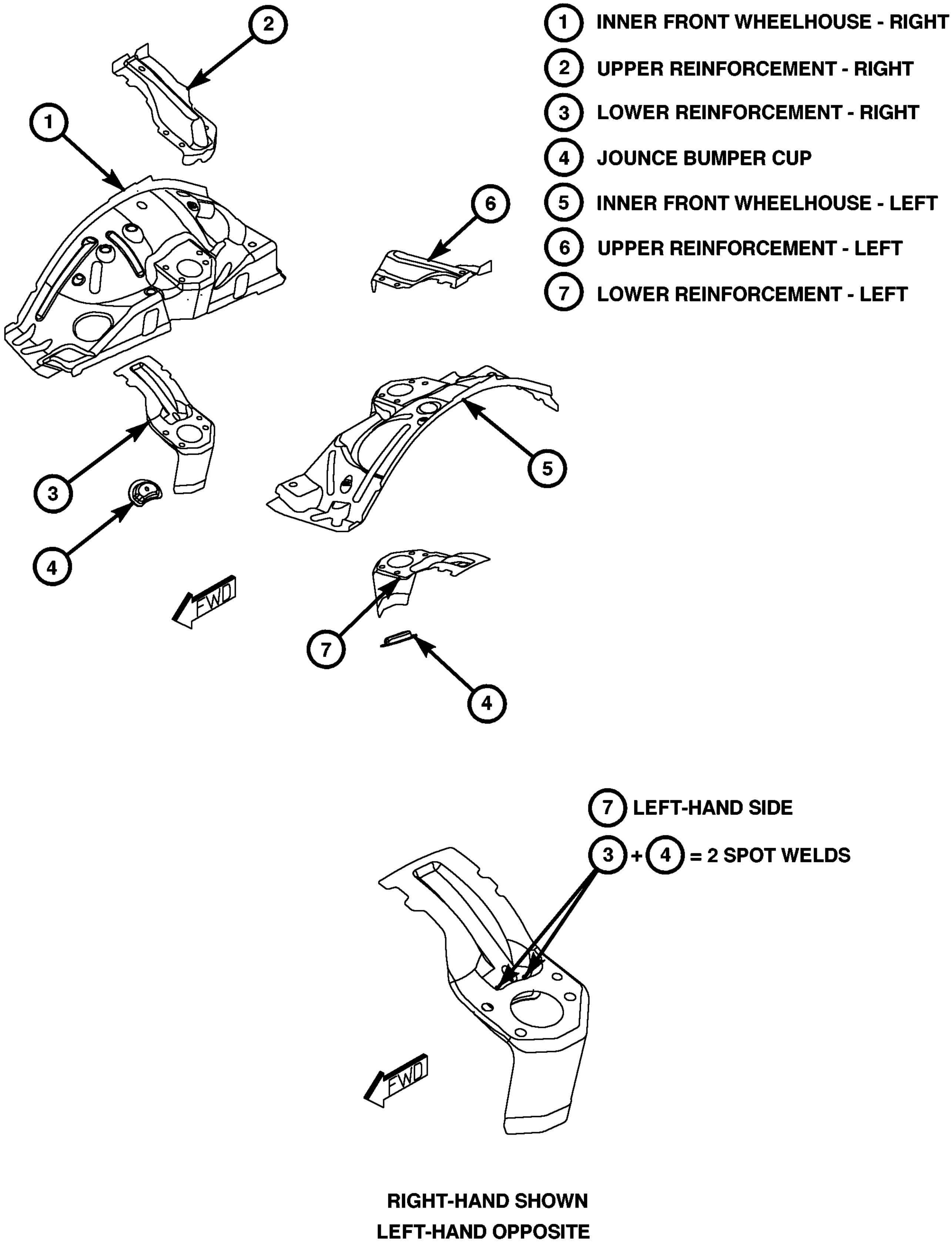


Fig. 5 INNER WHEEL HOUSES

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

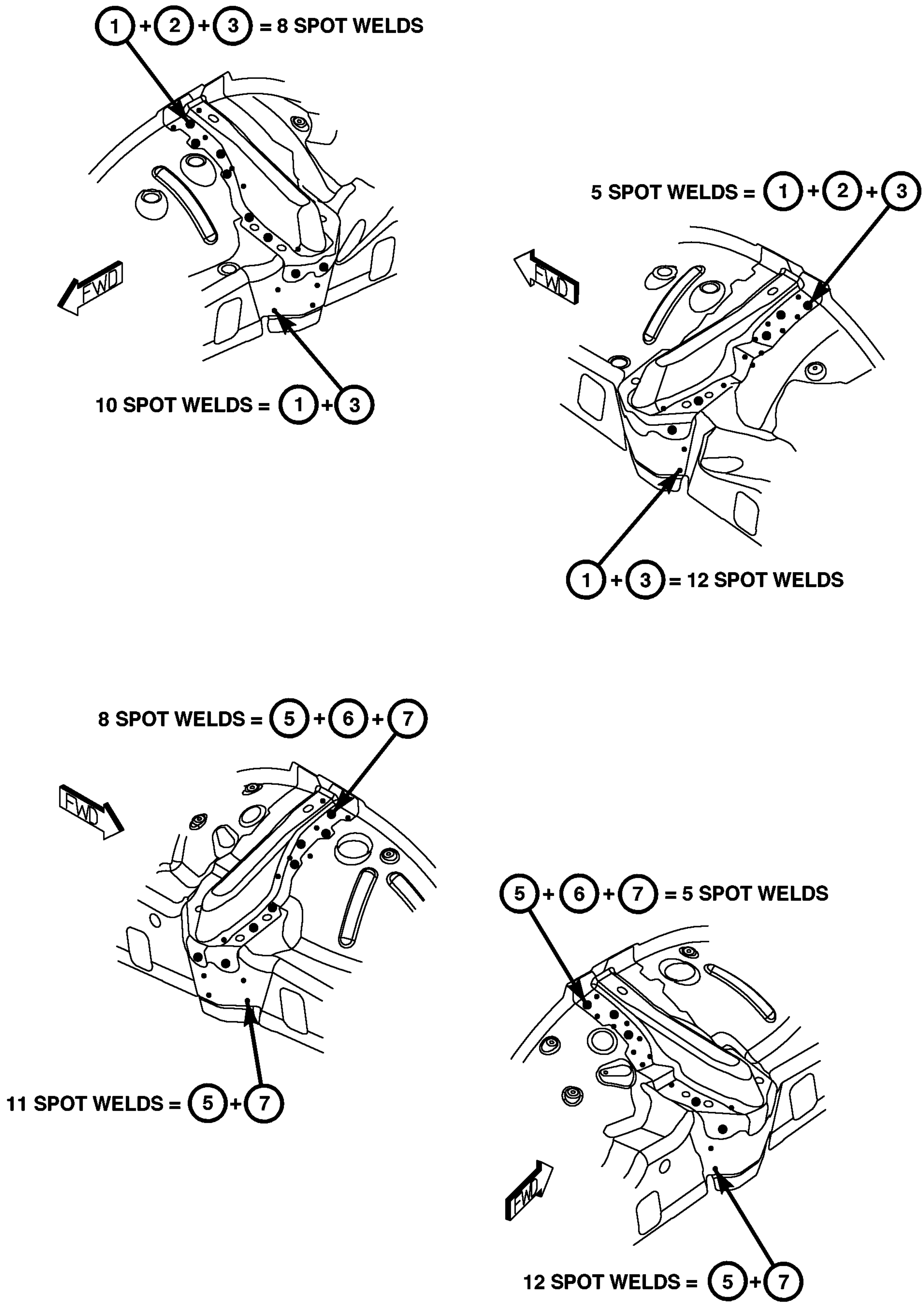


Fig. 6 INNER WHEEL HOUSES

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

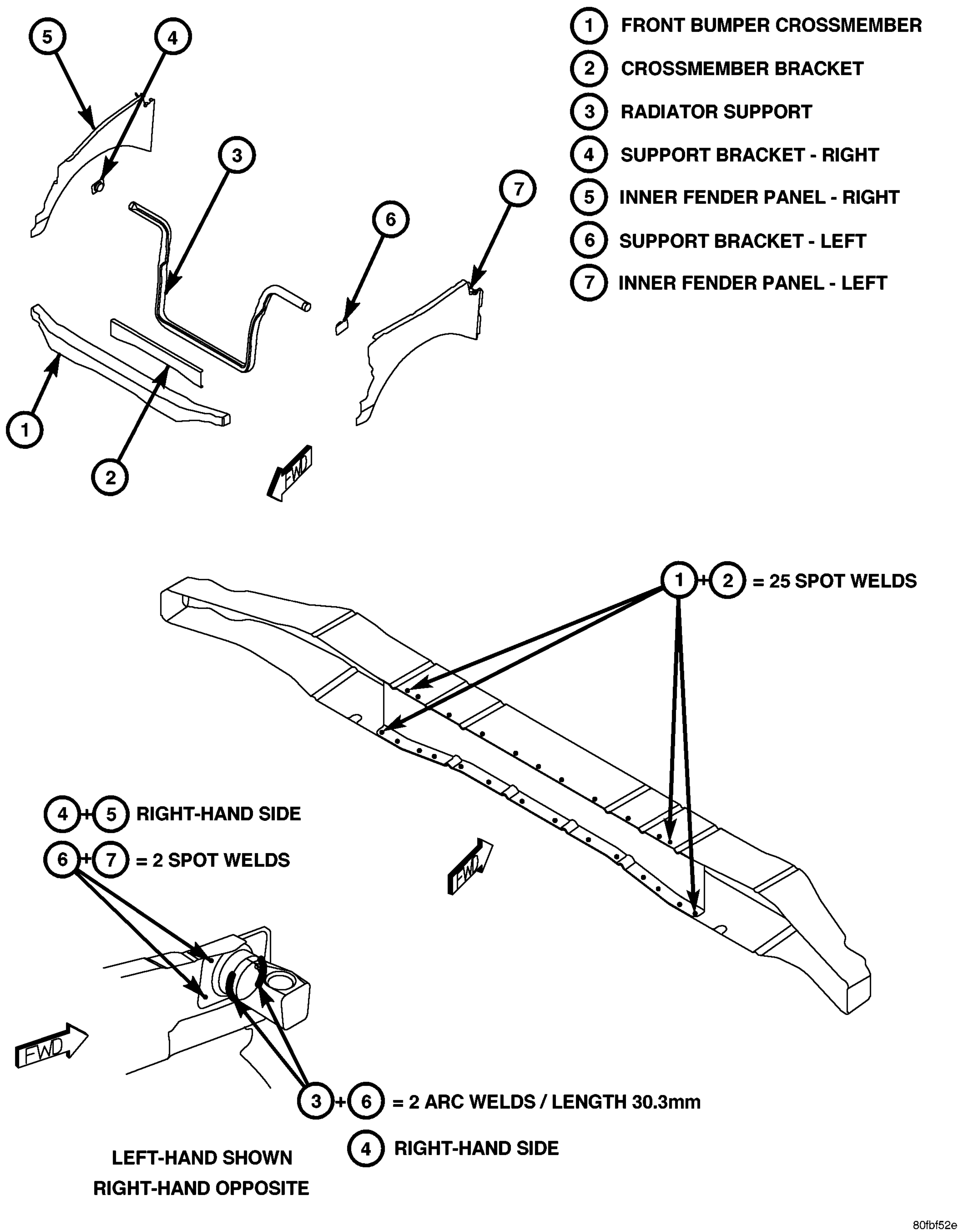


Fig. 7 FRONT BUMPER CROSSMEMBER

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

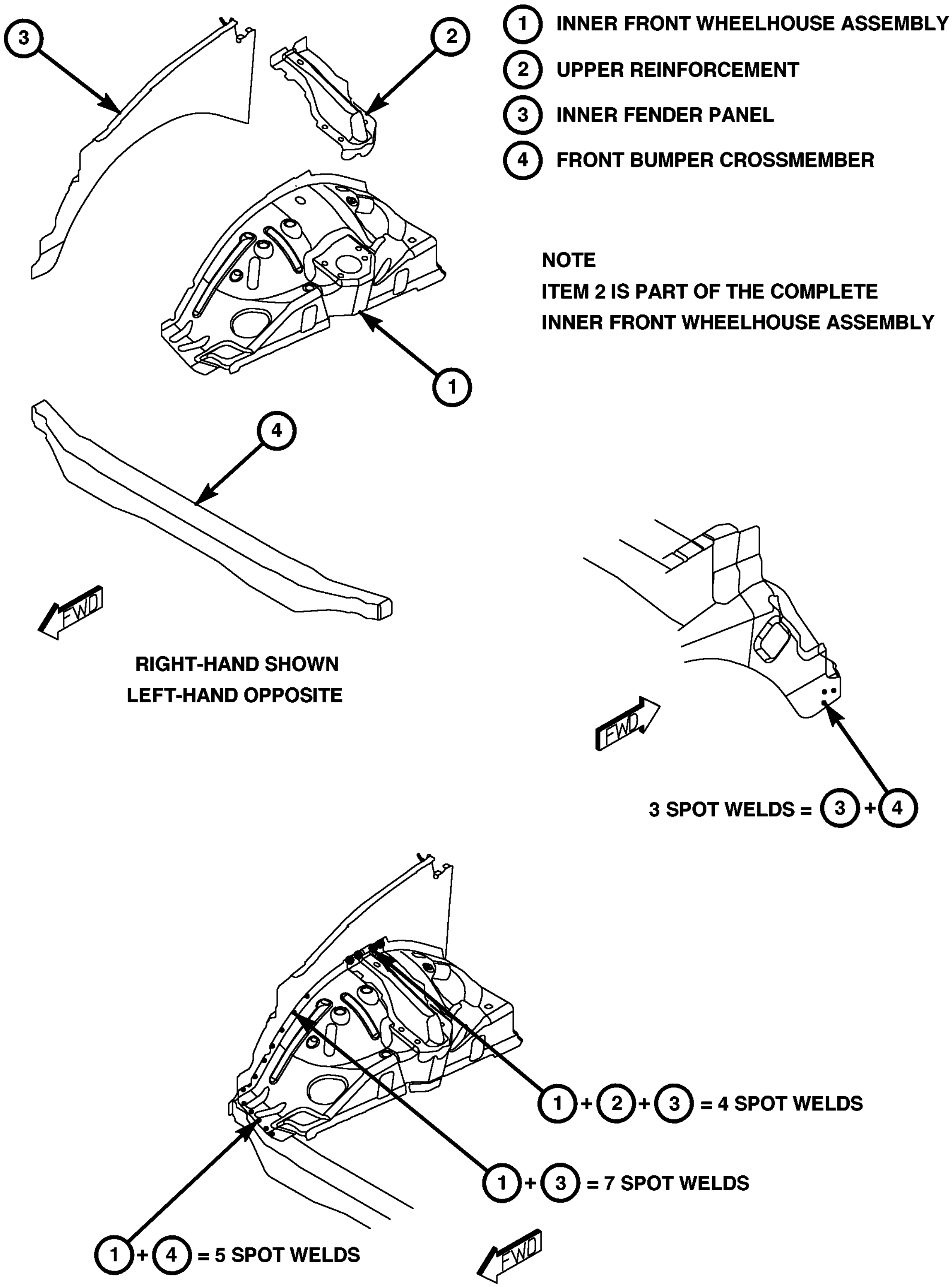


Fig. 8 INNER FRONT WHEELHOUSE

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

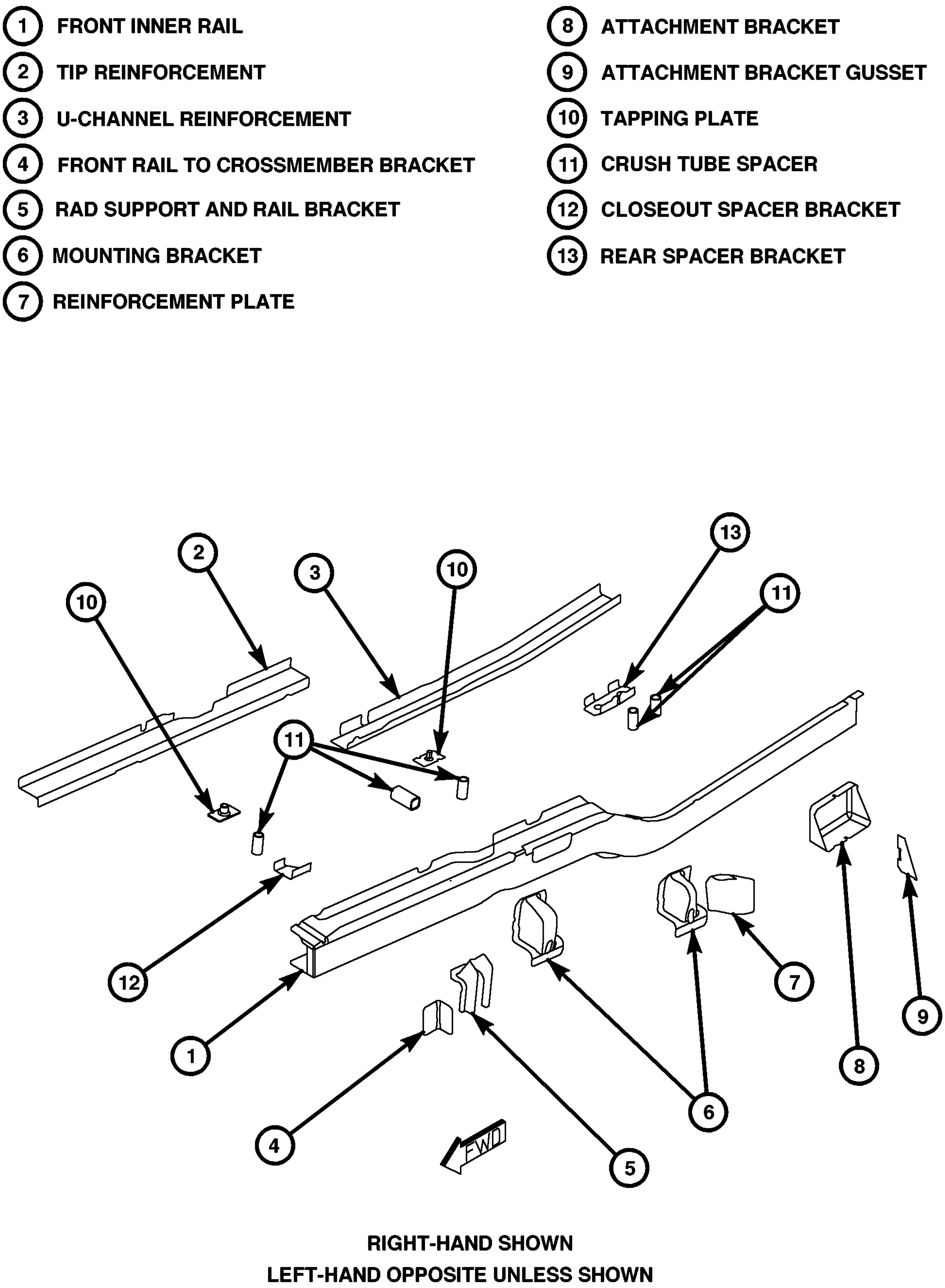


Fig. 9 FRONT INNER RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

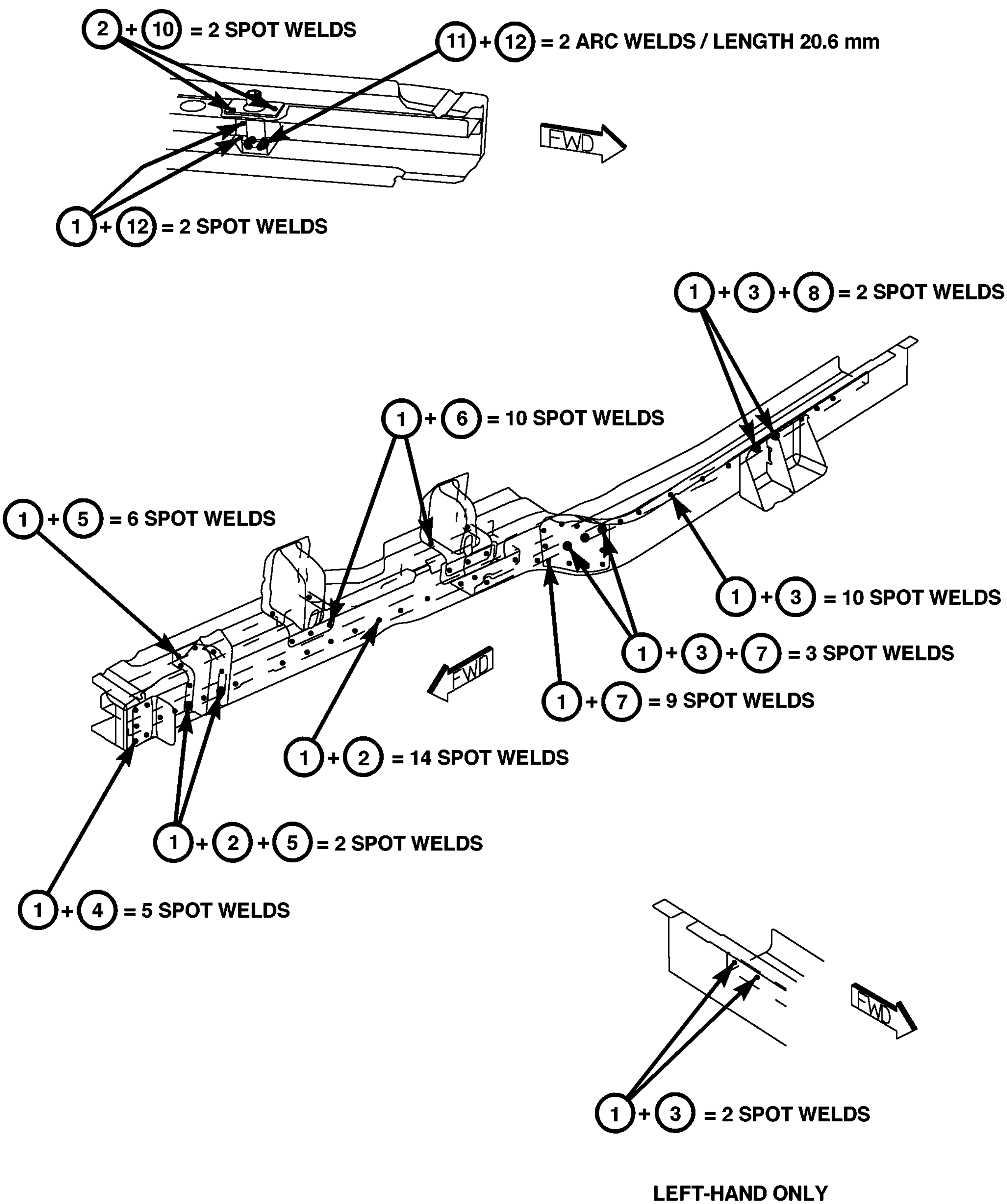


Fig. 10 FRONT INNER RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

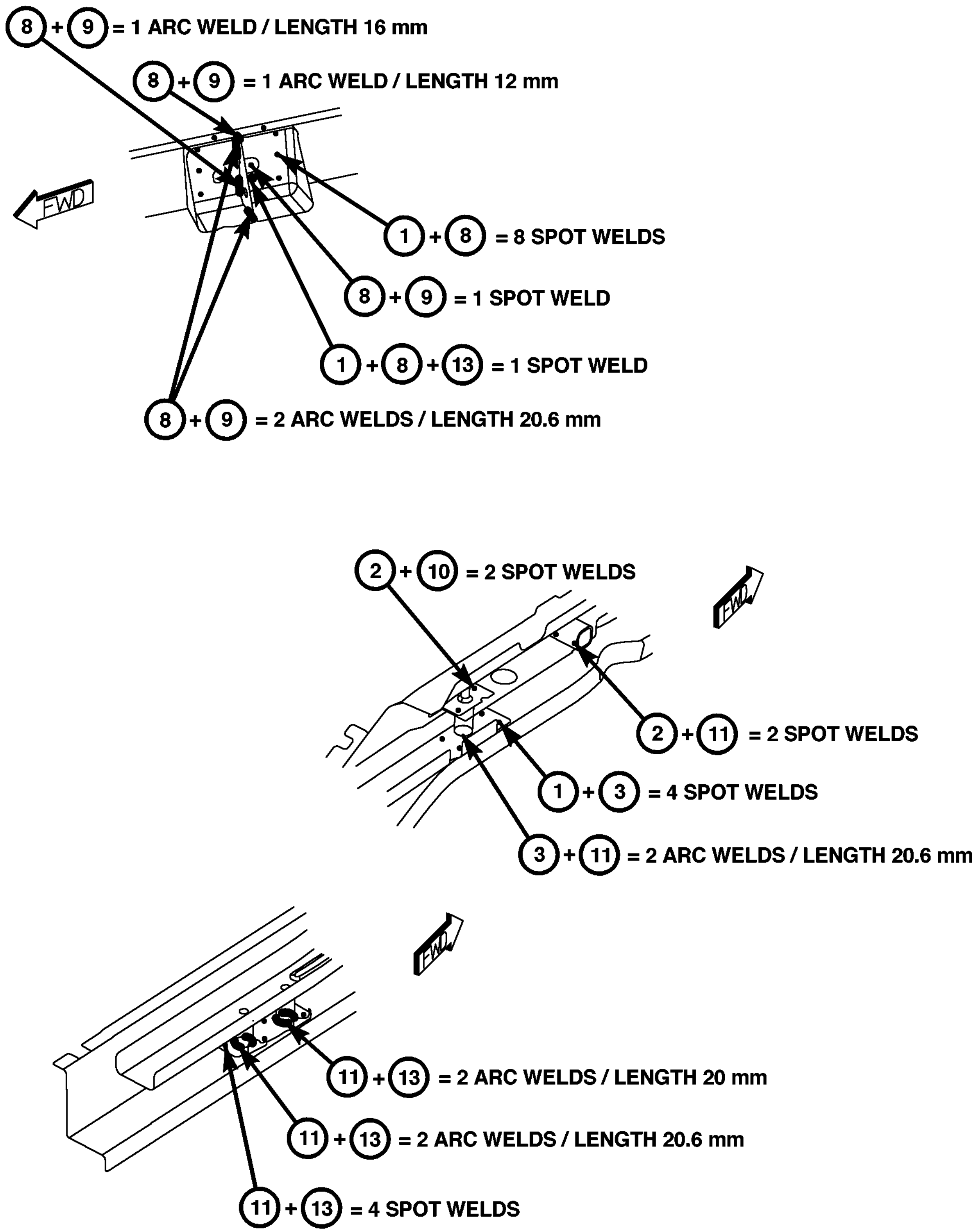


Fig. 11 FRONT INNER RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

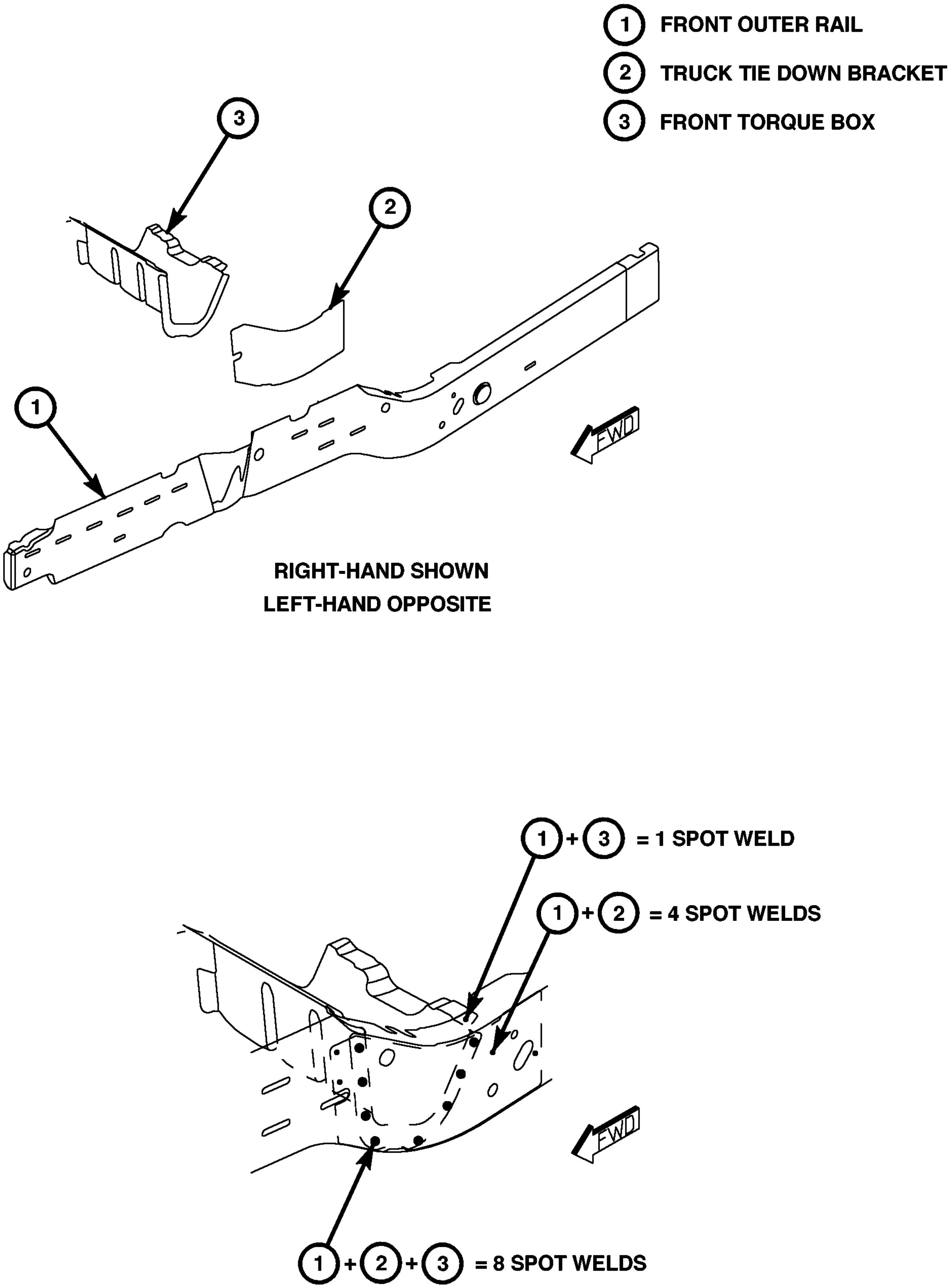


Fig. 12 FRONT OUTER RAIL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

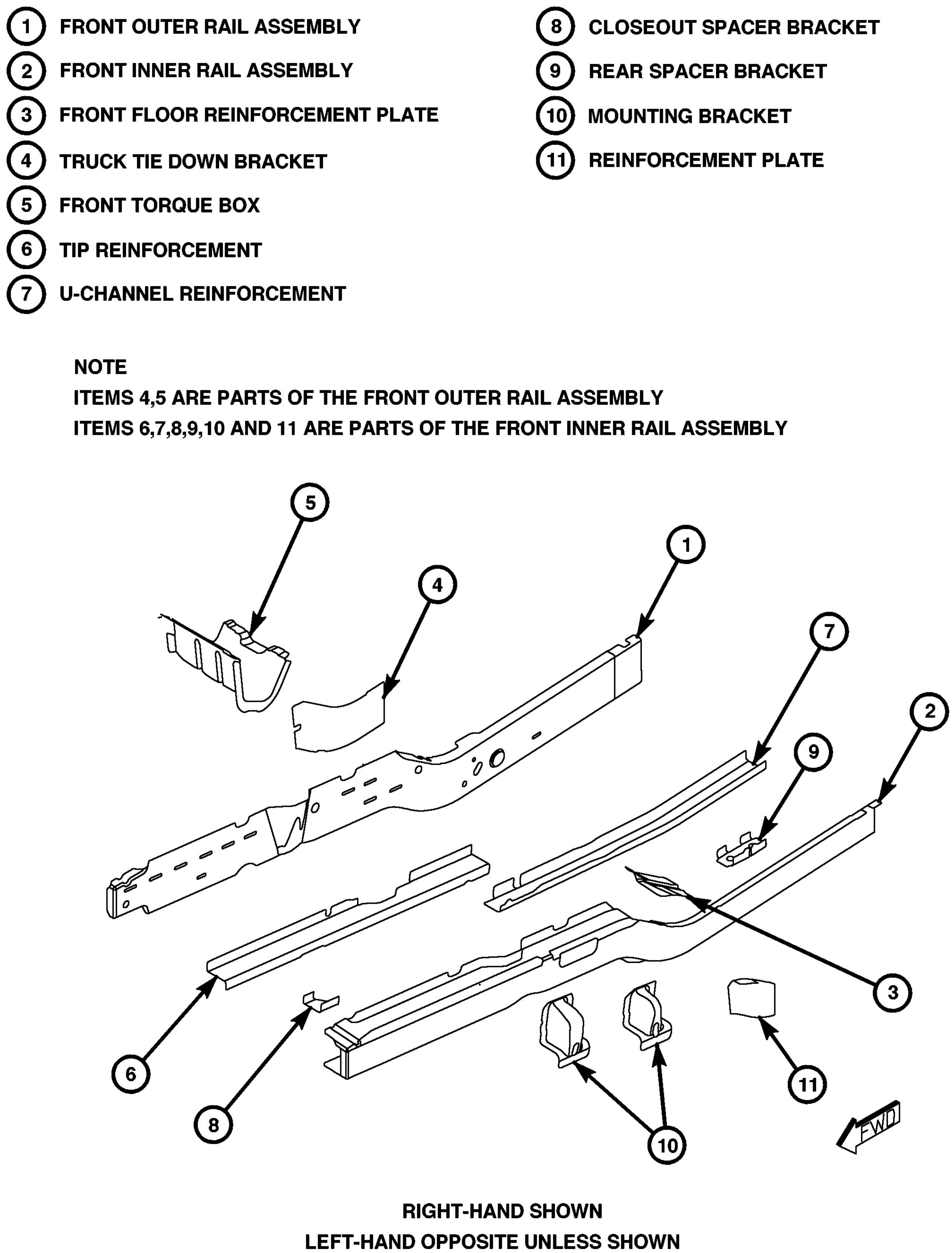


Fig. 13 FRONT OUTER RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

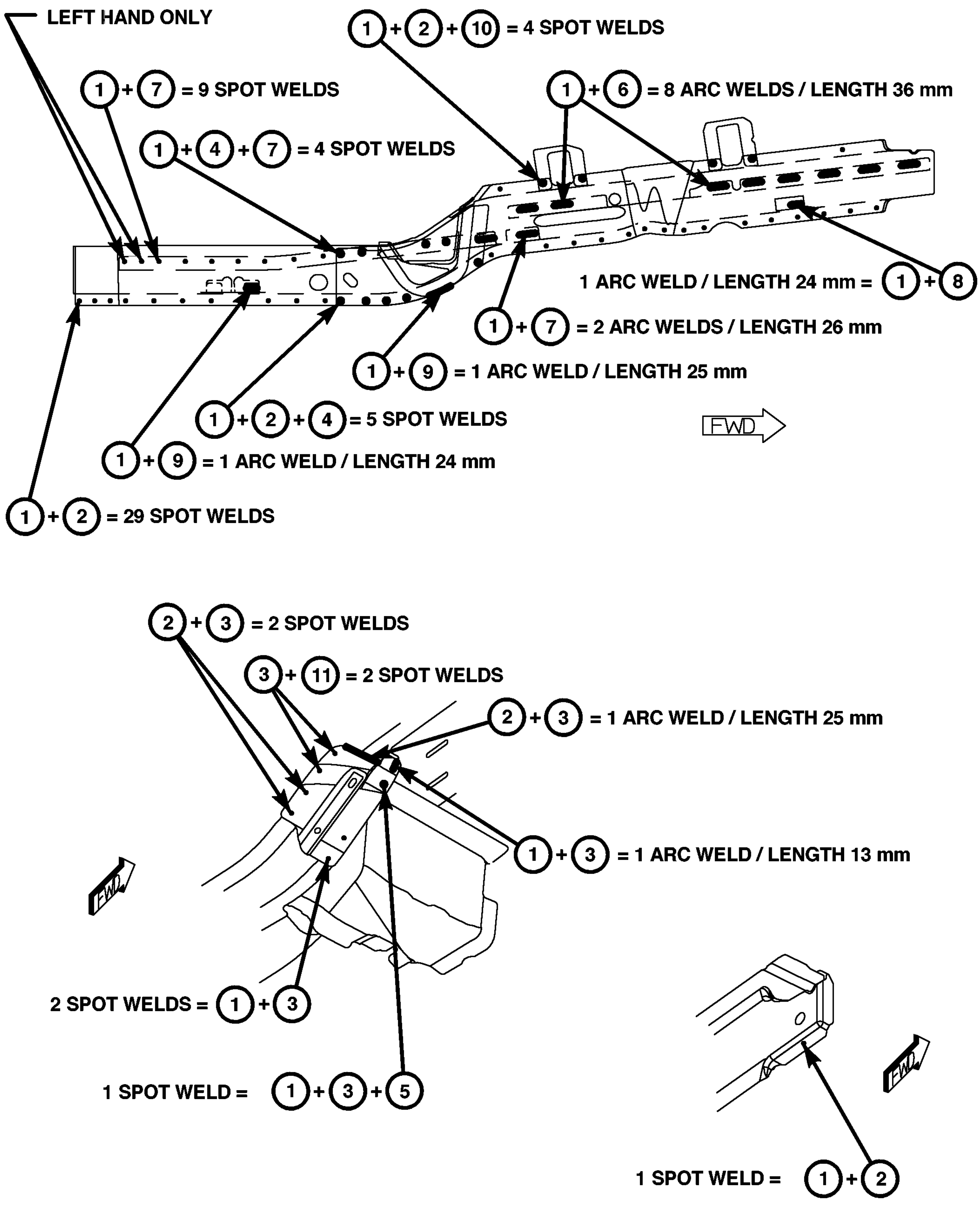


Fig. 14 FRONT OUTER RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

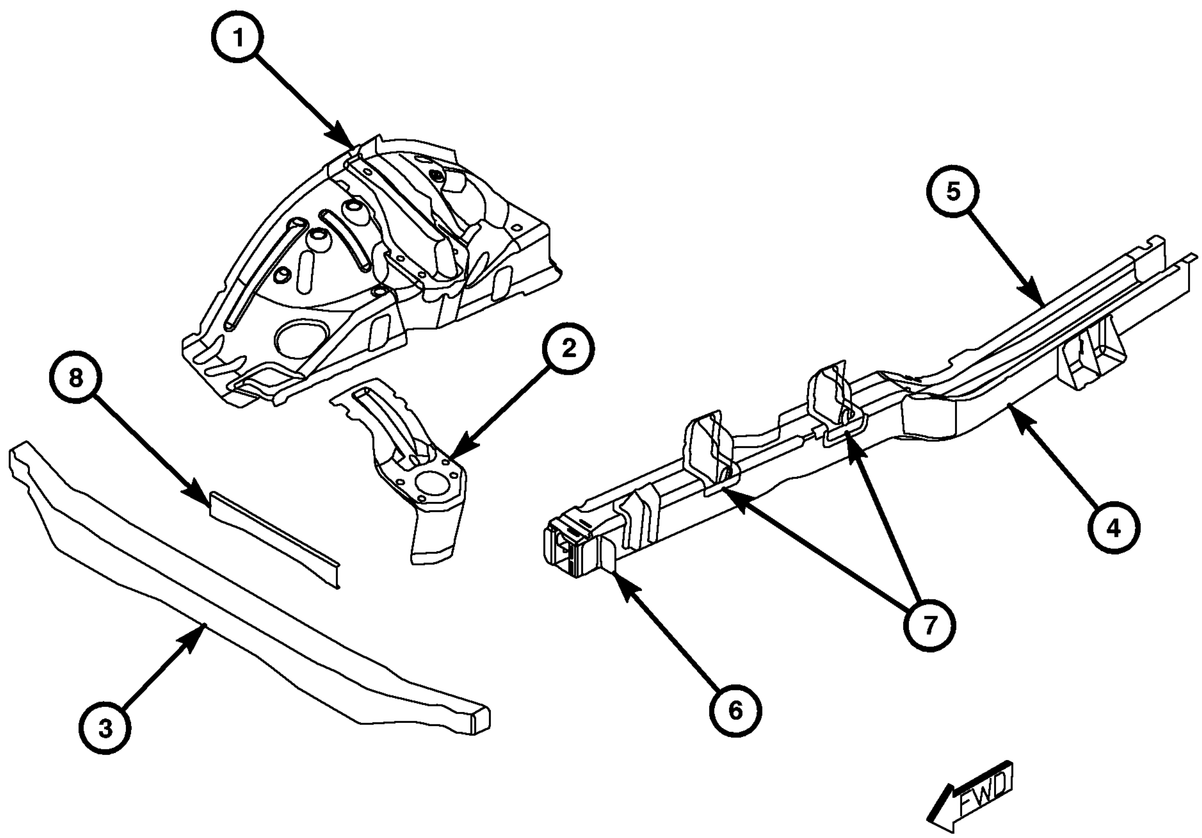
1. INNER FRONT WHEELHOUSE
2. LOWER REINFORCEMENT
3. FRONT BUMPER CROSSMEMBER
4. FRONT INNER RAIL ASSEMBLY
5. FRONT OUTER RAIL ASSEMBLY
6. FRONT RAIL TO CROSSMEMBER BRACKET
7. MOUNTING BRACKET
8. CROSSMEMBER BRACKET

NOTE

ITEMS 4,5,6 AND 7 ARE PARTS OF THE COMPLETE FRONT RAIL ASSEMBLY

ITEM 2 IS PART OF THE COMPLETE INNER FRONT WHEELHOUSE ASSEMBLY

ITEM 8 IS PART OF THE COMPLETE FRONT BUMPER CROSSMEMBER ASSEMBLY

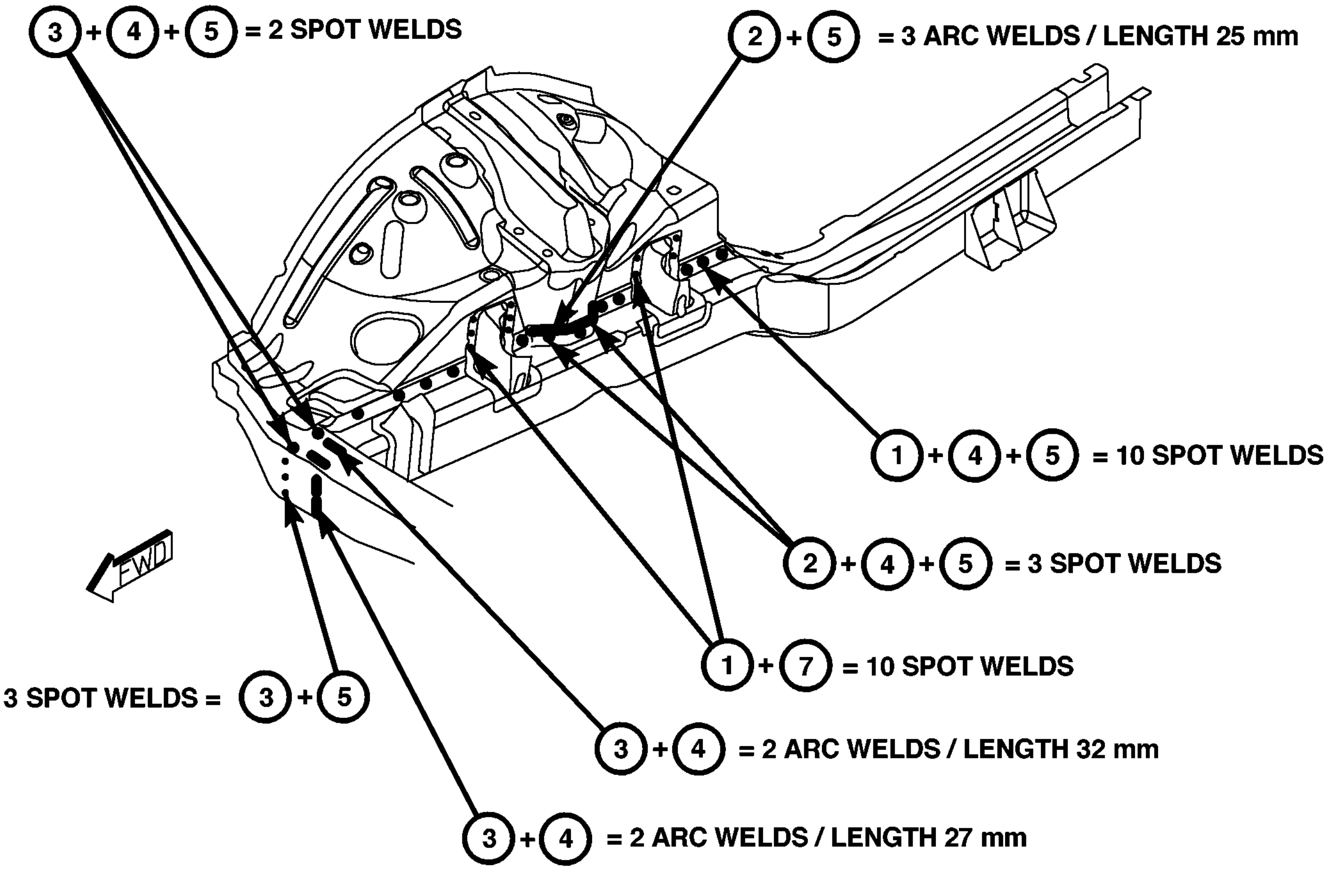


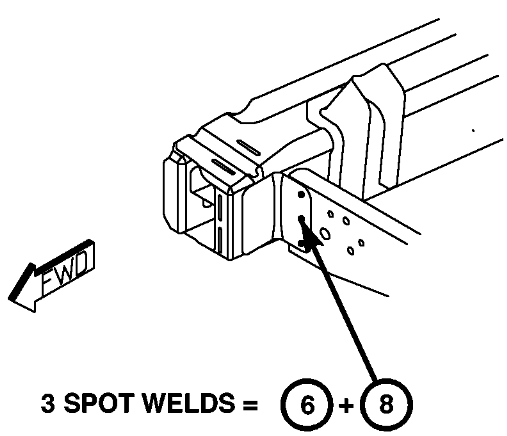
RIGHT-HAND SHOWN

LEFT-HAND OPPOSITE

Fig. 15 INNER FRONT WHEELHOUSE/FRONT INNER RAIL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)





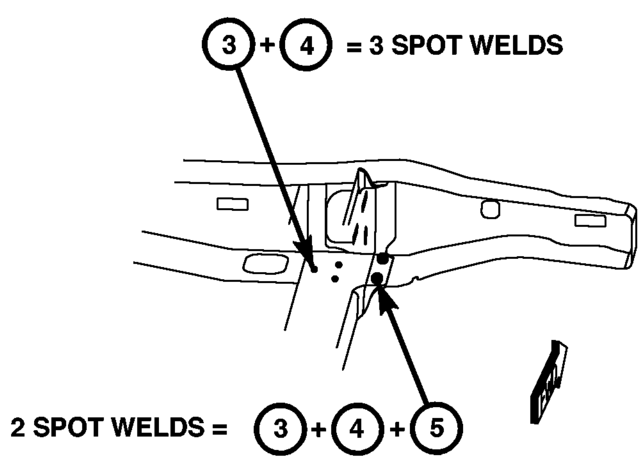


Fig. 16 INNER FRONT WHEELHOUSE/FRONT INNER RAIL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

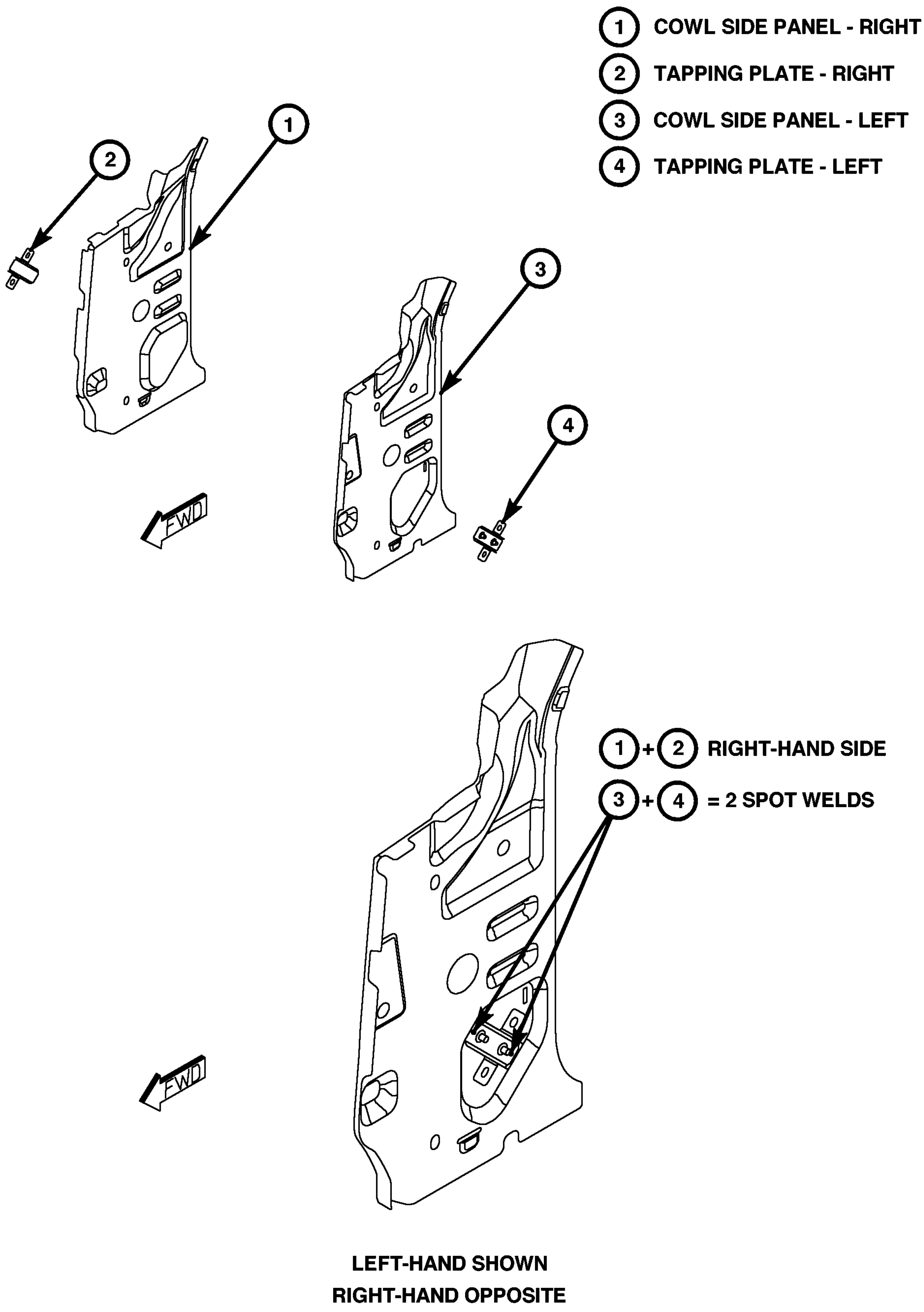


Fig. 17 COWL SIDE PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

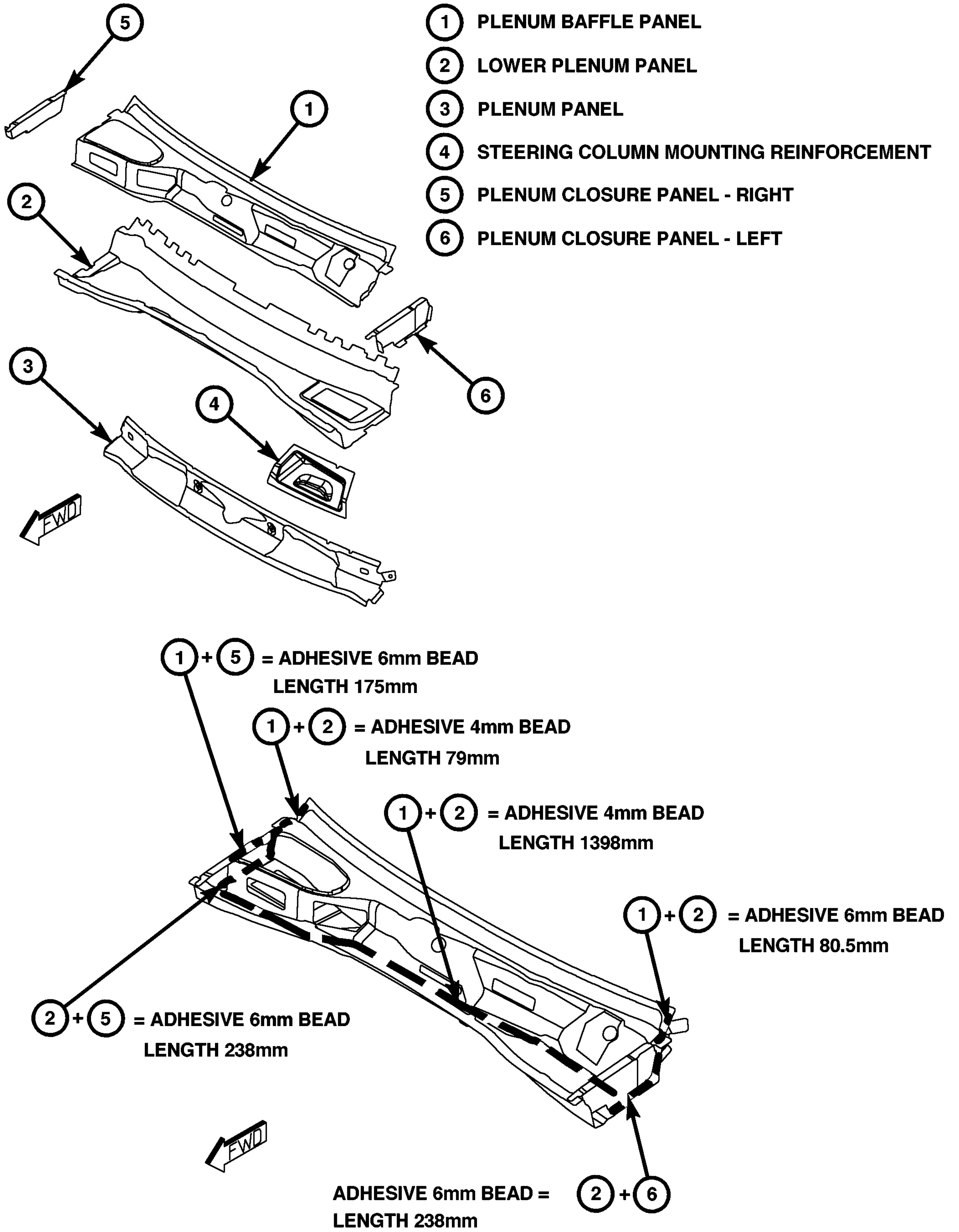


Fig. 18 PLENUM ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

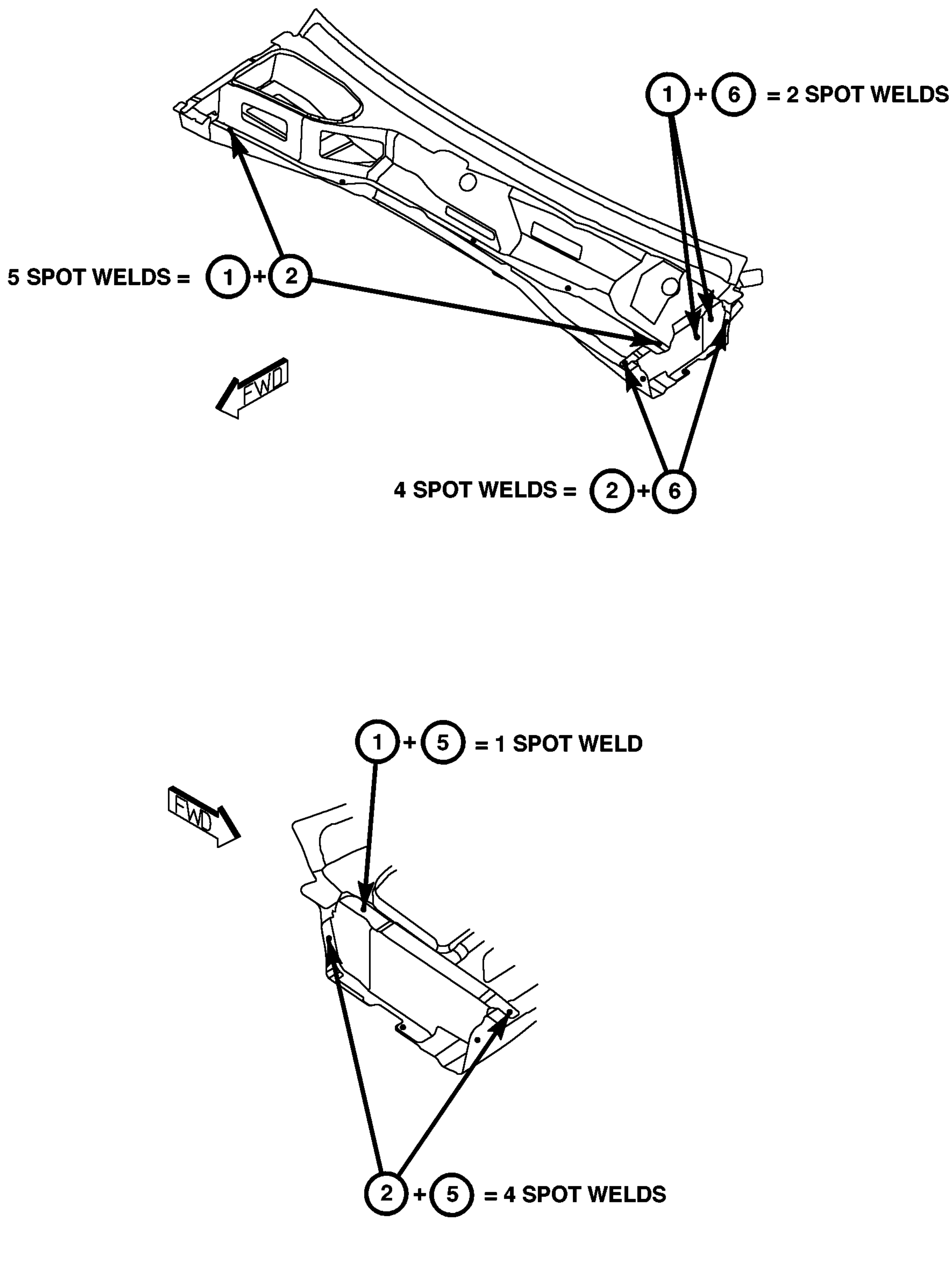
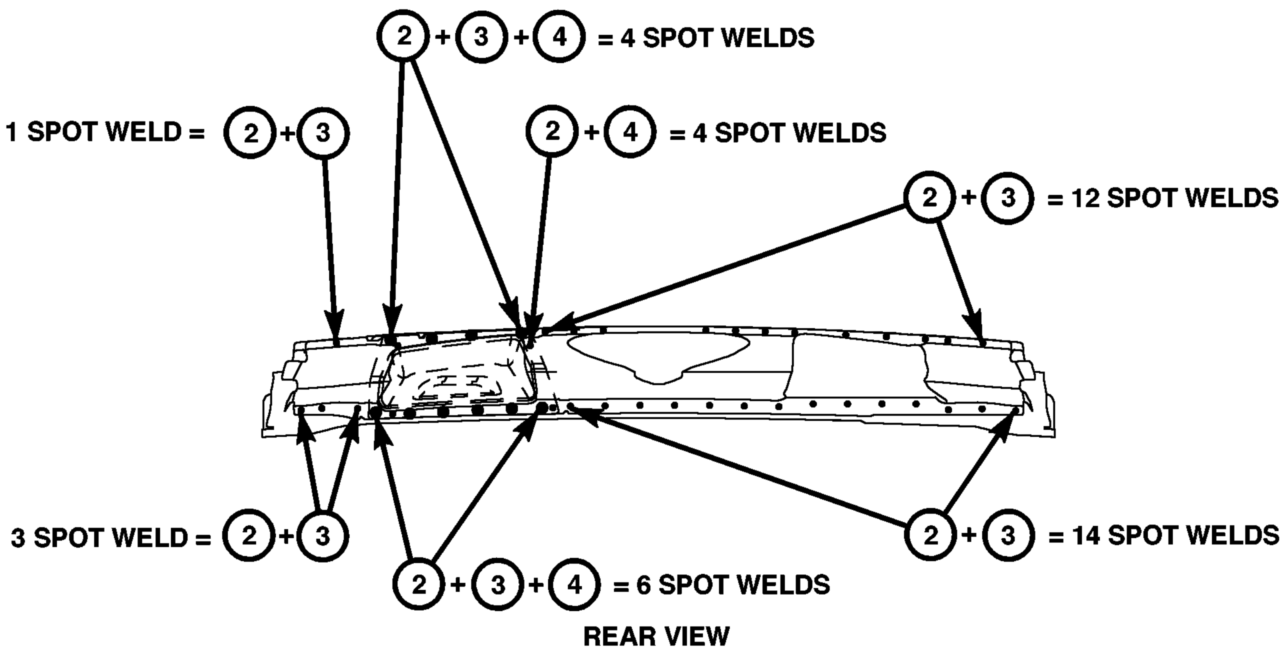


Fig. 19 PLENUM ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)



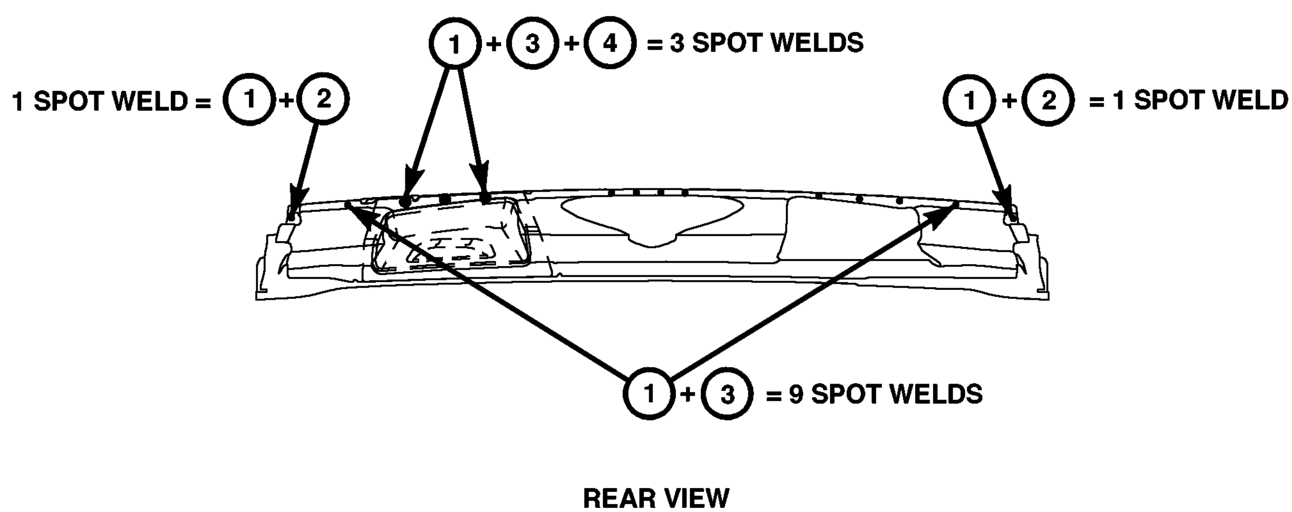


Fig. 20 PLENUM ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

FRONT END ASSEMBLY/UNDERBODY

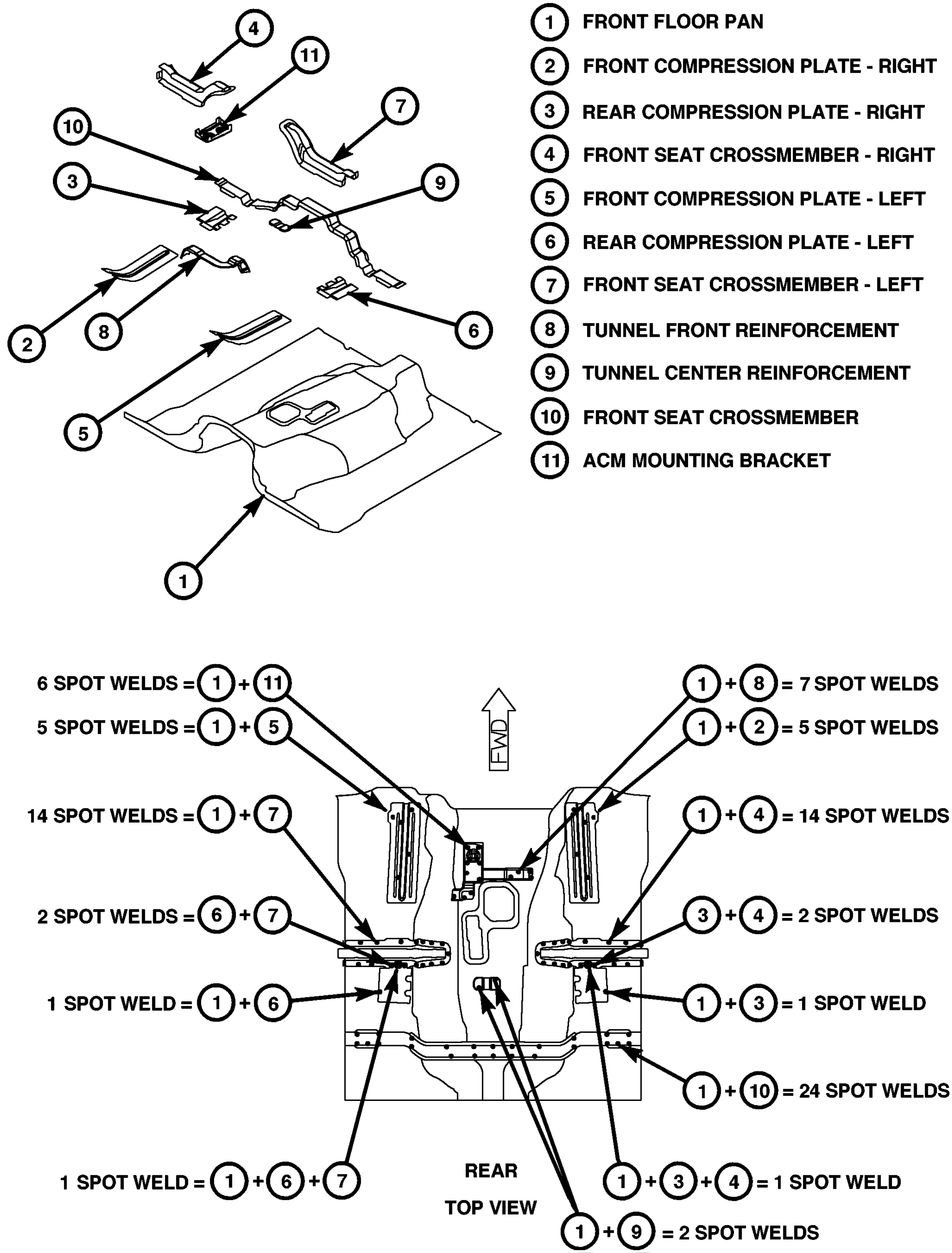


Fig. 21 FLOOR PAN ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

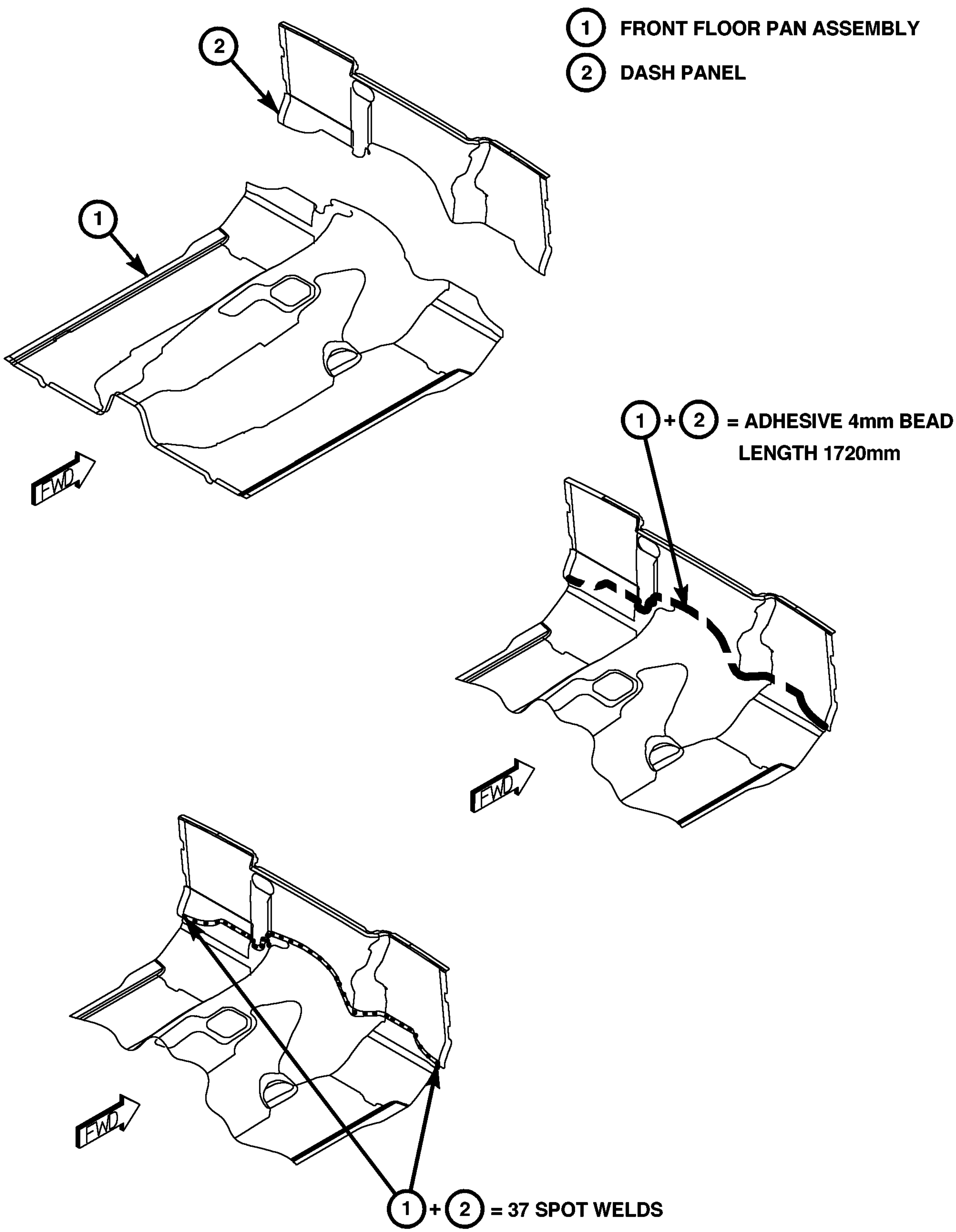


Fig. 22 FLOOR PAN ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

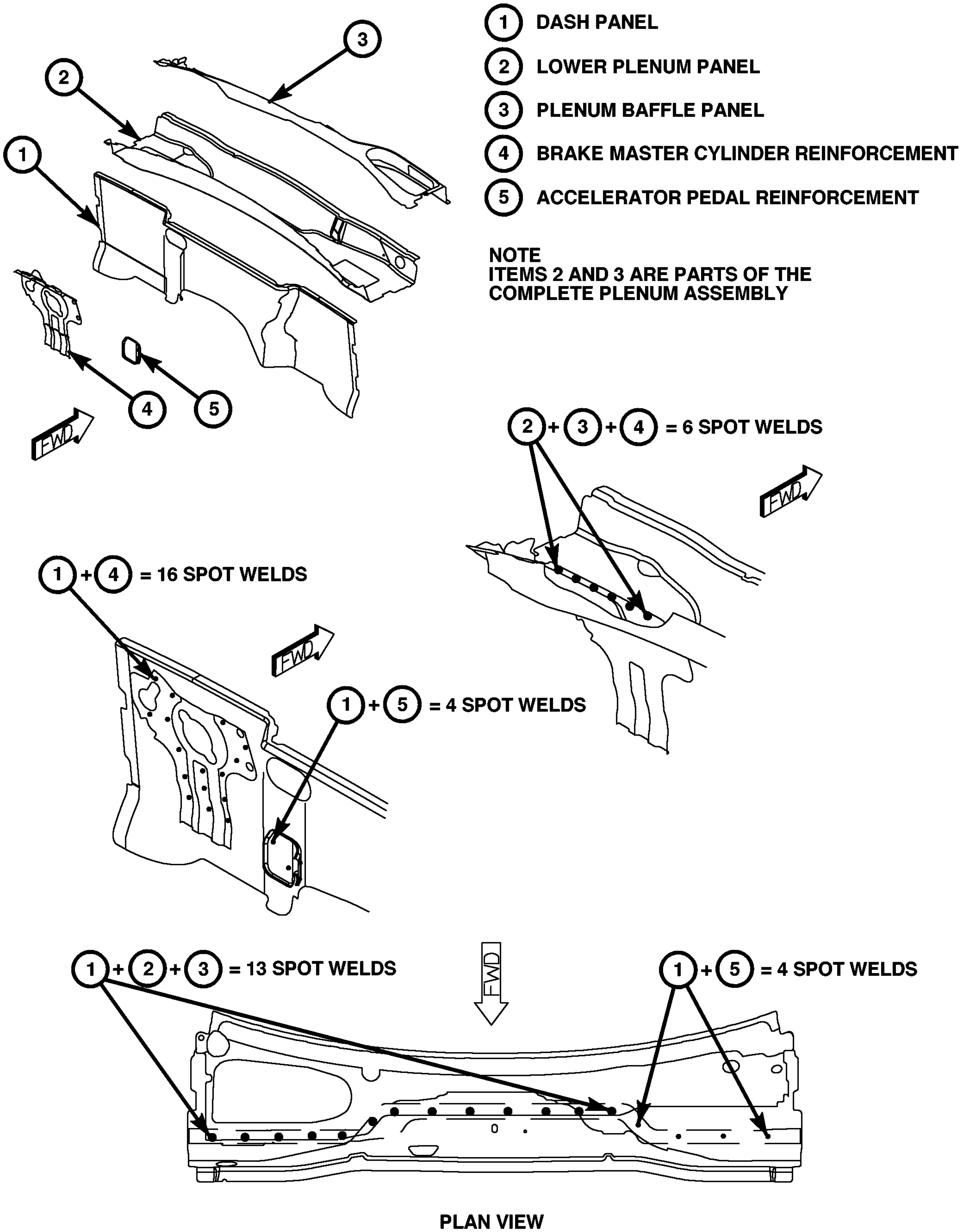


Fig. 23 DASH PANEL ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

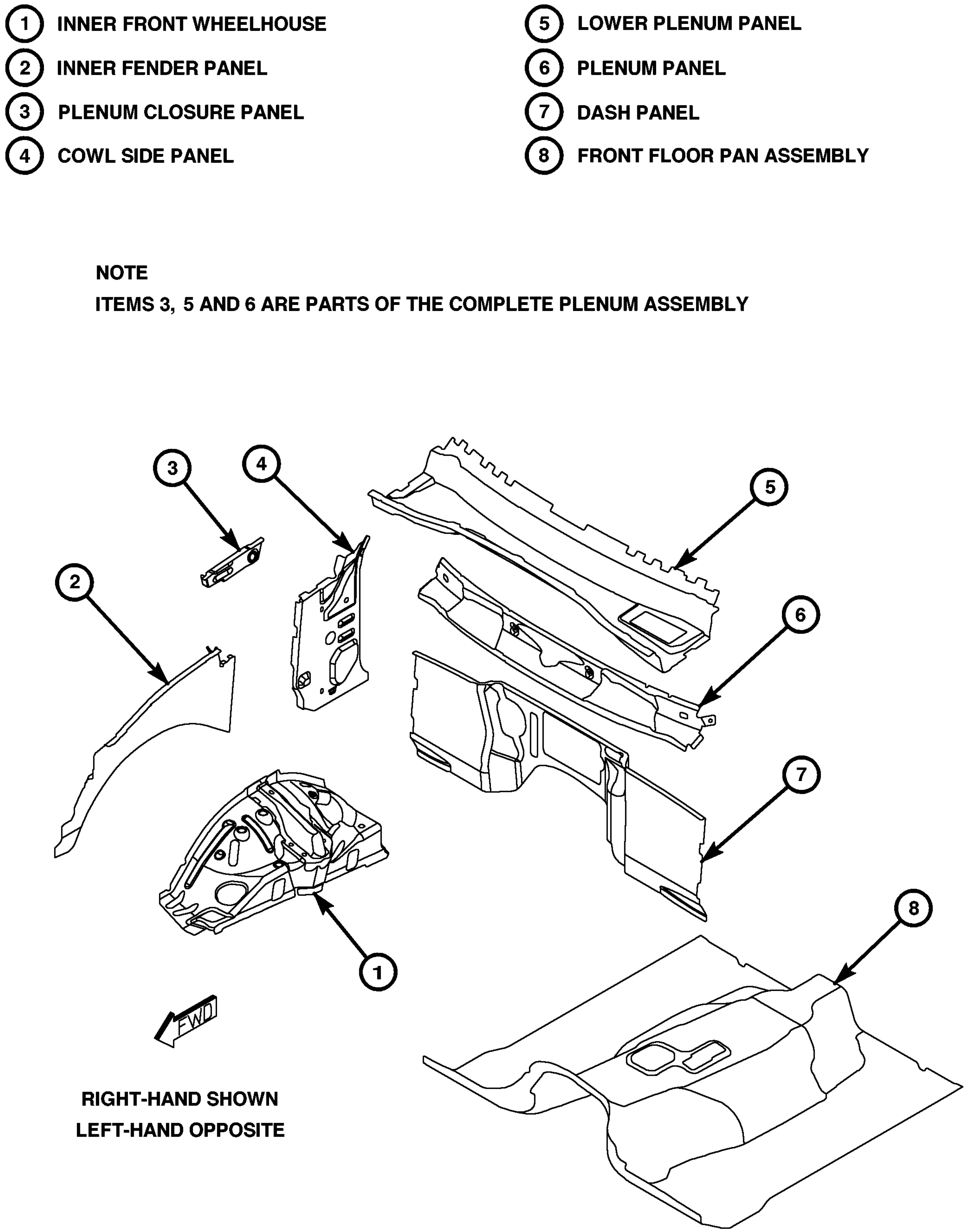


Fig. 24 DASH PANEL/WHEELHOUSE ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

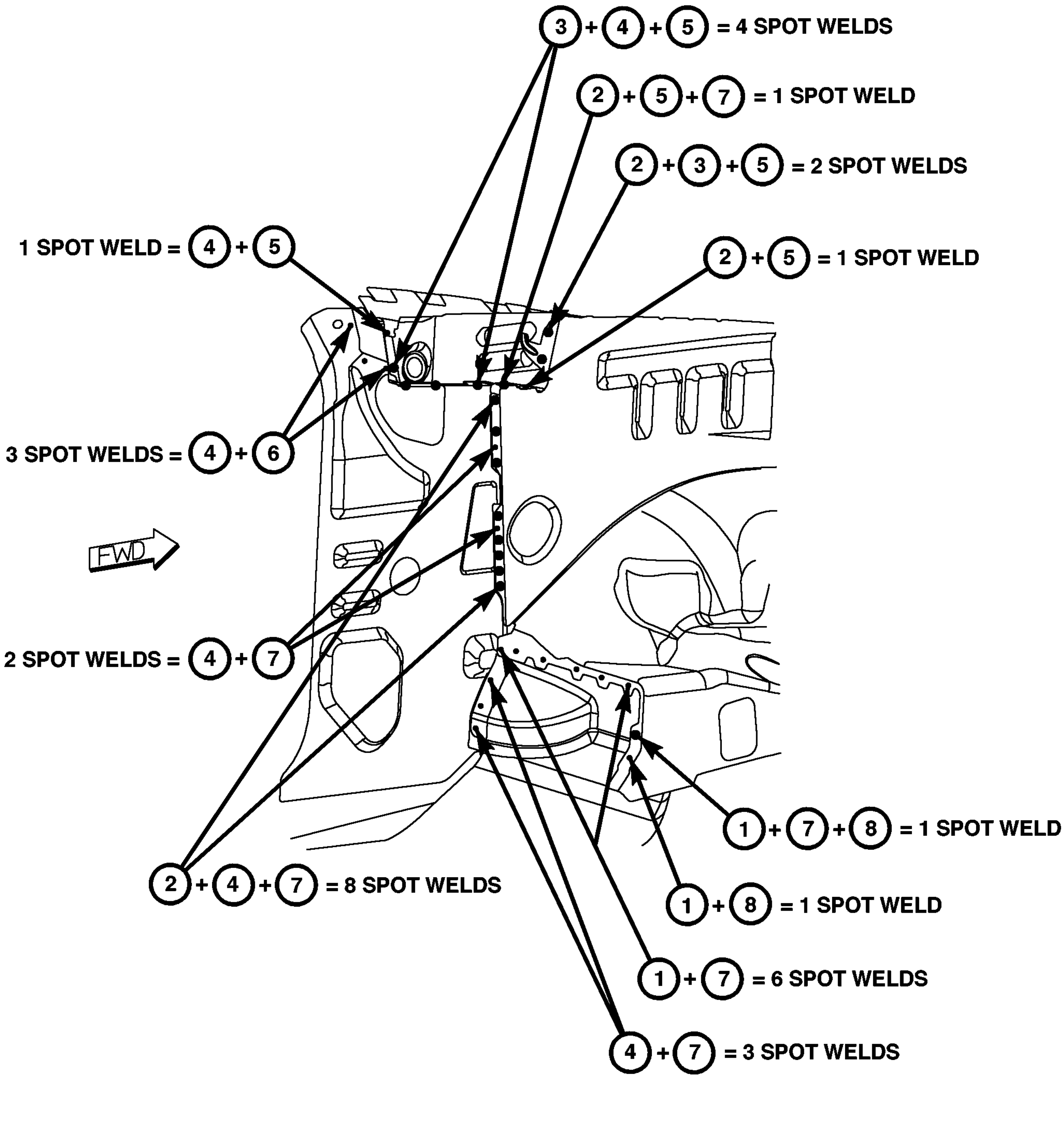
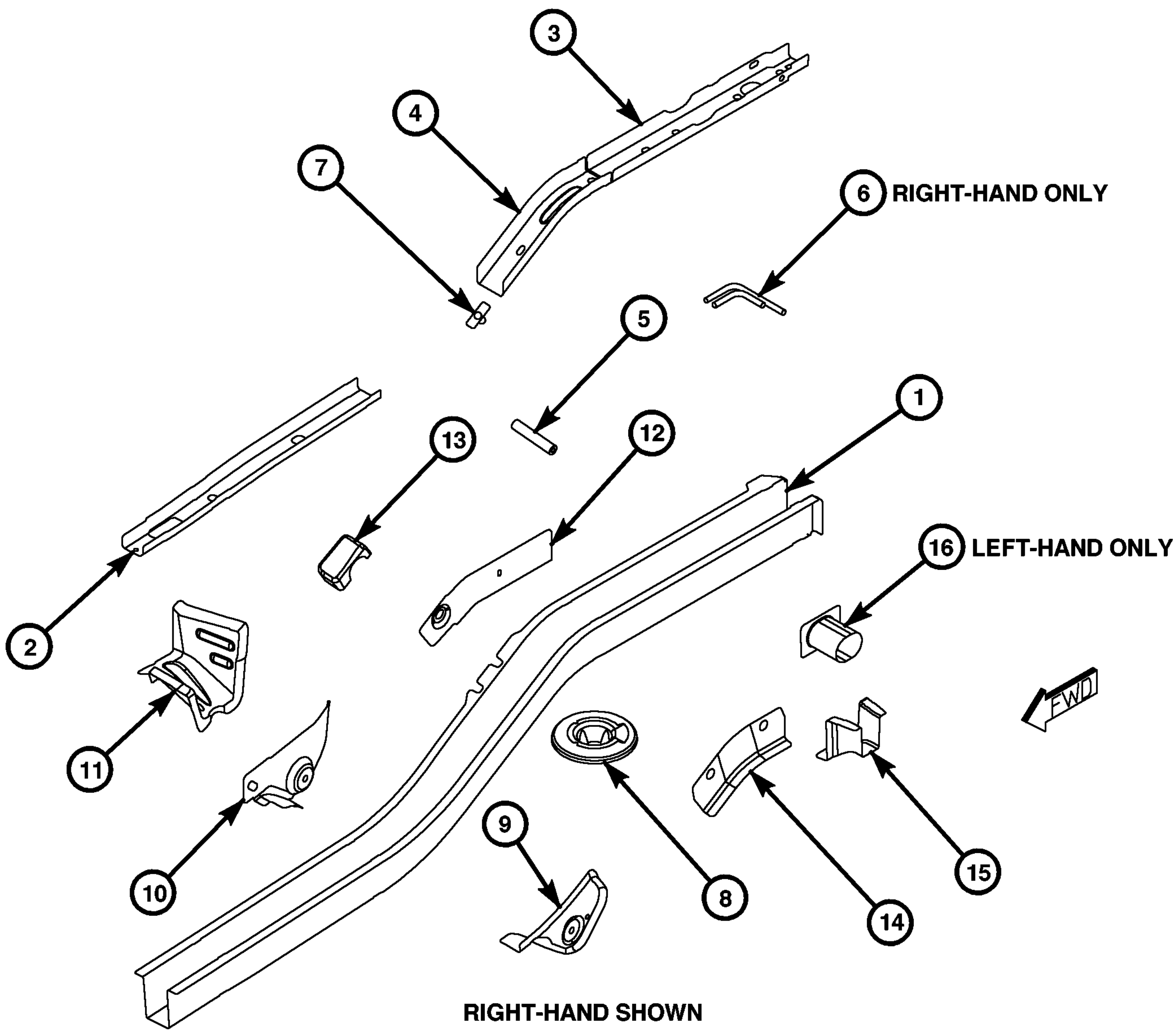


Fig. 25 COWL SIDE PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

REAR FRAME RAILS

1. REAR RAIL
2. RAIL FRONT REINFORCEMENT
3. RAIL REAR REINFORCEMENT
4. RAIL CENTER REINFORCEMENT
5. SHOCK MOUNTING SLEEVE
6. EXHAUST HANGER BRACKET
7. ANCHOR PLATE
8. COIL SPRING MOUNTING BRACKET
9. CONTROL ARM MOUNTING BRACKET
10. CONTROL ARM MOUNTING BRACKET
11. REAR TORQUE BOX
12. REAR SHOCK MOUNTING BRACKET
13. REAR SHOCK MOUNTING REINFORCEMENT
14. SPRING MOUNTING REINFORCEMENT
15. REAR SPRING OUTER CROSSMEMBER
16. FUEL PASS THROUGH SLEEVE



RIGHT-HAND SHOWN

LEFT-HAND OPPOSITE UNLESS SHOWN

Fig. 26 REAR FRAME RAILS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

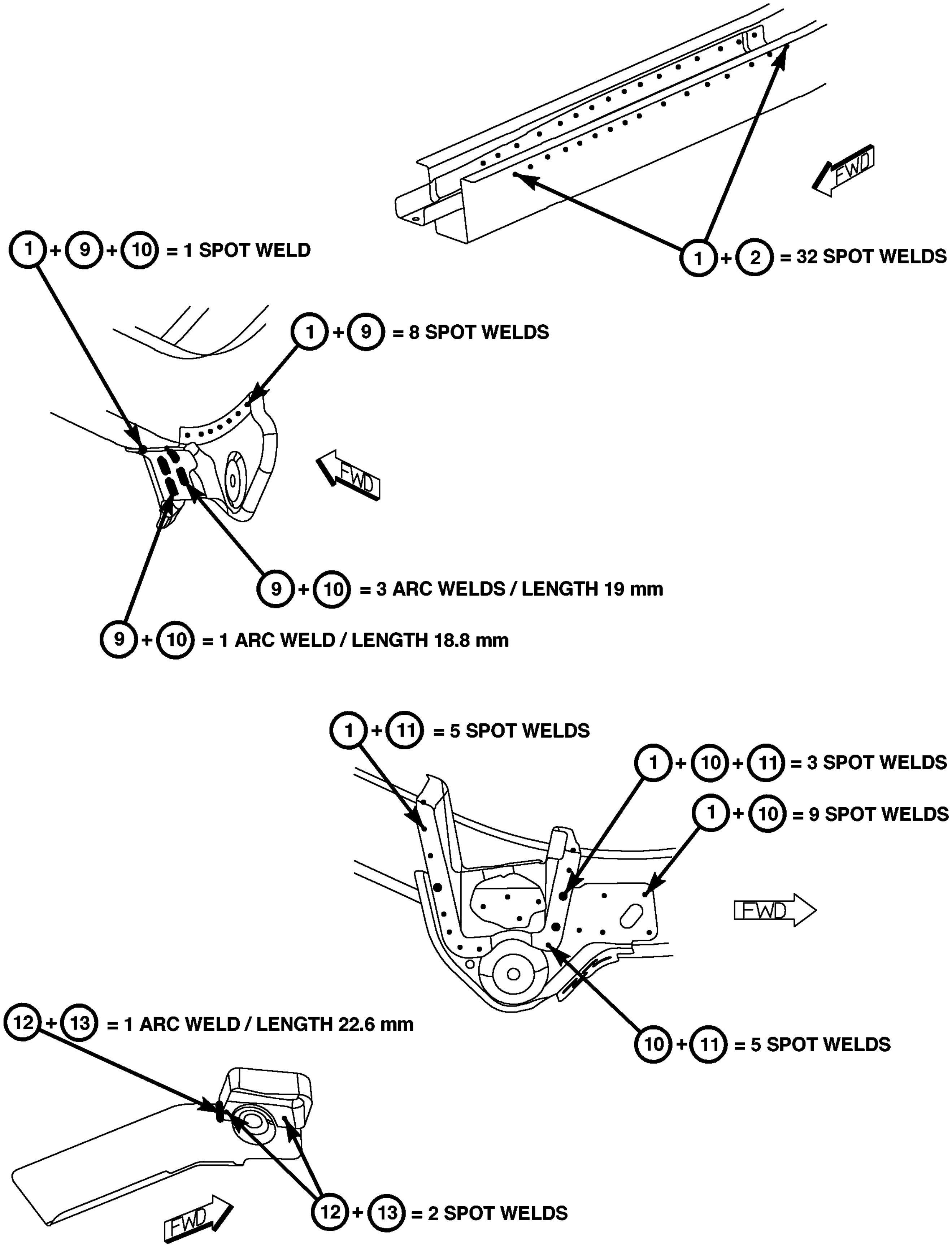


Fig. 27 REAR MOUNTING BRACKETS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

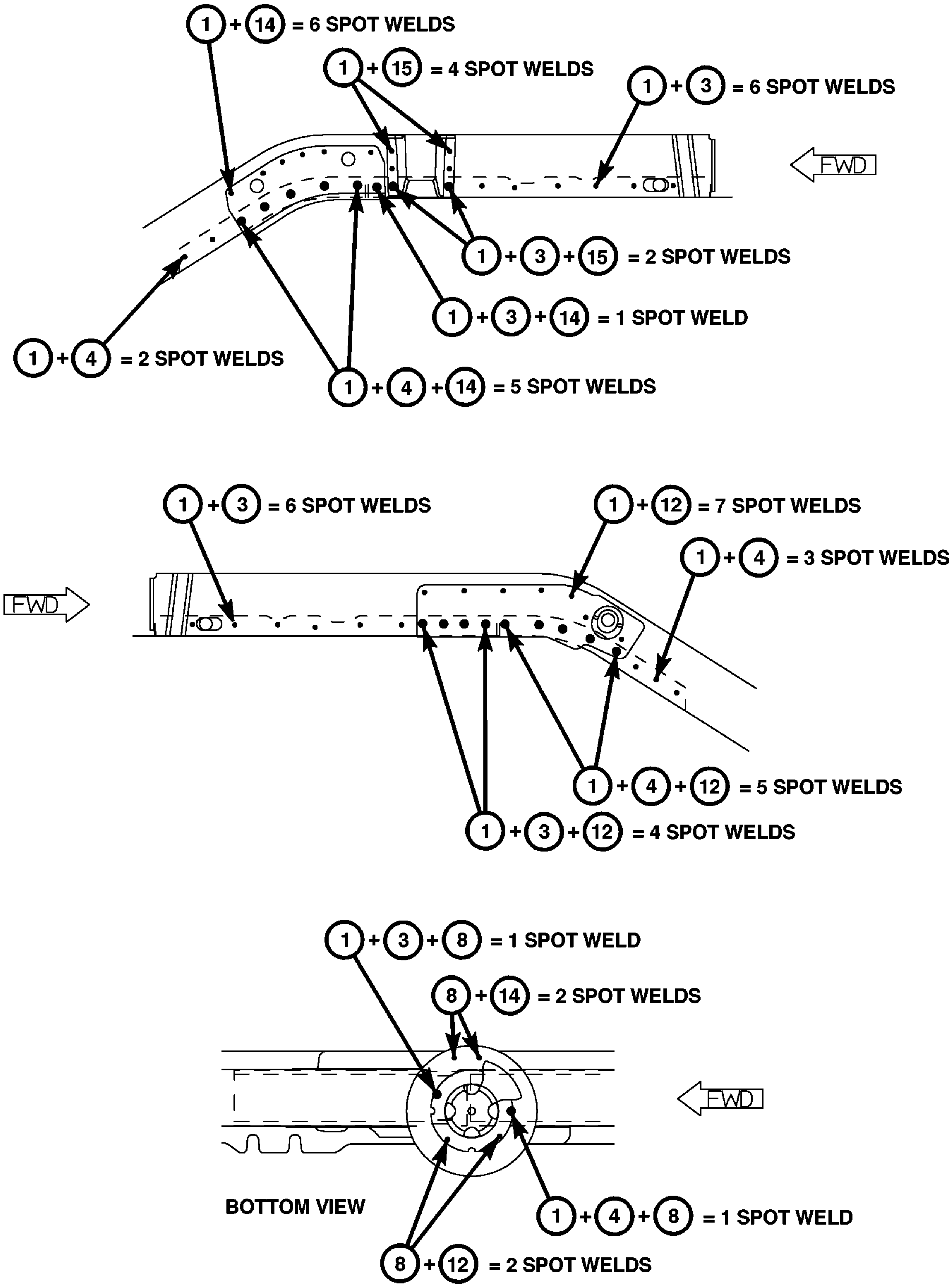


Fig. 28 REAR SPRING MOUNTINGS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

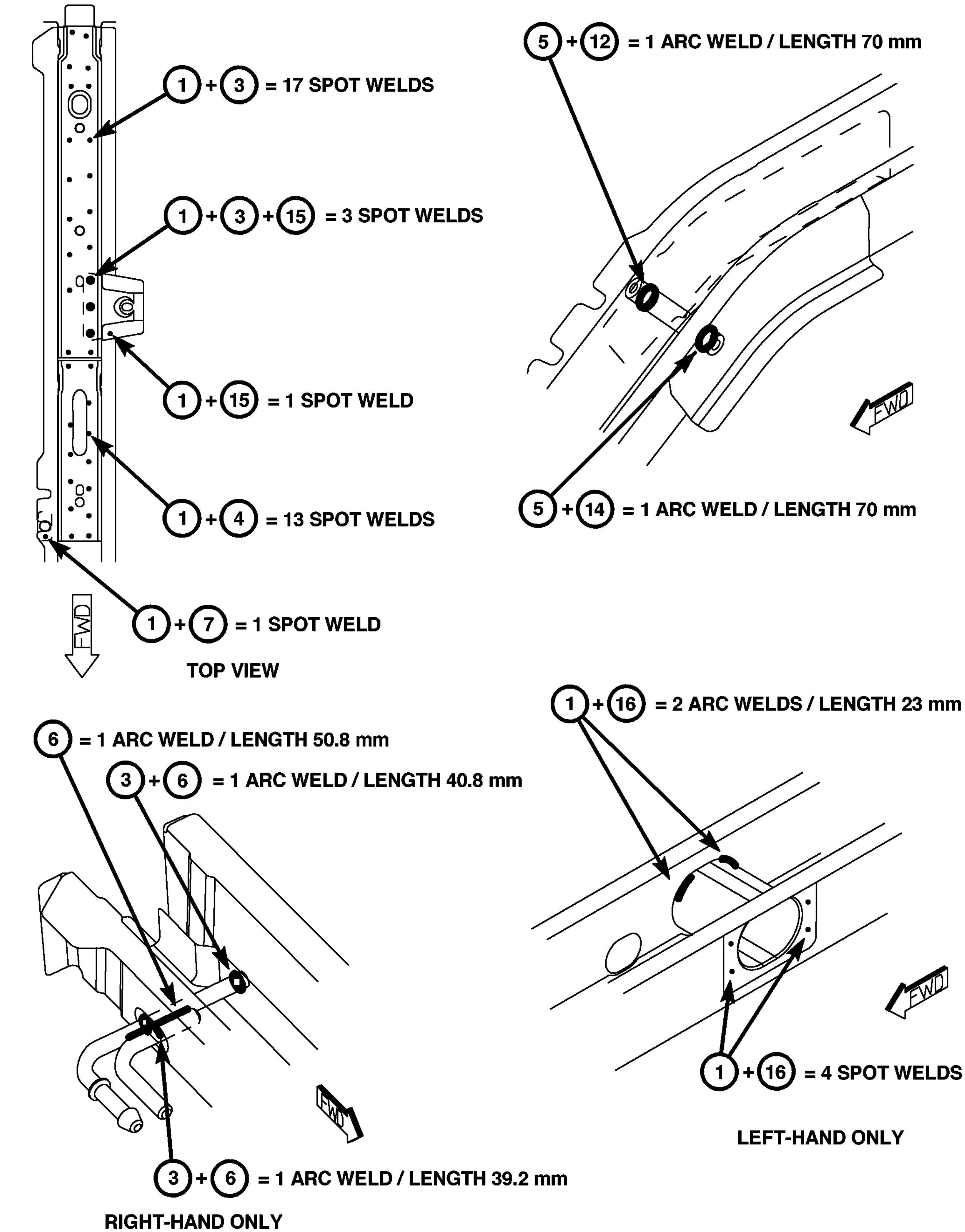


Fig. 29 REAR SPRING, SHOCK, FUEL PASS AND EXHAUST BRACKETS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

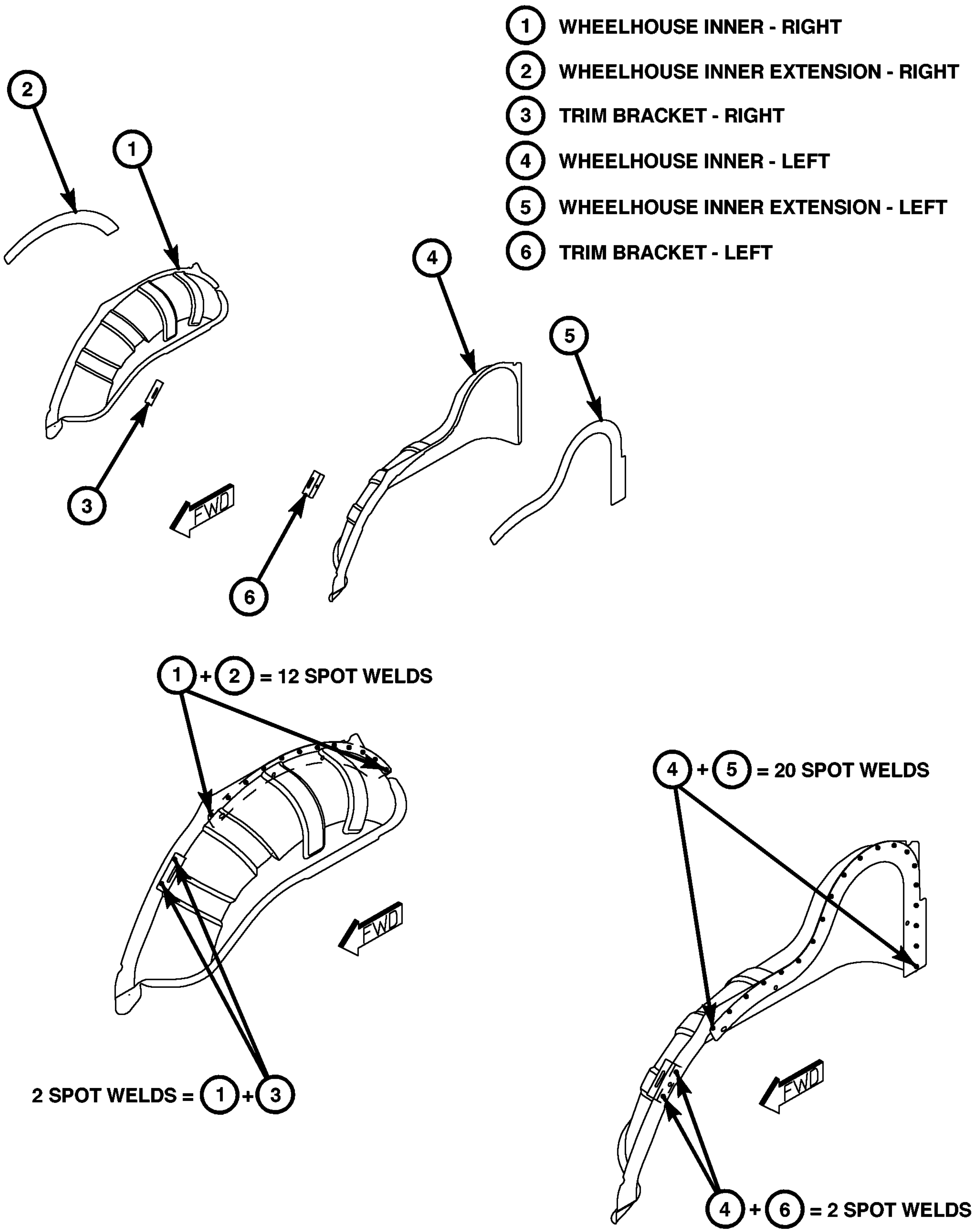


Fig. 30 REAR WHEELHOUSE ASSEMBLIES

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

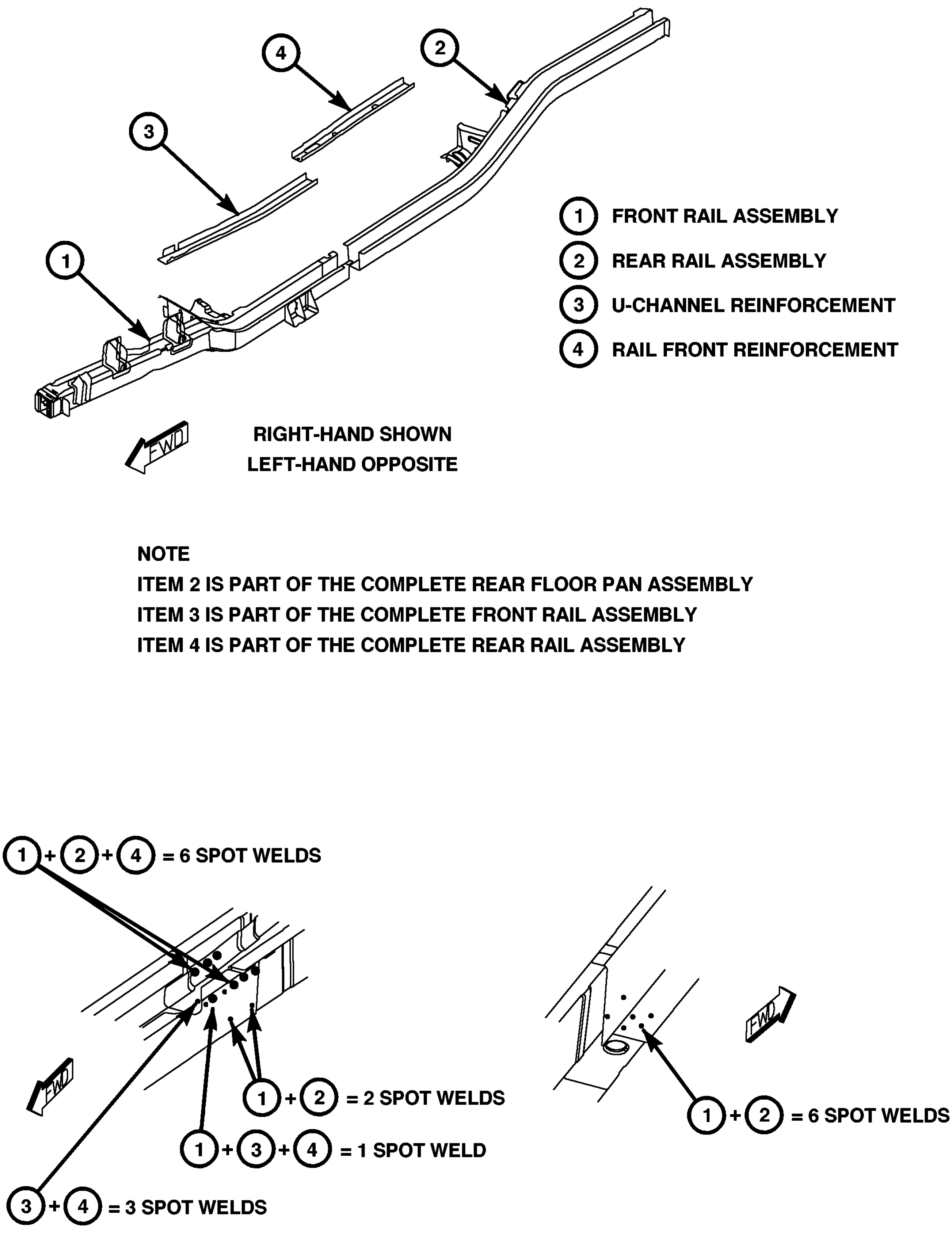


Fig. 31 RAIL ASSEMBLIES – FRONT/REAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

REAR FLOOR PAN ASSEMBLY

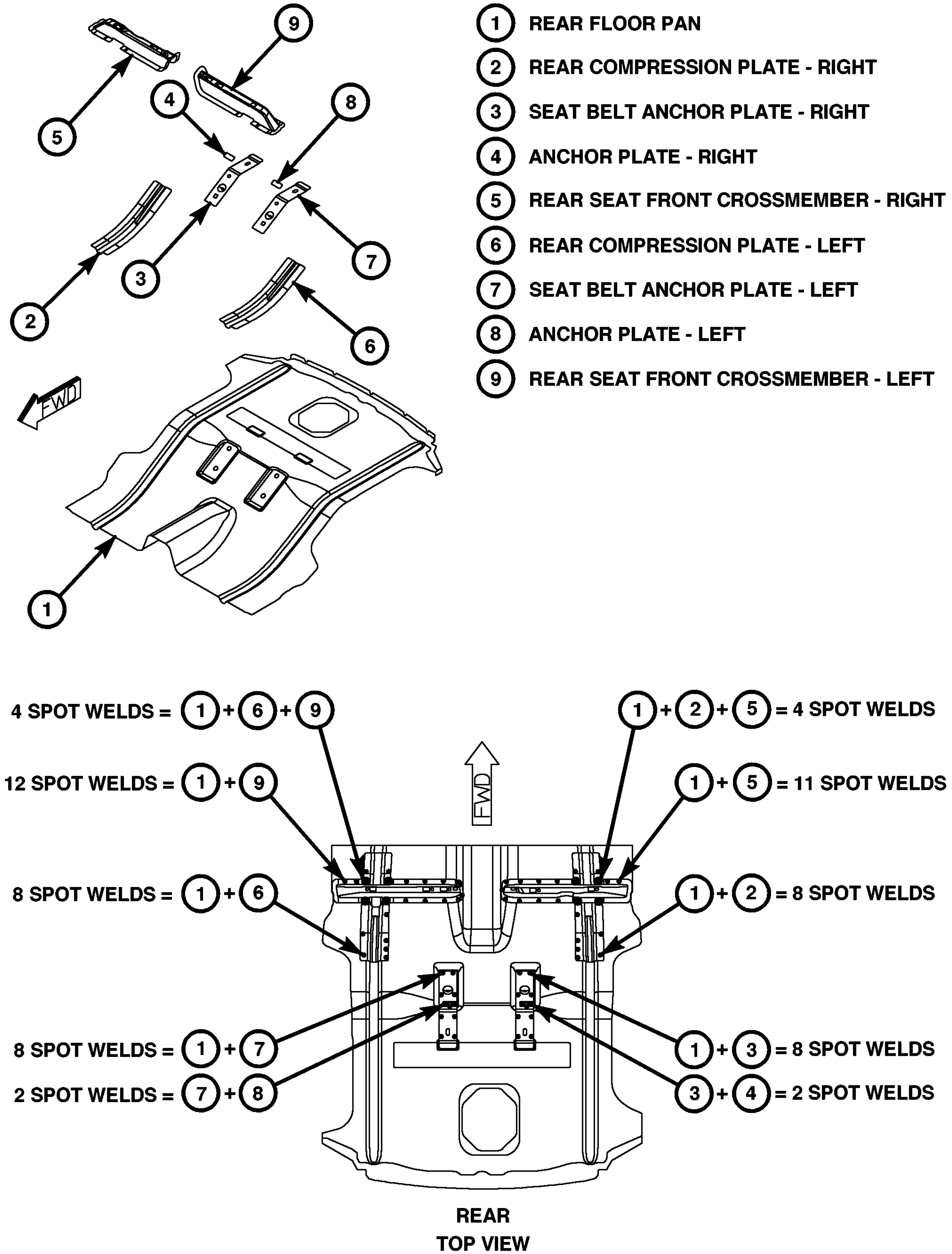


Fig. 32 REAR FLOOR PAN ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

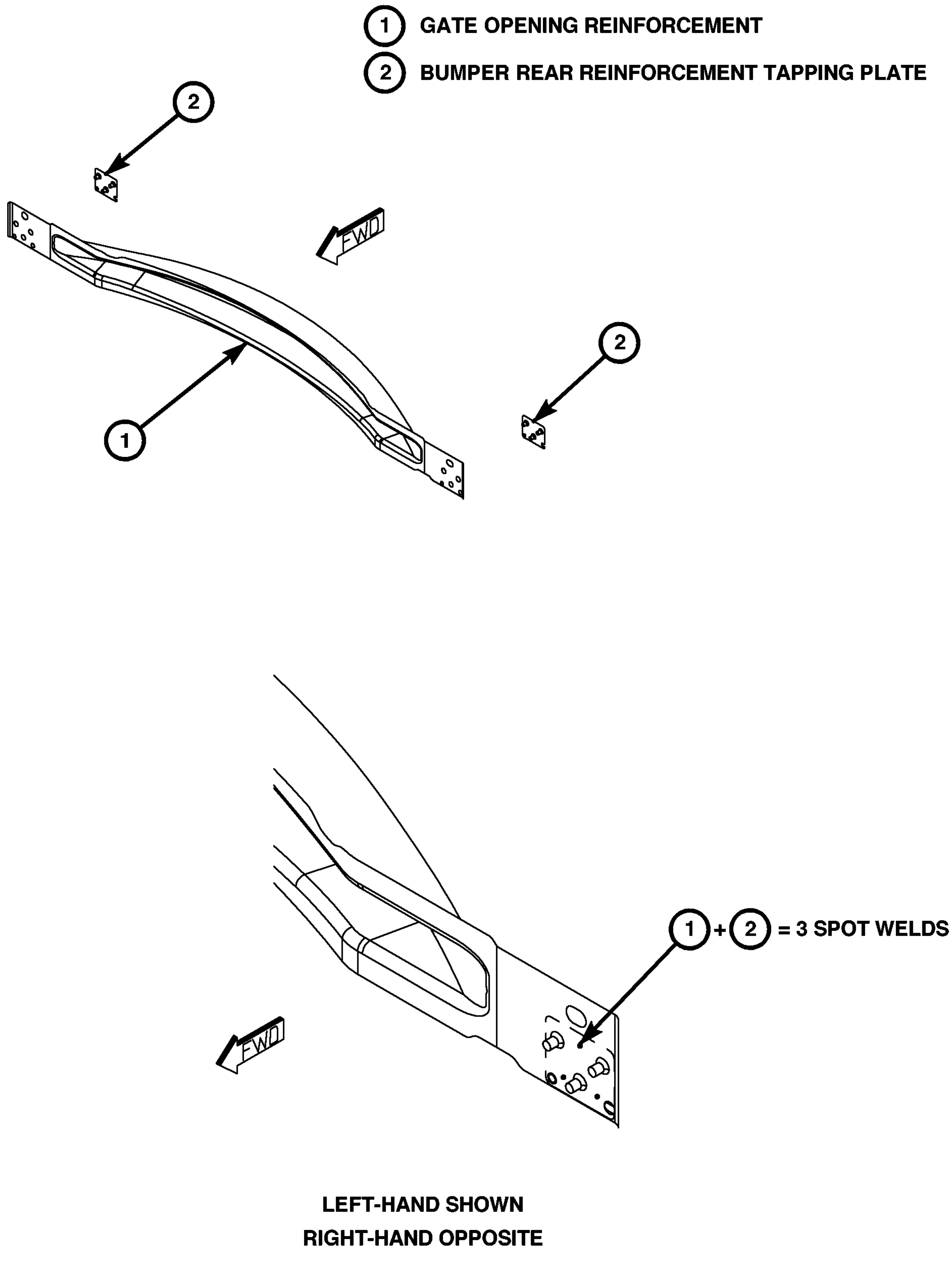


Fig. 33 BUMPER AND SWING GATE REINFORCEMENT

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

1 REAR FLOOR PAN ASSEMBLY
2 SEAT BELT ANCHOR PLATE
3 REAR COMPRESSION PLATE
4 REAR SEAT FRONT CROSSMEMBER
5 REAR RAIL ASSEMBLY - RIGHT
6 REAR RAIL ASSEMBLY - LEFT
7 REAR TORQUE BOX
8 ANCHOR PLATE
9 REAR SHOCK MOUNTING REINFORCEMENT
10 FUEL PASS-THROUGH SLEEVE
11 REAR SEAT CROSSMEMBER - RIGHT
12 A-ARM LOWER BRACKET
13 A-ARM UPPER BRACKET
14 REAR SEAT CROSSMEMBER BULKHEAD
15 REAR SPRING CENTER CROSSMEMBER
16 REAR SPRING OUTER CROSSMEMBER
17 FUEL TANK SUPPORT
18 REAR CROSSMEMBER
19 GATE OPENING REINFORCEMENT
20 REAR SEAT CROSSMEMBER - LEFT
21 FUEL TANK SUPPORT REINFORCEMENT

NOTE
ITEMS 7,8,9 AND 10 ARE PARTS OF THE RIGHT AND LEFT REAR RAIL ASSEMBLIES

ITEMS 2,3 AND 4 ARE PARTS OF THE REAR FLOOR PAN ASSEMBLY

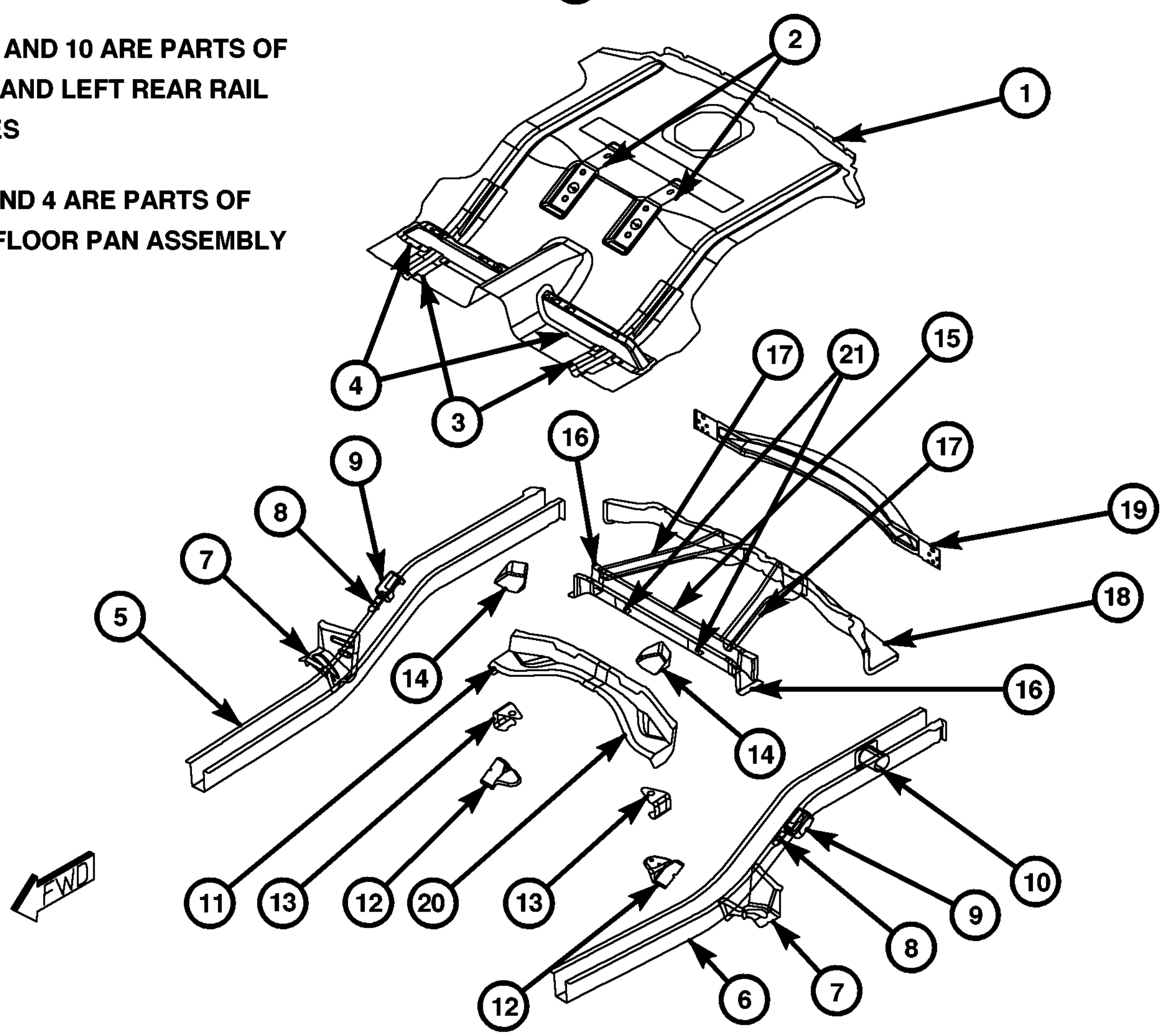


Fig. 34 REAR FLOOR PAN

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

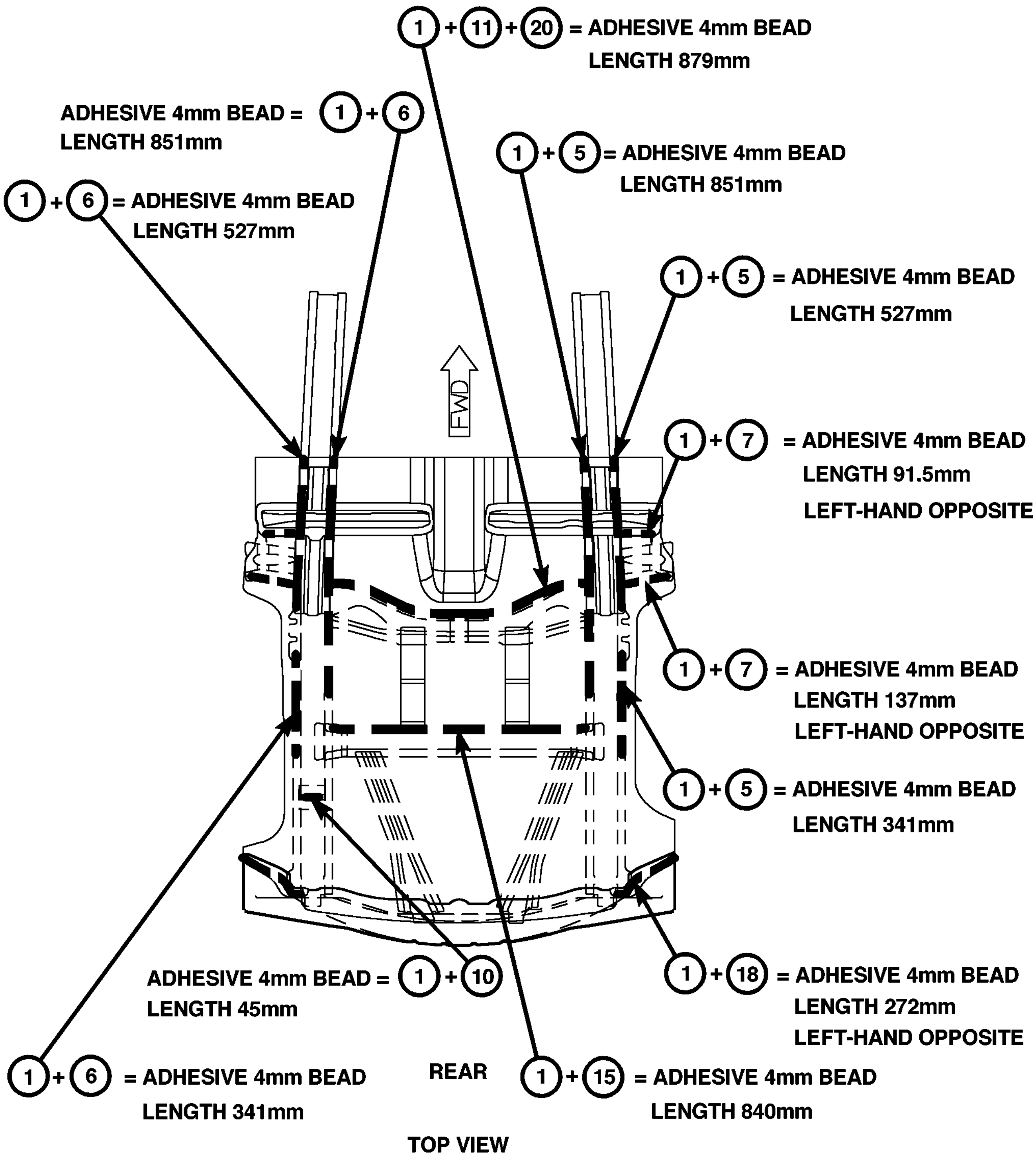


Fig. 35 REAR FLOOR PAN

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

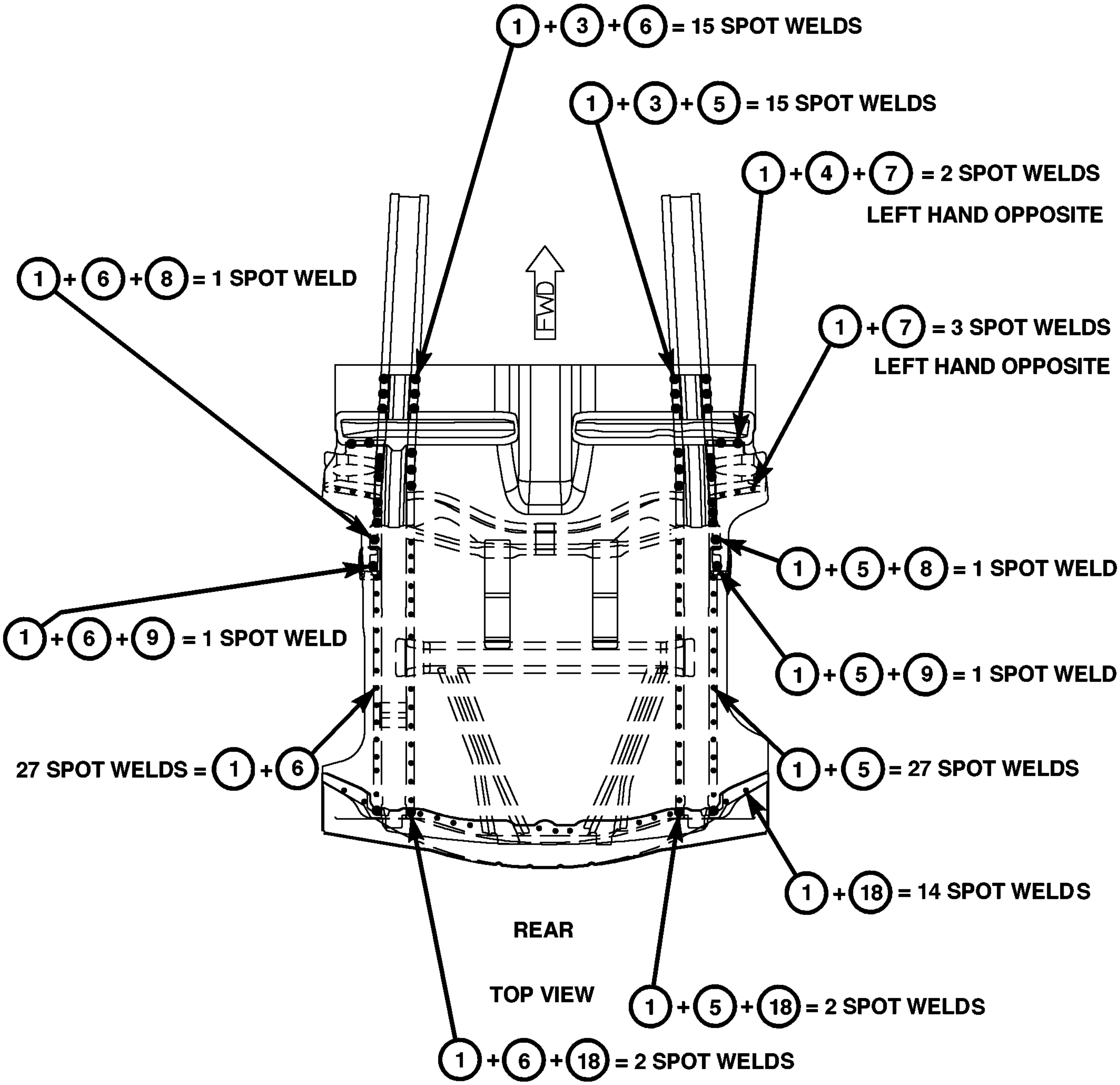


Fig. 36 REAR FLOOR PAN

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

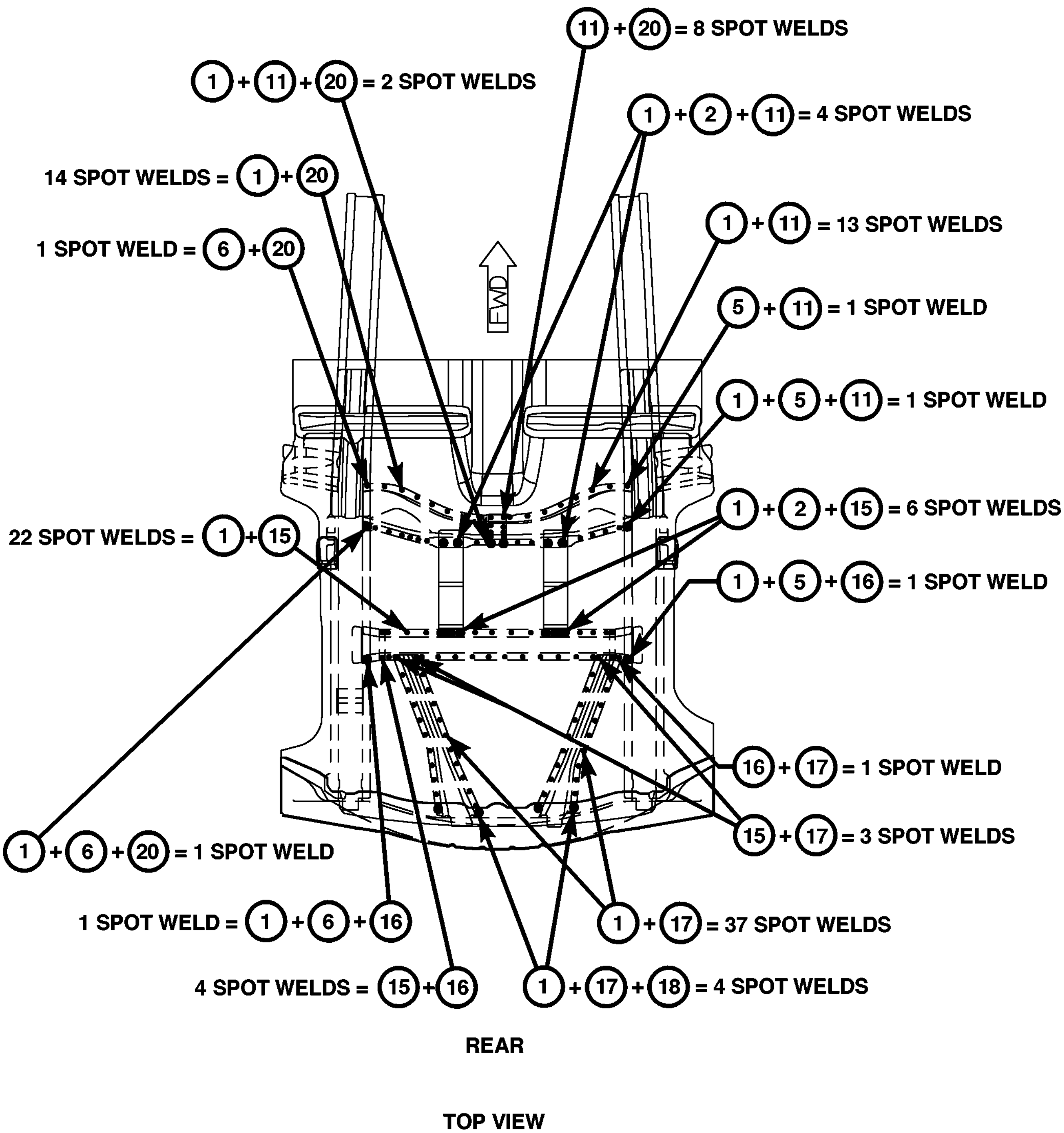


Fig. 37 REAR FLOOR PAN

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

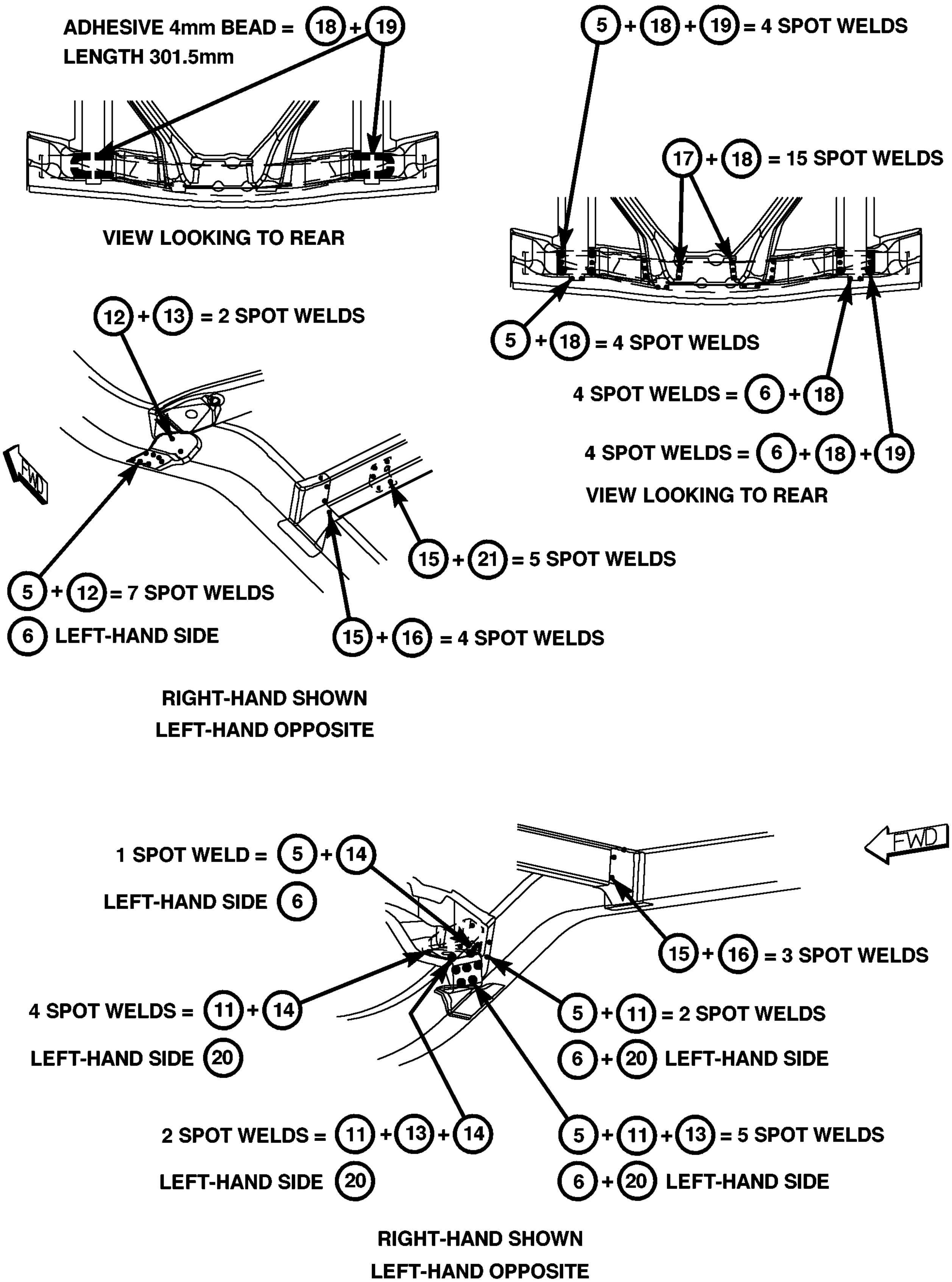


Fig. 38 REAR CROSSMEMBERS AND REINFORCEMENTS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

FULL FLOOR PAN ASSEMBLY

1. FRONT FLOOR PAN ASSEMBLY
2. REAR FLOOR PAN ASSEMBLY
3. FRONT RAIL ASSEMBLY - RIGHT
4. FRONT RAIL ASSEMBLY - LEFT
5. REAR RAIL ASSEMBLY - RIGHT
6. REAR RAIL ASSEMBLY - LEFT
7. COMPRESSION PLATE
8. REINFORCEMENT PLATE
9. FRONT SEAT FRONT CROSSMEMBER
10. FRONT SEAT REAR CROSSMEMBER
11. COMPRESSION PLATE
12. REAR SEAT FRONT CROSSMEMBER
13. BODY SIDE SILL
14. COWL SIDE PANEL
15. FRONT TORQUE BOX
16. REAR TORQUE BOX
17. INNER WHEELHOUSE - RIGHT
18. INNER WHEELHOUSE - LEFT
19. REAR SHOCK MOUNTING REINFORCEMENT
20. REAR CROSSMEMBER
21. D-PILLAR GUSSET - RIGHT
22. D-PILLAR GUSSET - LEFT

NOTE
ITEMS 7,9,10 AND 11 ARE PARTS OF THE FRONT FLOOR PAN ASSEMBLY

ITEMS 12,16,19 AND 20 ARE PARTS OF THE COMPLETE REAR FLOOR PAN ASSEMBLY

ITEM 15 IS PART OF THE RIGHT AND LEFT FRONT RAIL ASSEMBLIES

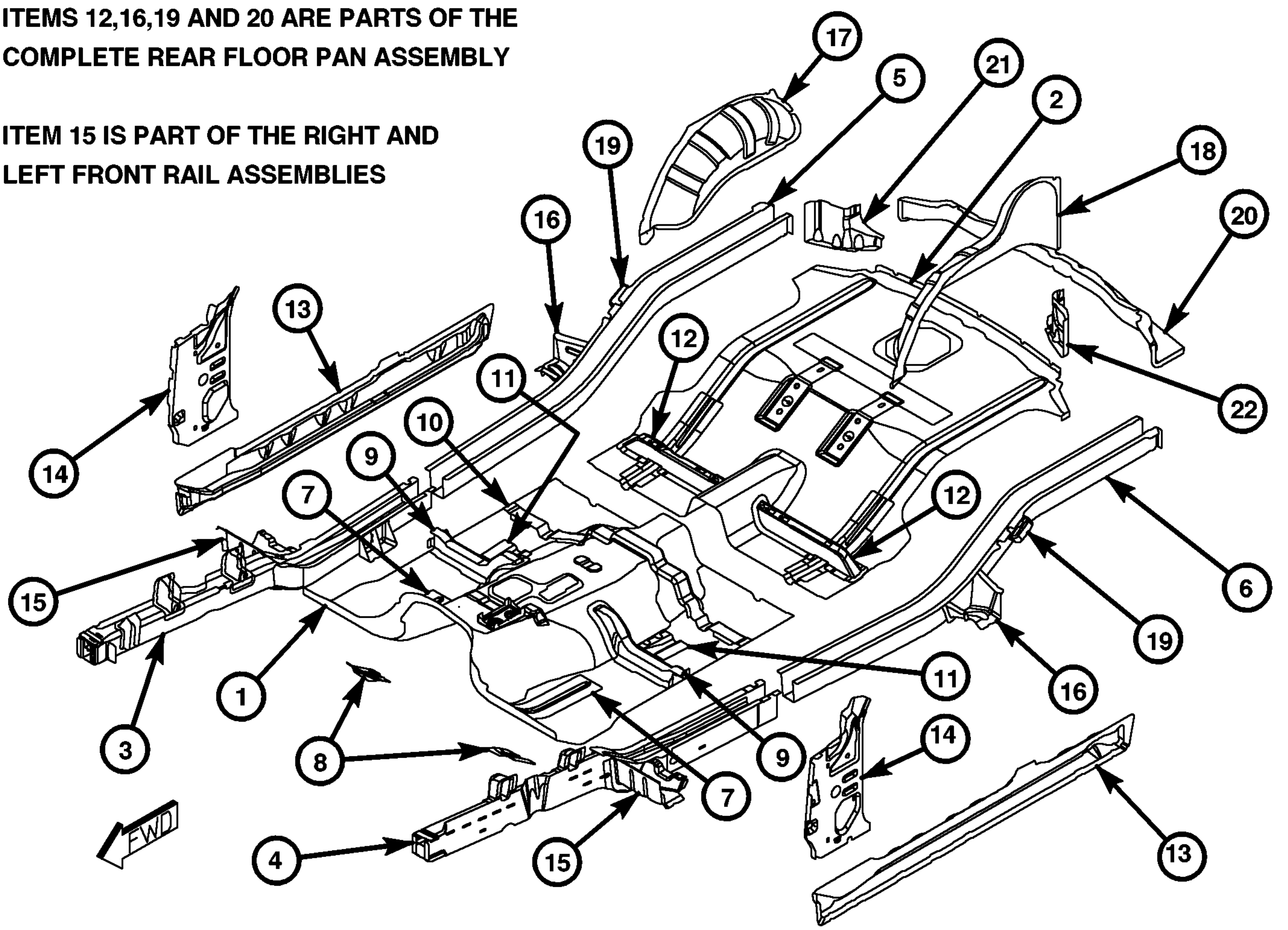


Fig. 39 FLOOR PAN ASSEMBLIES

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

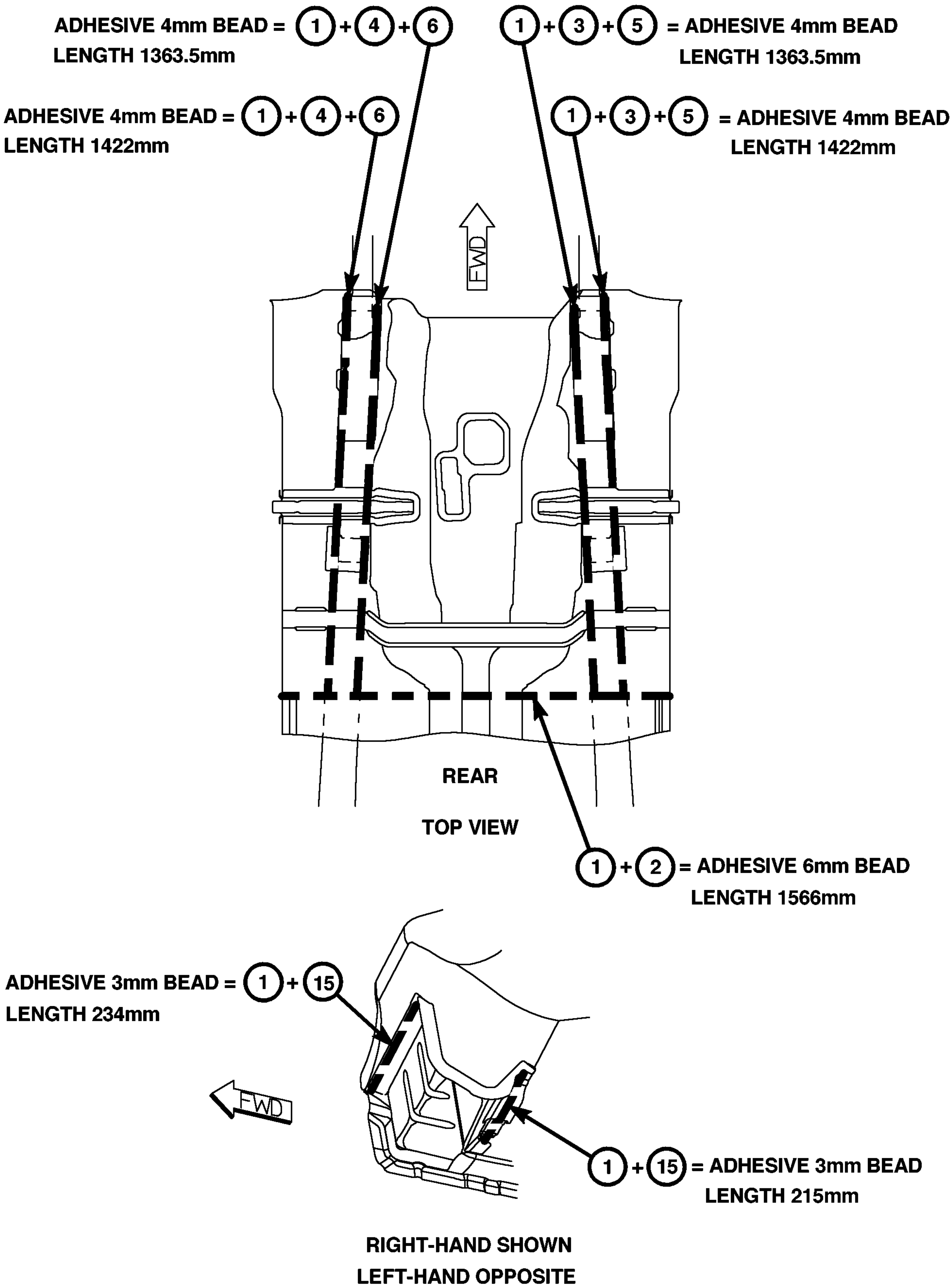


Fig. 40 FRONT RAILS – ADHESIVE LOCATIONS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

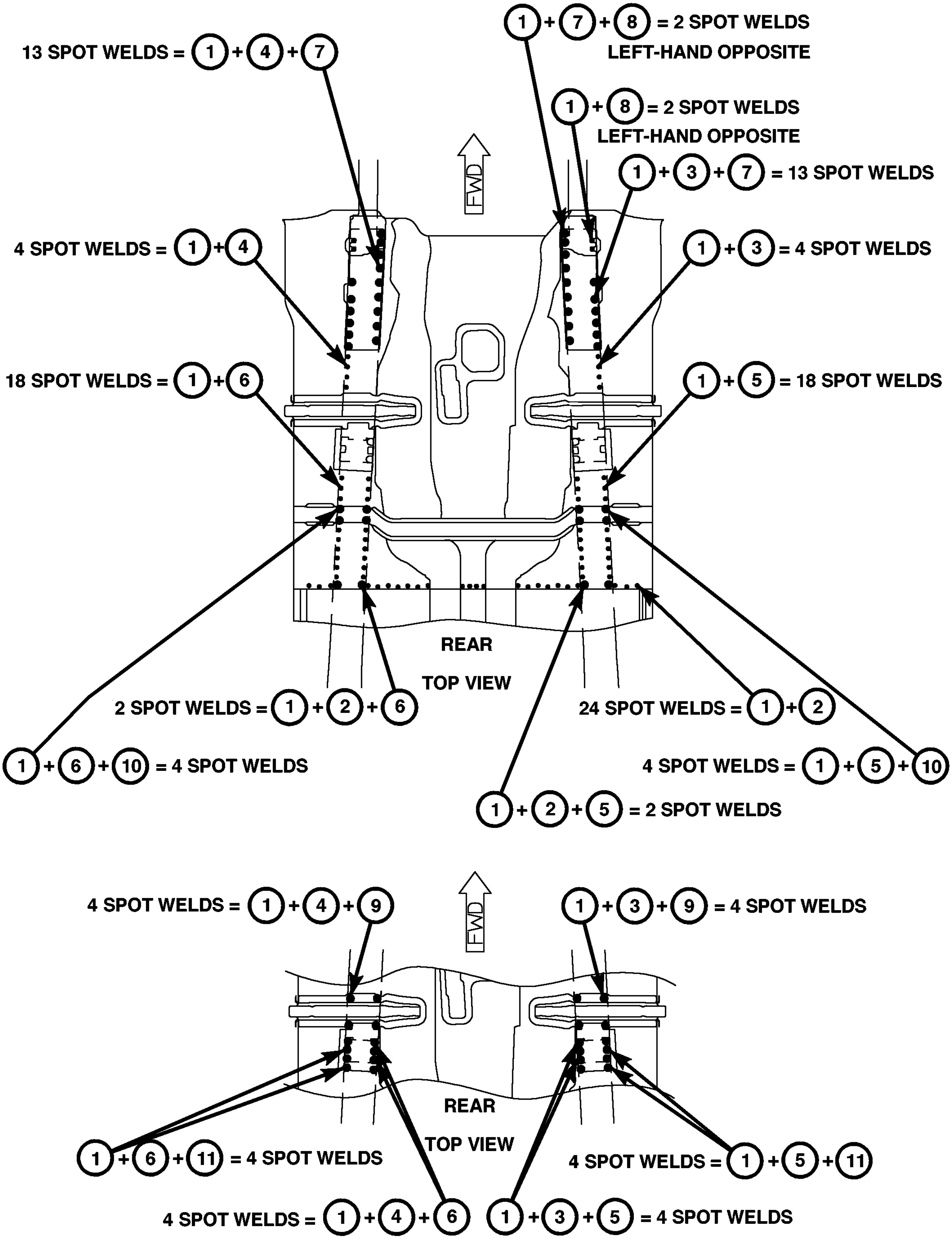
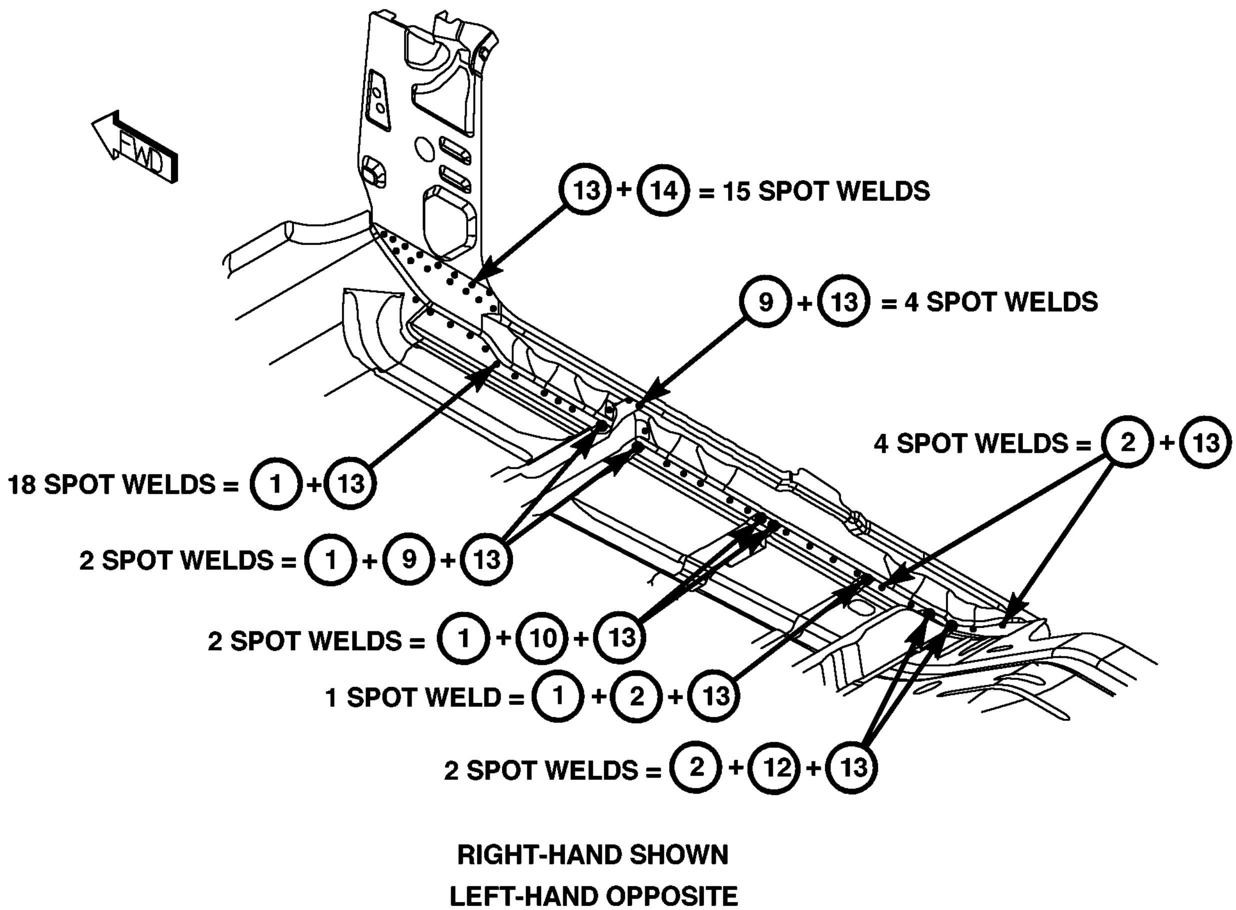
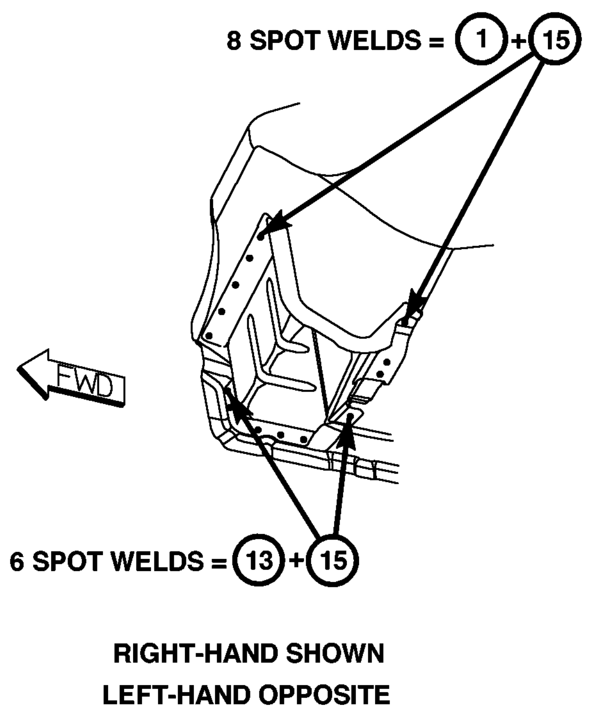


Fig. 41 FRONT RAILS – WELD LOCATIONS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)





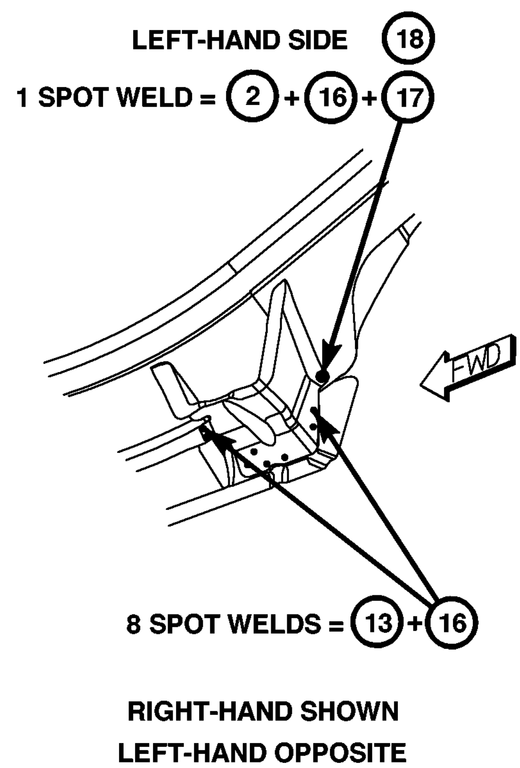


Fig. 42 SIDE SILLS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

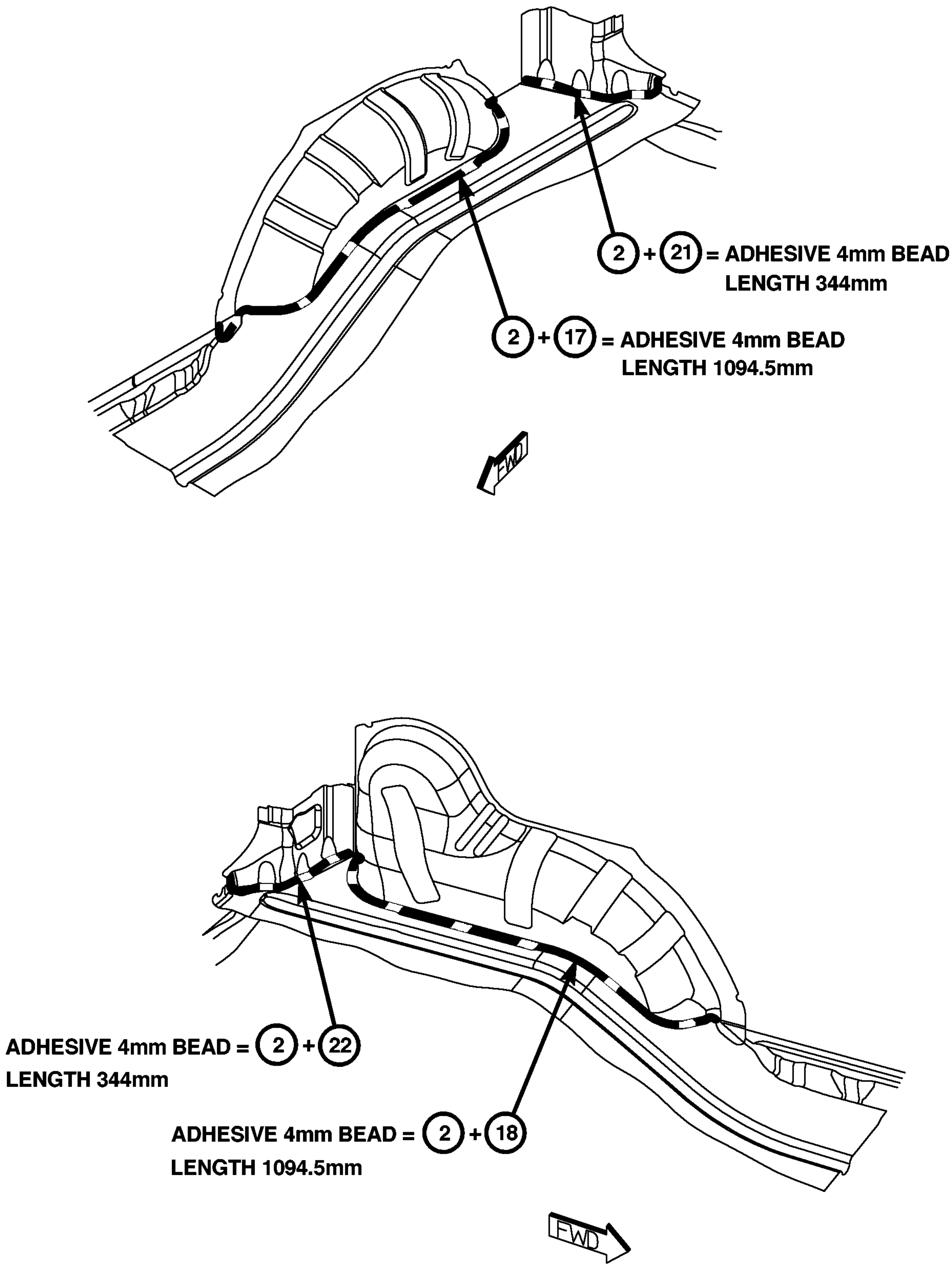


Fig. 43 WHEELHOUSES – ADHESIVE LOCATIONS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

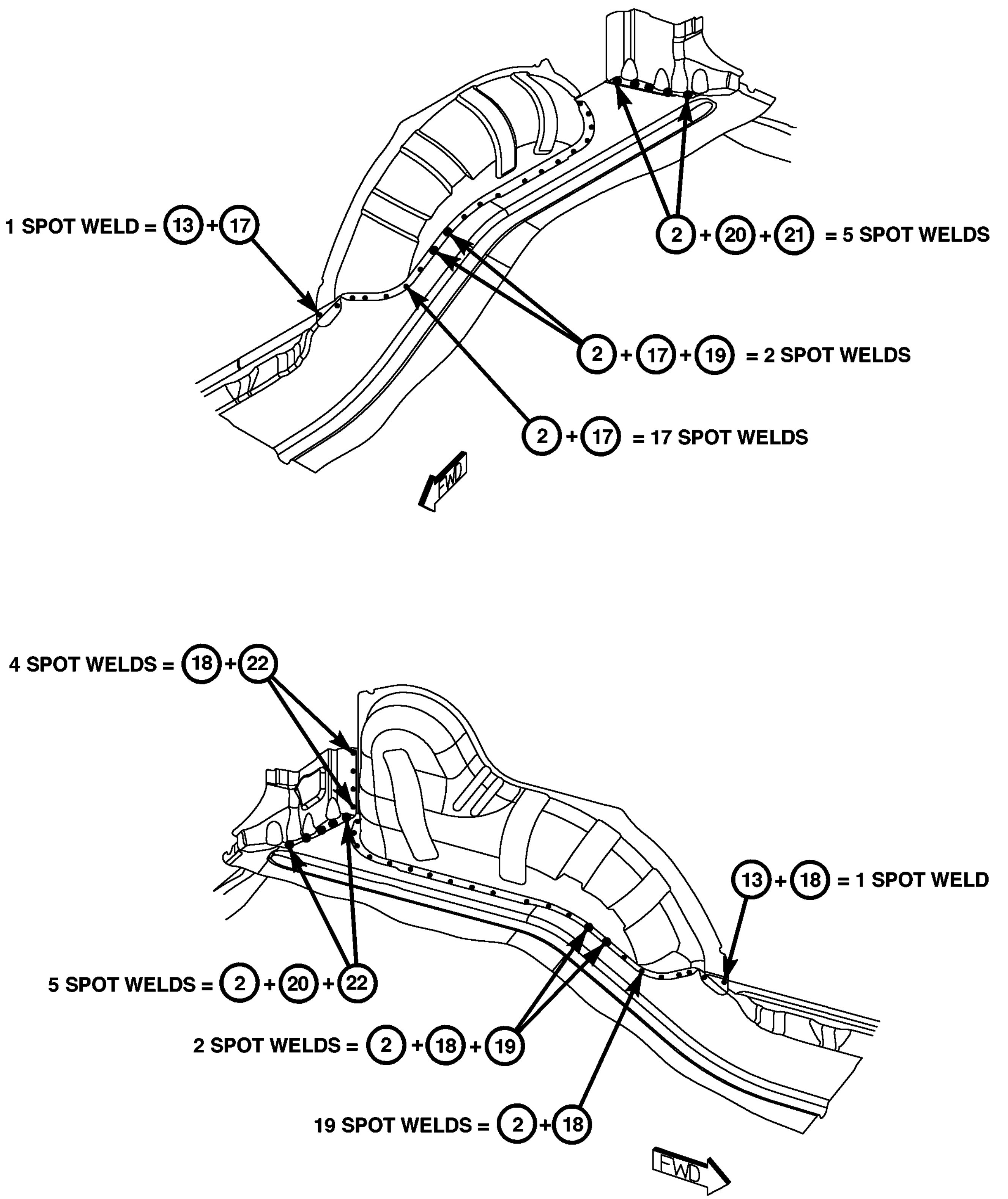


Fig. 44 WHEELHOUSES – WELD LOCATIONS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

BODY SIDE PANELS AND SUB ASSEMBLIES

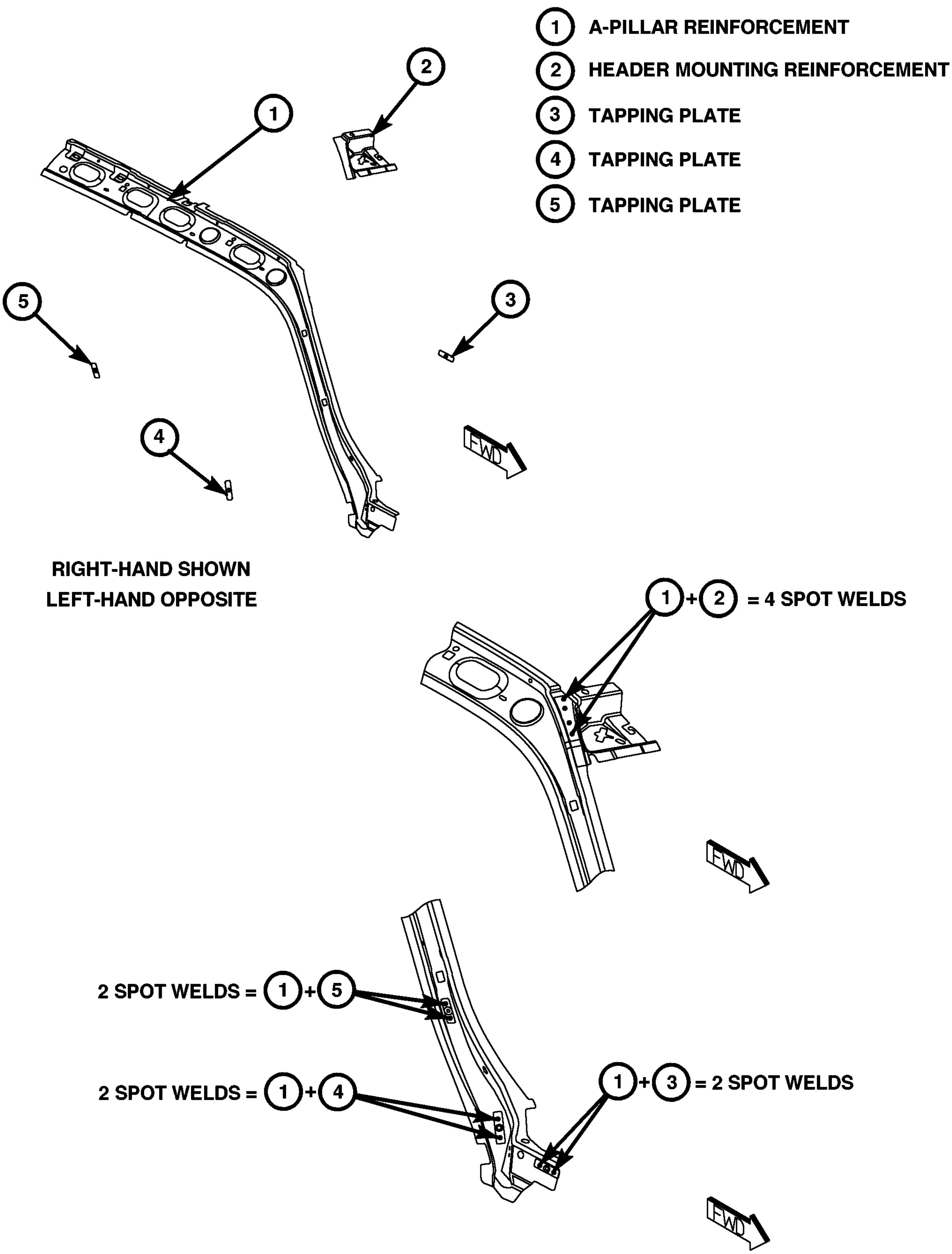


Fig. 45 A-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

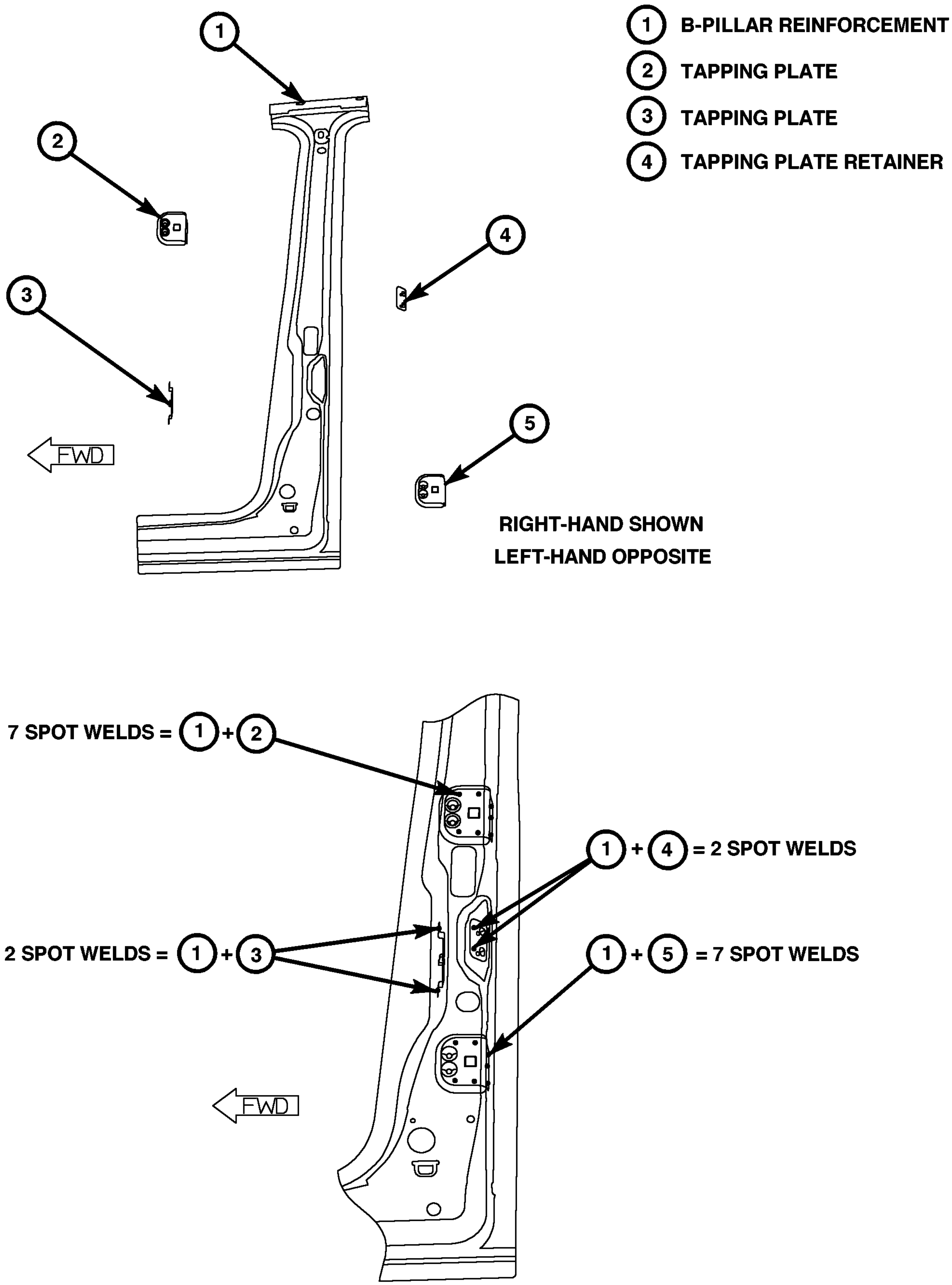


Fig. 46 B-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

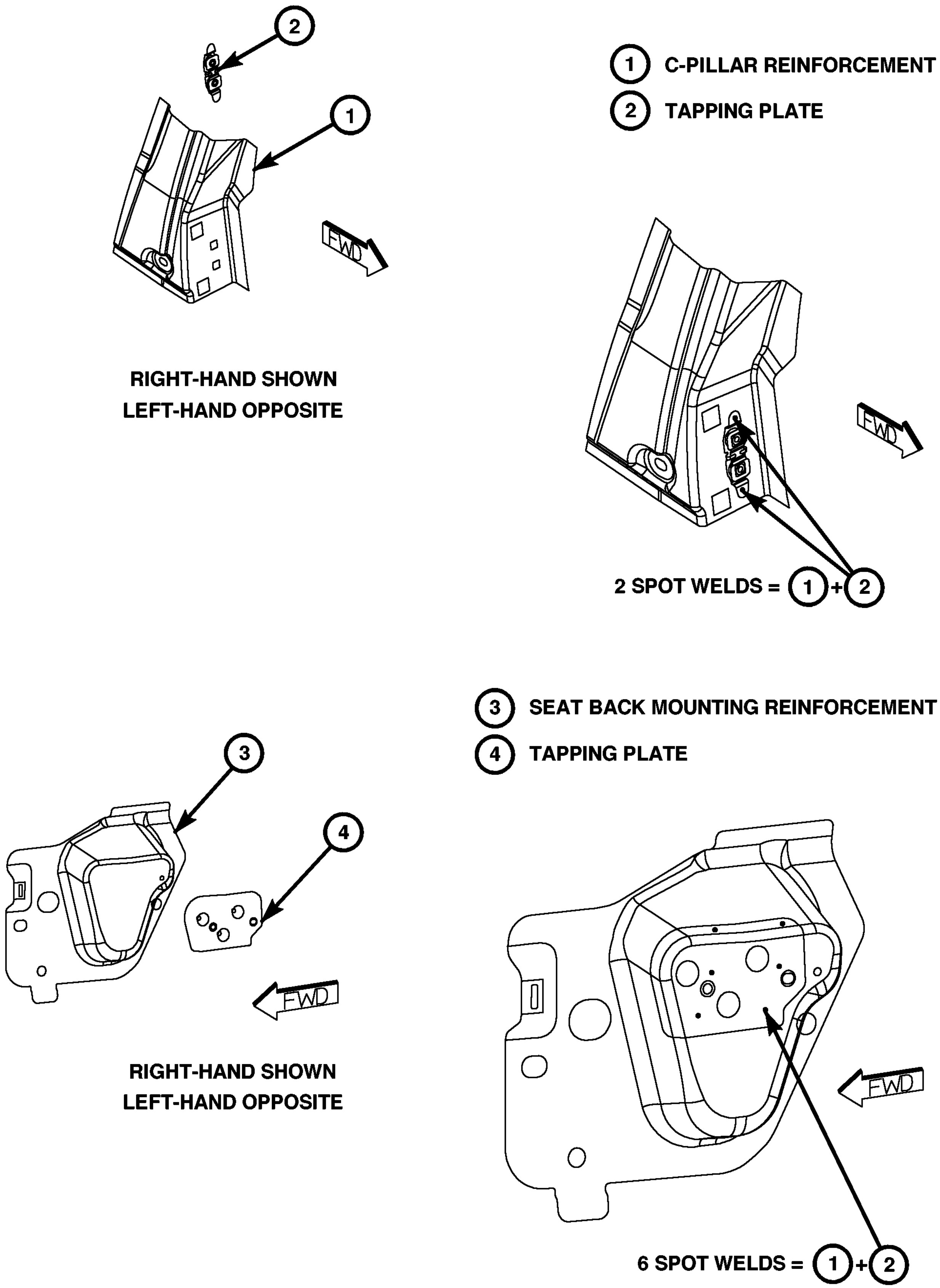


Fig. 47 C-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

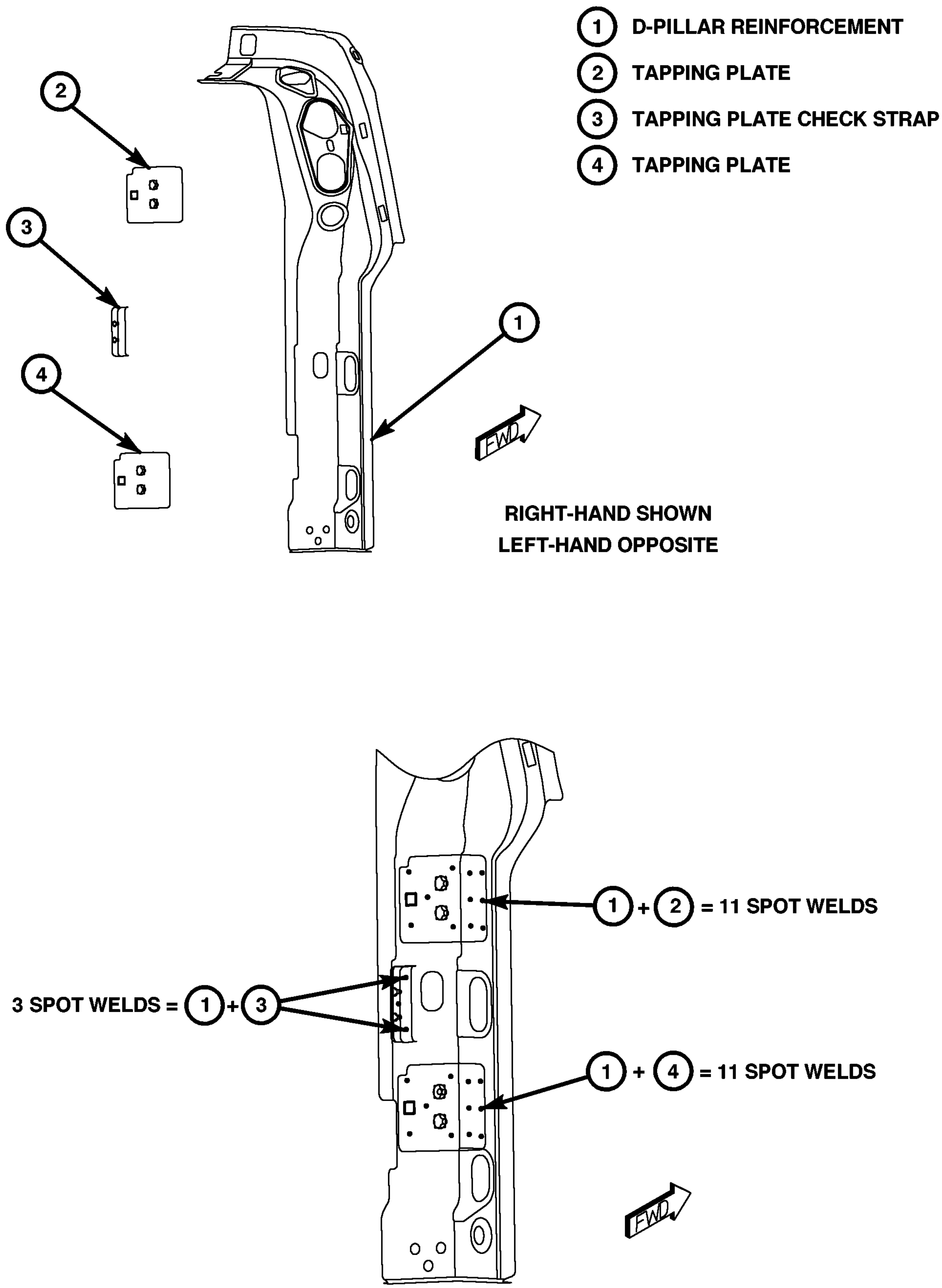


Fig. 48 D-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

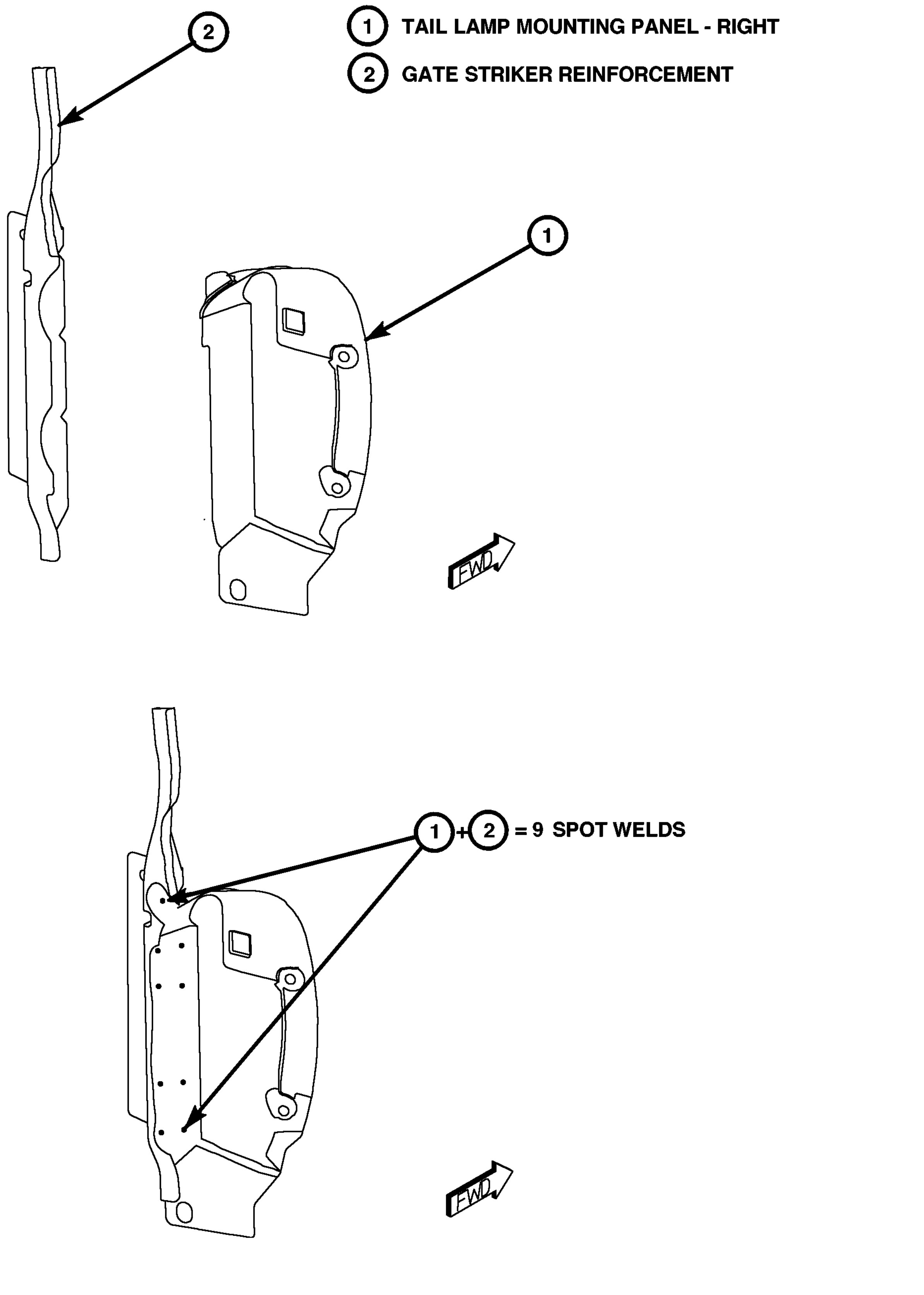


Fig. 49 TAIL LAMP MOUNTING PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

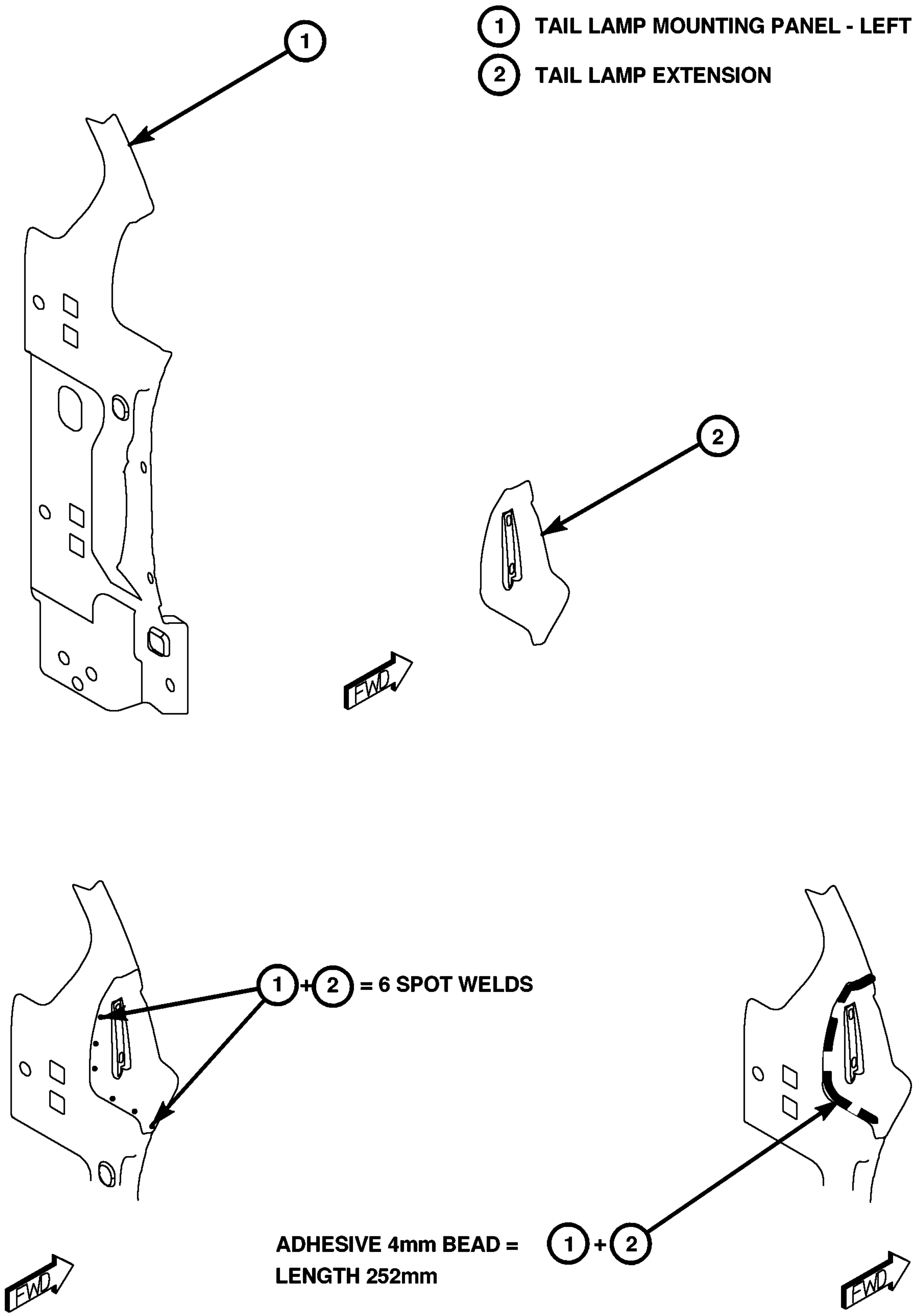


Fig. 50 TAIL LAMP MOUNTING PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

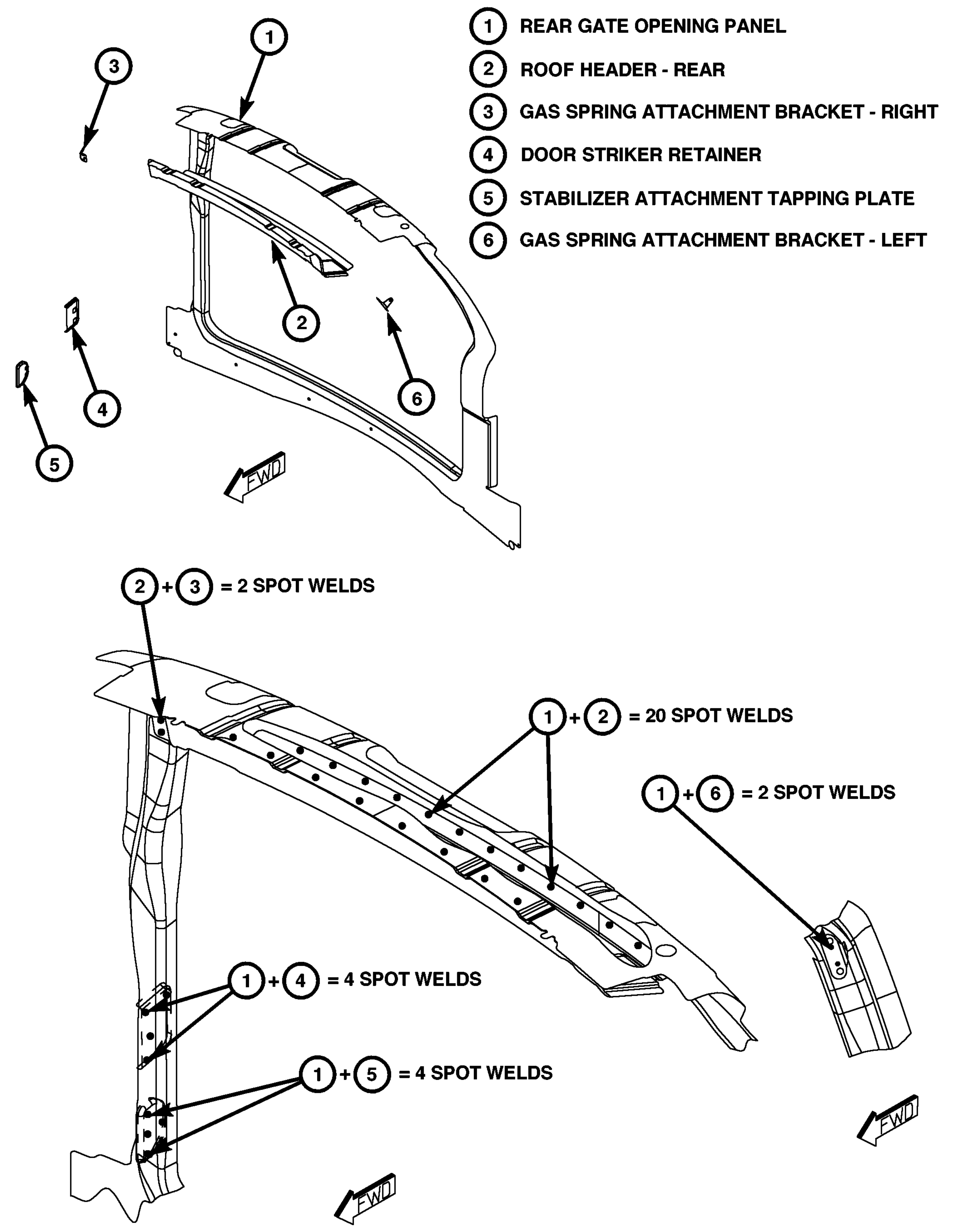
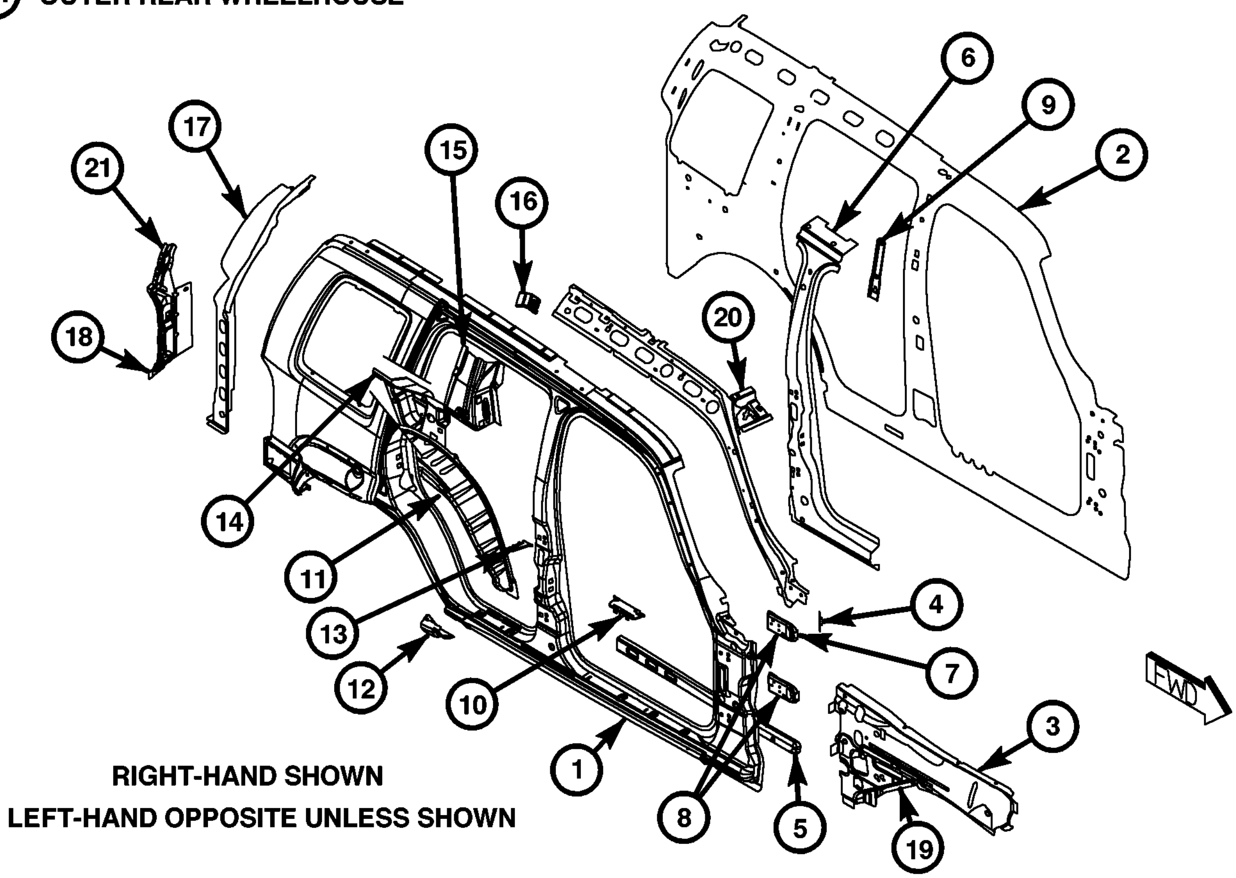


Fig. 51 SWING GATE OPENING

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

BODY SIDE PANELS

1. BODY SIDE OUTER PANEL
2. BODY SIDE INNER PANEL
3. INNER FENDER REINFORCEMENT ASSEMBLY
4. A-PILLAR REINFORCEMENT
5. BODY SIDE INNER LOWER REINFORCEMENT
6. B-PILLAR REINFORCEMENT
7. CHECK STRAP ATTACHMENT TAPING PLATE
8. DOOR HINGE TAPPING PLATE
9. B-PILLAR LOWER BAFFLE
10. SHOULDER BELT REINFORCEMENT
11. OUTER REAR WHEELHOUSE
12. SILL MOLDING ATTACH BRACKET
13. C-PILLAR LOWER BAFFLE
14. SEAT BACK ATTACH REINFORCEMENT
15. C-PILLAR REINFORCEMENT
16. SEAT-SHOULDER BELT REINFORCEMENT
17. D-PILLAR REINFORCEMENT
18. TAIL LAMP PANEL ASSEMBLY
19. INNER FENDER REINFORCEMENT
20. HEADER MOUNTING REINFORCEMENT
21. GATE STRIKER REINFORCEMENT



NOTE

ITEM 19 IS PART OF THE INNER FENDER REINFORCEMENT ASSEMBLY

ITEM 20 IS PART OF THE A-PILLAR REINFORCEMENT ASSEMBLY

ITEM 21 IS PART OF THE TAIL LAMP MOUNTING PANEL ASSEMBLY

Fig. 52 BODY SIDE PANEL ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

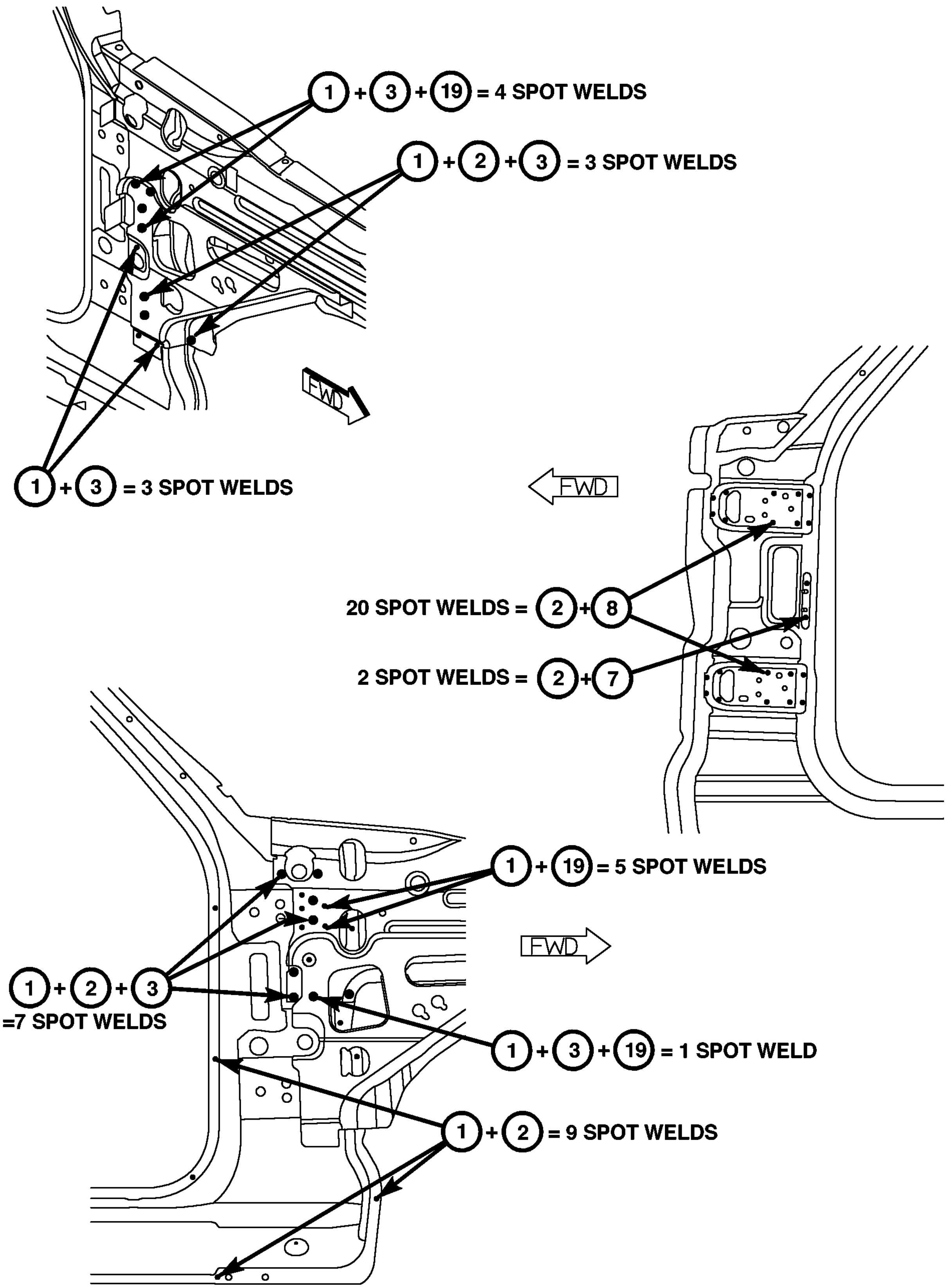


Fig. 53 FENDER REINFORCEMENT

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

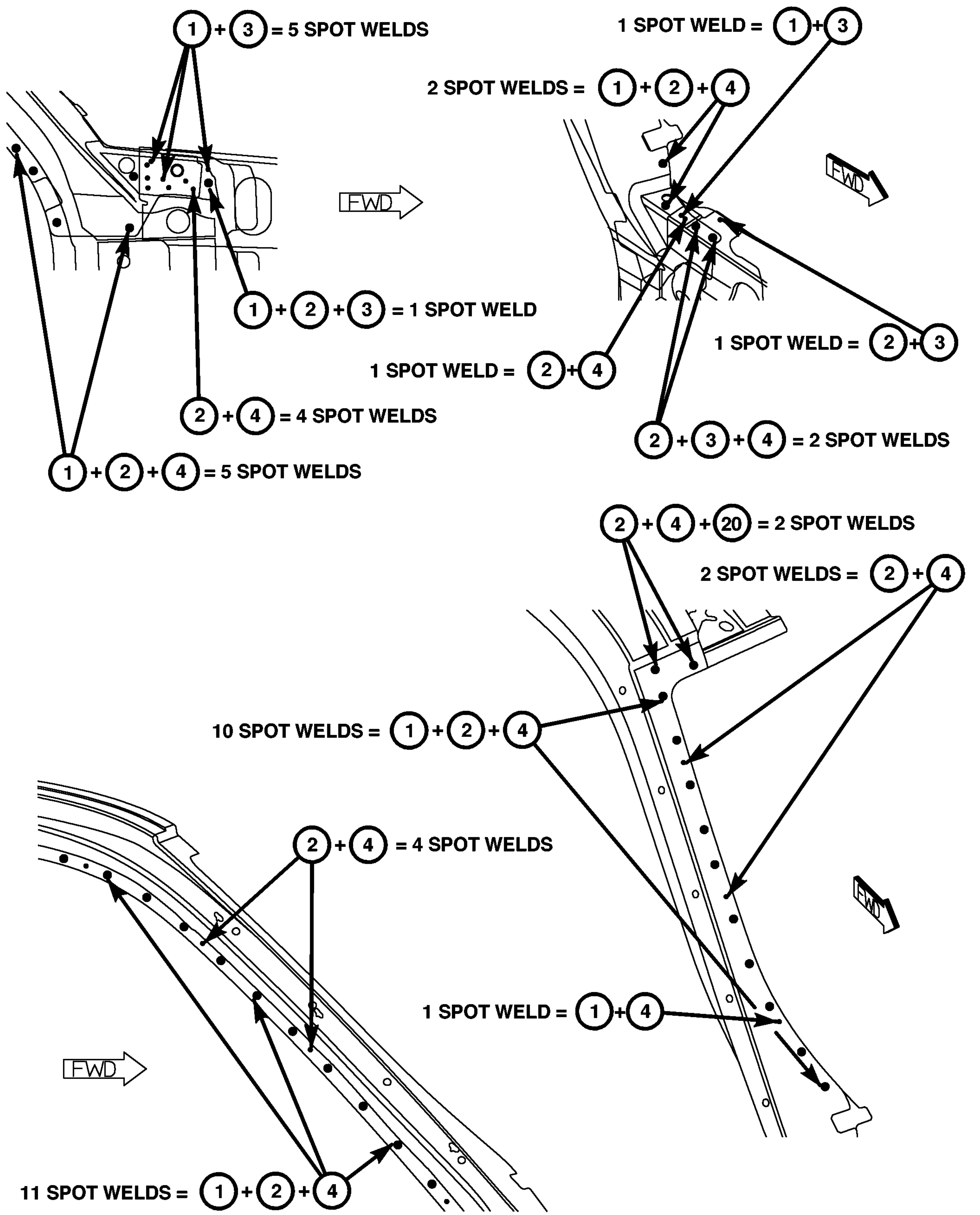


Fig. 54 A-PILLAR; FENDER REINFORCEMENT

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

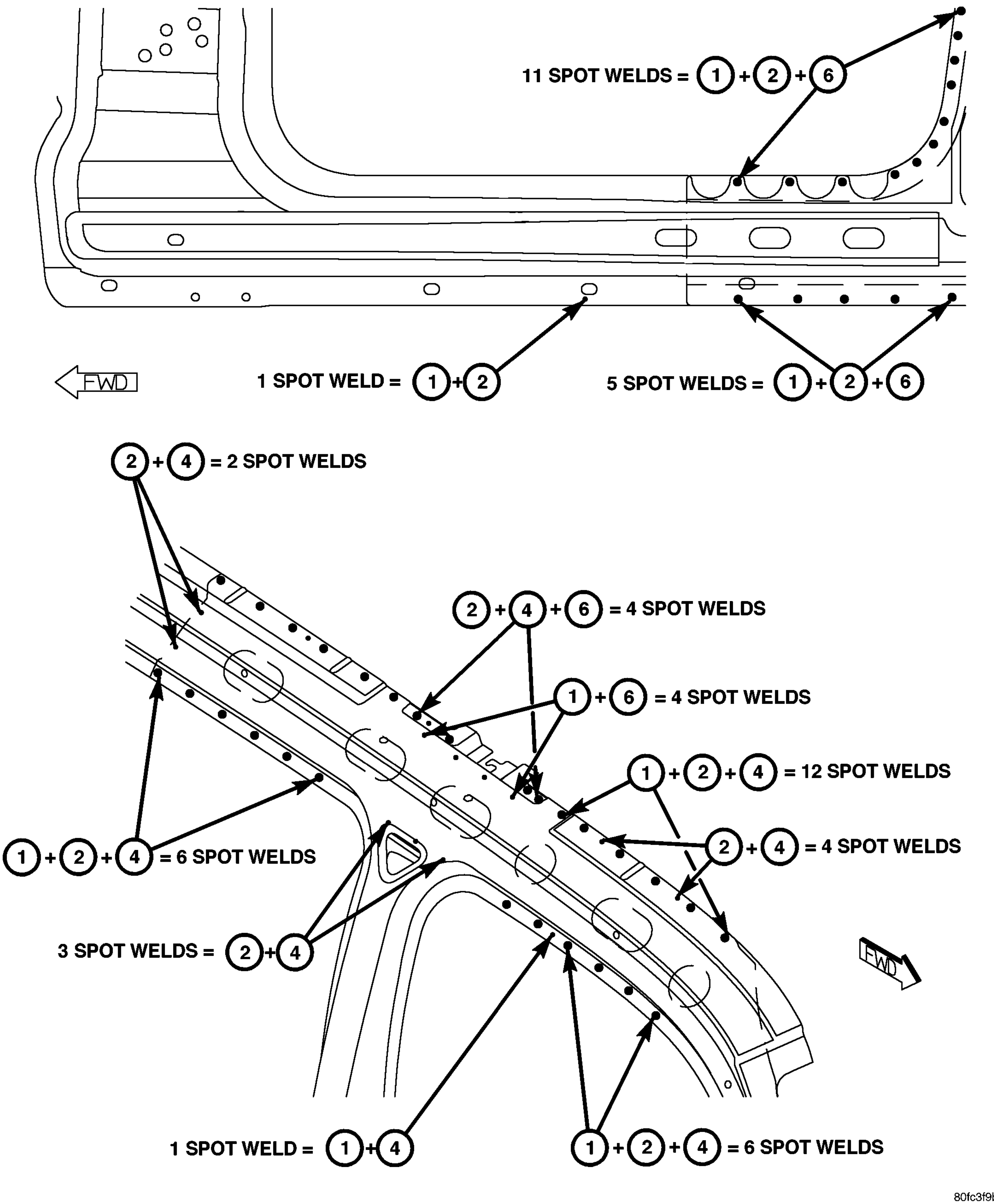


Fig. 55 UPPER AND LOWER BODY SIDE PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

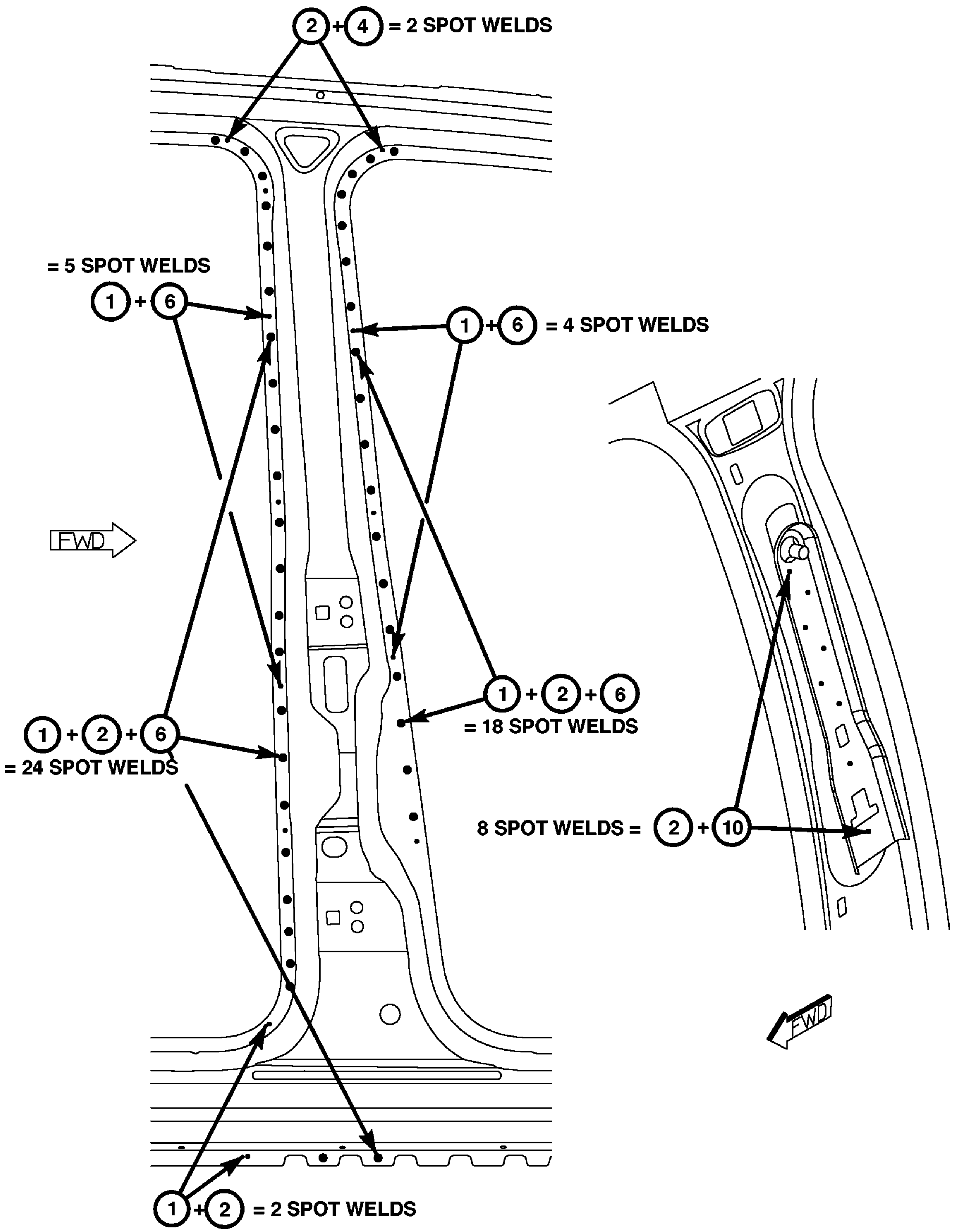


Fig. 56 B-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

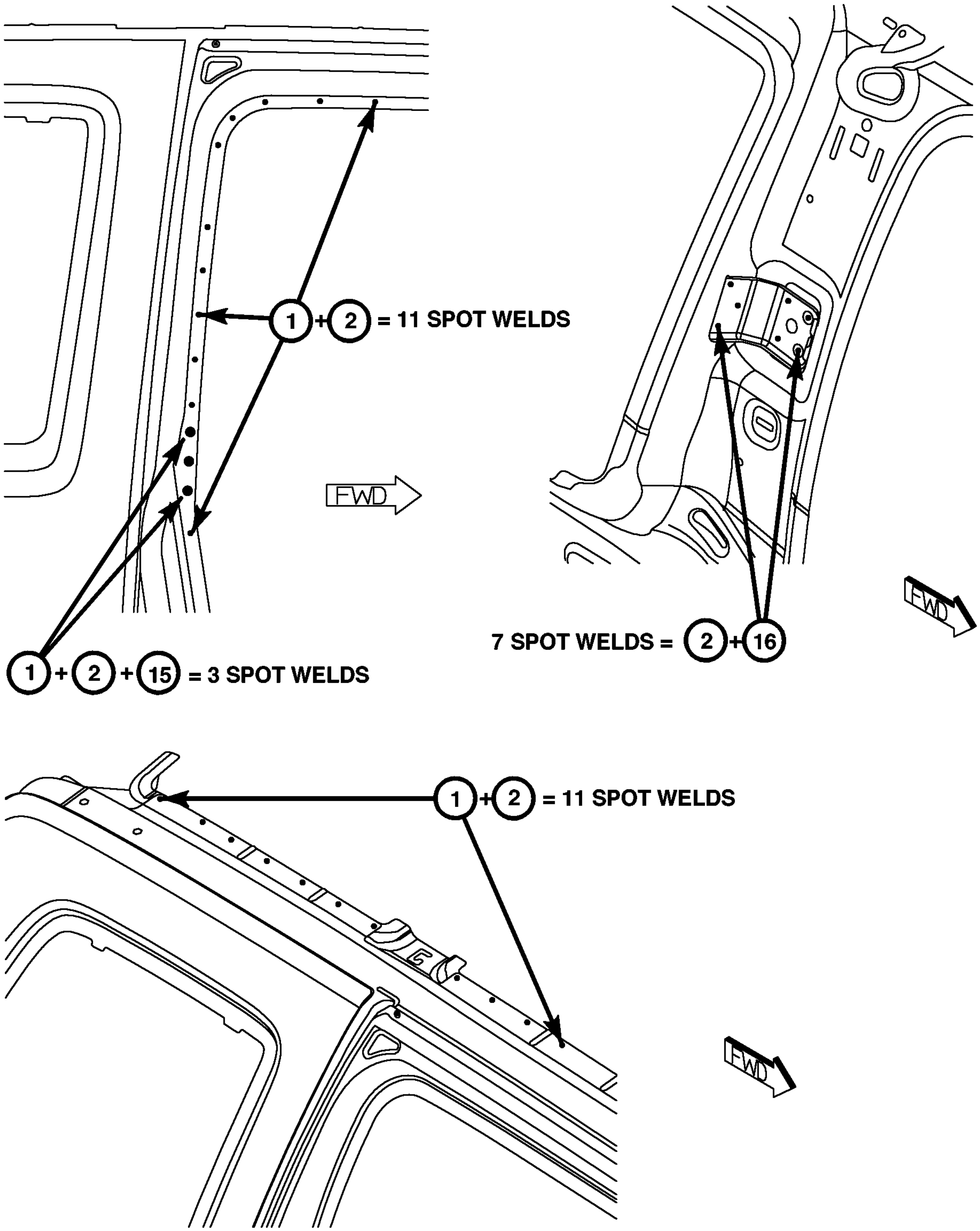


Fig. 57 C-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

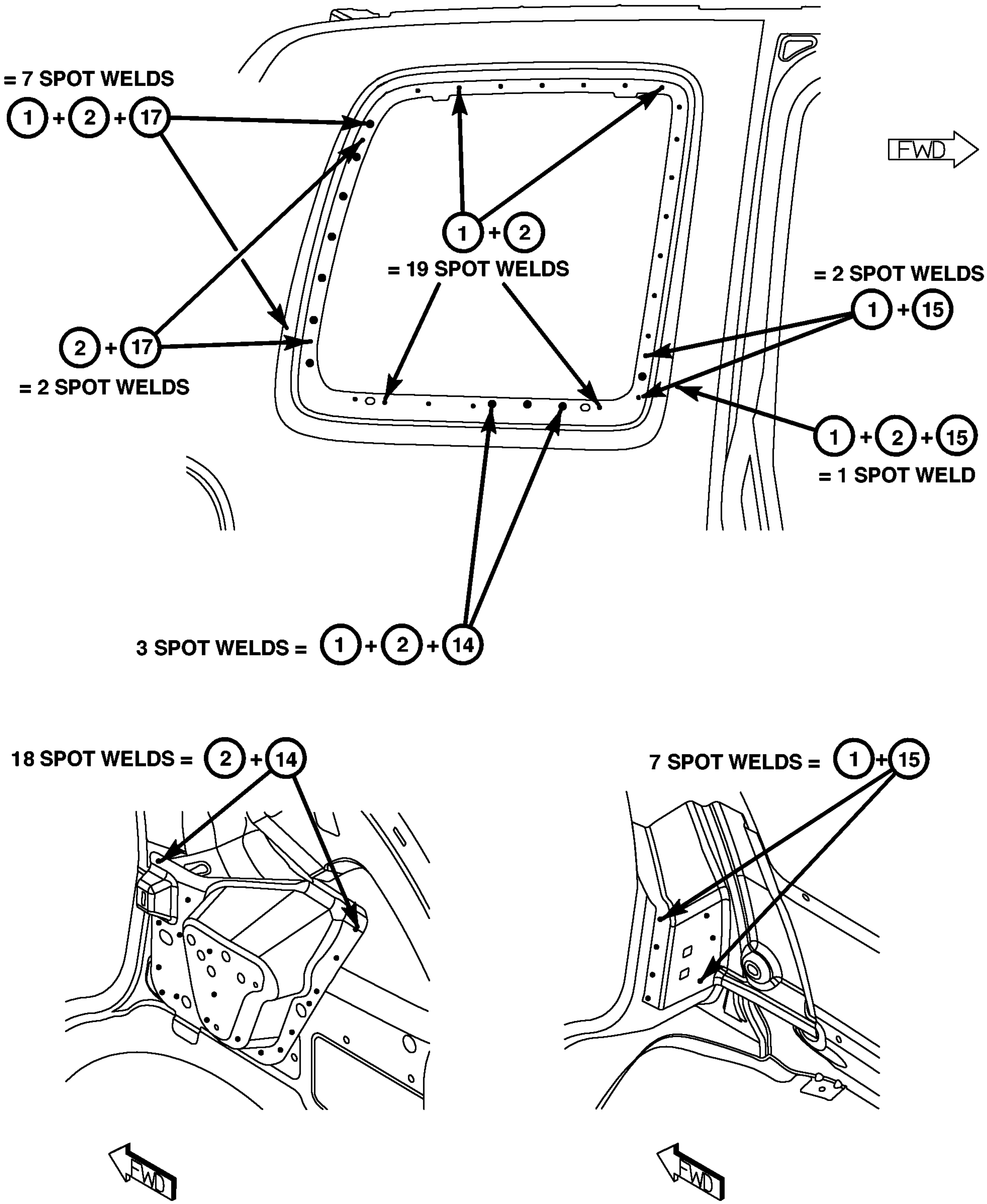


Fig. 58 QUARTER WINDOW OPENING

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

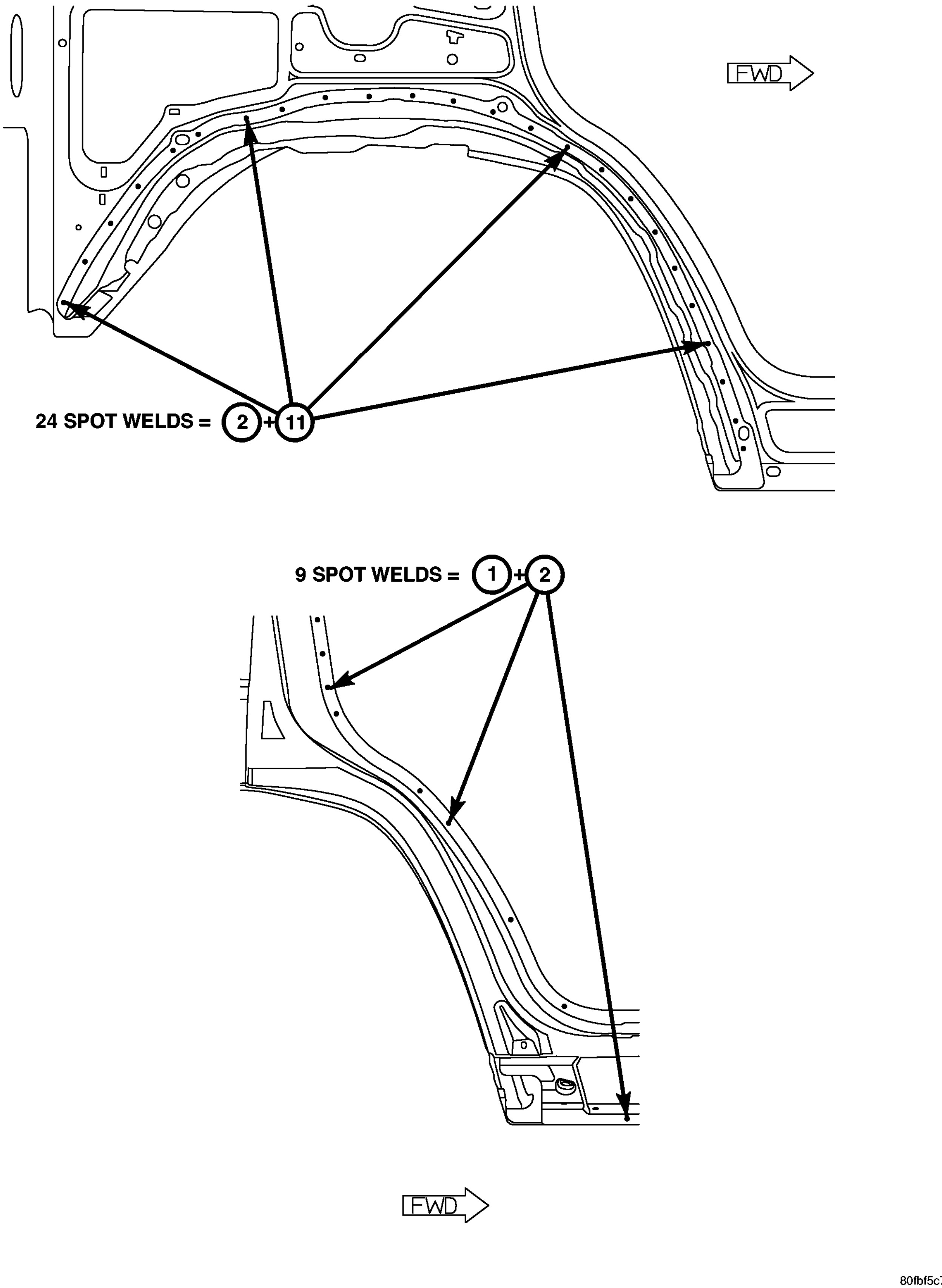


Fig. 59 OUTER REAR WHEELHOUSE

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

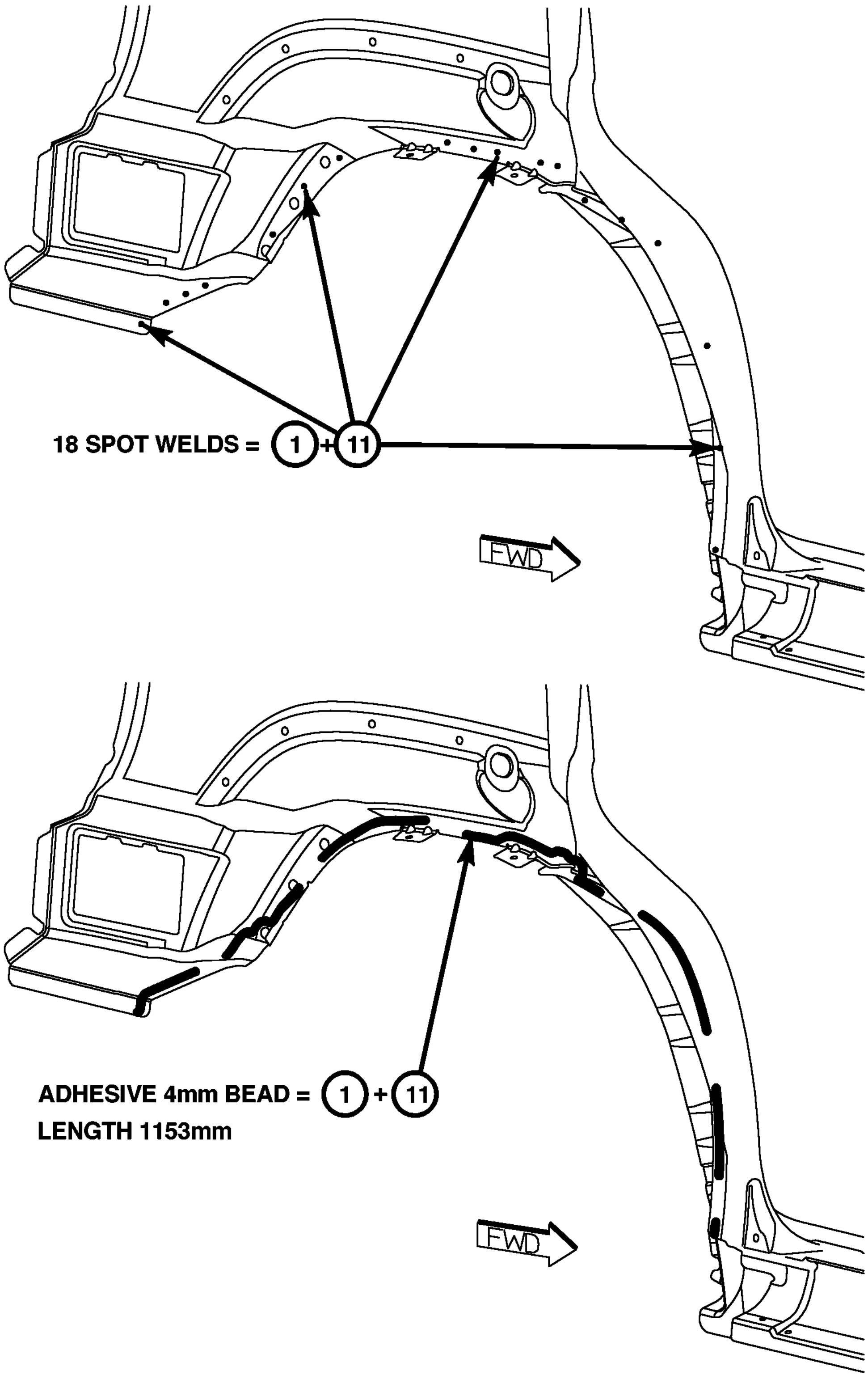


Fig. 60 OUTER REAR WHEELHOUSE

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

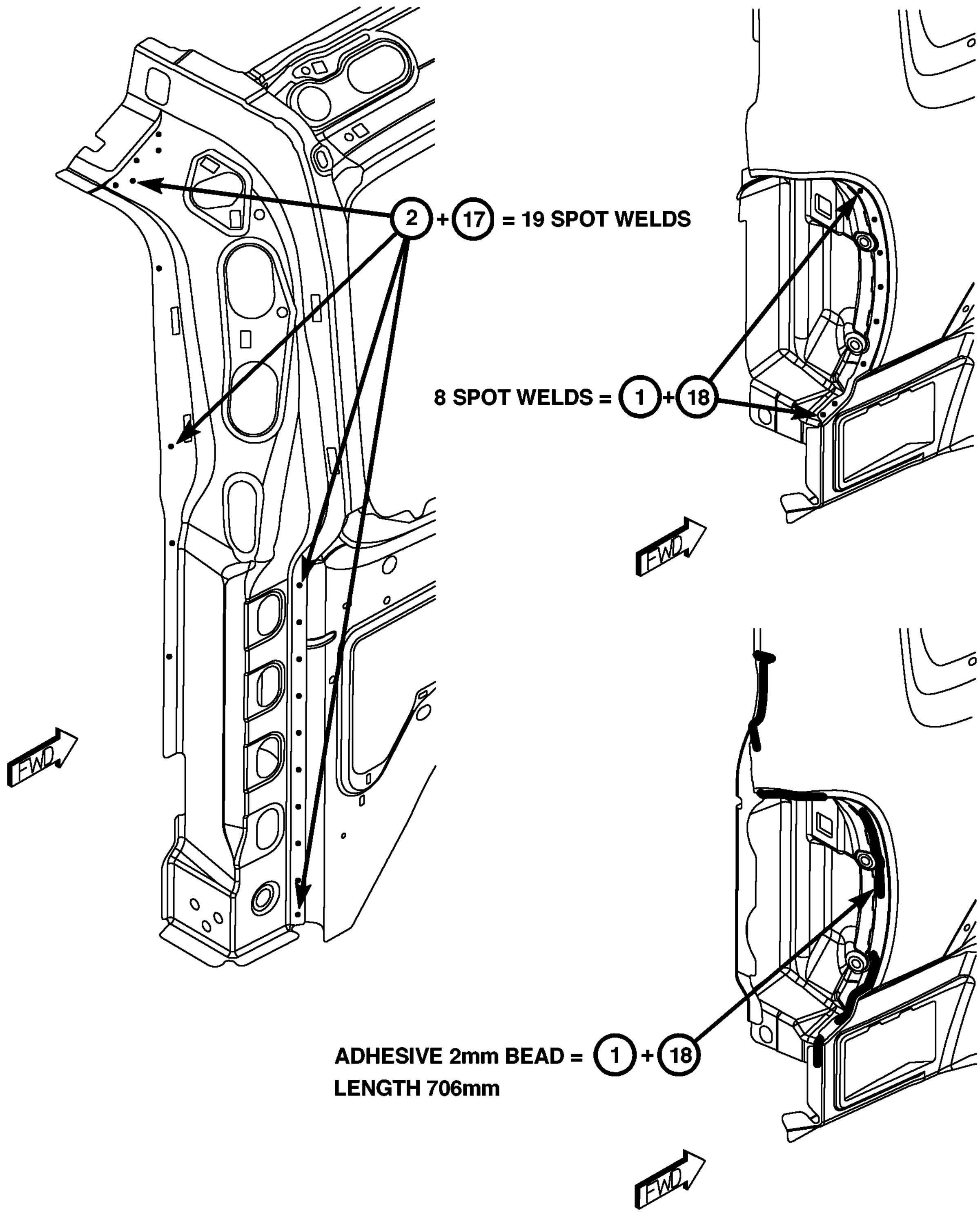


Fig. 61 D-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

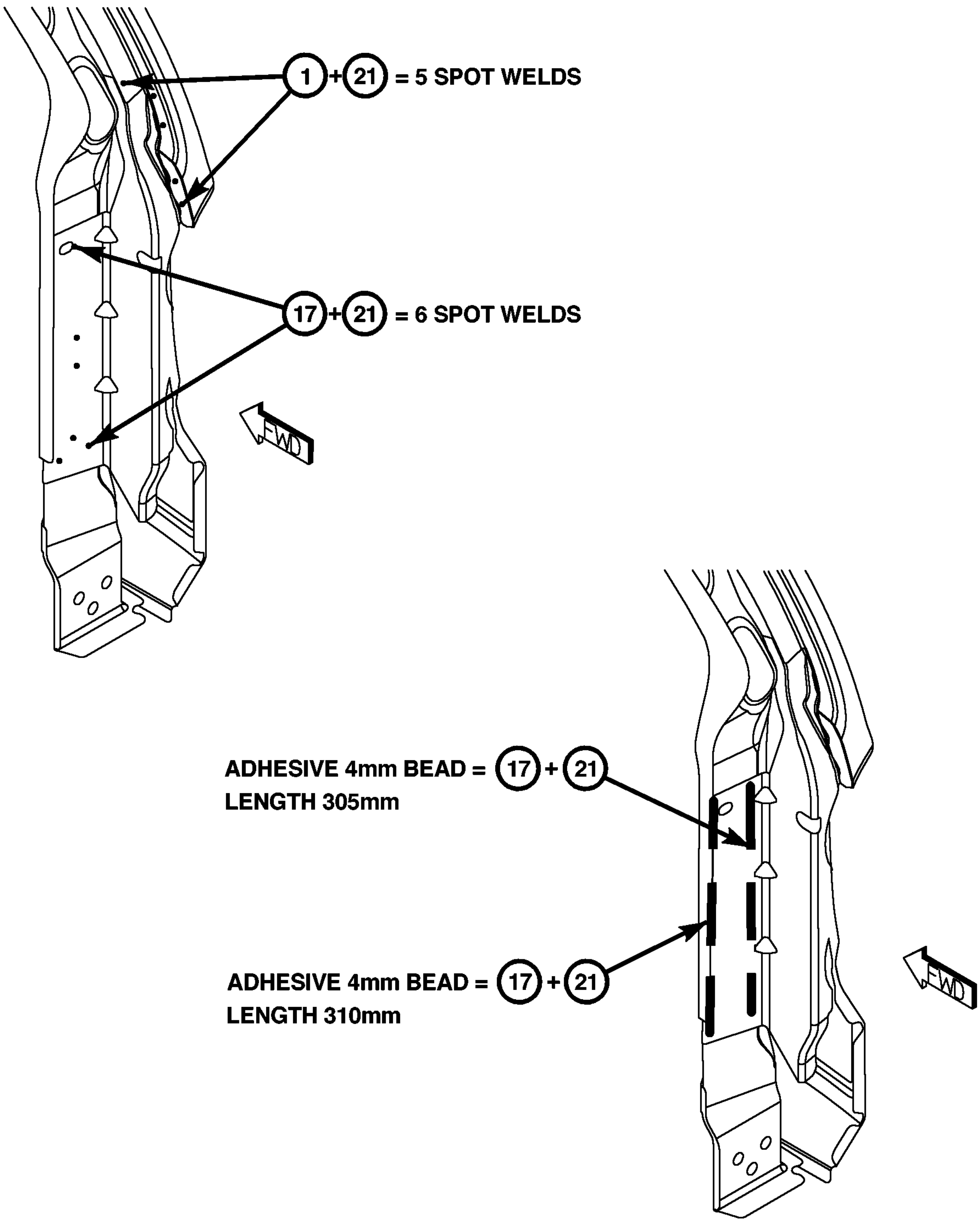
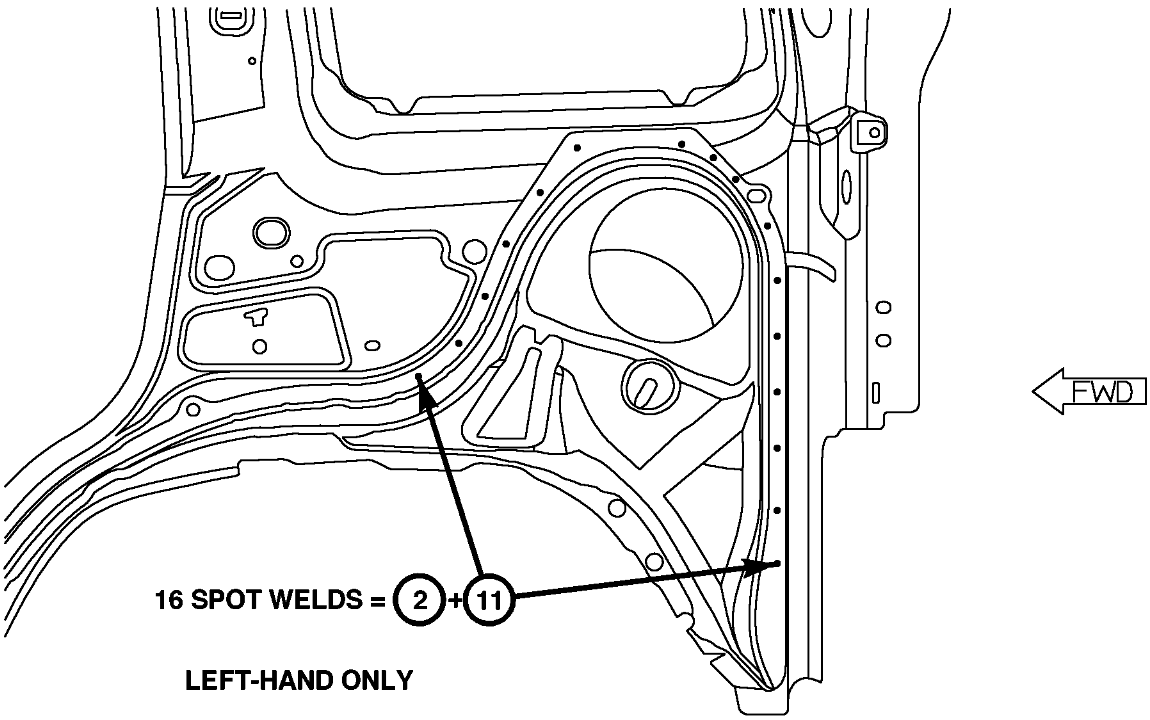


Fig. 62 SWING GATE STRIKER REINFORCEMENT

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)



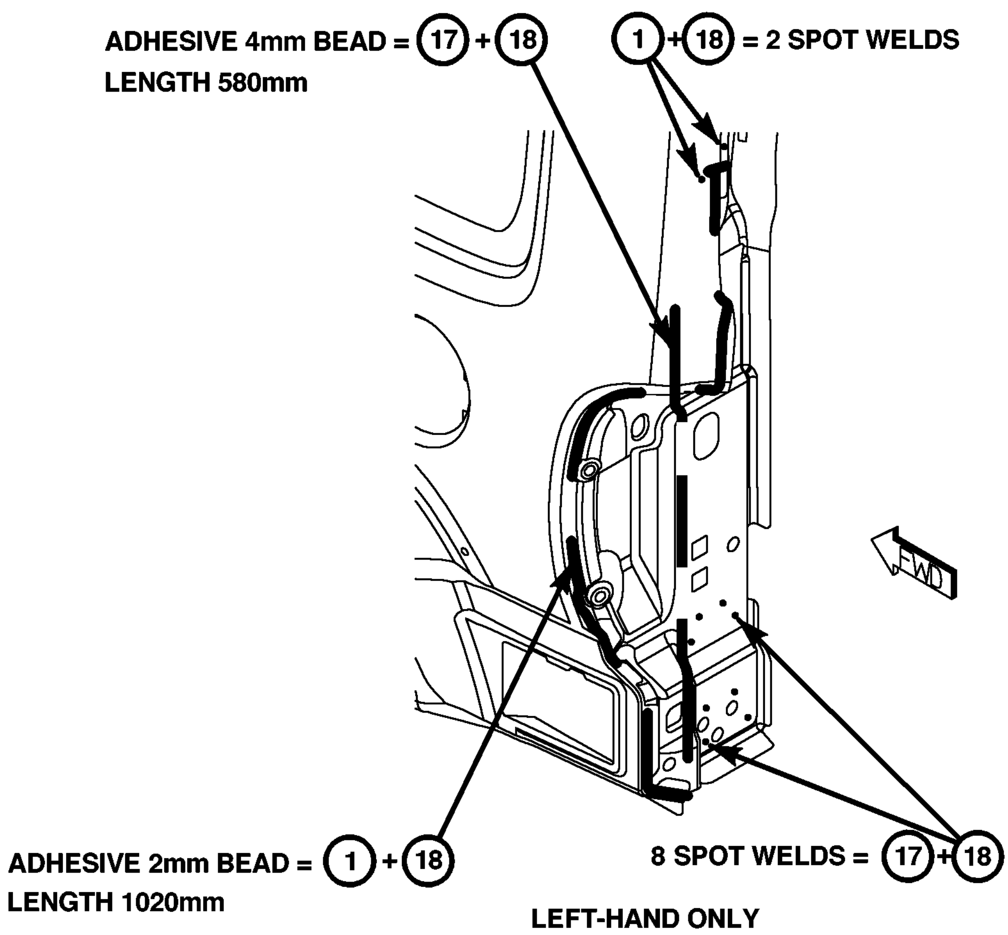


Fig. 63 REAR WHEELHOUSE AND TAIL LAMP

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

FENDER ASSEMBLIES

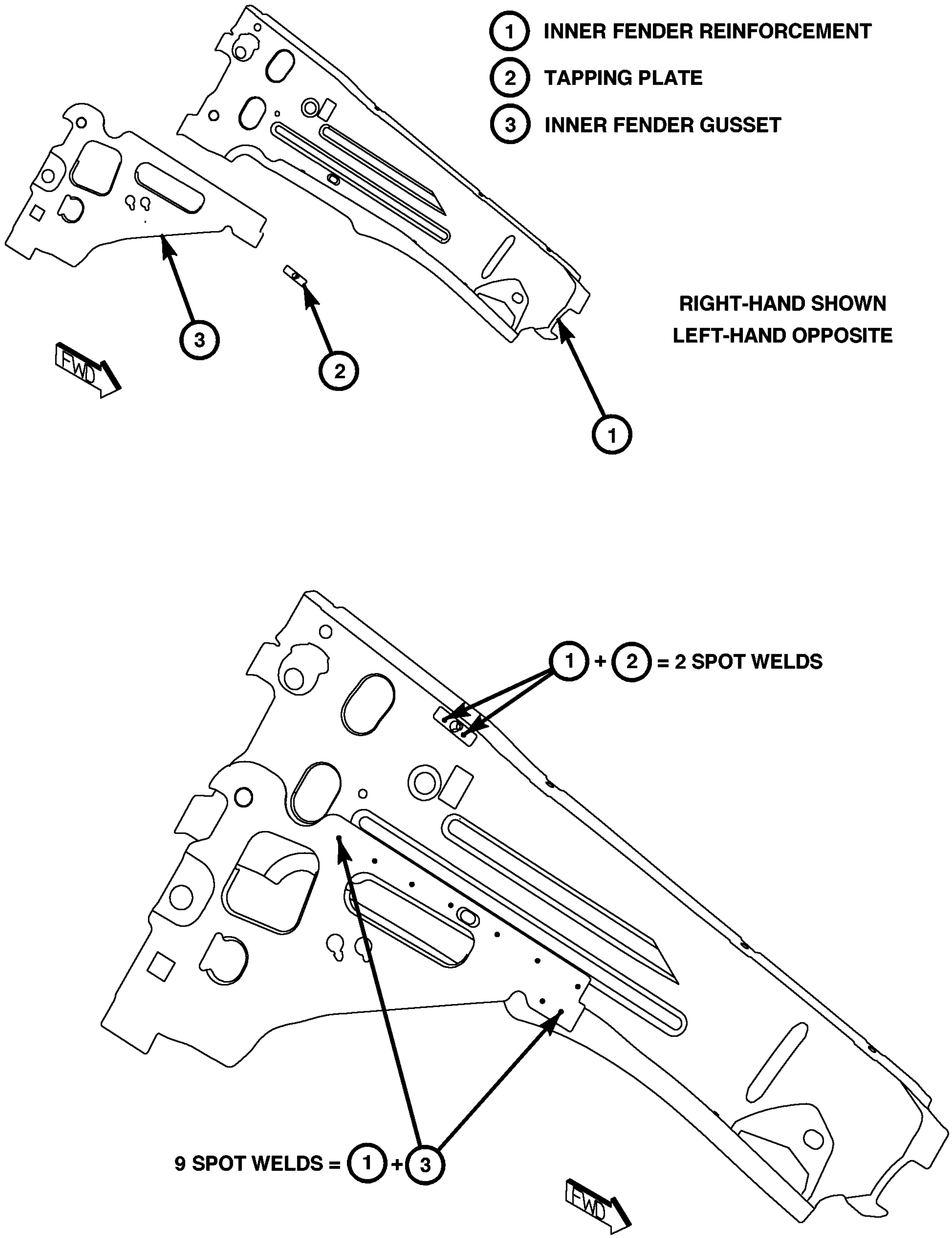


Fig. 64 FENDERS

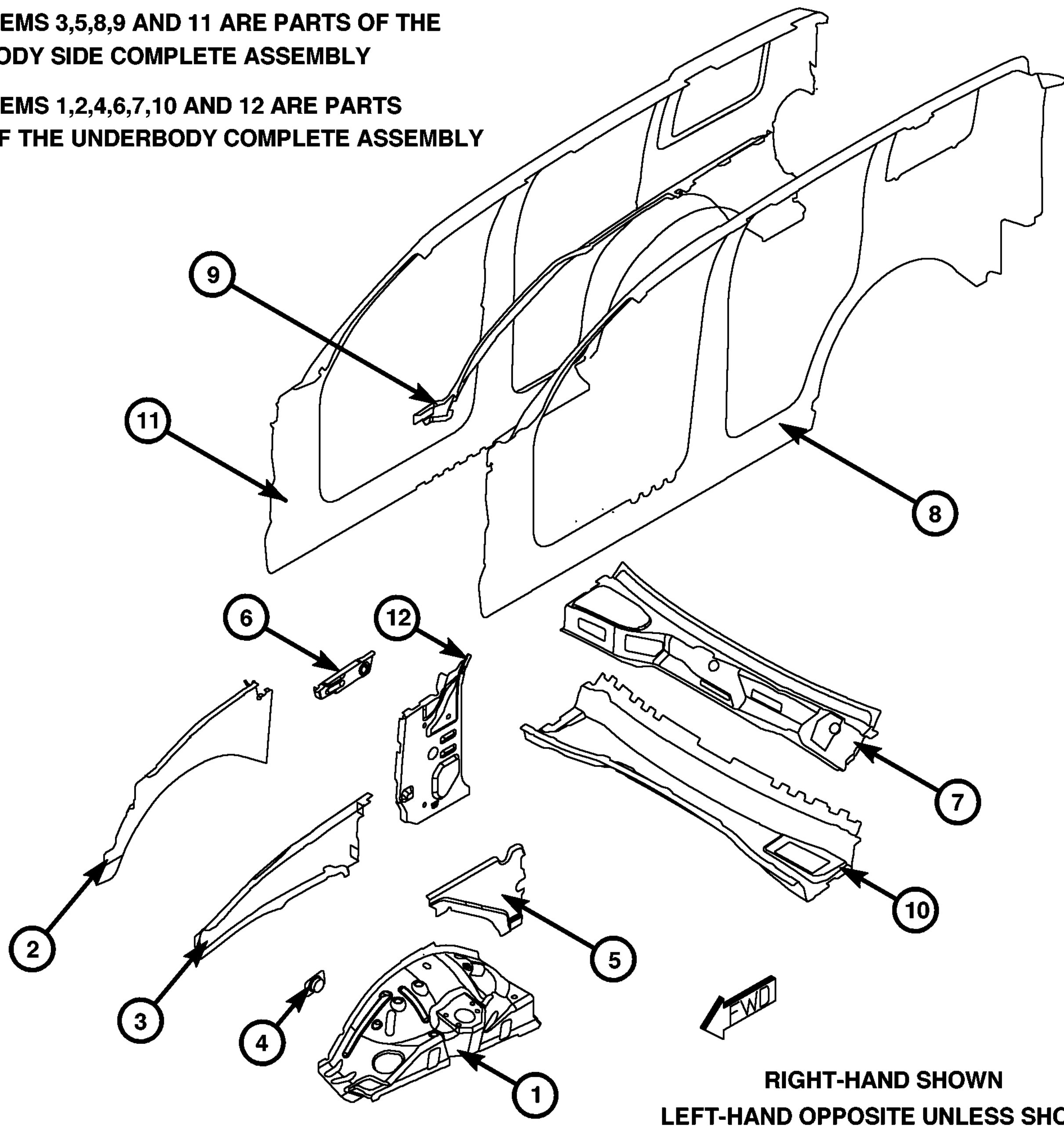
WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

1. INNER FRONT WHEELHOUSE
2. INNER FENDER REINFORCEMENT
3. INNER FENDER PANEL
4. RADIATOR SUPPORT BRACKET
5. INNER FRONT FENDER GUSSET
6. PLENUM CLOSURE
7. PLENUM BAFFLE
8. BODY SIDE INNER PANEL
9. A-PILLAR REINFORCEMENT
10. PLENUM LOWER PANEL
11. BODY SIDE OUTER PANEL
12. COWL SIDE PANEL

NOTE

ITEMS 3,5,8,9 AND 11 ARE PARTS OF THE BODY SIDE COMPLETE ASSEMBLY

ITEMS 1,2,4,6,7,10 AND 12 ARE PARTS OF THE UNDERBODY COMPLETE ASSEMBLY



RIGHT-HAND SHOWN
LEFT-HAND OPPOSITE UNLESS SHOWN

Fig. 65 FENDER ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

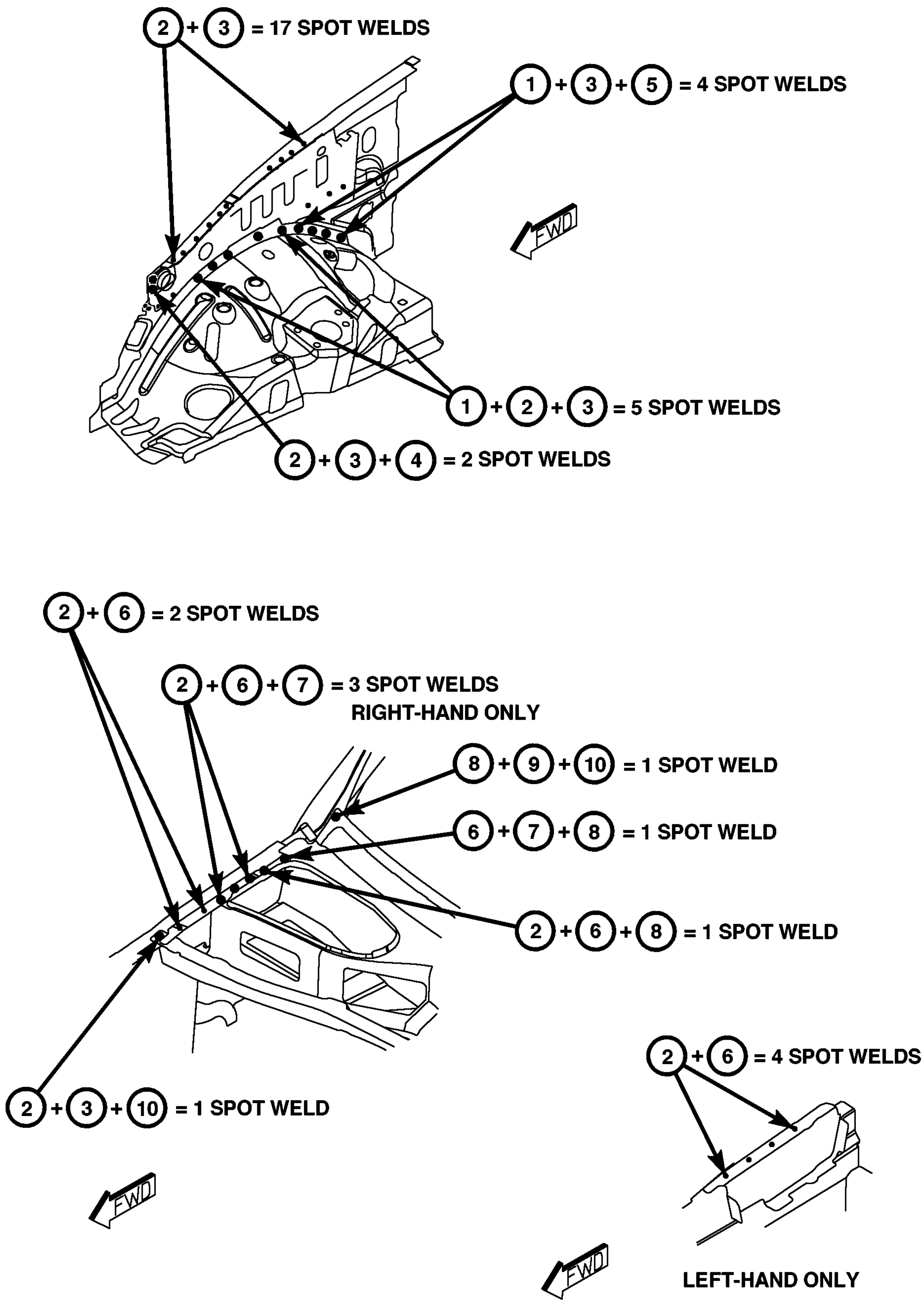


Fig. 66 INNER FENDER

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

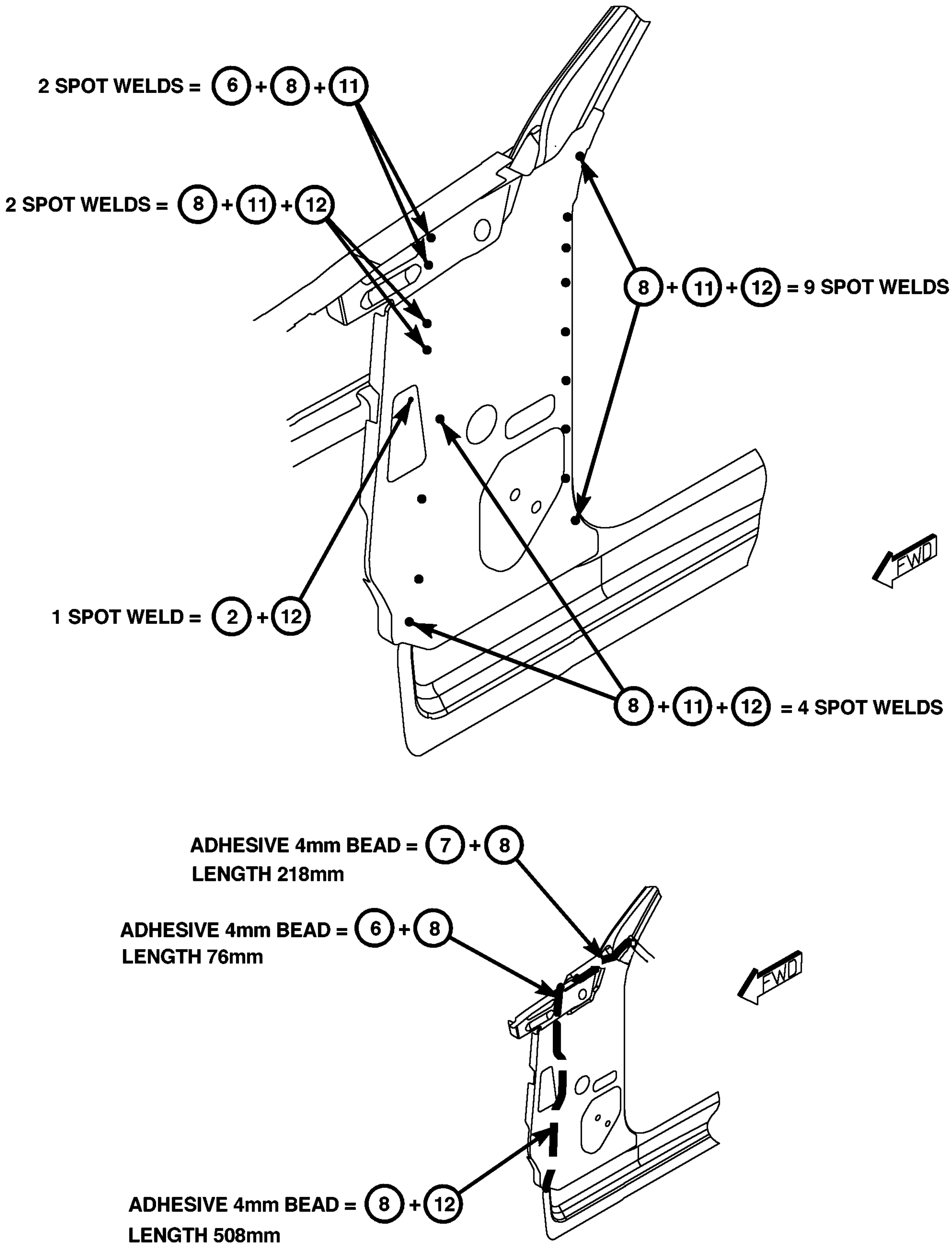


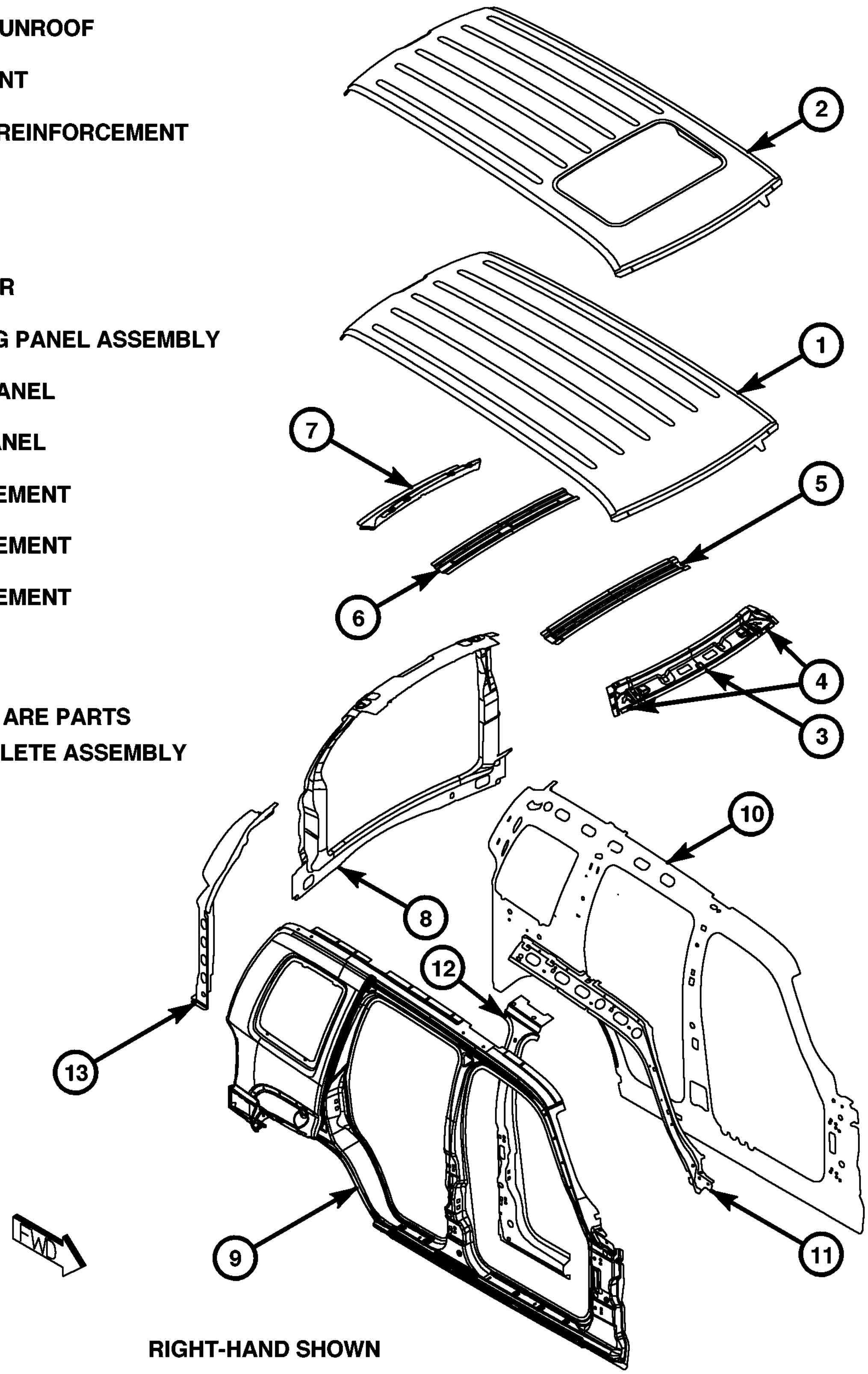
Fig. 67 FRONT INNER SIDE PANELS

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

ROOF PANEL ASSEMBLIES

1. ROOF PANEL
2. ROOF PANEL WITH SUNROOF
3. ROOF HEADER - FRONT
4. HEADER MOUNTING REINFORCEMENT
5. ROOF BOW - FRONT
6. ROOF BOW - REAR
7. ROOF HEADER - REAR
8. REAR GATE OPENING PANEL ASSEMBLY
9. BODY SIDE OUTER PANEL
10. BODY SIDE INNER PANEL
11. A-PILLAR REINFORCEMENT
12. B-PILLAR REINFORCEMENT
13. D-PILLAR REINFORCEMENT

NOTE
ITEMS 4,9,10,11,12 AND 13 ARE PARTS
OF THE BODY SIDE COMPLETE ASSEMBLY



RIGHT-HAND SHOWN
LEFT-HAND OPPOSITE

Fig. 68 ROOF PANEL ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

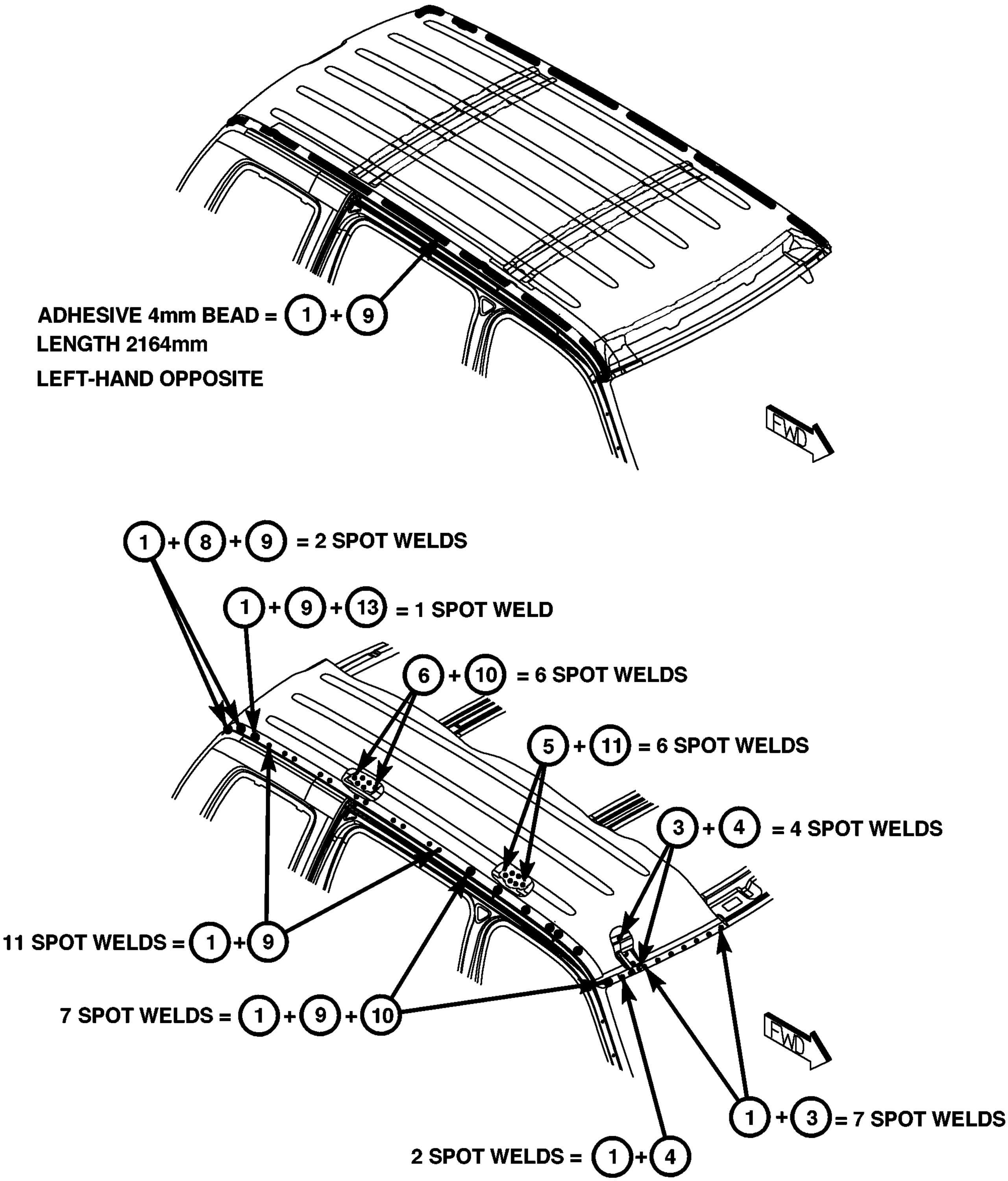


Fig. 69 ROOF PANEL ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

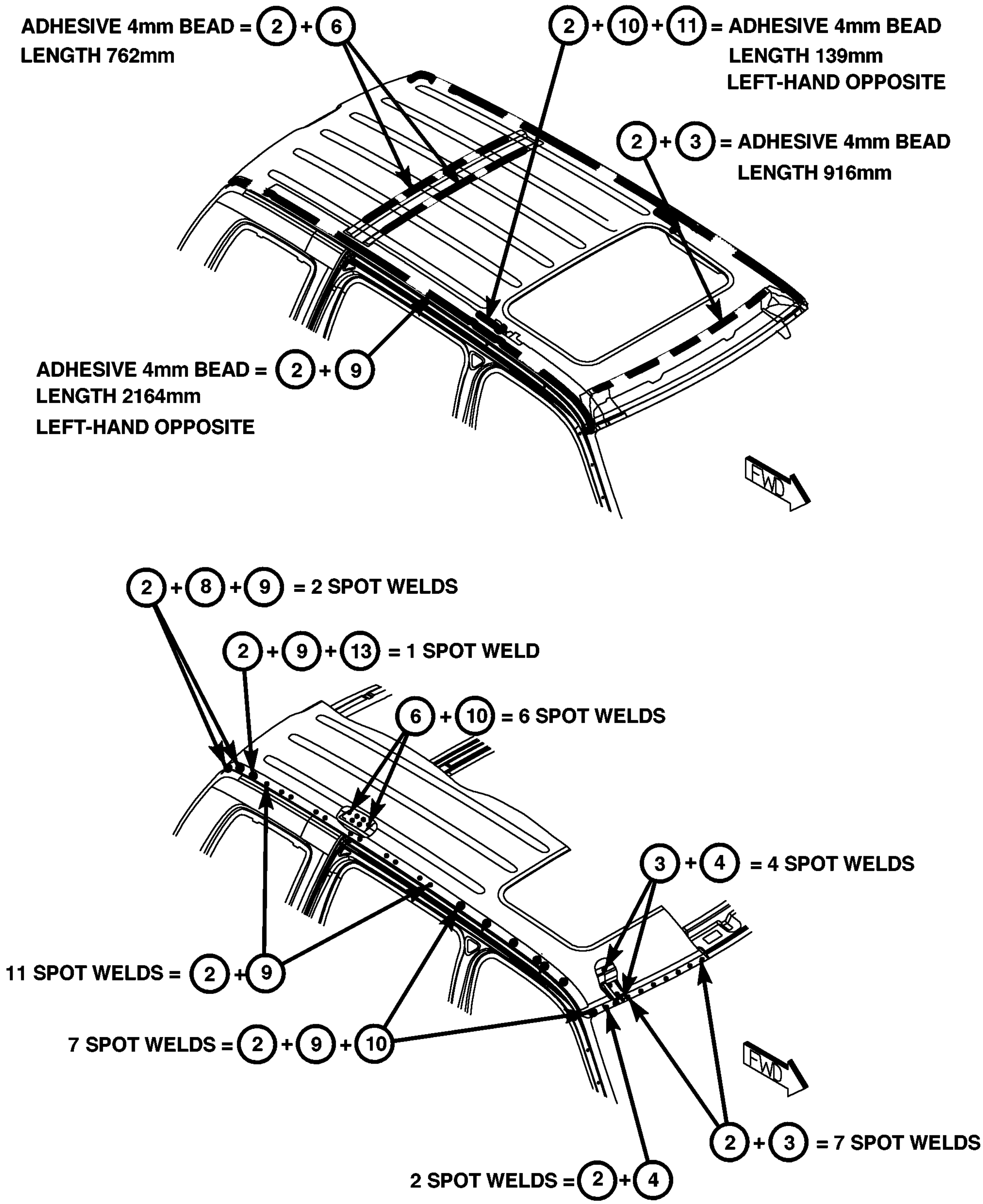
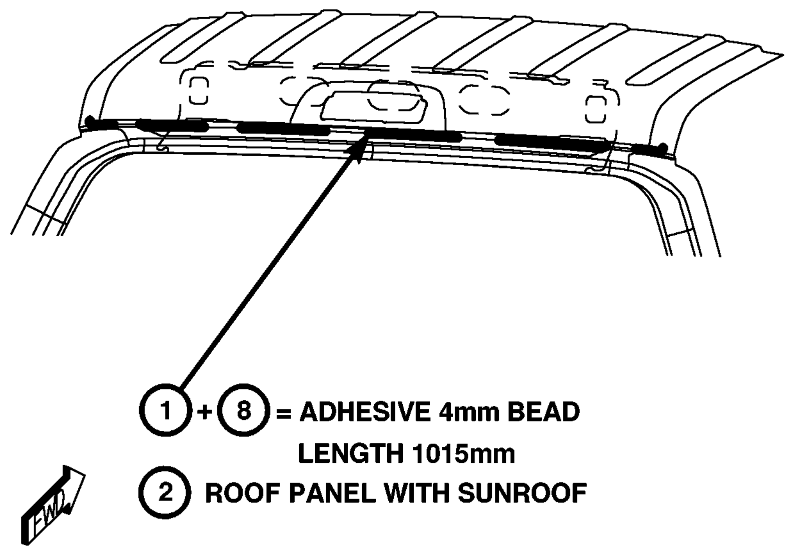


Fig. 70 ROOF PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)



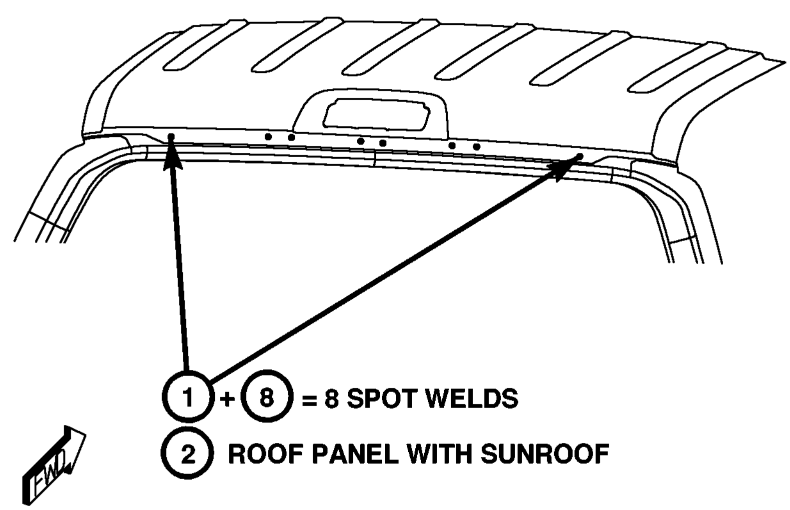


Fig. 71 ROOF PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

BODY SIDE PANELS & FLOOR PAN ASSEMBLIES

1. BODY SIDE OUTER PANEL
2. BODY SIDE INNER PANEL
3. BODY SIDE SILL
4. REAR WHEELHOUSE OUTER PANEL
5. REAR WHEELHOUSE INNER PANEL ASSEMBLY
6. REAR WHEELHOUSE INNER EXTENSION
7. REAR CROSSMEMBER
8. REAR FLOOR PAN
9. D-PILLAR REINFORCEMENT
10. ROOF HEADER - REAR
11. REAR GATE OPENING PANEL ASSEMBLY
12. GATE STRIKER REINFORCEMENT
13. D-PILLAR LOWER TO FLOOR GUSSET
14. GATE OPENING REINFORCEMENT
15. TAIL LAMP MOUNTING PANEL

NOTE

ITEMS 1,2,9,12 AND 15 ARE PARTS OF THE BODY SIDE COMPLETE ASSEMBLY

ITEMS 3,4,5,6,7,8,13 AND 14 ARE PARTS OF THE UNDERBODY COMPLETE ASSEMBLY

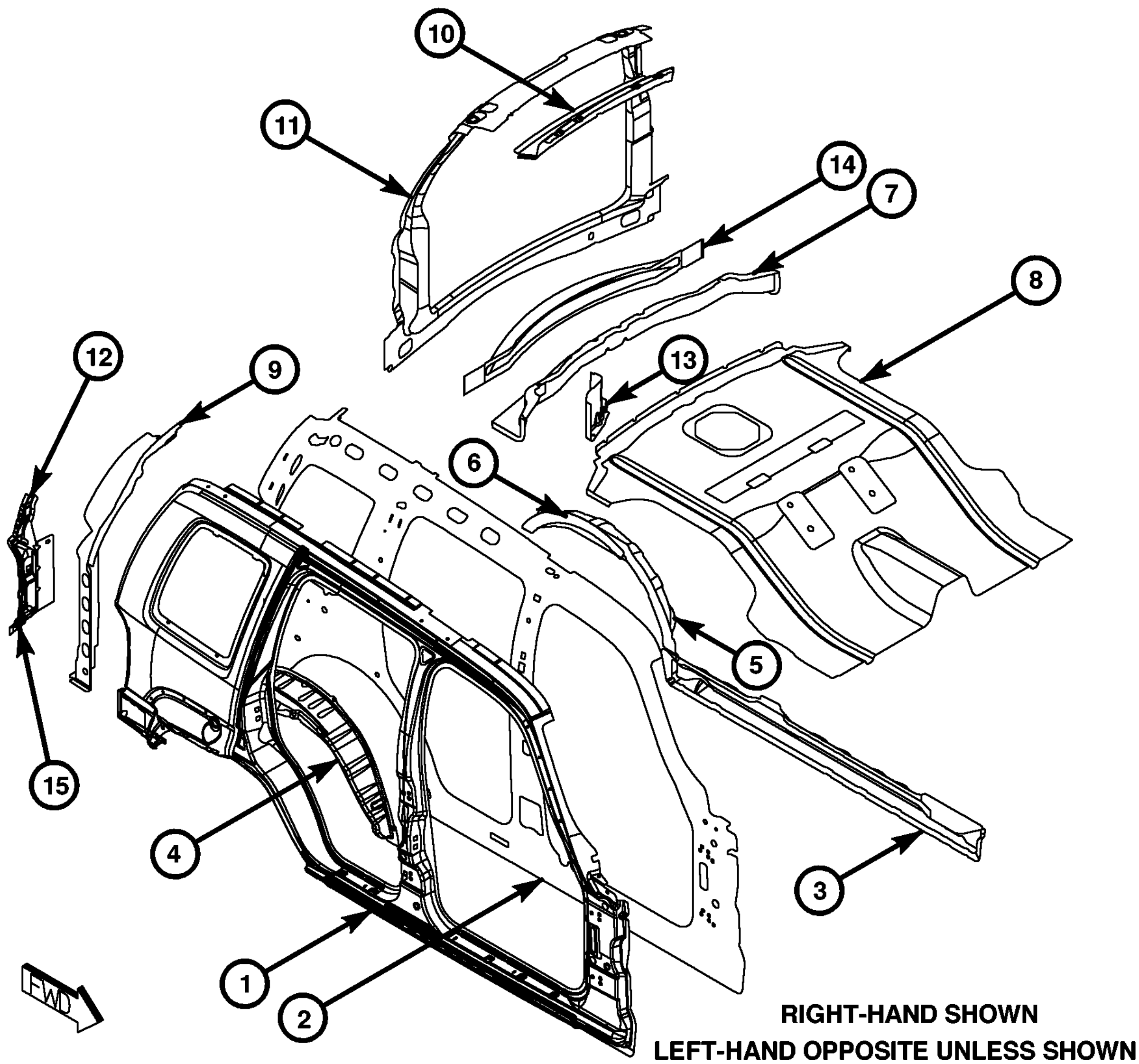


Fig. 72 BODY SIDE PANEL ASSEMBLY

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

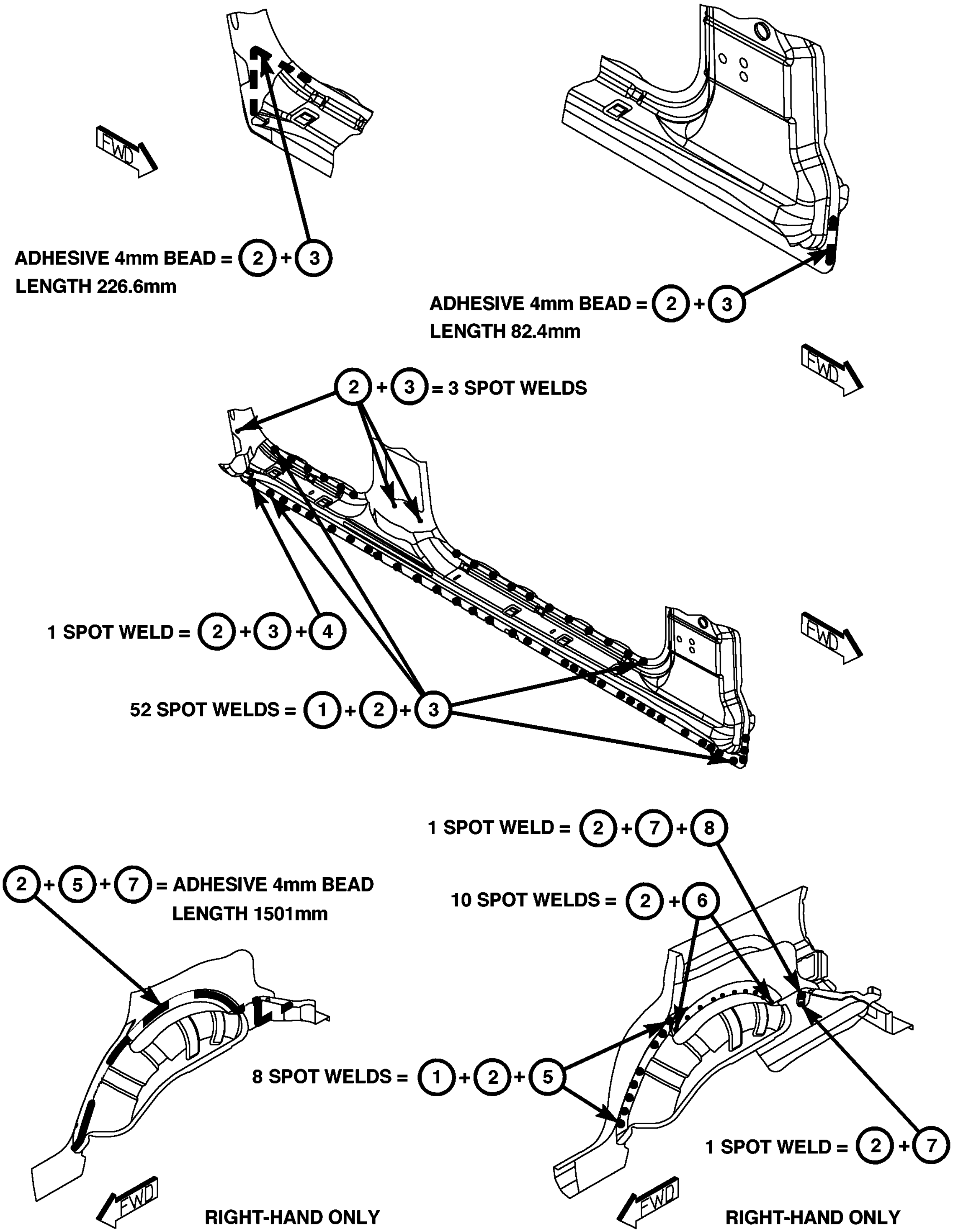


Fig. 73 BODY SIDE PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

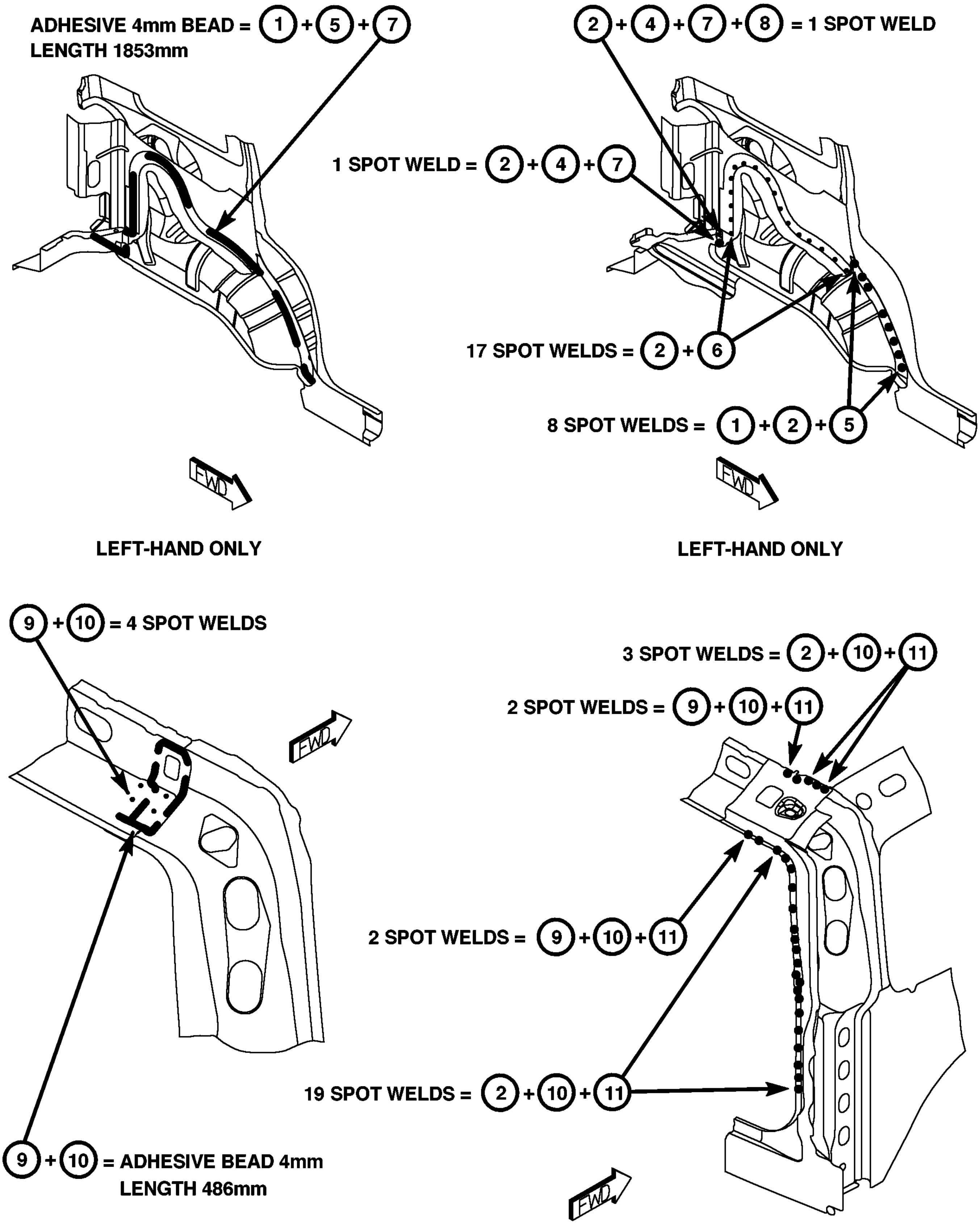


Fig. 74 BODY SIDE PANEL

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

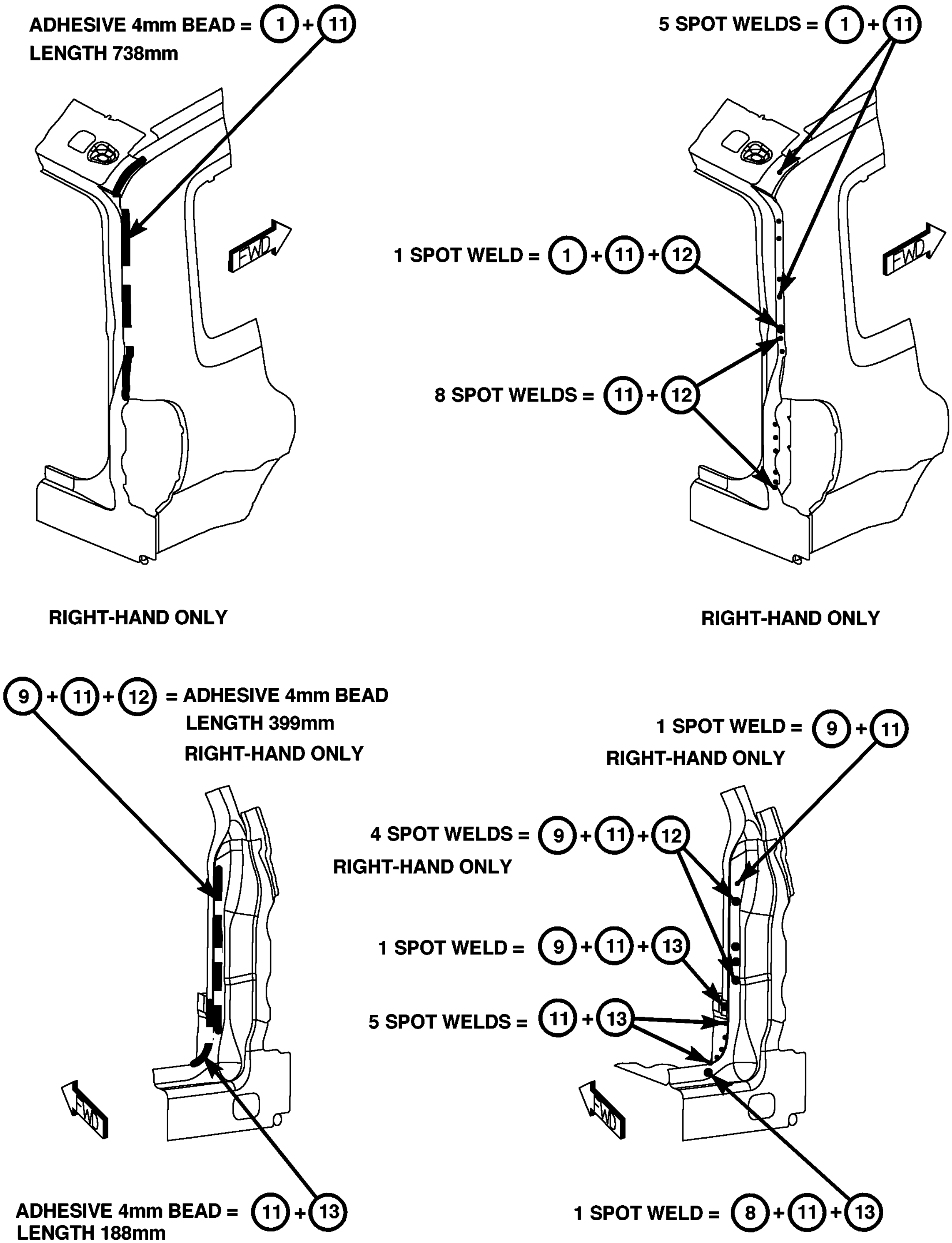


Fig. 75 D-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)

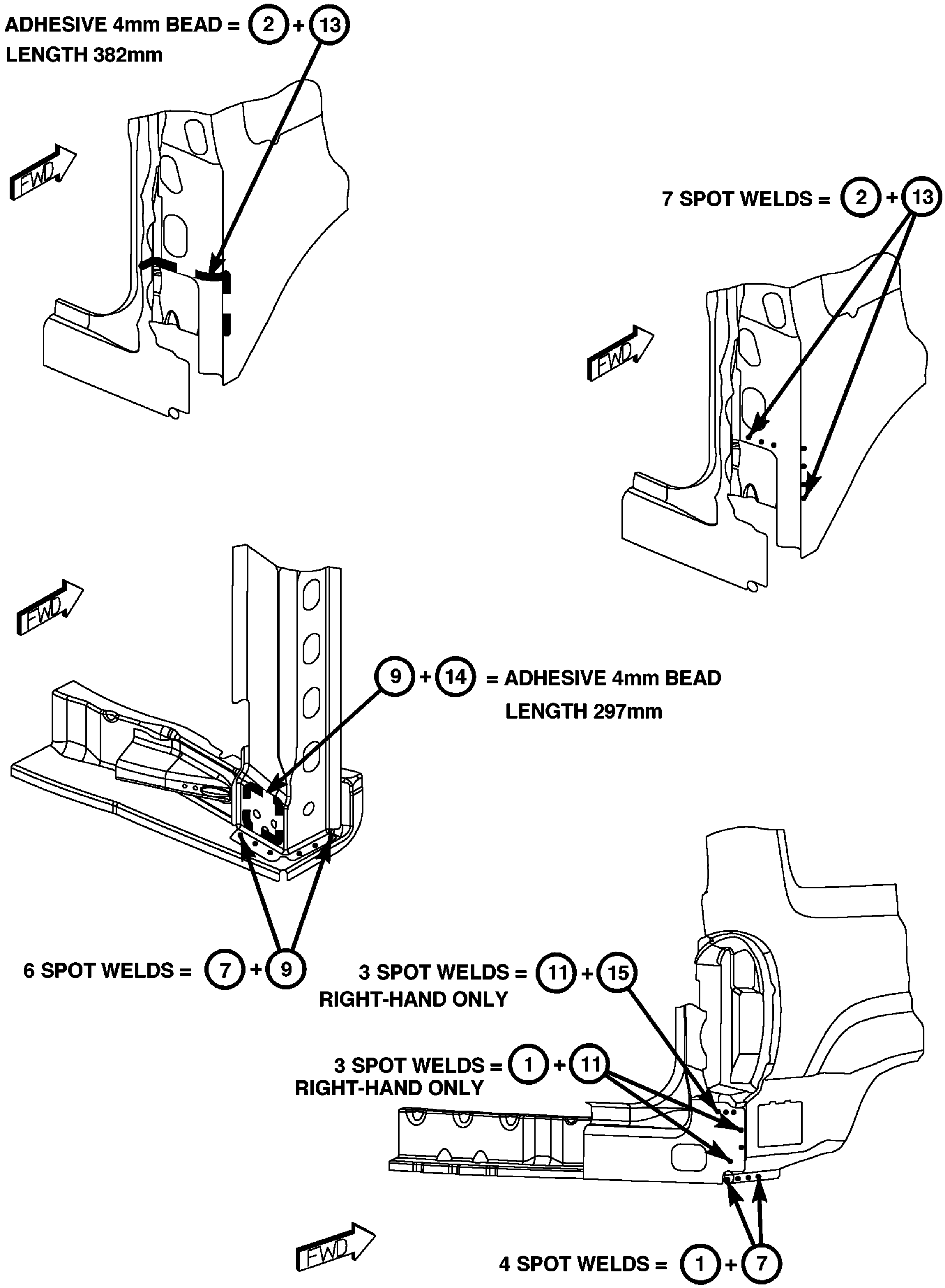
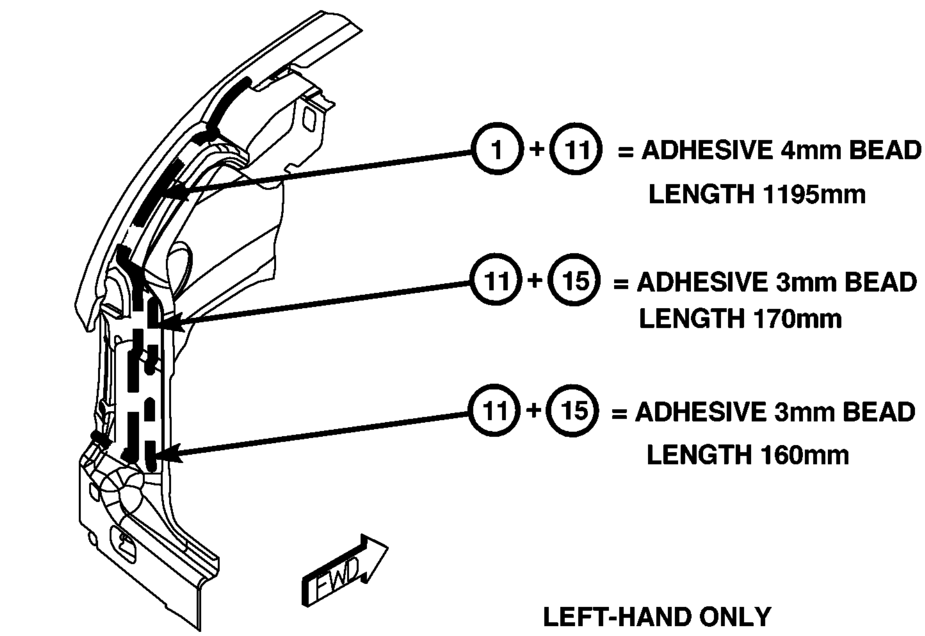


Fig. 76 D-PILLAR

WELD AND STRUCTURAL ADHESIVE LOCATIONS (Continued)



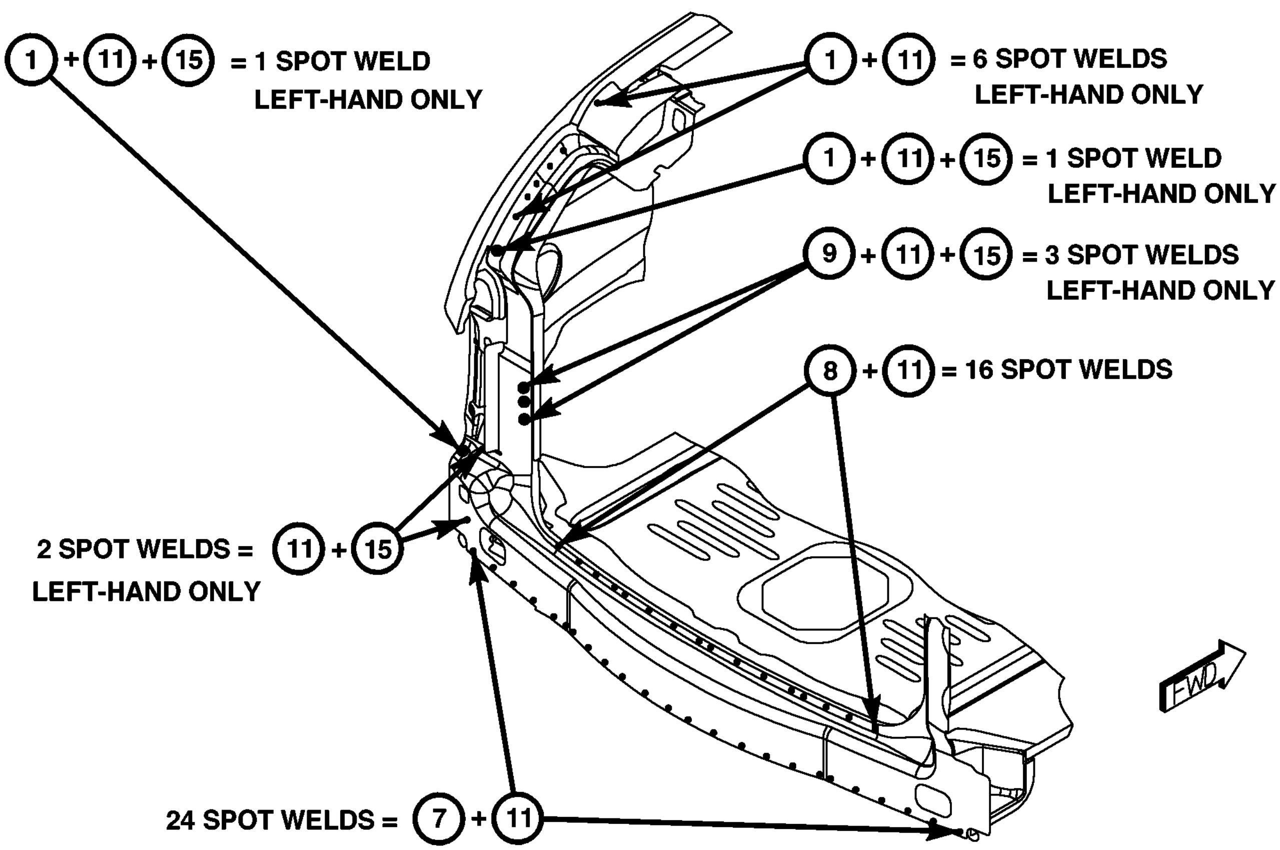


Fig. 77 SWING GATE OPENING

SEALER LOCATIONS

SPECIFICATIONS

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WHEELHOUSES	(97)
WHEELHOUSE	(98)
ROOF PANEL ASSEMBLY	(99)
REAR ROOF HEADER AND ROOF PANEL	(100)

SEALER LOCATIONS (Continued)

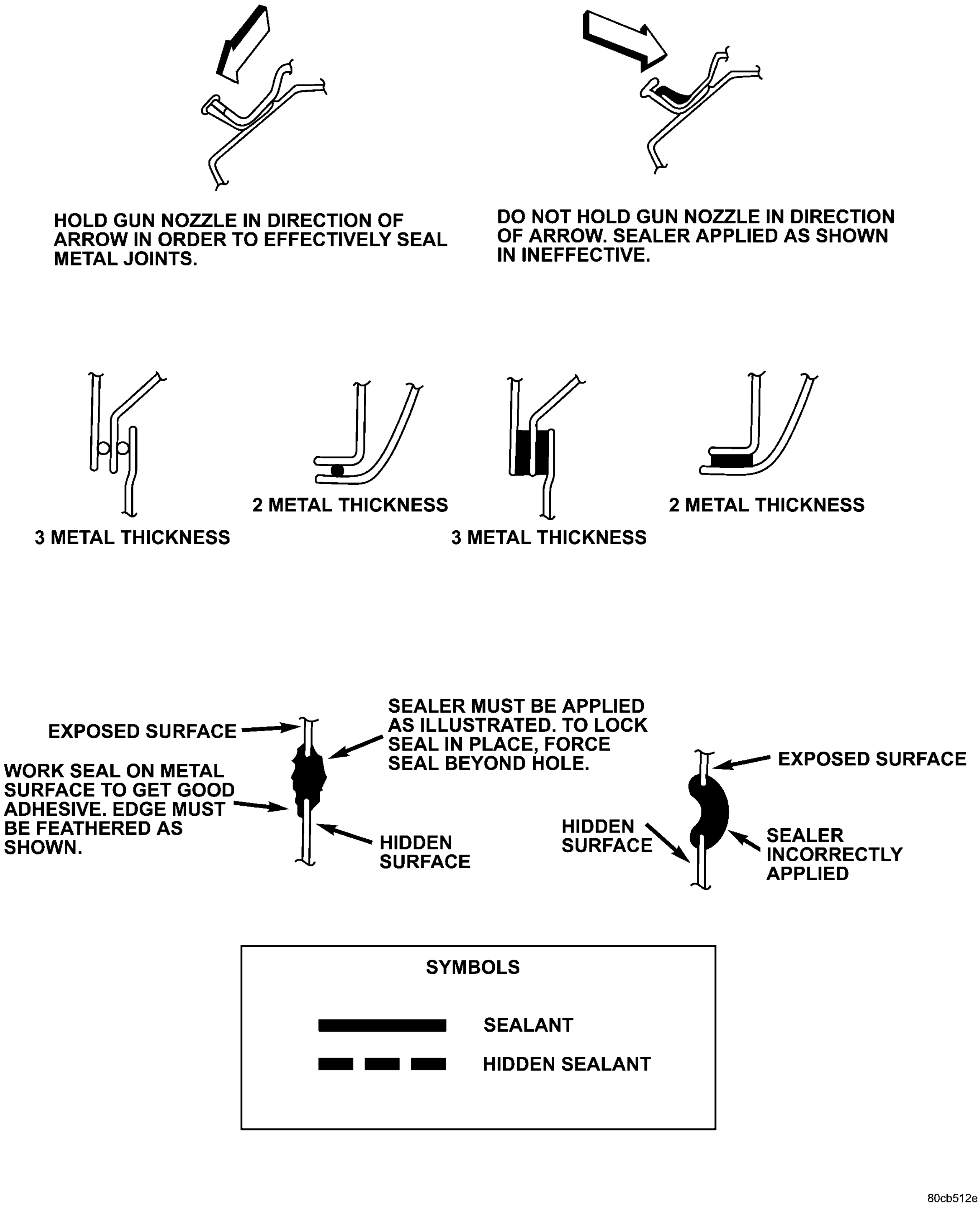


Fig. 78 APPLICATION METHODS

SEALER LOCATIONS (Continued)

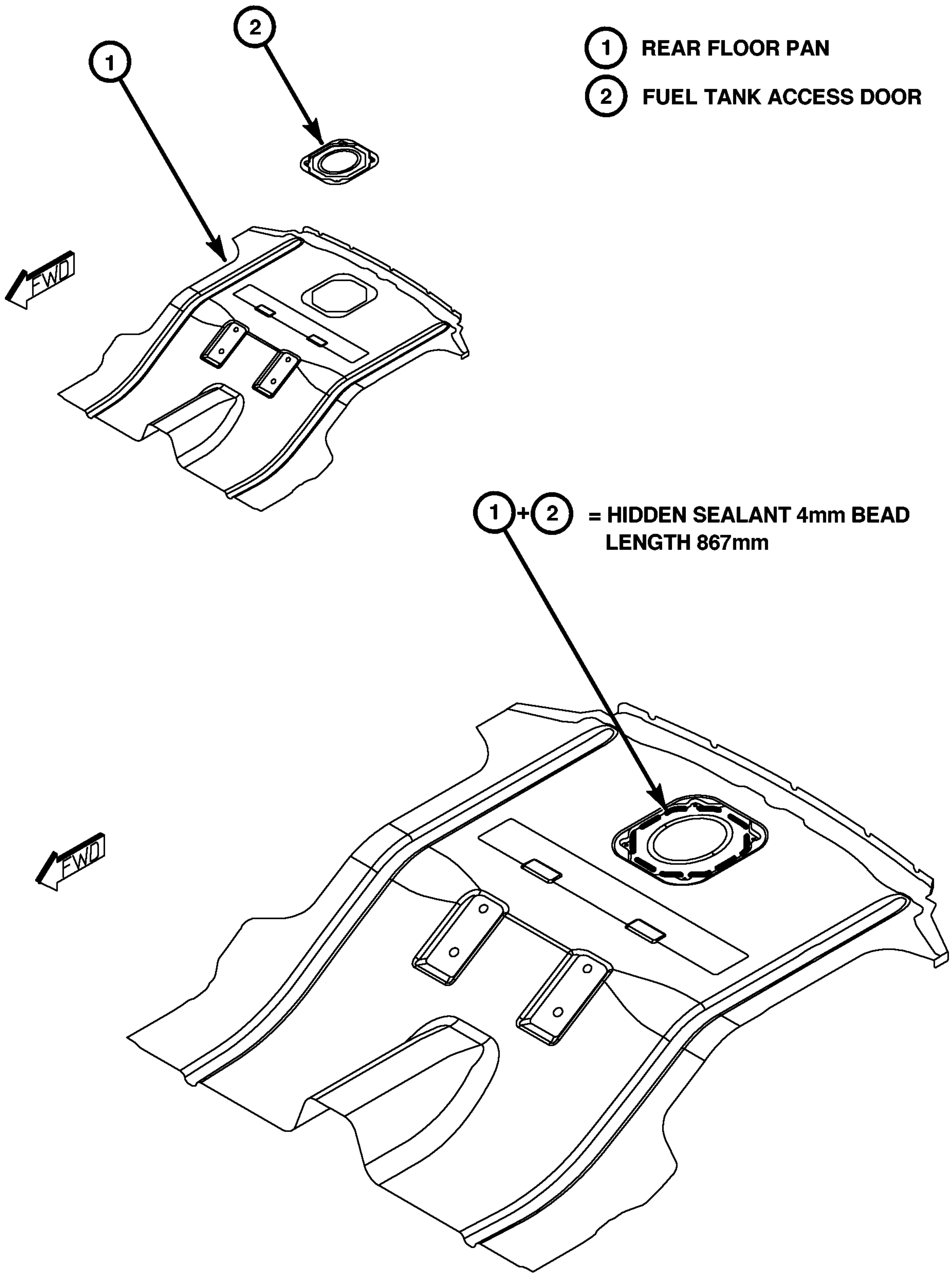


Fig. 79 REAR FLOOR PAN

SEALER LOCATIONS (Continued)

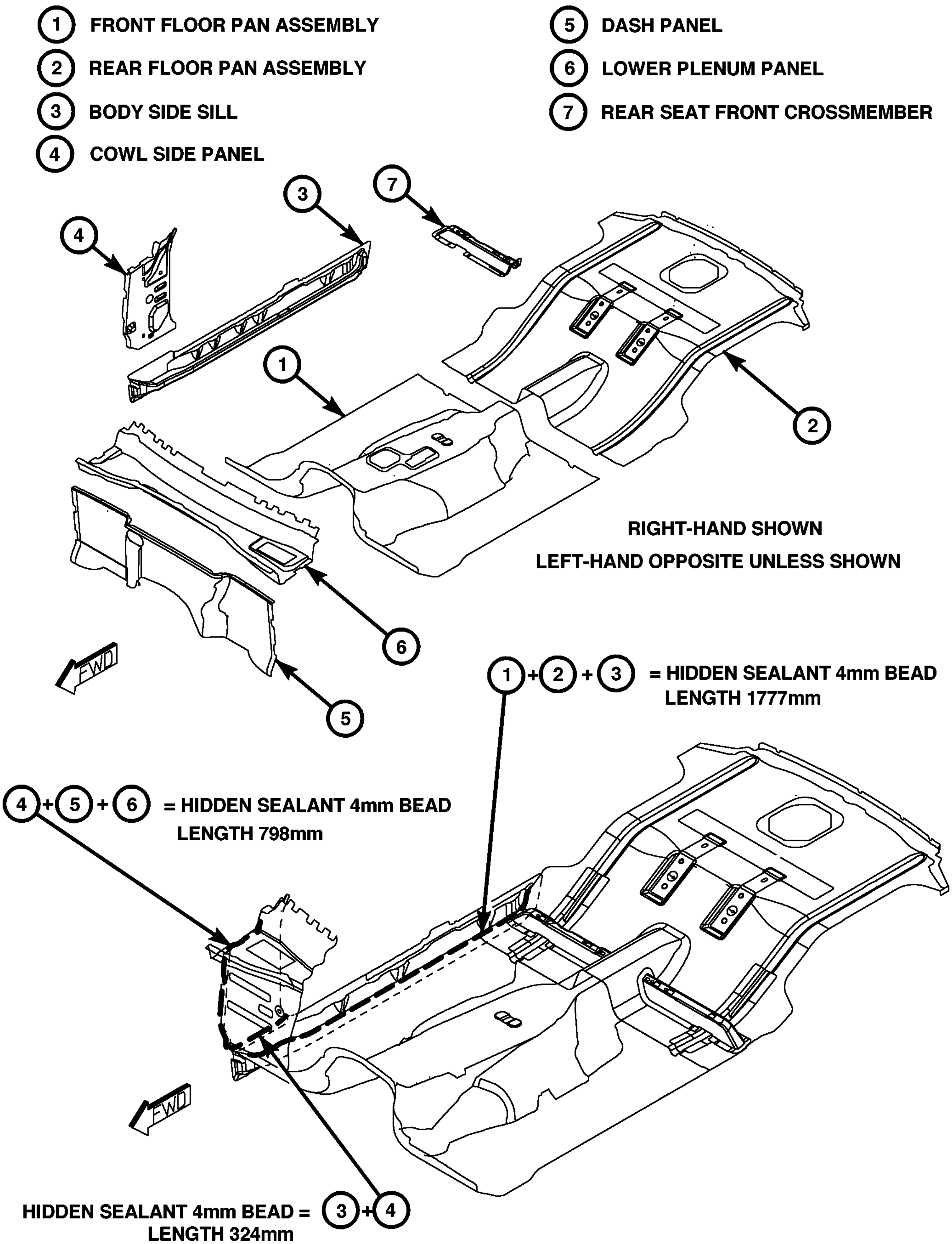


Fig. 80 FULL FLOOR PAN

SEALER LOCATIONS (Continued)

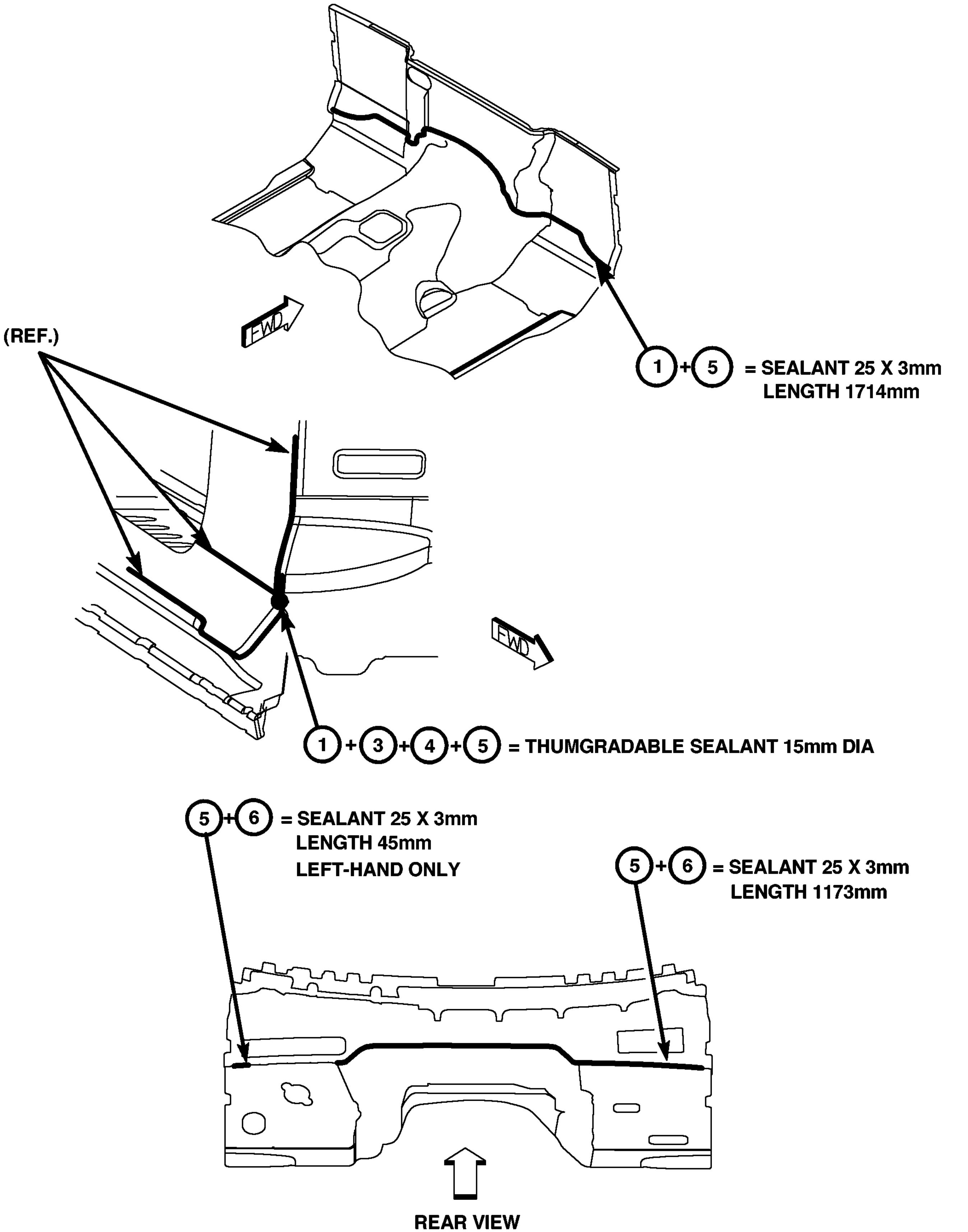
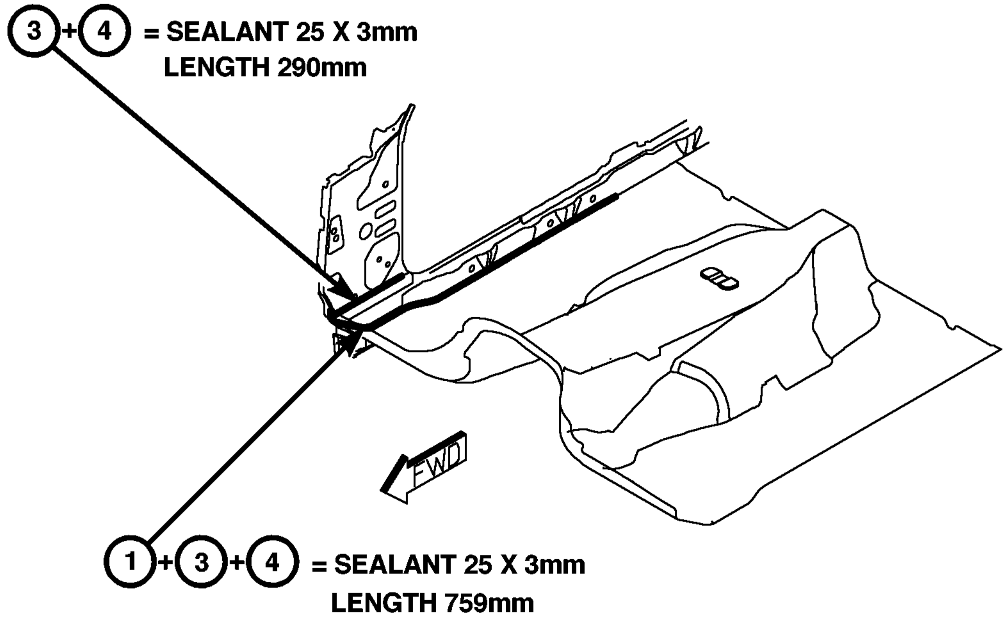


Fig. 81 FRONT FLOOR PAN & DASH PANEL

SEALER LOCATIONS (Continued)



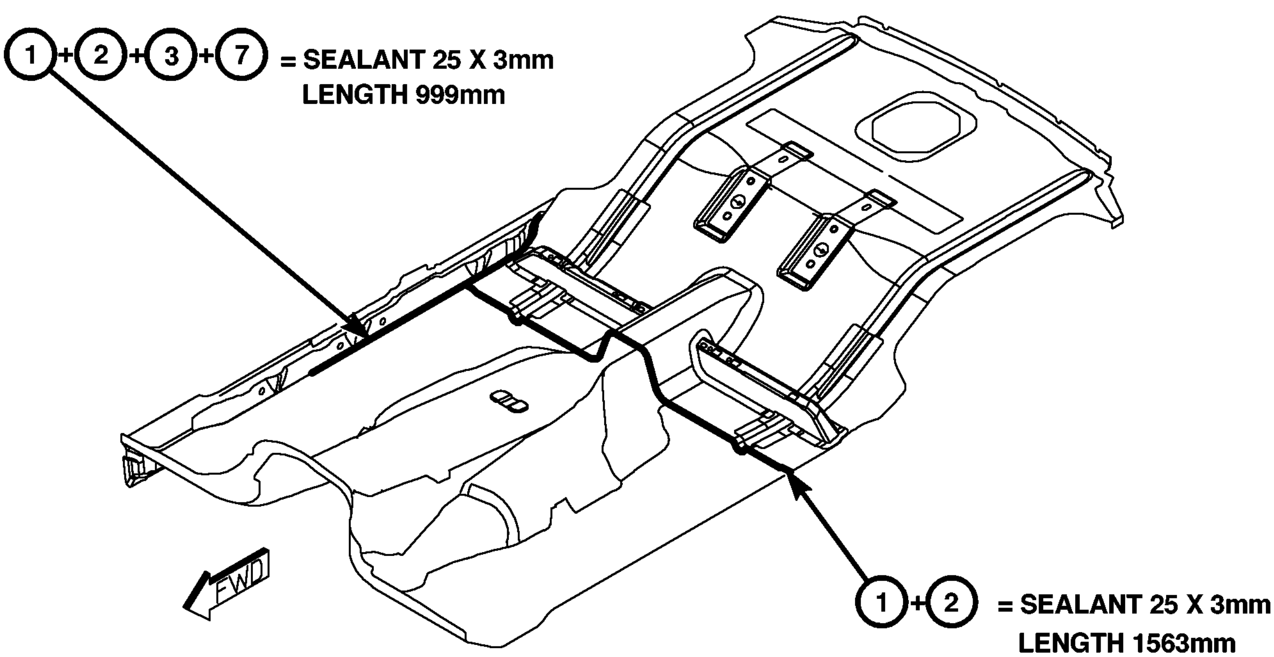


Fig. 82 FLOOR PAN

SEALER LOCATIONS (Continued)

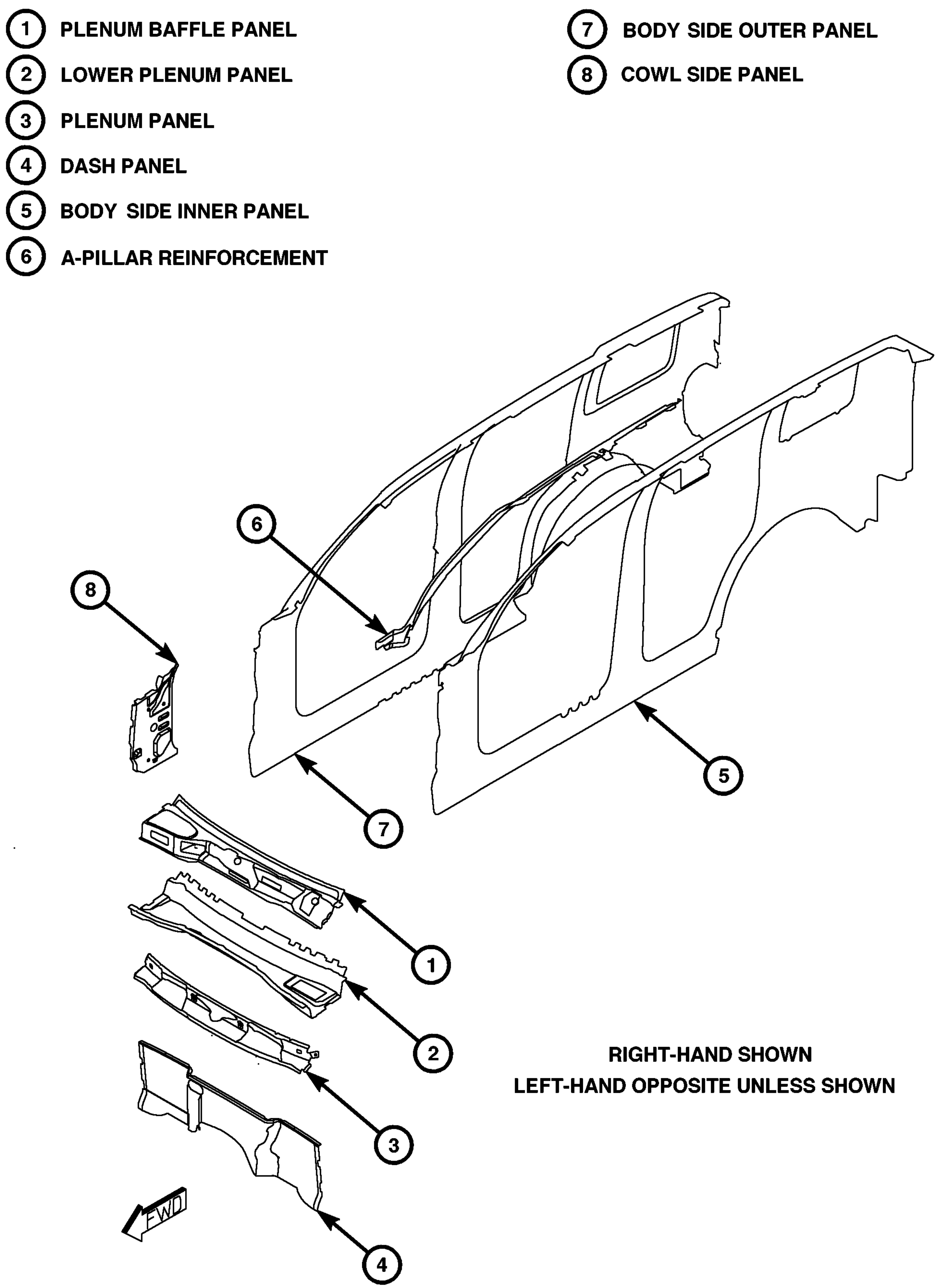
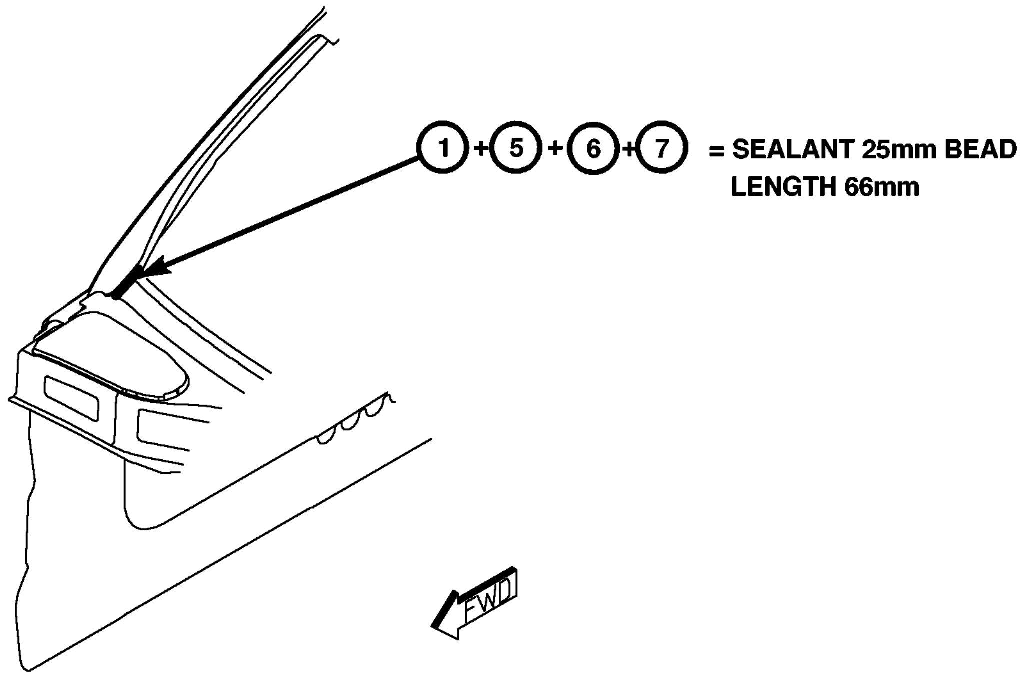


Fig. 83 BODY SIDE PANEL ASSEMBLY

SEALER LOCATIONS (Continued)



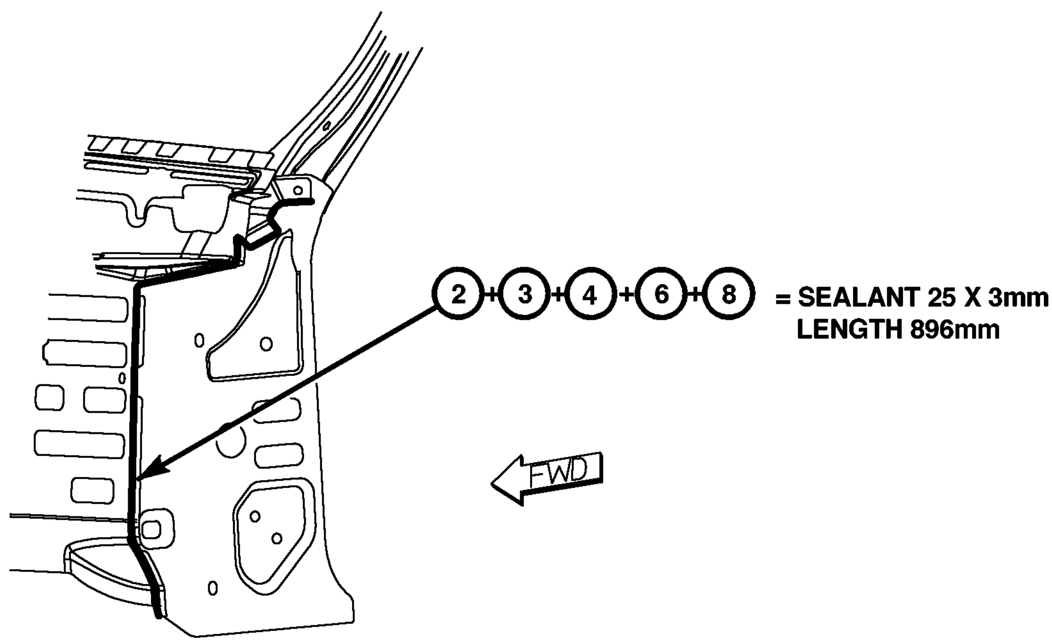


Fig. 84 A-PILLAR & DASH PANEL

SEALER LOCATIONS (Continued)

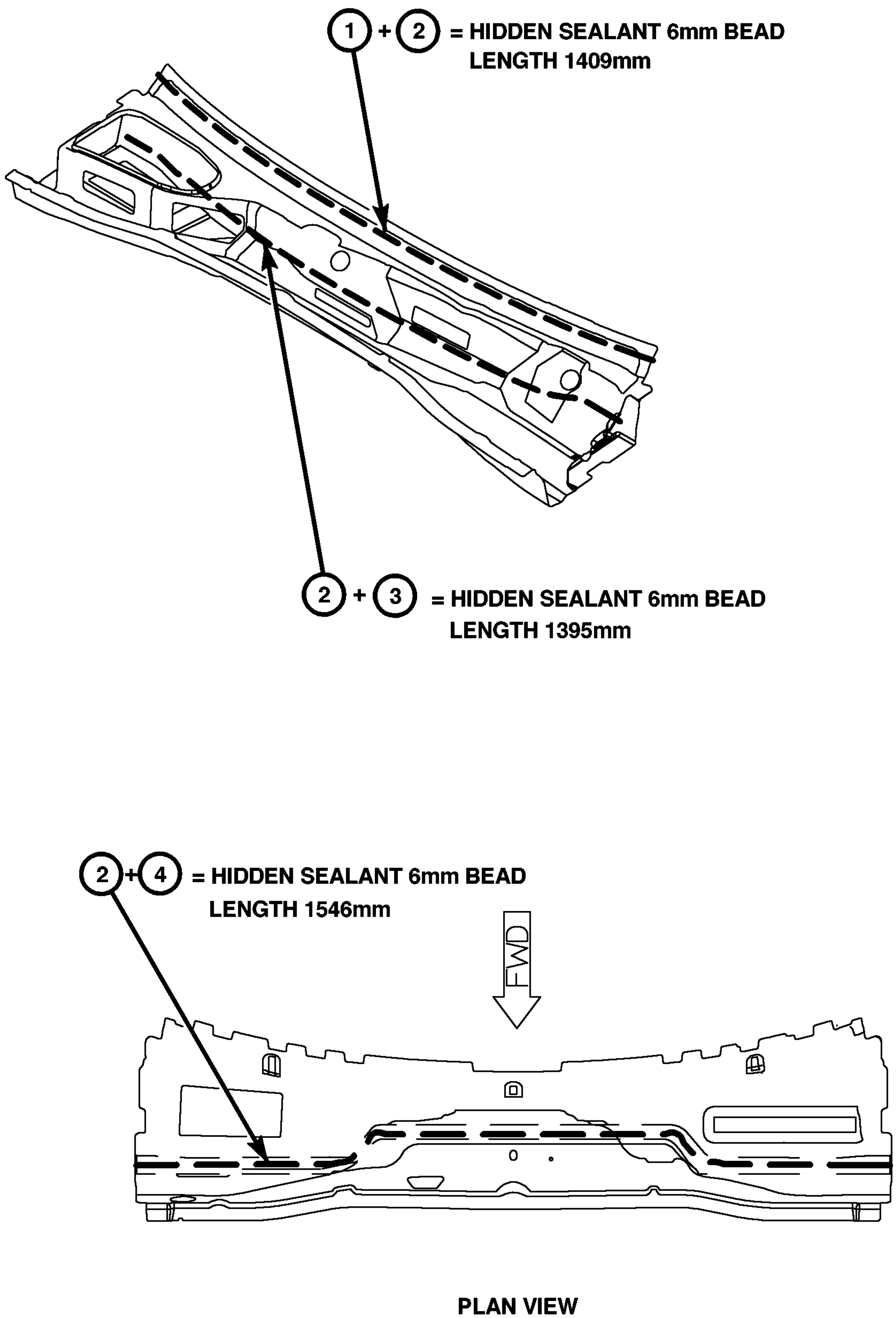


Fig. 85 PLENUM AND DASH PANEL

SEALER LOCATIONS (Continued)

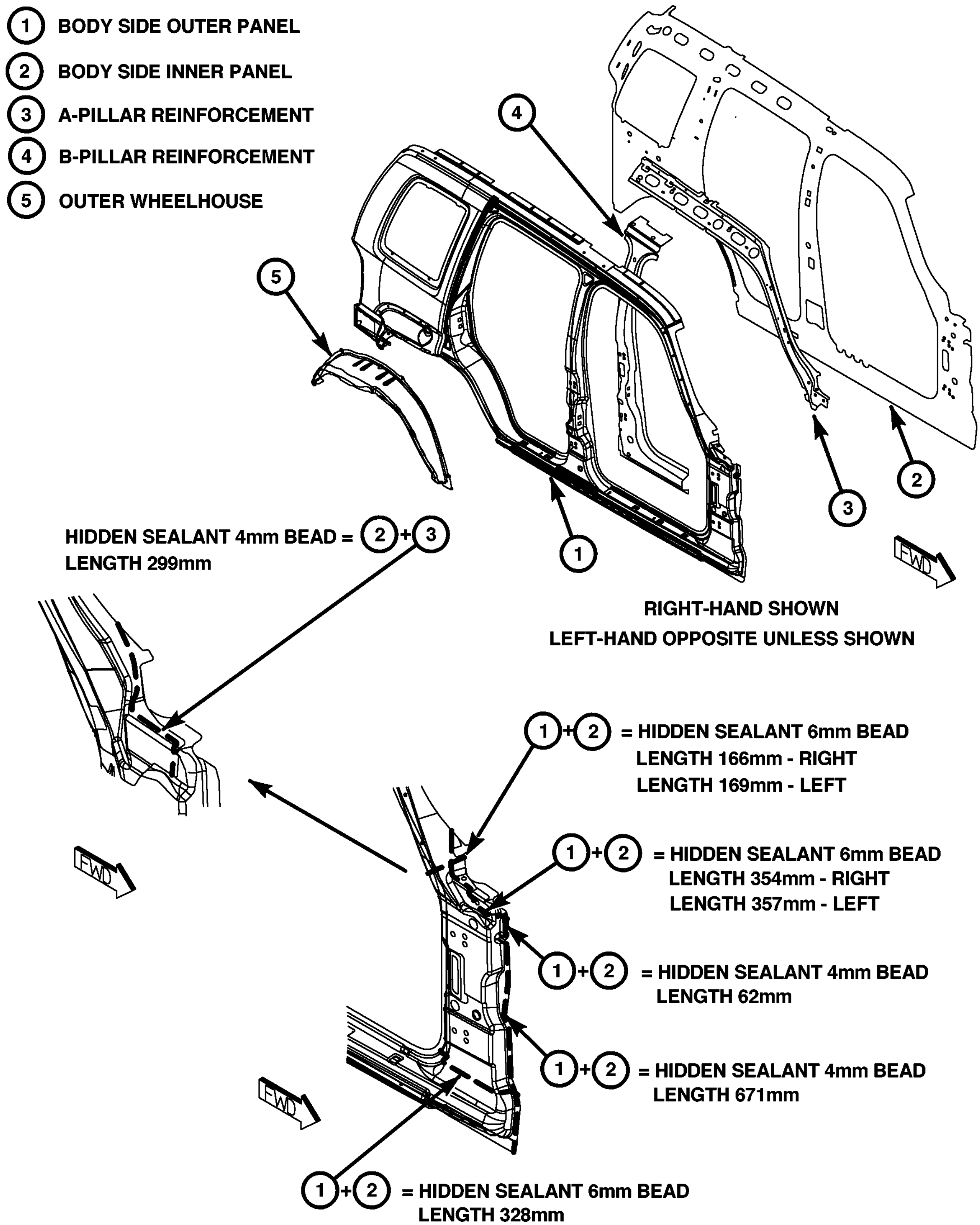


Fig. 86 BODY SIDE PANEL ASSEMBLIES

SEALER LOCATIONS (Continued)

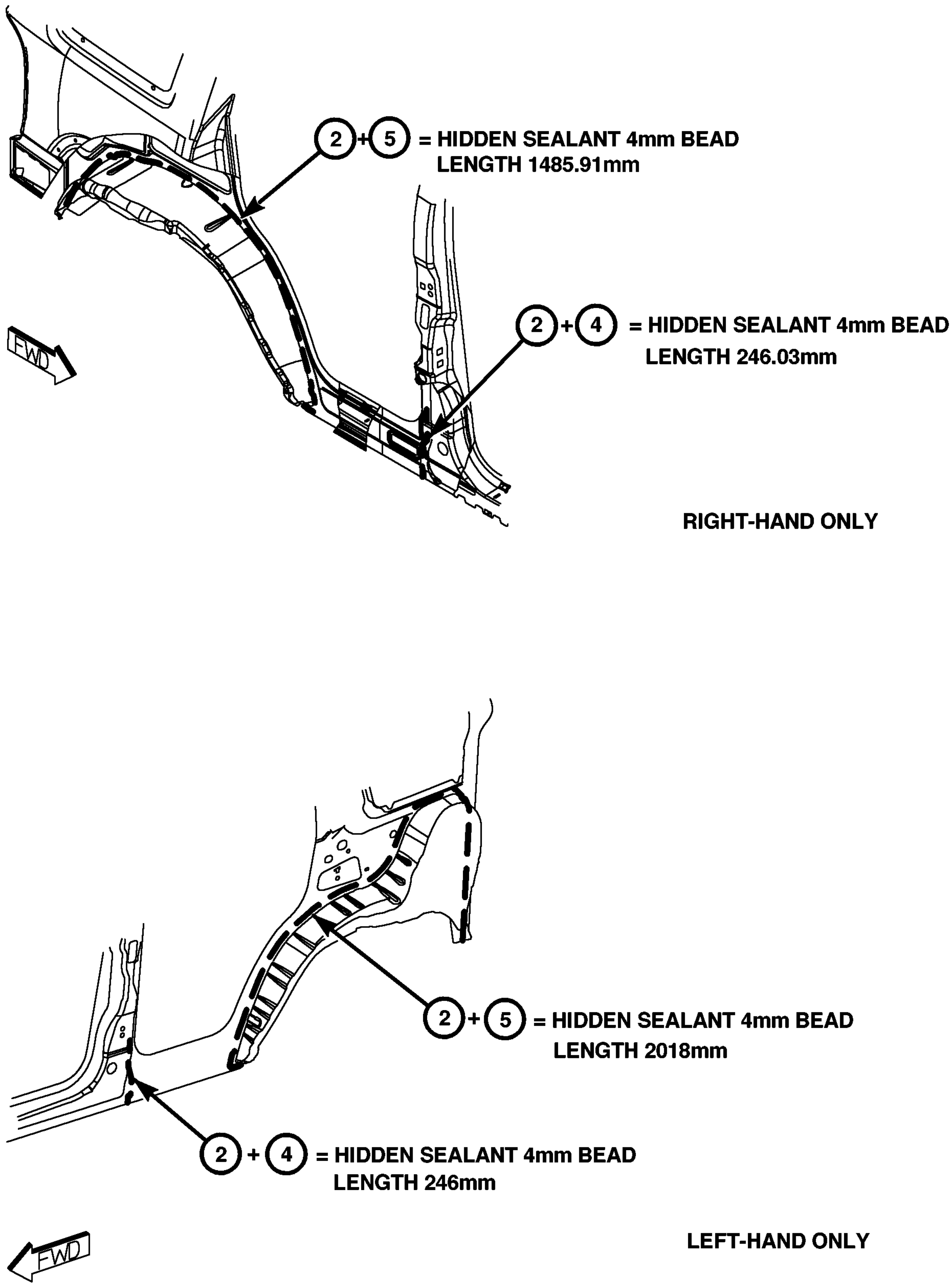


Fig. 87 WHEELHOUSES

SEALER LOCATIONS (Continued)

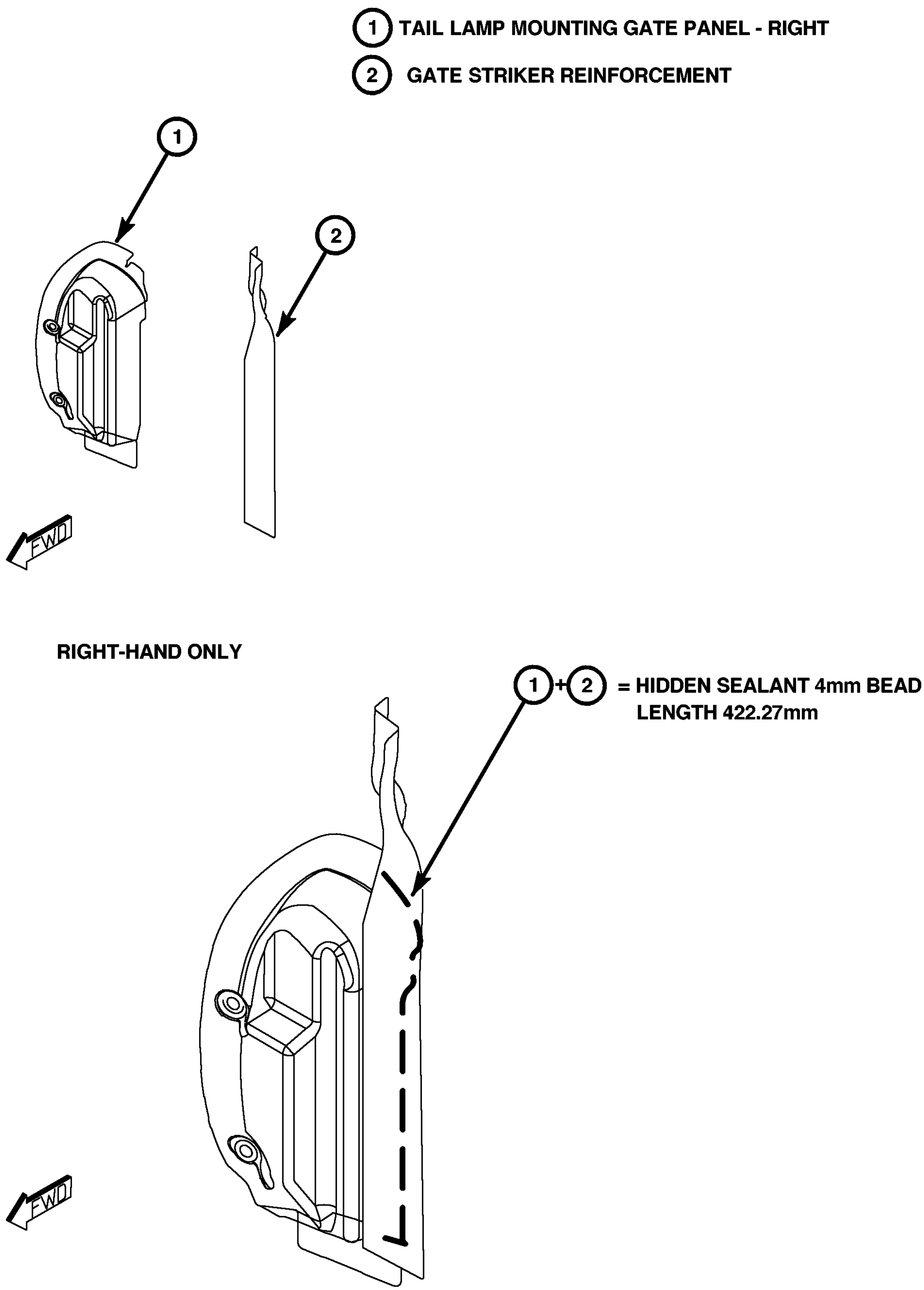


Fig. 88 TAIL LAMP MOUNTING

SEALER LOCATIONS (Continued)

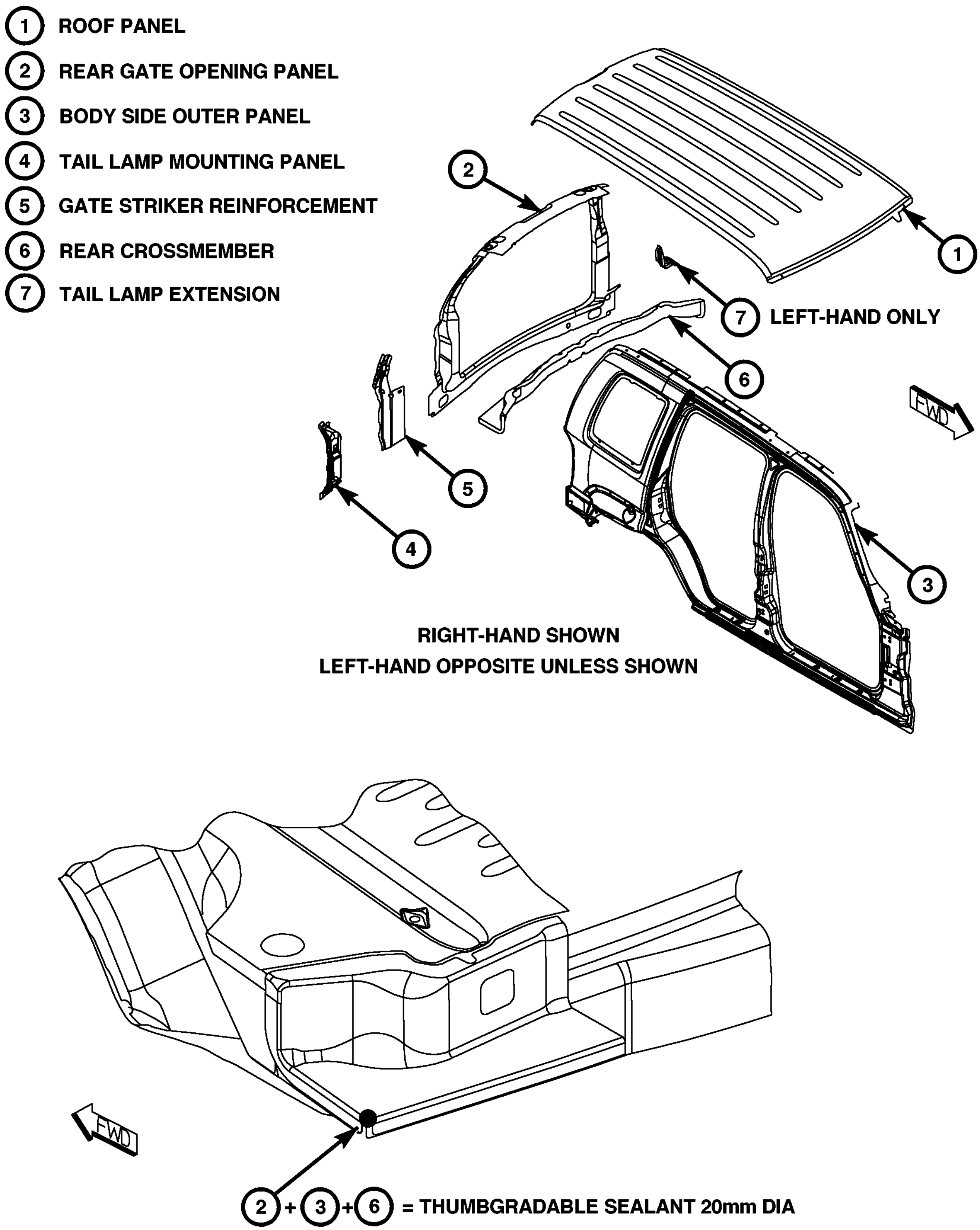


Fig. 89 ROOF PANEL & BODY SIDE SILL ASSEMBLY

SEALER LOCATIONS (Continued)

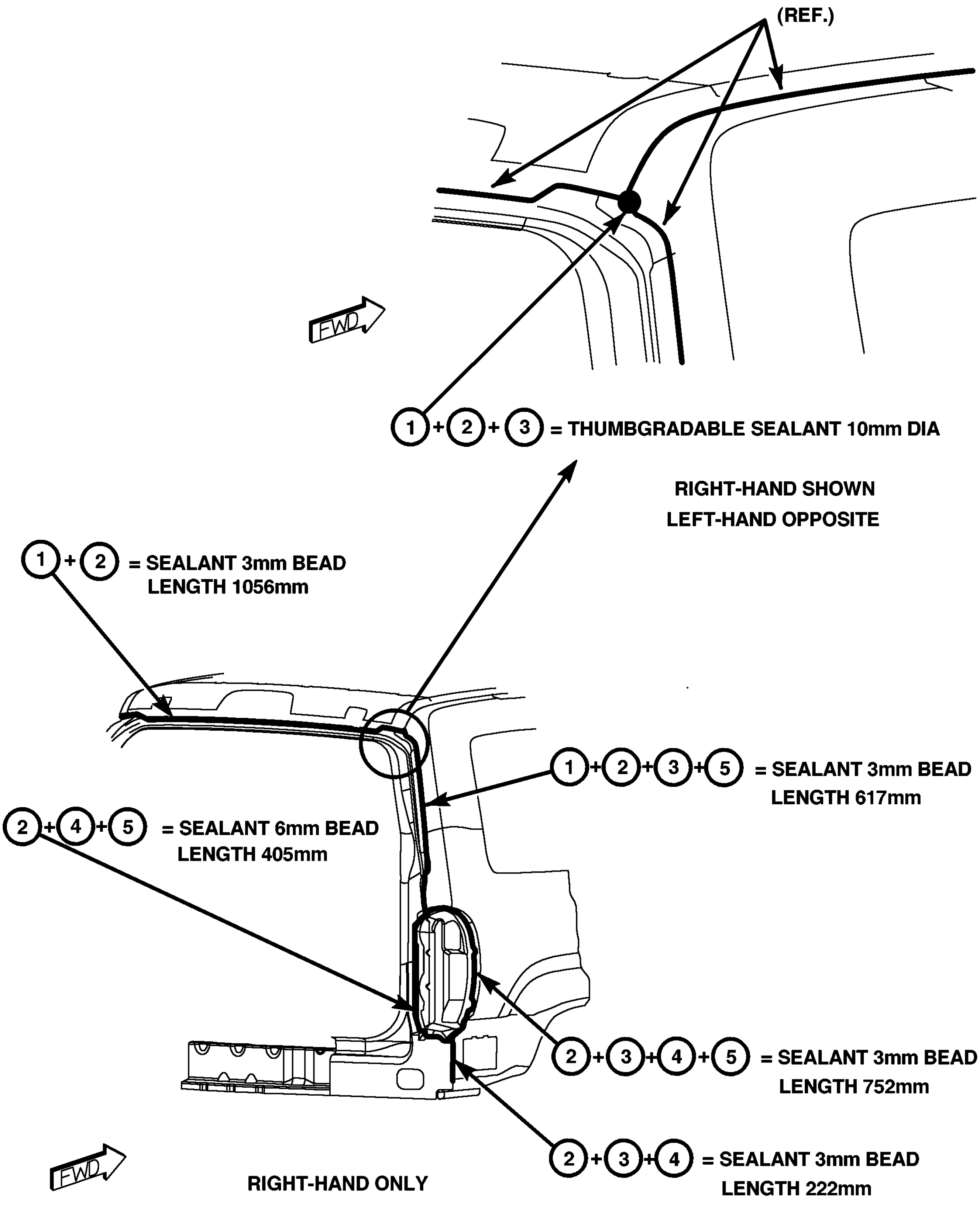


Fig. 90 SWING GATE OPENING

SEALER LOCATIONS (Continued)

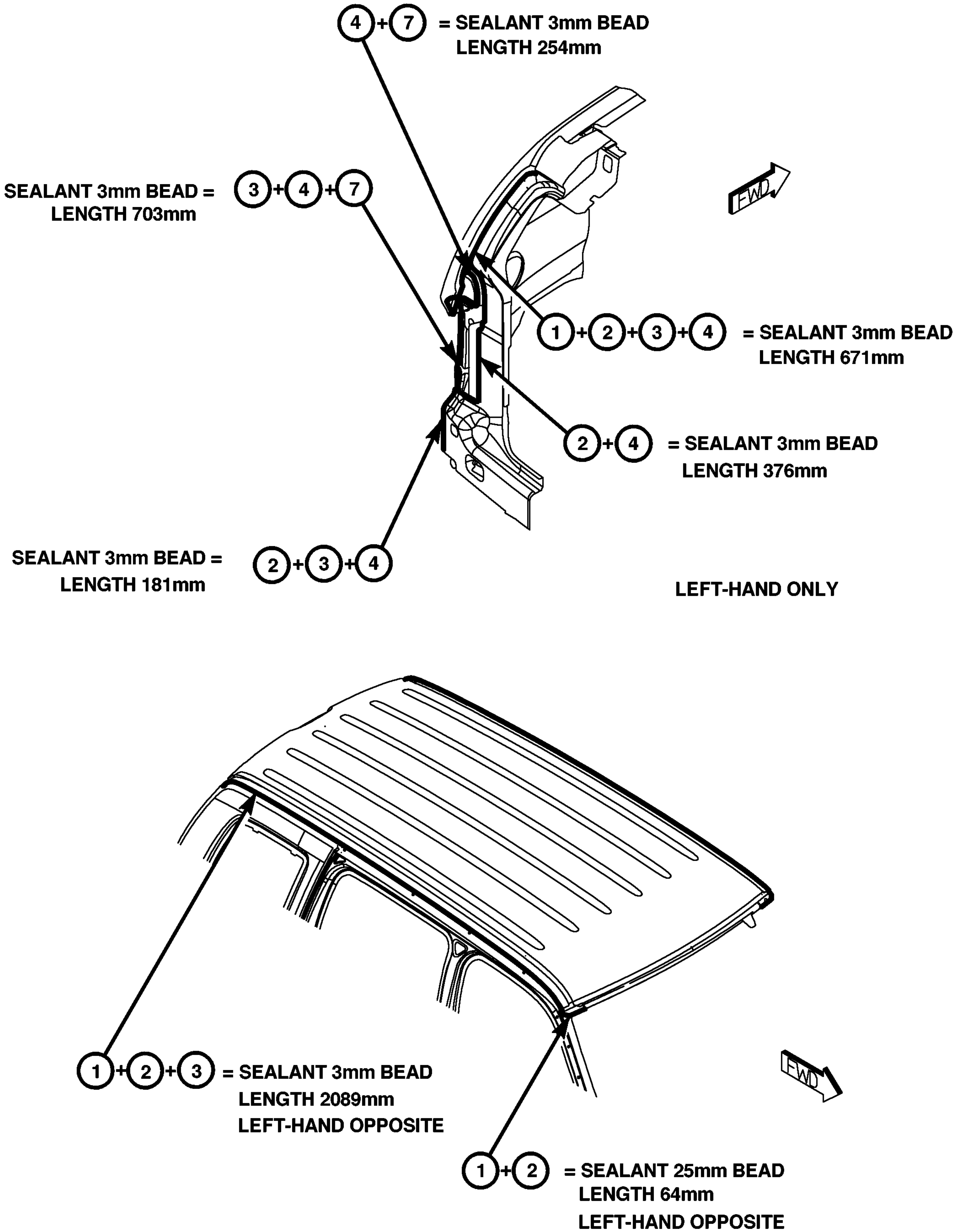


Fig. 91 ROOF PANEL; SWING GATE OPENING

SEALER LOCATIONS (Continued)

1 TAIL LAMP MOUNTING GATE PANEL - RIGHT
2 GATE STRIKER REINFORCEMENT
3 REAR GATE OPENING PANEL
4 REAR CROSSMEMBER
5 REAR FLOOR PAN
6 BODY SIDE INNER PANEL
7 A-PILLAR REINFORCEMENT
8 BODY SIDE OUTER PANEL
9 BODY SIDE SILL
10 COWL SIDE PANEL

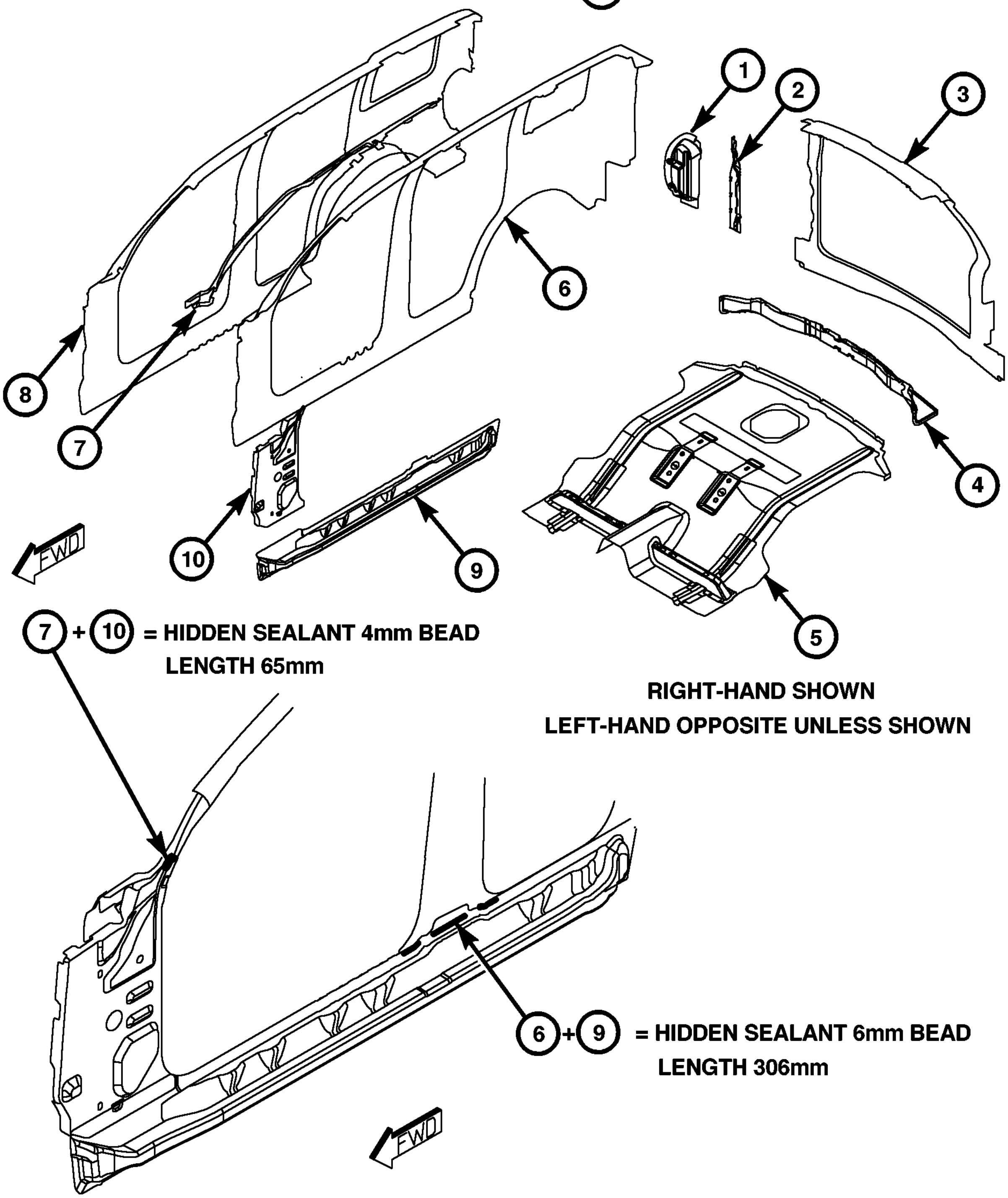


Fig. 92 BODY SIDE PANEL ASSEMBLY

SEALER LOCATIONS (Continued)

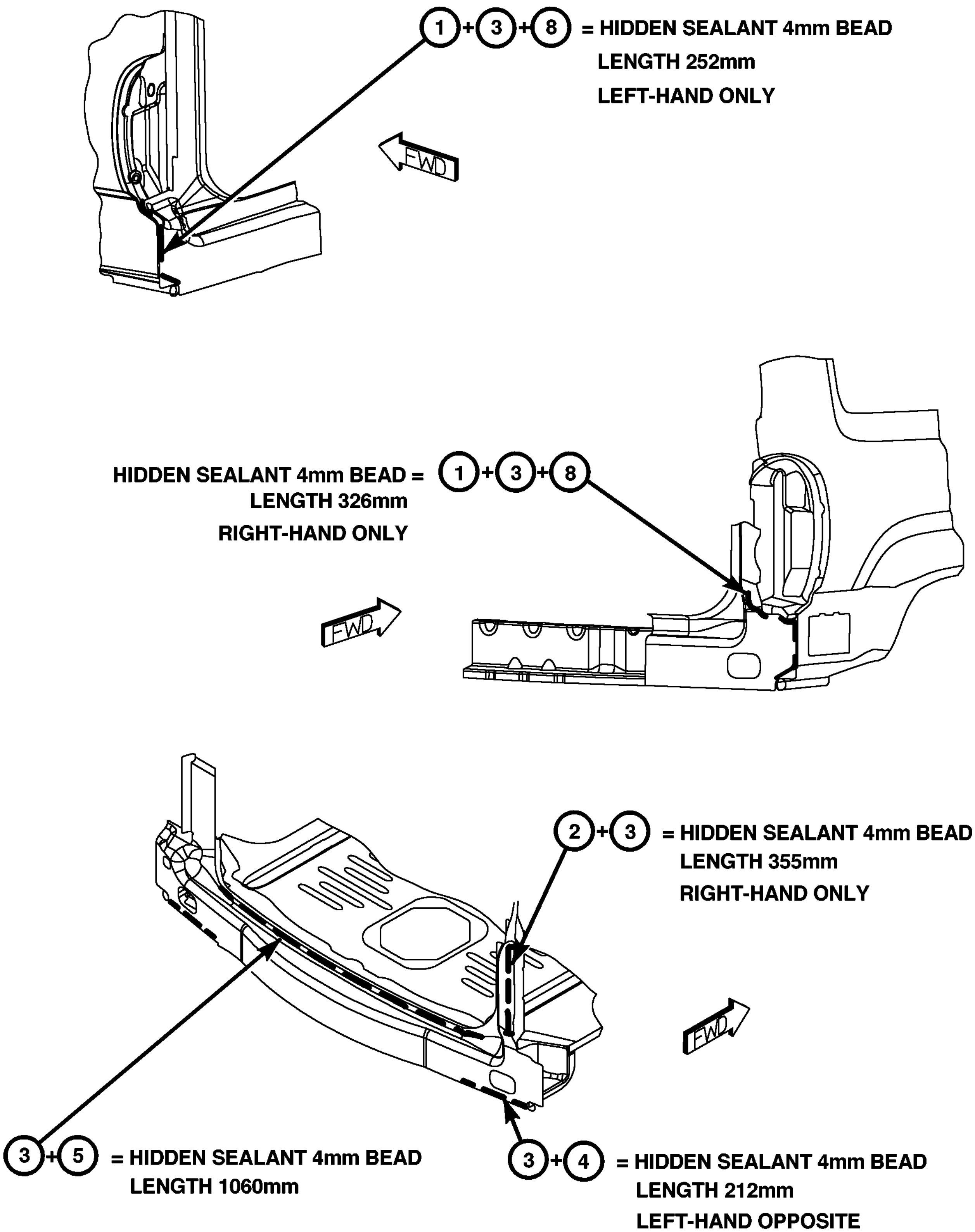


Fig. 93 SWING GATE OPENING

SEALER LOCATIONS (Continued)

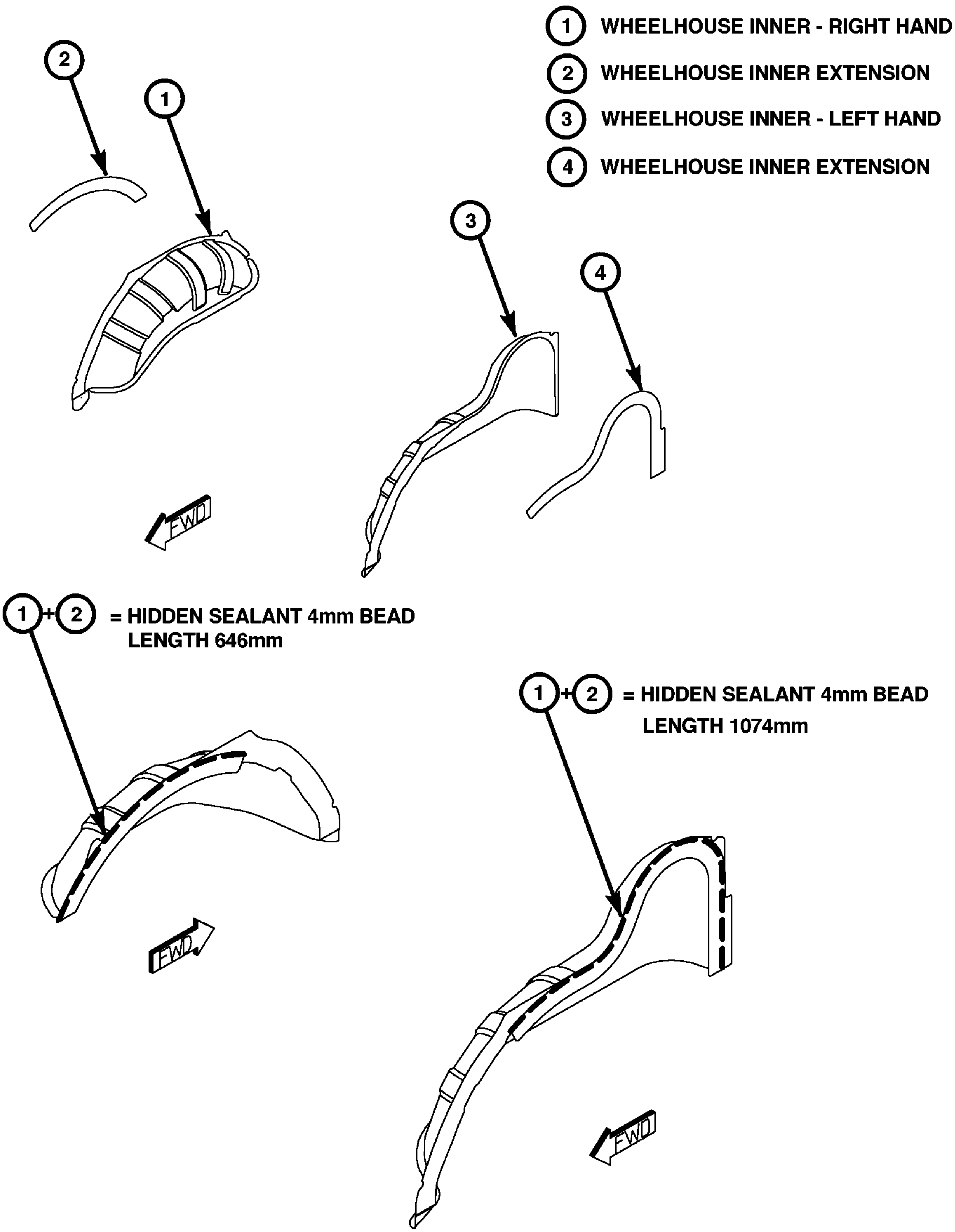


Fig. 94 WHEELHOUSES

SEALER LOCATIONS (Continued)

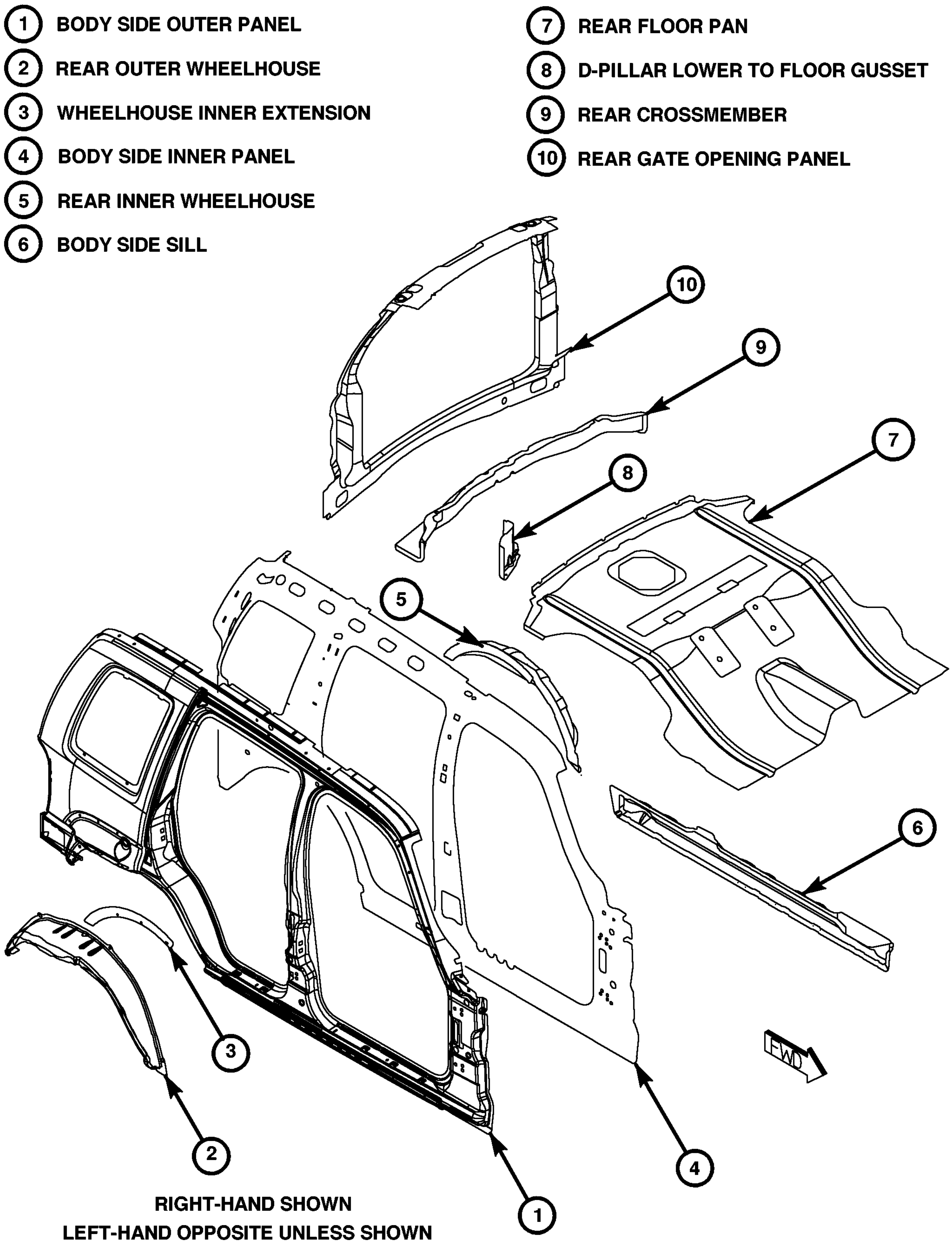


Fig. 95 BODY SIDE PANEL ASSEMBLY

SEALER LOCATIONS (Continued)

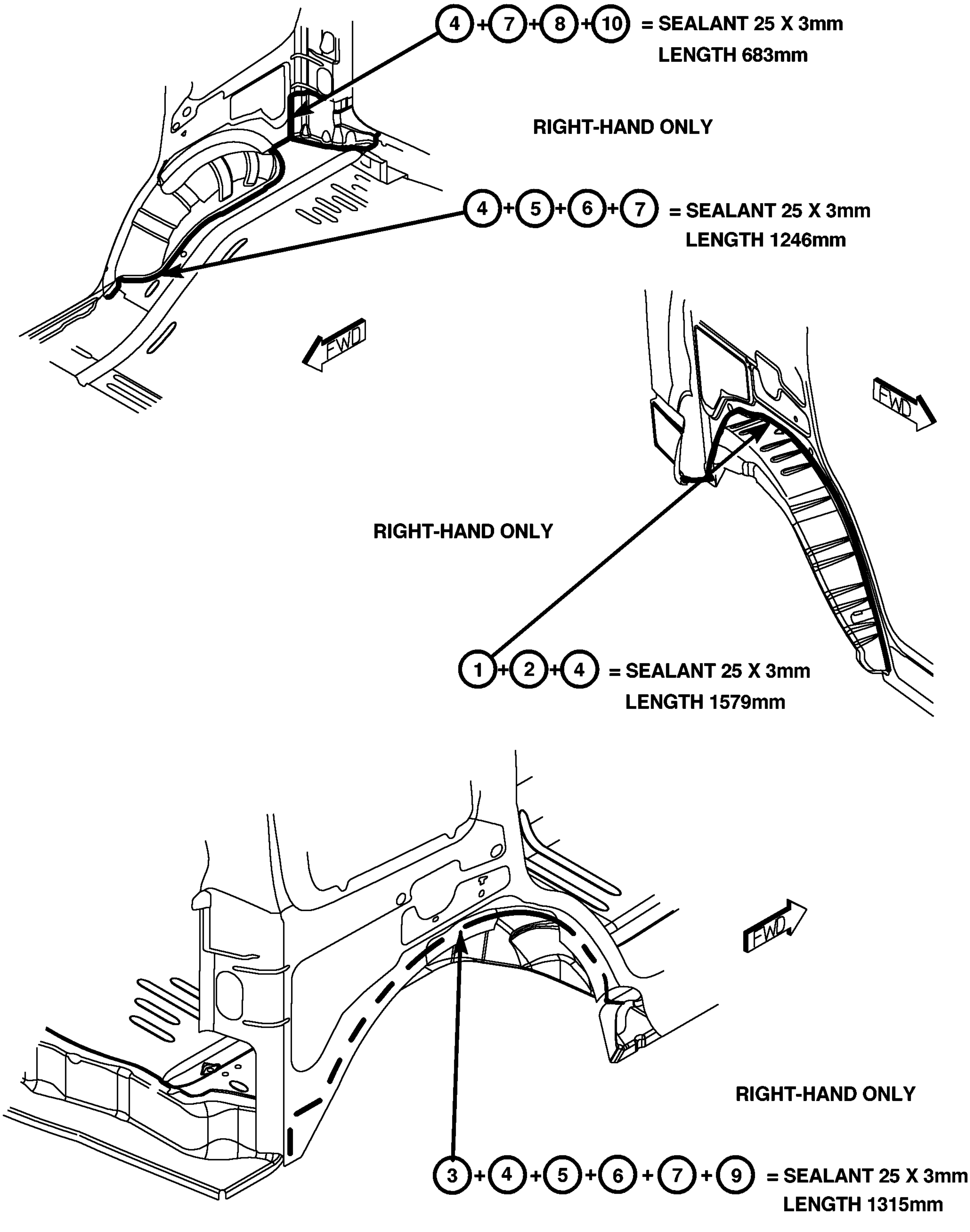


Fig. 96 WHEELHOUSES

SEALER LOCATIONS (Continued)

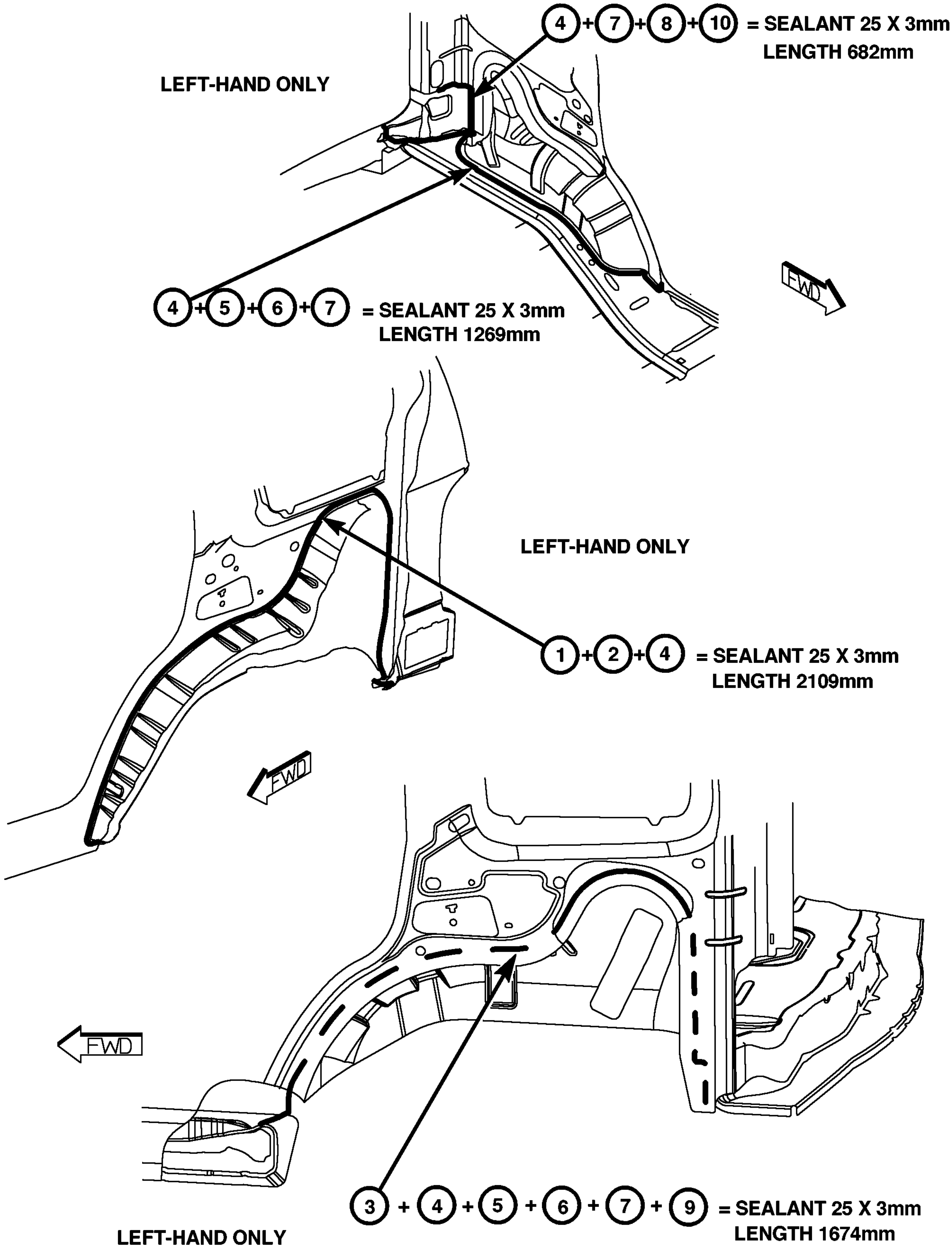


Fig. 97 WHEELHOUSES

SEALER LOCATIONS (Continued)

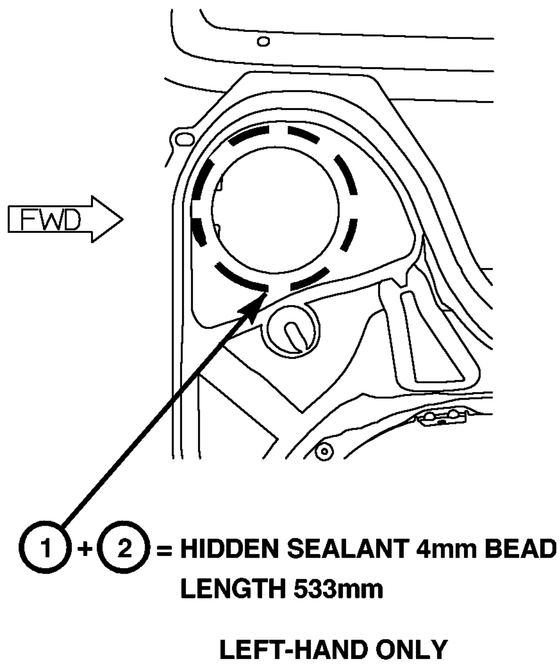
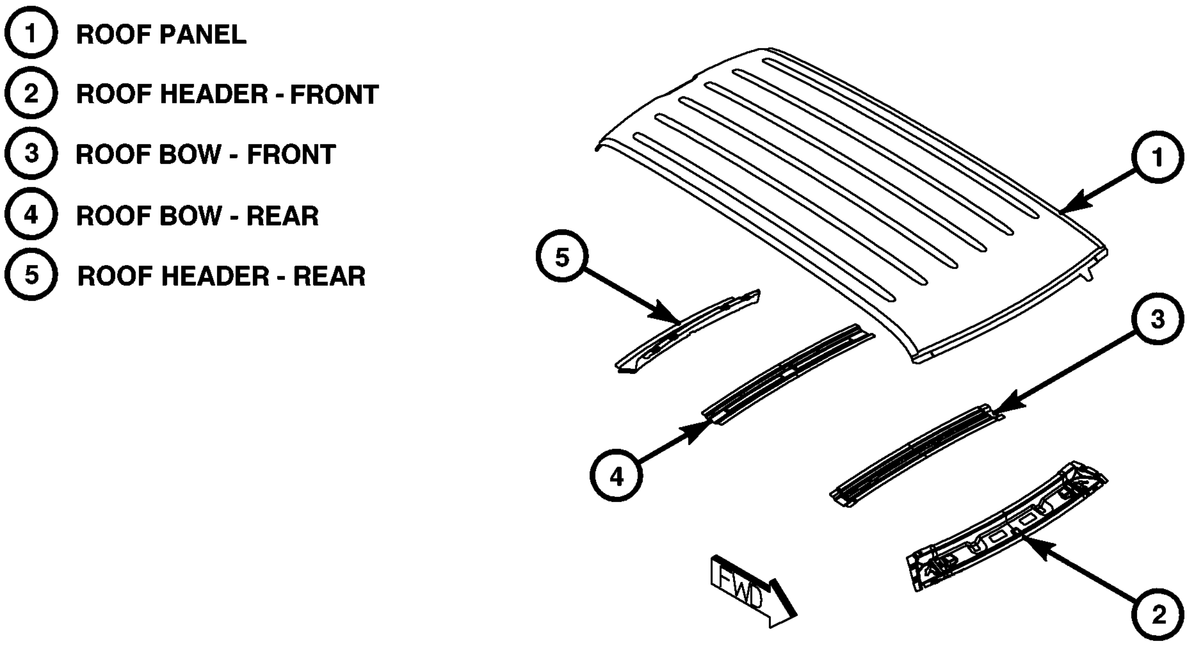


Fig. 98 WHEELHOUSE

SEALER LOCATIONS (Continued)



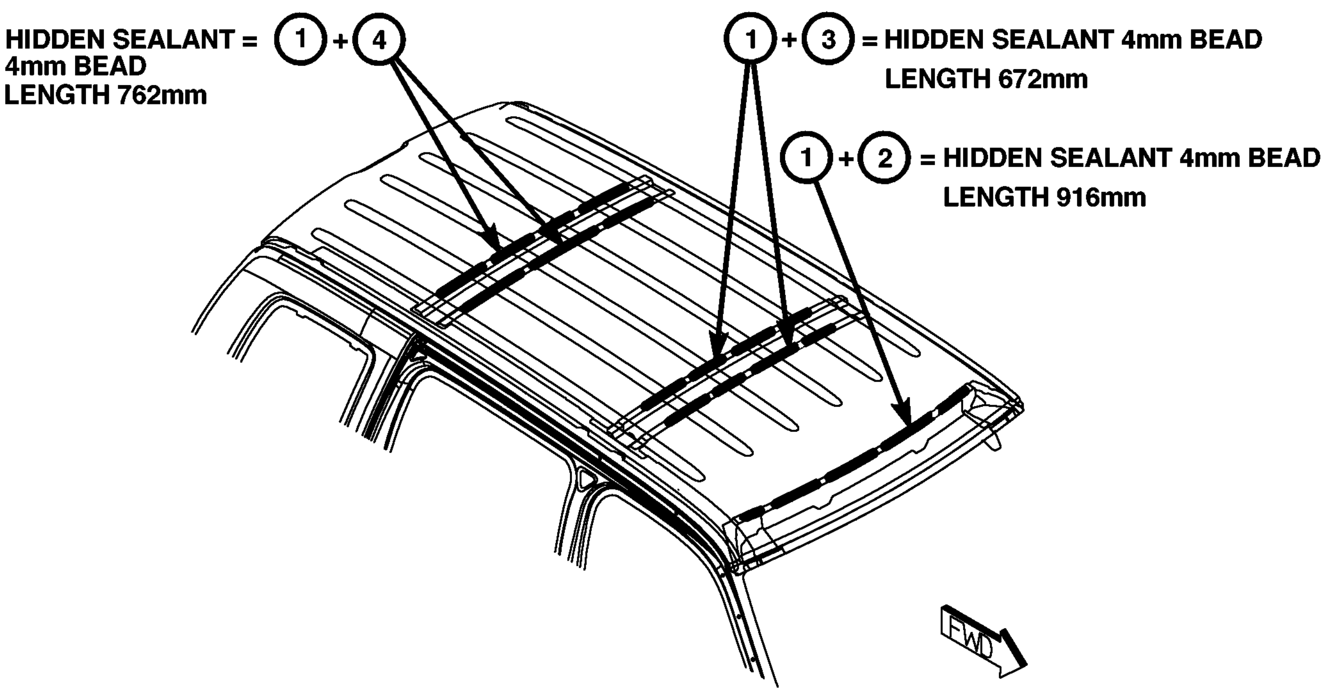


Fig. 99 ROOF PANEL ASSEMBLY

SEALER LOCATIONS (Continued)

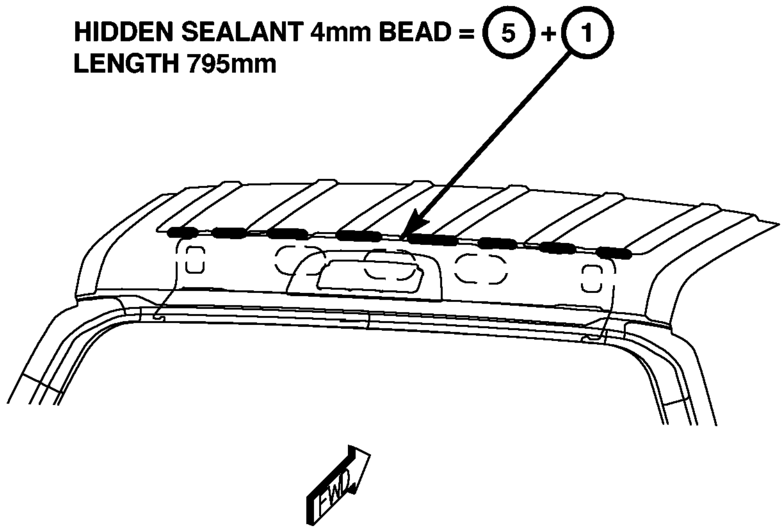


Fig. 100 ROOF PANEL/REAR ROOF HEADER

OPENING DIMENSIONS

SPECIFICATIONS

INDEX

DESCRIPTION	FIGURE
ENGINE COMPARTMENT	(101)
WINDSHIELD OPENING	(102)
BODY SIDE OPENINGS	(103)
SWING GATE OPENING	(104)

OPENING DIMENSIONS (Continued)

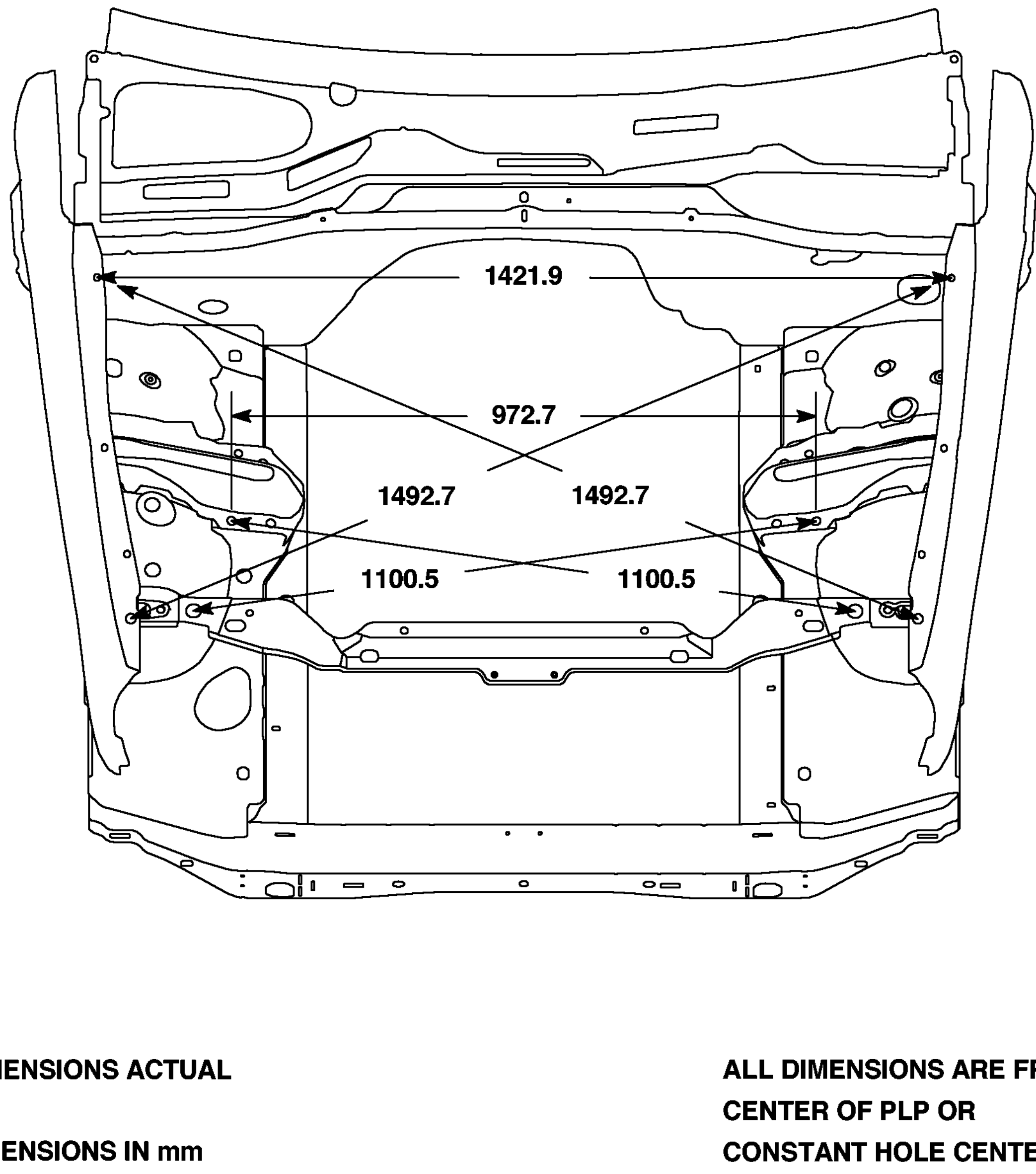


Fig. 101 ENGINE COMPARTMENT

OPENING DIMENSIONS (Continued)

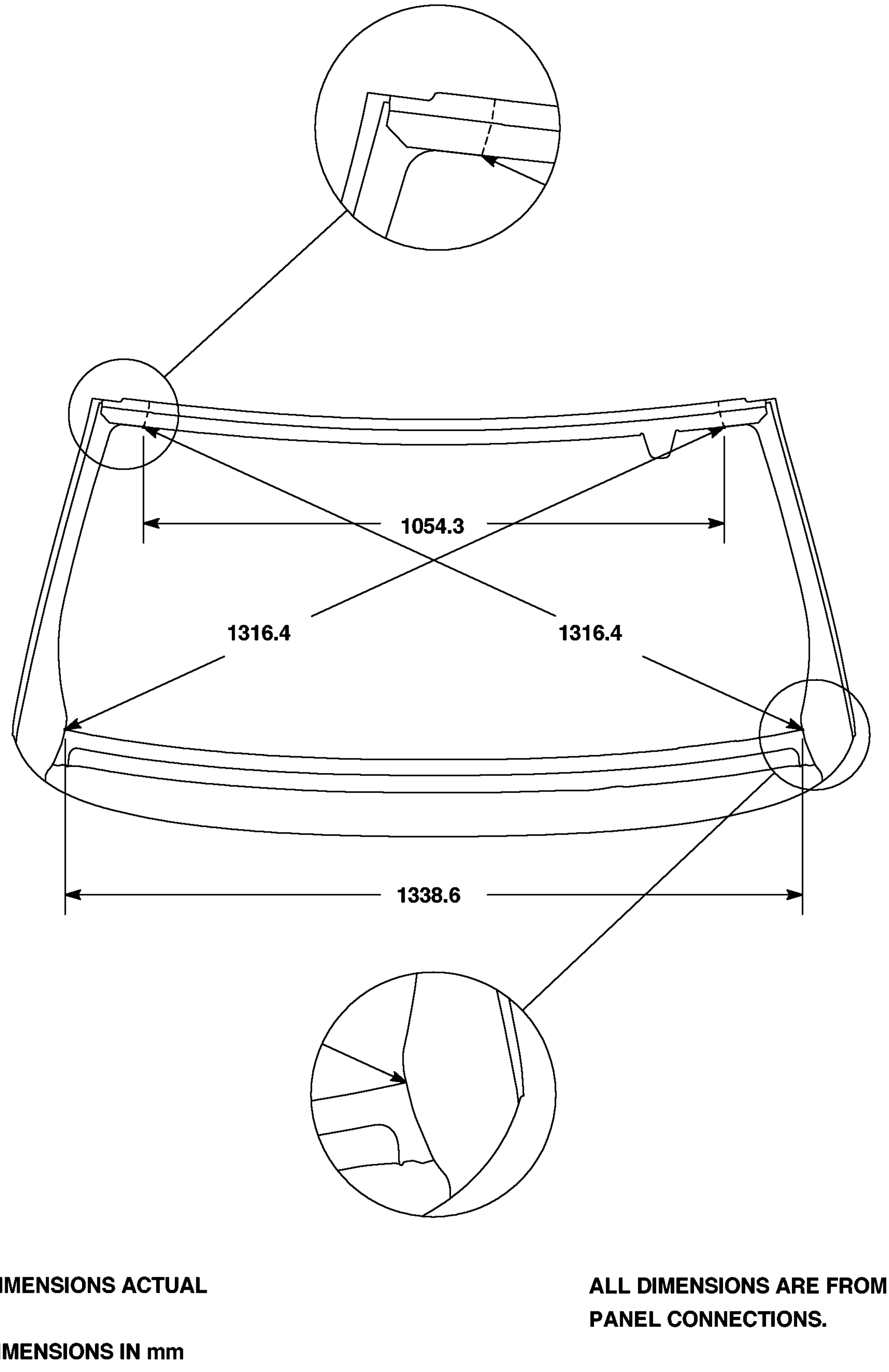


Fig. 102 WINDSHIELD OPENING

OPENING DIMENSIONS (Continued)

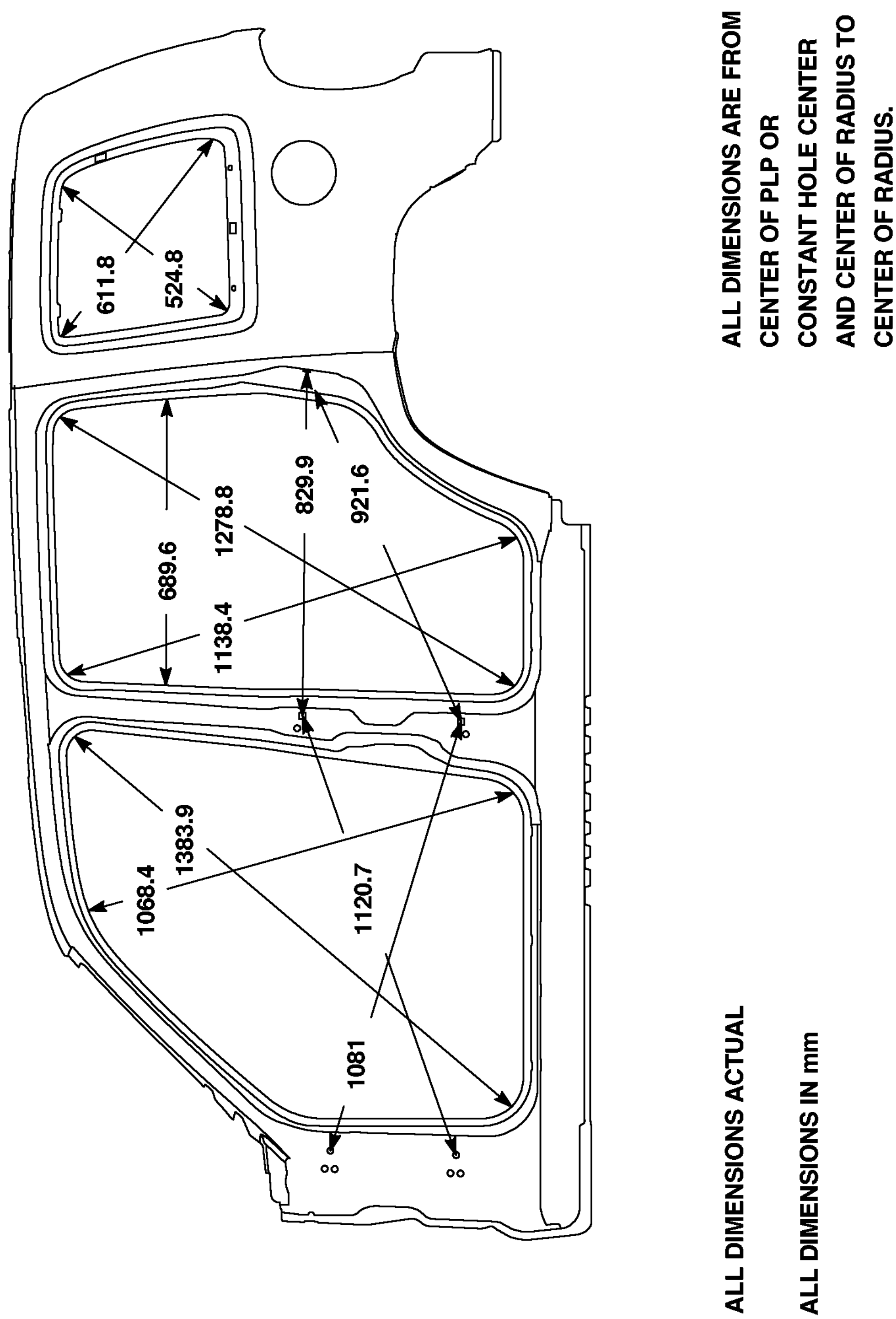


Fig. 103 BODY SIDE OPENINGS

OPENING DIMENSIONS (Continued)

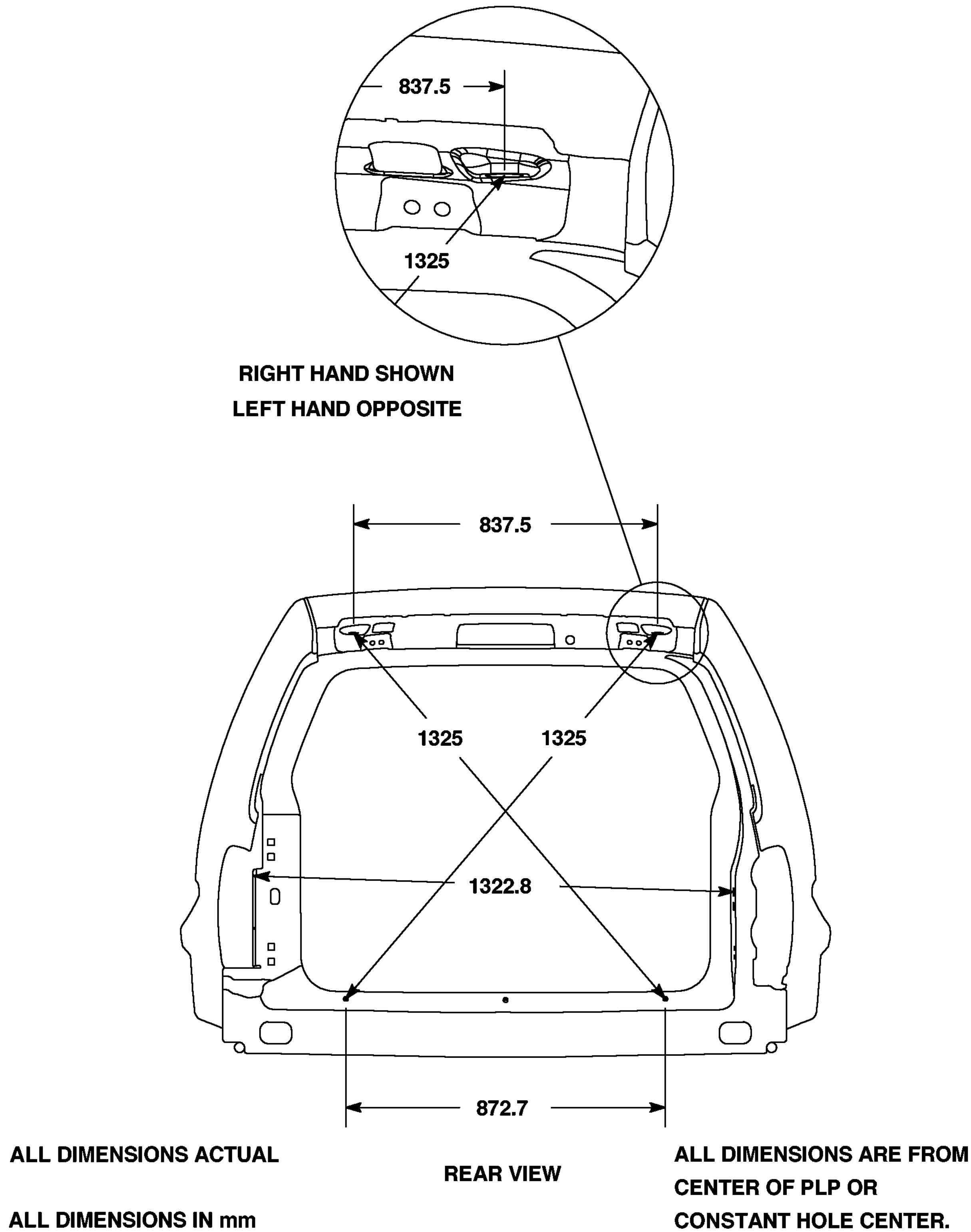


Fig. 104 SWING GATE OPENING

GAP AND FLUSH

SPECIFICATIONS

GAP & FLUSH DIMENSIONS INDEX

DESCRIPTION	FIGURE
FRONT QUADRANT	(105)
REAR QUADRANT	(106)

GAP AND FLUSH (Continued)

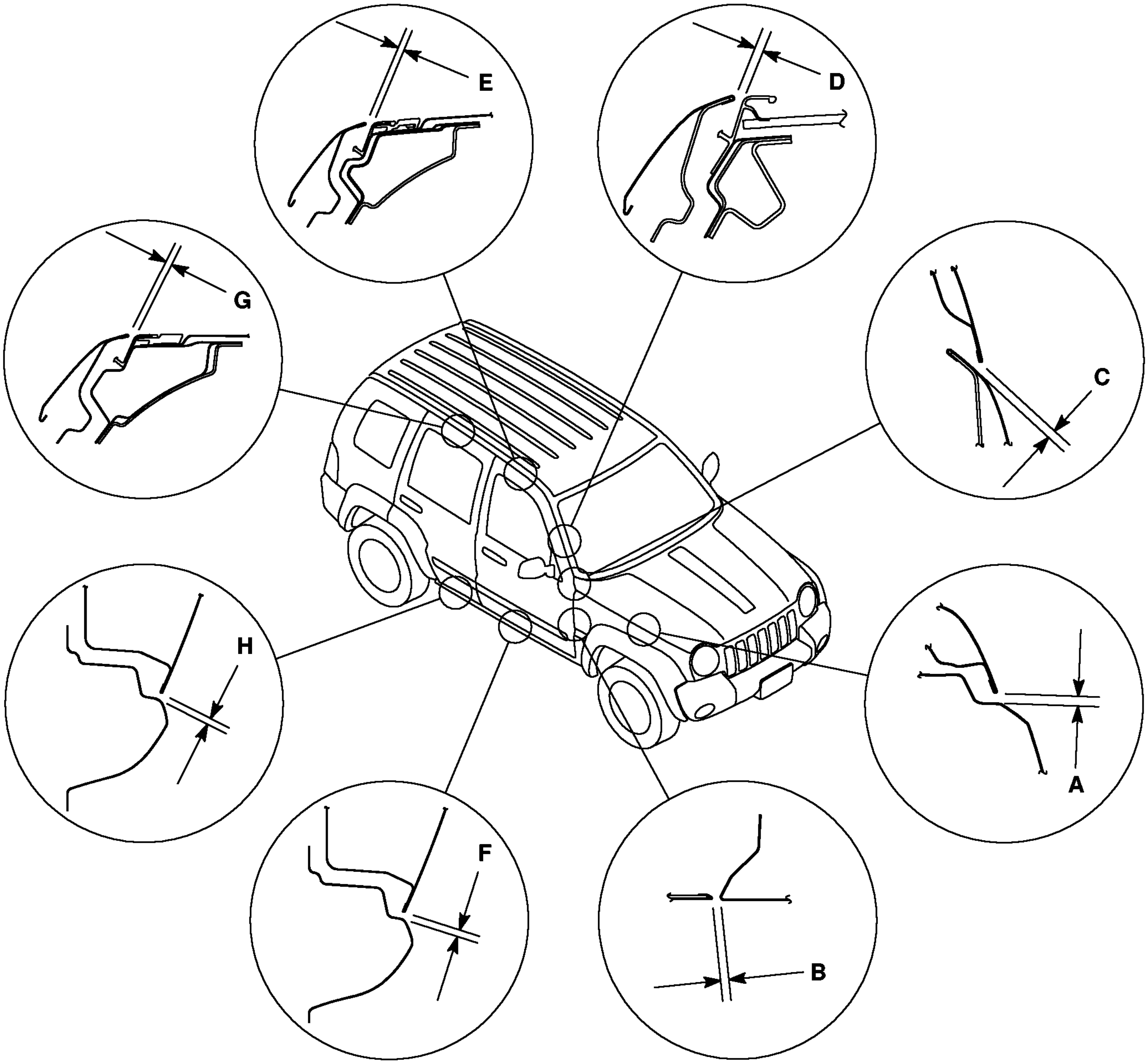


Fig. 105 GAP & FLUSH/FRONT QUADRANT

NOTE:
All measurements are in mm.

O/F = Over Flush

U/F = Under Flush

DIMENSION	GAP	FLUSH	DIMENSION	GAP	FLUSH
A	6.0 +/- 2.0	O/F 12.0 +/- 2.0	E	5.0 +/- 1.5	O/F 3.0 +/- 1.5
B	5.0 +/- 1.0	O/F 0.5 +/- 1.5	F	6.0 +/- 2.0	U/F 18.5 +/- 1.5
C	6.0 +/- 1.5	O/F 3.0 +/- 2.0	G	5.0 +/- 1.5	O/F 3.0 +/- 1.5
D	5.0 +/- 1.5	O/F 5.0 +/- 1.5	H	6.0 +/- 2.0	U/F 18.5 +/- 1.5

GAP AND FLUSH (Continued)

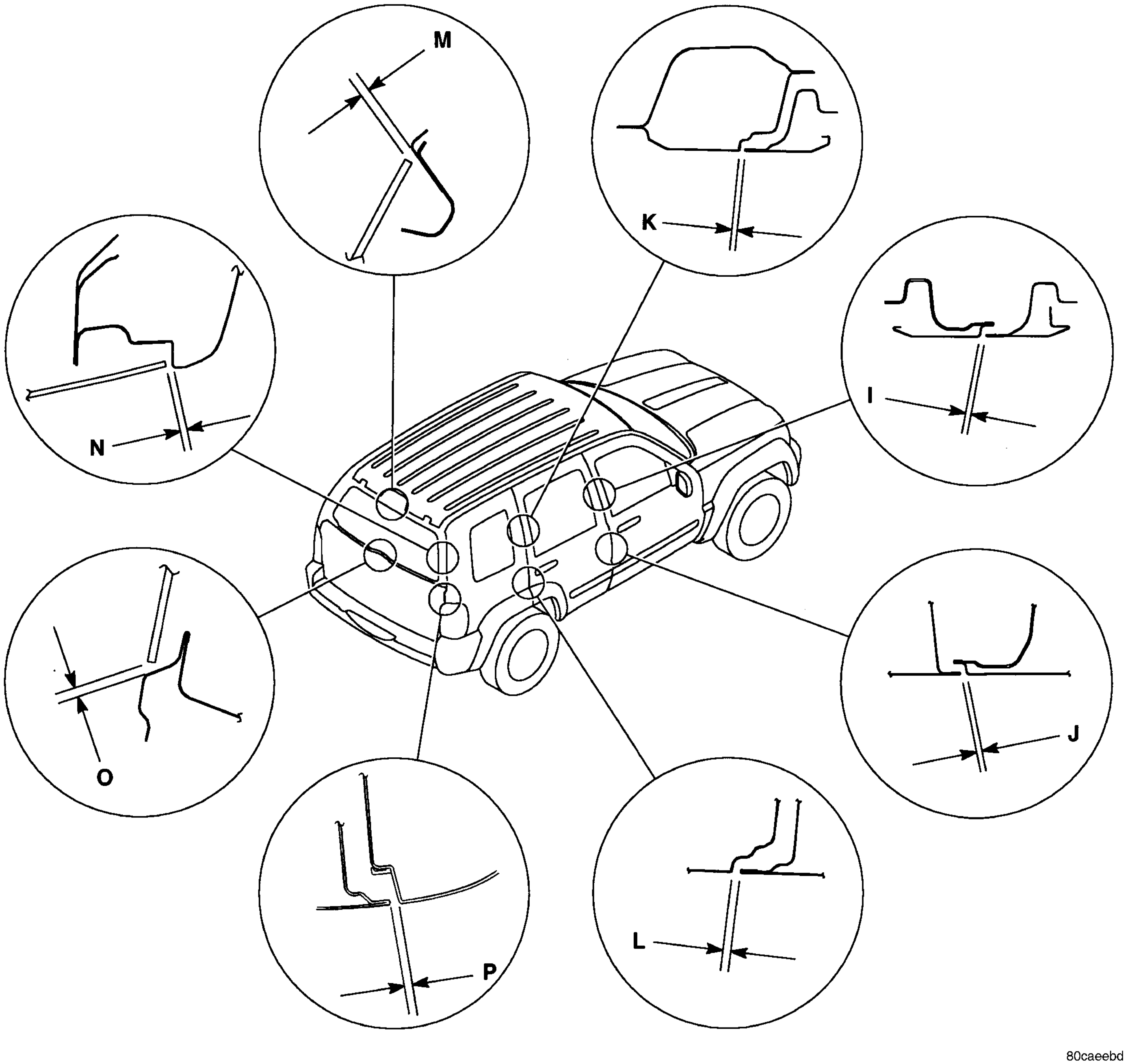


Fig. 106 GAP & FLUSH/REAR QUADRANT

NOTE:
All measurements are in mm.

O/F = Over Flush

U/F = Under Flush

DIMENSION	GAP	FLUSH	DIMENSION	GAP	FLUSH
I	5.0 +/- 1.0	0.0 +/- 1.5	M	6.0 +/- 1.5	U/F 4.7 +2.5/-1.0
J	5.0 +/- 1.0	0.0 +/- 1.5	N	6.0 +/- 1.5	U/F 4.0 +2.5/-1.0
K	5.0 +/- 1.0	0.0 +/- 1.5	O	6.0 +/- 1.5	0.0 - 2.0 O/F
L	5.0 +/- 1.0	0.0 +/- 1.5	P	5.0 +/- 1.0	U/F 0.5 +/- 1.0

HEATING & AIR CONDITIONING

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HEATING & AIR CONDITIONING

DESCRIPTION

DESCRIPTION - HEATER AND AIR CONDITIONER

All vehicles are equipped with a common HVAC housing assembly (Fig. 1). The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. On heater-only systems, the evaporator coil is omitted from the housing.

DESCRIPTION - COOLING SYSTEM REQUIREMENTS

To maintain the performance level of the HVAC system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or condenser will reduce the performance of the air conditioning and engine cooling systems.

The engine cooling system includes the heater core and the heater hoses. Refer to Engine Cooling for more information before the opening of, or attempting any service to the engine cooling system.

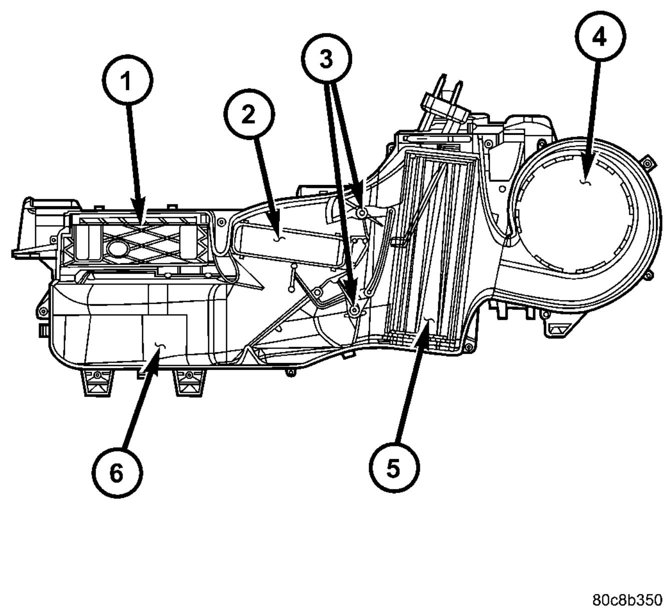


Fig. 1 Blend Door

1 - DEFROSTER DOOR
2- HEATER CORE
3- BLEND DOORS
4- BLOWER MOTOR HOUSING
5- EVAPORATOR (A/C ONLY)
6- LOWER HVAC CASE ASSEMBLY

DESCRIPTION - REFRIGERANT SYSTEM SERVICE PORT

The two refrigerant system service ports are used to charge, recover/recycle, evacuate, and test the air conditioning refrigerant system. Unique service port coupler sizes are used on the R-134a system, to ensure that the refrigerant system is not accidentally contaminated by the use of the wrong refrigerant (R-12), or refrigerant system service equipment.

OPERATION

OPERATION - HEATER AND AIR CONDITIONER

The heater and optional air conditioner are blend-air type systems. In a blend-air system, a blend door controls the amount of unconditioned air (or cooled air from the evaporator on models with air conditioning) that is allowed to flow through, or around, the heater core. A temperature control knob on the A/C Heater control panel determines the discharge air temperature by controlling an electric actuator, which moves the blend door. This allows an almost immediate control of the output air temperature of the system.

The mode control knob on the heater-only or A/C Heater control panel is used to direct the conditioned air to the selected system outlets. Both mode control switches use engine vacuum to control the mode doors, which are operated by vacuum actuators.

On all vehicles, the outside air intake can be shut off by selecting the Recirculation Mode with the mode control knob. This will operate a vacuum actuated recirculation door that closes off the outside fresh air intake and recirculates the air that is already inside the vehicle.

The optional air conditioner for all models is designed for the use of non-CFC, R-134a refrigerant. The air conditioning system has an evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. This air conditioning system uses a fixed orifice tube in the liquid line near the condenser outlet tube to meter refrigerant flow to the evaporator coil. To maintain minimum evaporator temperature and prevent evaporator freezing, the A/C low pressure switch on the accumulator cycles the compressor clutch.

OPERATION - REFRIGERANT SYSTEM SERVICE PORT

The high pressure service port is located on the refrigerant line, near the discharge port of the compressor. The low pressure service port is located on the liquid line at the side of the engine compartment, near the condensor.

Each of the service ports has a threaded plastic protective cap installed over it from the factory. After servicing the refrigerant system, always reinstall both of the service port caps.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - A/C PERFORMANCE

The air conditioning system is designed to provide the passenger compartment with low temperature and low humidity air. The evaporator, located in the HVAC housing on the dash panel below the instrument panel, is cooled to temperatures near the freezing point. As warm damp air passes through the cooled evaporator, the air transfers its heat to the refrigerant in the evaporator and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an air conditioning system will be more effective in the Recirculation Mode. With the system in the Recirculation Mode, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, the air conditioning system performance levels improve.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the air conditioning system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. High humidity greatly reduces the ability of the evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Removing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from the air conditioning system on humid days. A performance test is the best way to determine whether the system is performing up to standard. This test also provides valuable clues as to the possible cause of trouble with the air conditioning system.

Before proceeding, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). The air temperature in the test room and in the vehicle must be a minimum of 21° C (70° F) for this test.

HEATING & AIR CONDITIONING (Continued)

(1) Connect a tachometer, a manifold gauge set or A/C recycling/charging station.

(2) Set the A/C Heater mode control switch knob in the Recirculation Mode position, the temperature control knob in the full cool position, and the blower motor switch knob in the highest speed position.

(3) Start the engine and hold the idle at 1,000 rpm with the compressor clutch engaged.

(4) The engine should be at operating temperature. The doors and windows must be closed.

(5) Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.

(6) The compressor clutch may cycle, depending upon the ambient temperature and humidity. If the clutch cycles, unplug the a/c low pressure switch wire harness connector. (Fig. 2). Place a jumper wire across the terminals of the a/c low pressure switch wire harness connector.

(7) With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.

(8) Compare the discharge air temperature to the Performance Temperature and Pressure chart. If the discharge air temperature is high, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS - CHARGE CAPACITY).

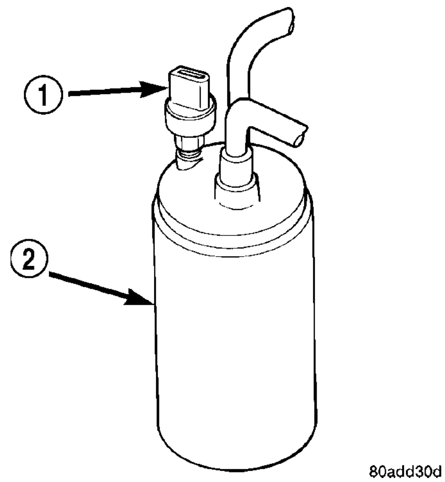


Fig. 2 A/C LOW PRESSURE SWITCH - TYPICAL

1 - A/C LOW PRESSURE SWITCH
2 - ACCUMULATOR

Performance Temperature and Pressure					
Ambient Air Temperature	21° C (70° F)	27° C (80° F)	32° C (90° F)	38° C (100° F)	43° C (110° F)
Air Temperature at Center Panel Outlet	7° C (45° F)	7° C (45° F)	13° C (55° F)	13° C (55° F)	18° C (64° F)
Compressor Inlet Pressure at Service Port (Low Side)	138 to 207 kPa (20 to 30 psi)	172 to 241 kPa (25 to 35 psi)	207 to 276 kPa (30 to 40 psi)	241 to 310 kPa (35 to 45 psi)	276 to 345 kPa (40 to 50 psi)
Condensor Outlet Pressuree at Service Port (High Side)	1034 to 1724 kPa (150 to 250 psi)	1379 to 2068 kPa (200 to 300 psi)	1724 to 2413 kPa (250 to 350 psi)	1999 to 2689 kPa (290 to 390 psi)	2413 to 2965 kPa (350 to 430 psi)

(9) Compare the compressor discharge pressure to the Performance Temperature and Pressure chart. If the compressor discharge pressure is high, see the Pressure Diagnosis chart.

HEATING & AIR CONDITIONING (Continued)

Pressure Diagnosis		
Condition	Possible Causes	Correction
Rapid compressor clutch cycling (ten or more cycles per minute).	1. Low refrigerant system charge.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Faulty fuse.	2. Check the fuses in the Power Distribution Center and the junction block. Repair the shorted circuit or component and replace the fuses, if required.
	3. Faulty a/c compressor clutch coil.	3. See A/C Compressor/Diagnosis and Testing - Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required.
	4. Faulty a/c compressor clutch relay.	4. See A/C Compressor Clutch Relay/Diagnosis and Testing - Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required.
	5. Improperly installed or faulty a/c low pressure switch.	5. See A/C Low Pressure Switch/Diagnosis and Testing in this group. Test the a/c low pressure switch and tighten or replace, if required.
	6. Faulty a/c high pressure switch.	6. See A/C High Pressure Switch/Diagnosis and Testing in this group. Test the a/c high pressure switch and replace, if required.
	7. Faulty Powertrain Control Module (PCM).	7. (Refer to Appropriate Diagnostic Information). Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system.	1. See Refrigerant Oil/Standard Procedure - Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Blend door inoperative or sealing improperly.	2. See Blend Door in this group. Inspect the blend door for proper operation and sealing and correct, if required.
	3. Blend door actuator faulty or inoperative.	3. Perform blend door actuator diagnosis, replace if faulty.
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the accumulator is restricted.	2. See Accumulator in this group. Replace the restricted accumulator, if required.
	3. Refrigerant flow through the evaporator coil is restricted.	3. See A/C Evaporator in this group. Replace the restricted evaporator coil, if required.

HEATING & AIR CONDITIONING (Continued)

Pressure Diagnosis		
Condition	Possible Causes	Correction
	4. Faulty compressor.	4. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. Condenser air flow restricted.	1. Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Refer to Cooling for more information on air seals. Clean, repair, or replace components as required.
	2. Inoperative cooling fan.	2. Refer to Cooling for more information. Test the cooling fan and replace, if required.
	3. Refrigerant system overcharged.	3. See Plumbing/Standard Procedure - Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	4. Air in the refrigerant system.	4. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	5. Engine overheating.	5. Refer to Cooling for more information. Test the cooling system and repair, if required.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping.	1. Refer to Cooling for more information. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required.
	2. Fixed orifice tube not installed.	2. See A/C Orifice Tube in this group. Replace the liquid line, if required.
	3. Faulty compressor.	3. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines.	1. See Liquid, Suction, and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required.
	2. Restricted refrigerant flow through the fixed orifice tube.	2. See A/C Orifice Tube in this group. Replace the liquid line, if required.
	3. Restricted refrigerant flow through the condenser.	3. See A/C Condenser in this group. Replace the restricted condenser, if required.

DIAGNOSIS AND TESTING - HEATER PERFORMANCE

Before performing the following tests, refer to Cooling for the procedures to check the radiator coolant level, serpentine drive belt tension, radiator air flow and the radiator fan operation. Also be certain that the accessory vacuum supply line is connected at the engine intake manifold.

MAXIMUM HEATER OUTPUT

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the floor heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the HVAC housing floor outlets. Compare the test thermometer reading to the Temperature Reference chart.

Temperature Reference				
Ambient Air Temperature	15.5° C (60° F)	21.1° C (70° F)	26.6° C (80° F)	32.2° C (90° F)
Minimum Air Temperature at Floor Outlet	52.2° C (126° F)	56.1° C (133° F)	59.4° C (139° F)	62.2° C (144° F)

If the floor outlet air temperature is too low, refer to Cooling to check the engine coolant temperature specifications. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Cooling for the procedures.

OBSTRUCTED COOLANT FLOW Possible locations or causes of obstructed coolant flow:

- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS Possible locations or causes of insufficient heat:

- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.

TEMPERATURE CONTROL

If the heater outlet air temperature cannot be adjusted with the temperature control knob on the A/C Heater control panel, the following could require service:

- The A/C Heater control.
- The blend door actuator.
- The blend door.
- Improper engine coolant temperature.

DIAGNOSIS AND TESTING - VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the heater-only and a/c heater housings. Testing of the heater-only and A/C Heater mode control switch operation will determine if the vacuum, electrical, and mechanical controls are functioning. However, it is possible that a vacuum control system that operates perfectly at engine idle (high engine vacuum) may not function properly at high engine speeds or loads (low engine vacuum). This can be caused by leaks in the vacuum system, or a faulty vacuum check valve.

A vacuum system test will help to identify the source of poor vacuum system performance or vacuum system leaks. Before starting this test, stop the engine and make certain that the problem is not a disconnected vacuum supply tube at the engine intake manifold vacuum tap or at the vacuum reservoir.

HEATING & AIR CONDITIONING (Continued)

Use an adjustable vacuum test set (Special Tool C-3707-B) and a suitable vacuum pump to test the HVAC vacuum control system. With a finger placed over the end of the vacuum test hose probe (Fig. 3), adjust the bleed valve on the test set gauge to obtain a vacuum of exactly 27 kPa (8 in. Hg.). Release and block the end of the probe several times to verify that the vacuum reading returns to the exact 27 kPa (8 in. Hg.) setting. Otherwise, a false reading will be obtained during testing.

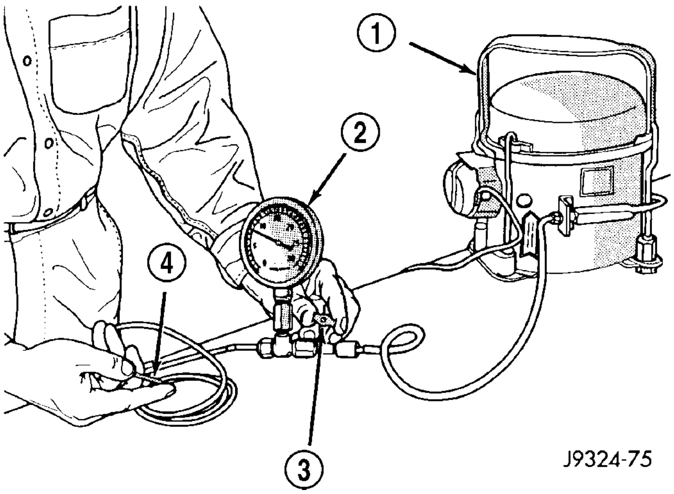


Fig. 3 ADJUST VACUUM TEST BLEED VALVE

1 - VACUUM PUMP TOOL C-4289
2 - VACUUM TEST SET C-3707
3 - BLEED VALVE
4 - PROBE

VACUUM CHECK VALVE

(1) Remove the vacuum check valve. The valve is located in the vacuum supply tube (black) at the HVAC system vacuum tee.

(2) Connect the test set vacuum supply hose to the A/C Heater Control side of the valve. When connected to this side of the check valve, no vacuum should pass and the test set gauge should return to the 27 kPa (8 in. Hg.) setting. If OK, go to Step 3. If not OK, replace the faulty valve.

(3) Connect the test set vacuum supply hose to the engine vacuum side of the valve. When connected to this side of the check valve, vacuum should flow through the valve without restriction. If not OK, replace the faulty valve.

A/C HEATER CONTROLS

(1) Connect the test set vacuum probe to the HVAC vacuum supply (black) tube at the tee in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

(2) Place the A/C Heater Mode Control switch knob in each mode position, one position at a time, and pause after each selection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each selection is made. If not OK, a component or vacuum line in the vacuum circuit of the selected mode has a leak. See the procedure in Locating Vacuum Leaks.

CAUTION: Do not use lubricant on the switch ports or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. A drop of clean water in the connector plug holes will help the connector slide onto the switch ports.

LOCATING VACUUM LEAKS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the vacuum harness connector from the back of the HVAC control head(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL).

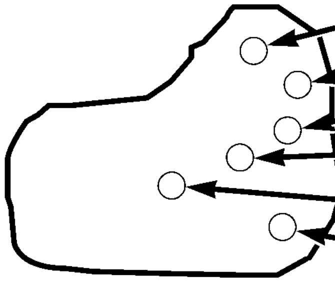
(2) Connect the test set vacuum hose probe to each port in the HVAC housing half of the vacuum harness connector, one port at a time, and pause after each connection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty A/C Heater Control. If not OK, go to Step 3.

(3) Determine the vacuum line color of the vacuum circuit that is leaking. To determine the vacuum line colors, refer to the Vacuum Circuits chart (Fig. 4).

(4) Disconnect and plug the vacuum line from the component (fitting, actuator, valve, switch, or reservoir) on the other end of the leaking circuit. Instrument panel disassembly or removal may be necessary to gain access to some components. See the appropriate service procedures.

(5) Connect the test set hose or probe to the open end of the leaking circuit. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty disconnected component. If not OK, go to Step 6.

HEATING & AIR CONDITIONING (Continued)



2002 KJ VACUUM LOGIC - HEATER ONLY CONTROL

PORT	1-GREEN	2-BLACK	3-BROWN	4-BLUE	5-YELLOW	6-RED
Actuation	Recirc Door	Source	Panel Door-Full	Floor/Def Floor	Floor/Def Mid-Pos	Panel Door-Mid
Off	Vacuum	Vacuum	Vent	Vent	Vent	Vent
Recirc	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Panel	Vent	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Bi-Level	Vent	Vacuum	Vent	Vacuum	Vacuum	Vacuum
Floor	Vent	Vacuum	Vent	Vacuum	Vacuum	Vent
Floor/Def	Vent	Vacuum	Vent	Vent	Vacuum	Vent
Defrost	Vent	Vacuum	Vent	Vent	Vent	Vent

2002 KJ VACUUM LOGIC - A/C CONTROL

PORT	1-GREEN	2-BLACK	3-BROWN	4-BLUE	5-YELLOW	6-RED
Actuation	Recirc Door	Source	Panel Door-Full	Floor/Def Floor	Floor/Def Mid-Pos	Panel Door-Mid
Off	Vacuum	Vacuum	Vent	Vent	Vent	Vent
Recirc a/c	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Panel a/c	Vent	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Bi-Level a/c	Vent	Vacuum	Vent	Vacuum	Vacuum	Vacuum
Bi-Level	Vent	Vacuum	Vent	Vacuum	Vacuum	Vacuum
Panel	Vent	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum
Floor	Vent	Vacuum	Vent	Vacuum	Vacuum	Vent
Floor/Def	Vent	Vacuum	Vent	Vent	Vacuum	Vent
Defrost	Vent	Vacuum	Vent	Vent	Vent	Vent

80cb228a

Fig. 4

HEATING & AIR CONDITIONING (Continued)

(6) To locate a leak in a vacuum line, leave one end of the line plugged and connect the test set hose or probe to the other end of the line. Run your fingers slowly along the line while watching the test set gauge. The vacuum reading will fluctuate when your fingers contact the source of the leak. To repair the vacuum line, cut out the leaking section of the line. Then, insert the loose ends of the line into a suitable length of 3 millimeter (0.125 inch) inside diameter rubber hose.

STANDARD PROCEDURE - DIODE REPLACEMENT

(1) Disconnect the battery negative cable and isolate it.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 5).

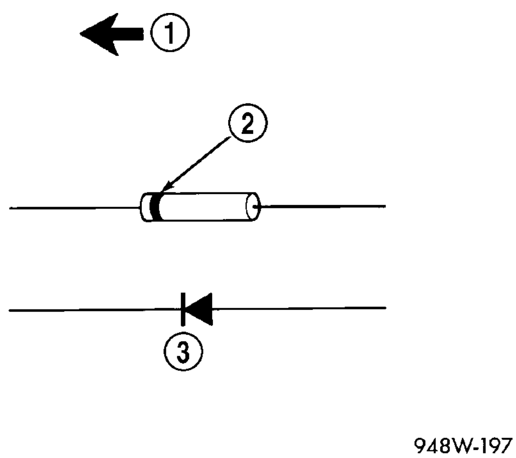


Fig. 5 DIODE IDENTIFICATION

1 - CURRENT FLOW
2 - BAND AROUND DIODE INDICATES CURRENT FLOW
3 - DIODE AS SHOWN IN THE DIAGRAMS

(4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(5) Install the new diode in the harness, making sure current flow is correct. If necessary refer to the appropriate wiring diagram for current flow.

(6) Solder the connections together using rosin core type solder only. **Do not use acid core solder.**

(7) Tape the diode to the harness using electrical tape making, sure the diode is completely sealed from the elements.

(8) Re-connect the battery negative cable, and test affected systems.

SPECIFICATIONS

A/C APPLICATION TABLE

Item	Description	Notes
Vehicle	KJ- Liberty	
System	R134a w/ fixed orifice tube	
Compressor	Sanden SD-7	SP-15 PAG oil
Freeze–up Control	A/C low pressure switch	accumulator mounted
Low psi Control	opens < 25 psi - resets > 43 psi	
High psi Control	switch - opens > 450-490 psi - resets < 270-330 psi	discharge line
Control Head	manual type	
Mode Door	vacuum	
Blend Door	electric	
Recirculation Door	vacuum	
Blower Motor	hardwired to control head	resistor block
Cooling Fan	viscous for cooling, single speed electric for A/C	
Clutch	Electro-mechanical	
Control	relay	PCM
Draw	2 - 3.7 amps @ 12V	± 0.5V @ 70° F
Gap	0.016″ - 0.031″	
DRB III®		
Reads	TPS, RPM, A/C switch test	
Actuators	clutch and fan relay	

HEATING & AIR CONDITIONING (Continued)

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
A/C COMPRESSOR CLUTCH PLATE NUT	14.4	10.5	127.4
A/C COMPRESOR LINE MANIFOLD FASTENER	28 (±6)	21 (±4)	250 (±50)
A/C COMPRESSOR TO MOUNTING BRACKET BOLTS - 3.7L and 2.4L	27	20	239
A/C COMPRESSOR TO MOUNTING BRACKET BOLTS - 2.5L DIESEL	33	25	292
ACCUMULATOR RETAINING BAND	5	3.7	44
BLEND DOOR ACTUATOR SCREWS	2.4 (±.34)	1.8 (±.25)	21 (±3)
HVAC HOUSING SCREWS	2.4 (±.34)	1.8 (±.25)	21 (±3)
HVAC HOUSING TO DASH PANEL NUTS	6.2	4.6	55
SUCTION LINE TO ACCUMULATOR FITTING	9	6.6	80

CONTROLS

TABLE OF CONTENTS

A/C COMPRESSOR CLUTCH

DESCRIPTION - 3.7L and 2.4L

The compressor clutch assembly consists of a stationary electromagnetic coil, a rotor bearing and rotor assembly, and a clutch plate (Fig. 1). The electromagnetic coil unit and the rotor bearing and rotor assembly are each retained on the nose of the compressor front housing with snap rings. The clutch plate is keyed to the compressor shaft and secured with a nut. These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt.

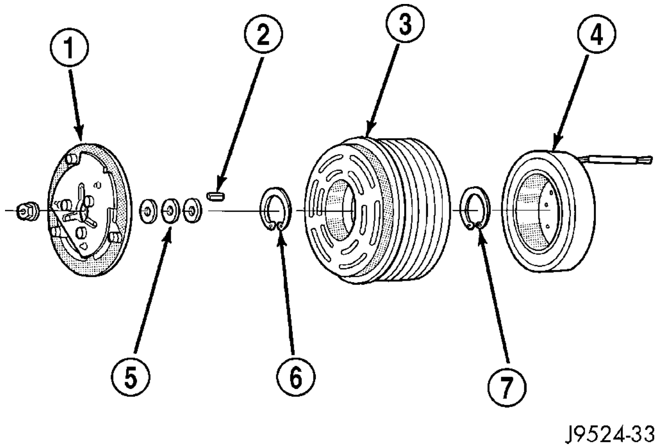


Fig. 1 COMPRESSOR CLUTCH - TYPICAL

1 - CLUTCH PLATE
2 - DRIFT PIN (NOT USED ON KJ)
3 - ROTOR
4 - COIL
5 - CLUTCH SHIMS
6 - SNAP RING
7 - SNAP RING

OPERATION - 3.7L and 2.4L

When the clutch coil is energized, it magnetically draws the clutch into contact with the rotor and drives the compressor shaft. When the coil is not energized, the rotor freewheels on the clutch rotor bearing, which is part of the rotor. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch engagement is controlled by several components: the A/C Heater mode control switch, the A/C low pressure switch, the A/C high pressure switch, the compressor clutch relay, and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to thirty seconds. Refer to Electronic Control Modules for more information on the PCM controls.

DIAGNOSIS AND TESTING - A/C COMPRESSOR CLUTCH

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information). The battery must be fully-charged before performing the following tests. Refer to Battery for more information.

(1) Connect an ammeter (0 to 10 ampere scale) in series with the clutch coil terminal. Use a voltmeter (0 to 20 volt scale) with clip-type leads for measuring the voltage across the battery and the compressor clutch coil.

(2) With the A/C Heater mode control switch in any A/C mode, and the blower motor switch in the lowest speed position, start the engine and run it at normal idle.

(3) The compressor clutch coil voltage should read within 0.2 volts of the battery voltage. If there is voltage at the clutch coil, but the reading is not within 0.2 volts of the battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as required. If there is no voltage reading at the clutch coil, use a DRB III ® scan tool and (Refer to Appropriate Diagnostic Information) for testing of the compressor clutch circuit and PCM control. The following components must be checked and repaired as required before you can complete testing of the clutch coil:

- Fuses in the junction block and the Power Distribution Center (PDC)
- A/C heater mode control switch
- Compressor clutch relay
- A/C high pressure switch
- A/C low pressure switch
- Powertrain Control Module (PCM).

(4) The compressor clutch coil is acceptable if the current draw measured at the clutch coil is 2.0 to 3.9 amperes with the electrical system voltage at 11.5 to 12.5 volts. This should only be checked with the work area temperature at 21° C (70° F). If system voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until the system voltage drops below 12.5 volts.

(a) If the clutch coil current reading is four amperes or more, the coil is shorted and should be replaced.

(b) If the clutch coil current reading is zero, the coil is open and should be replaced.

A/C COMPRESSOR CLUTCH (Continued)

STANDARD PROCEDURE - A/C COMPRESSOR CLUTCH BREAK-IN

After a new compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the A/C Heater control to the Recirculation Mode, the blower motor switch in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

REMOVAL

The refrigerant system can remain fully-charged during compressor clutch, rotor, or coil replacement. The compressor clutch can be serviced in the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the serpentine drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Unplug the compressor clutch coil wire harness connector.

(4) Remove the four bolts that secure the compressor to the mounting bracket.

(5) Remove the compressor from the mounting bracket. Support the compressor in the engine compartment while servicing the clutch.

(6) Insert the two pins of the spanner wrench (Special Tool C-4489 or equivalent) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 2).

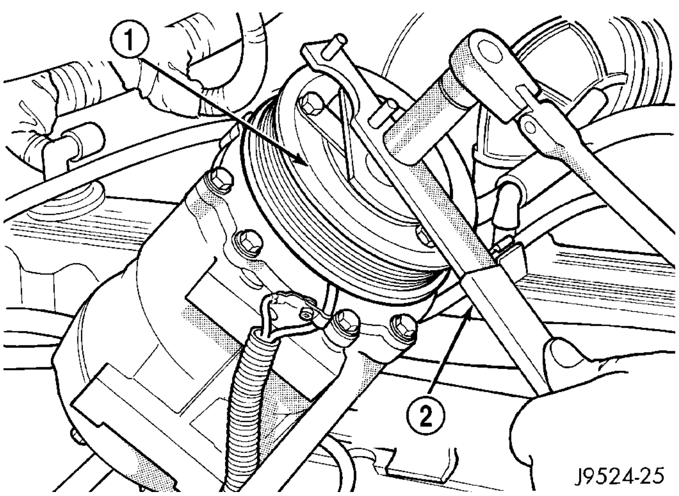


Fig. 2 CLUTCH NUT REMOVE - Typical

1 - CLUTCH PLATE
2 - SPANNER

(7) Remove the clutch plate.

(8) Remove the compressor clutch shims.

(9) Remove the external front housing snap ring with snap ring pliers (Fig. 3).

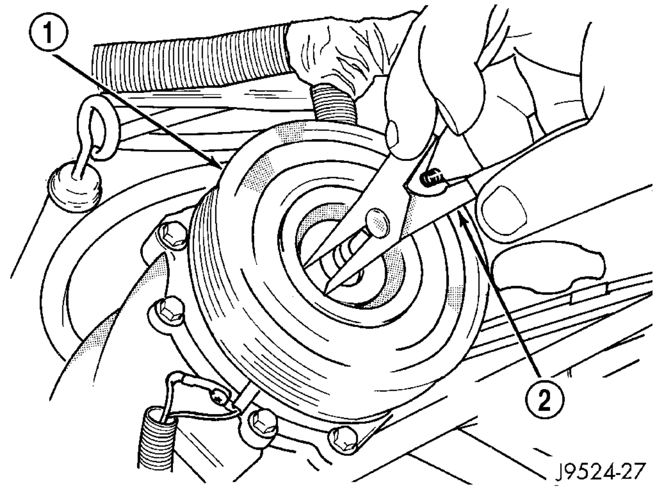


Fig. 3 EXTERNAL SNAP RING REMOVE - Typical

1 - PULLEY
2 - SNAP RING PLIERS

(10) Install the lip of the rotor puller (Special Tool C-6141-1 or equivalent) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141-2 or equivalent) (Fig. 4).

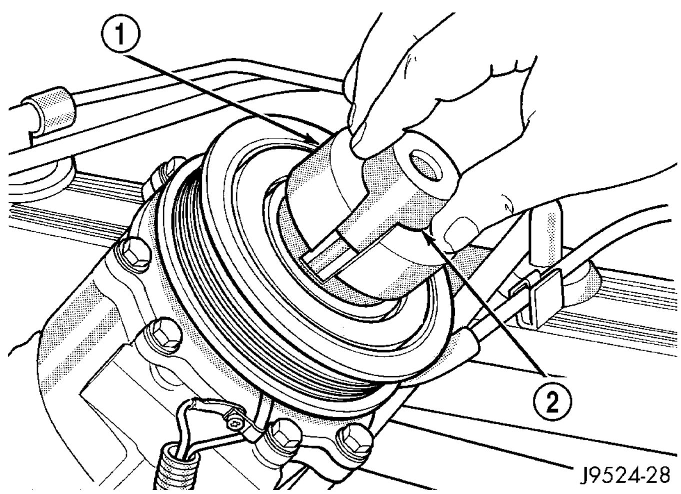


Fig. 4 SHAFT PROTECTOR AND PULLER - Typical

1 - PULLER JAW
2 - SHAFT PROTECTOR

A/C COMPRESSOR CLUTCH (Continued)

(11) Install the puller through-bolts (Special Tool C-6461 or equivalent) through the puller flange and into the jaws of the rotor puller and tighten (Fig. 5). Turn the puller center bolt clockwise until the rotor is free.

CAUTION: DO NOT APPLY FORCE TO THE END OF THE COMPRESSOR SHAFT.

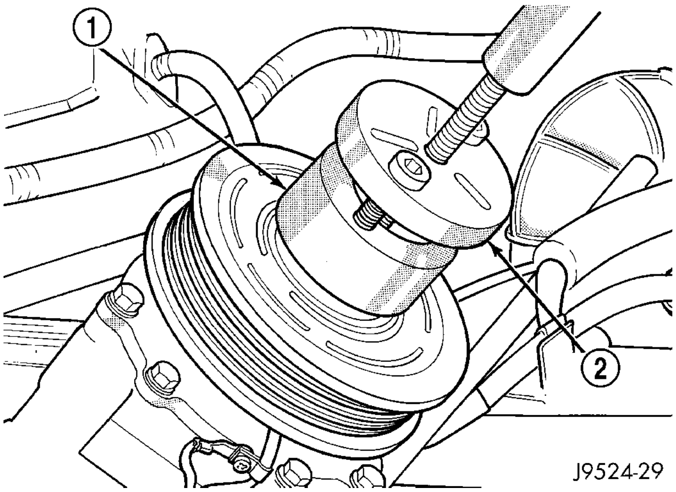


Fig. 5 INSTALL PULLER PLATE - Typical

1 - PULLER JAW
2 - PULLER

(12) Remove the screw and retainer from the clutch coil lead wire harness on the compressor front housing (Fig. 6).

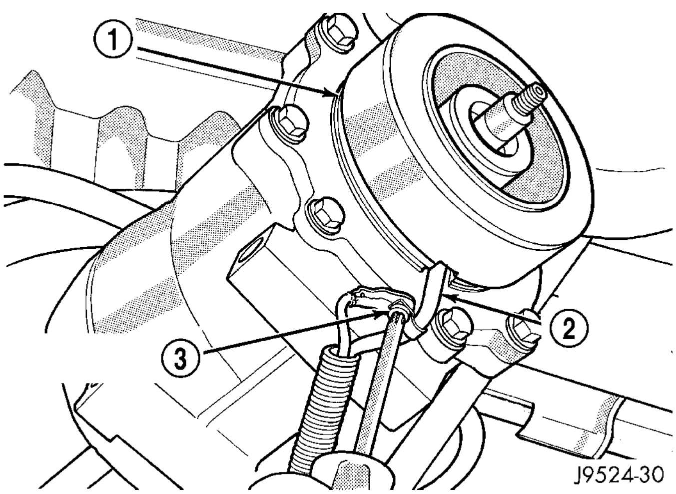


Fig. 6 CLUTCH COIL LEAD WIRE HARNESS - Typical

1 - COIL
2 - COIL WIRE
3 - RETAINER SCREW

(13) Remove the snap ring from the compressor hub and remove the clutch field coil (Fig. 7). Slide the clutch field coil off of the compressor hub.

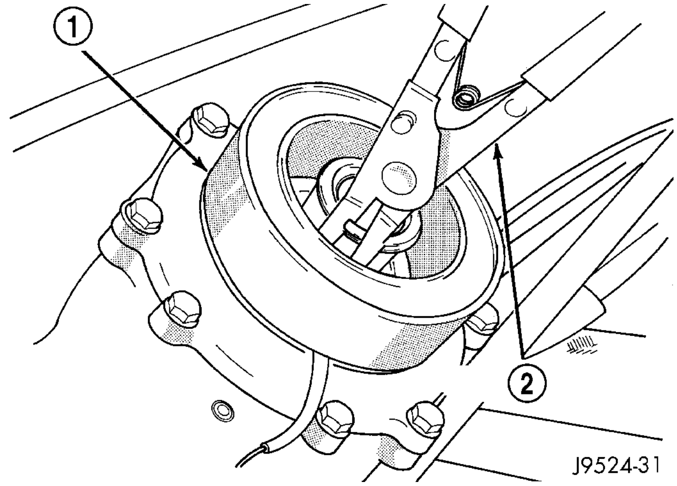


Fig. 7 CLUTCH FIELD COIL SNAP RING REMOVE - Typical

1 - COIL
2 - SNAP RING PLIERS

INSPECTION

Examine the friction surfaces of the clutch rotor and the clutch plate for wear. The rotor and clutch plate should be replaced if there is excessive wear or scoring.

If the friction surfaces are oily, inspect the shaft and nose area of the compressor for oil. Remove the felt from the front cover. If the felt is saturated with oil, the shaft seal is leaking and the compressor must be replaced.

Check the rotor bearing for roughness or excessive leakage of grease. Replace the rotor and clutch plate, if required.

INSTALLATION

(1) Install the clutch field coil and snap ring.

(2) Install the screw and retainer on the clutch coil lead wire harness on the compressor front housing. Tighten screw to 2.2 N·m (20 in. lbs.).

(3) Align the rotor assembly squarely on the front compressor housing hub.

(4) Install the rotor bearing assembly with the installer (Special Tool C-6871 or equivalent) (Fig. 8). Thread the installer on the shaft, then turn the nut until the rotor assembly is seated.

(5) Install the external front housing snap ring with snap ring pliers. The bevel side of the snap ring must be facing outward. Press the snap ring to make sure it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

A/C COMPRESSOR CLUTCH (Continued)

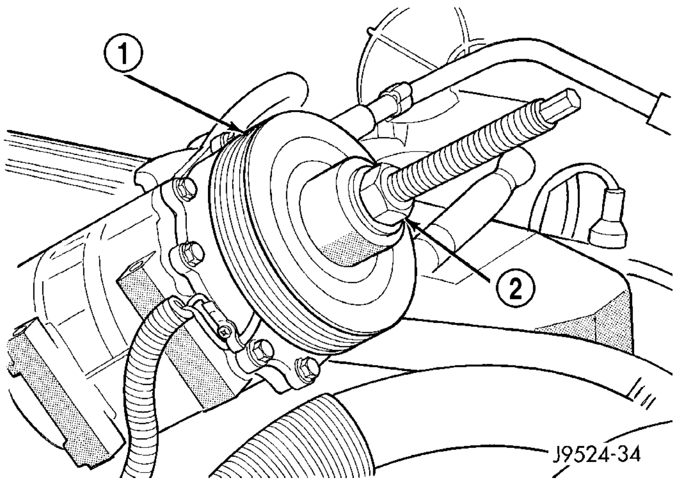


Fig. 8 CLUTCH PULLEY INSTALL - Typical

1 - ROTOR BEARING ASSEMBLY
2 - INSTALLER

(6) Install the original clutch shims on the compressor shaft.

(7) Install the clutch plate. Install the shaft hex nut and tighten to 15–20 N·m (11–15 ft. lbs.).

(8) Check the clutch air gap with a feeler gauge (Fig. 9). If the air gap does not meet the specification, add or subtract shims as required. The air gap specification is 0.41 to 0.79 millimeter (0.016 to 0.031 inch).

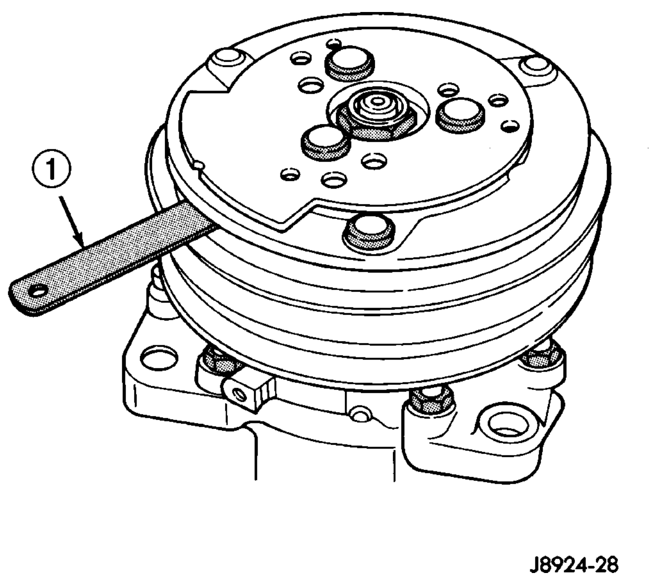


Fig. 9 CHECK CLUTCH AIR GAP - Typical

1 - FEELER GAUGE

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use a 1.0, 0.50, and 0.13 millimeter (0.040, 0.020, and 0.005 inch) shims from the new clutch hardware package that is provided with the new clutch.

(9) To complete the procedure, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

A/C COMPRESSOR CLUTCH RELAY

DESCRIPTION

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, the current capacity is lower, and the relay case dimensions are smaller than those of the conventional ISO relay.

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

OPERATION

The compressor clutch relay is a electromechanical device that switches battery current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds to inputs from the A/C Heater mode control switch, the A/C low pressure switch, and the A/C high pressure switch. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C COMPRESSOR CLUTCH RELAY - DIAGNOSIS AND TESTING)

The compressor clutch relay cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - COMPRESSOR CLUTCH RELAY

RELAY TEST

The compressor clutch relay (Fig. 10) is located in the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location. Remove the relay from the PDC to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

A/C COMPRESSOR CLUTCH RELAY (Continued)

(2) Resistance between terminals 85 and 86 (electromagnet) should be 67.5 to 82.5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see Relay Circuit Test. If not OK, replace the faulty relay.

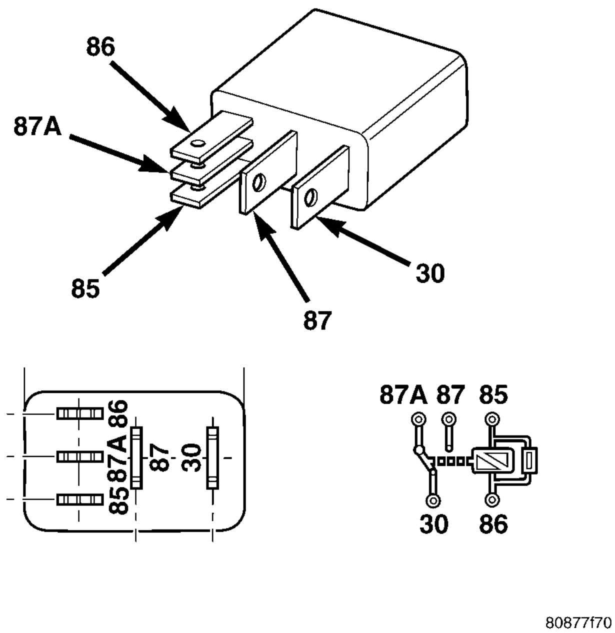


Fig. 10 COMPRESSOR CLUTCH RELAY

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

RELAY CIRCUIT TEST

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

(1) The relay common feed terminal cavity (30) is connected to fused battery feed. There should be battery voltage at the cavity for relay terminal 30 at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is not used in this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the compressor clutch coil. There should be continuity between this cavity and the A/C compressor clutch relay output circuit cavity of the compressor clutch coil wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The relay coil battery terminal (86) is connected to the fused ignition switch output (run/start) circuit. There should be battery voltage at the cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the fuse in the junction block as required.

(5) The coil ground terminal cavity (85) is switched to ground through the Powertrain Control Module (PCM). There should be continuity between this cavity and the A/C compressor clutch relay control circuit cavity of the PCM wire harness connector C (gray) at all times. If not OK, repair the open circuit as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC).

(3) Refer to the label on the PDC for compressor clutch relay identification and location.

(4) Unplug the compressor clutch relay from the PDC.

INSTALLATION

(1) Install the compressor clutch relay by aligning the relay terminals with the cavities in the PDC and pushing the relay firmly into place.

(2) Install the PDC cover.

(3) Connect the battery negative cable.

(4) Test the relay operation.

A/C HEATER CONTROL

DESCRIPTION

Both the heater-only and A/C heater systems use a combination of mechanical, electrical, and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the features, use, and suggested operation of these controls.

The heater-only or A/C heater control panel is located to the right of the instrument cluster on the instrument panel. The control panel contains a rotary-type temperature control knob, a rotary-type mode control switch knob, and a rotary-type blower motor speed switch knob. The control also has a push button to activate the rear window defogger.

The heater-only or A/C heater control panel cannot be repaired. If faulty or damaged, the entire unit must be replaced. The illumination lamps are available for service replacement.

A/C HEATER CONTROL (Continued)

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center bezel from the instrument panel(Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

(3) Release the vacuum harness from the A/C Heater control.

(4) Remove the four screws that secure the A/C Heater control to the instrument panel (Fig. 11).

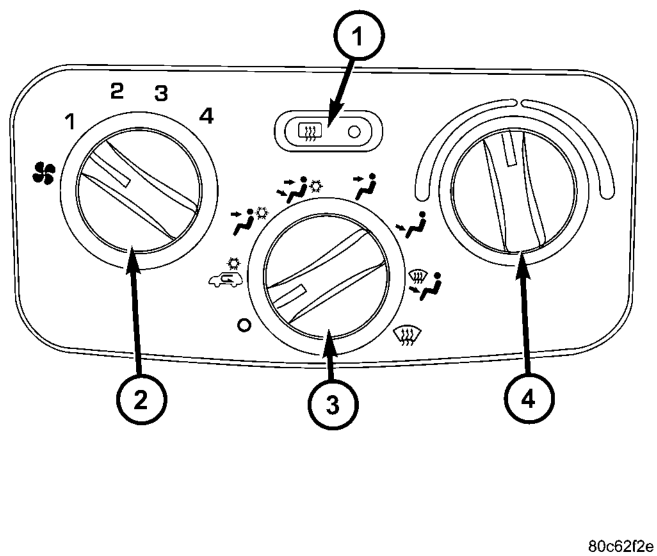


Fig. 11 A/C HEATER CONTROL

1 - REAR WINDOW DEFOGGER SWITCH
2 - BLOWER SPEED CONTROL
3 - MODE SELECT CONTROL
4 - TEMPERATURE SELECT CONTROL

(5) Pull the A/C Heater control assembly away from the instrument panel far enough to access the connections on the back of the control.

(6) Unplug the wire harness connectors from the back of the A/C Heater control (Fig. 12).

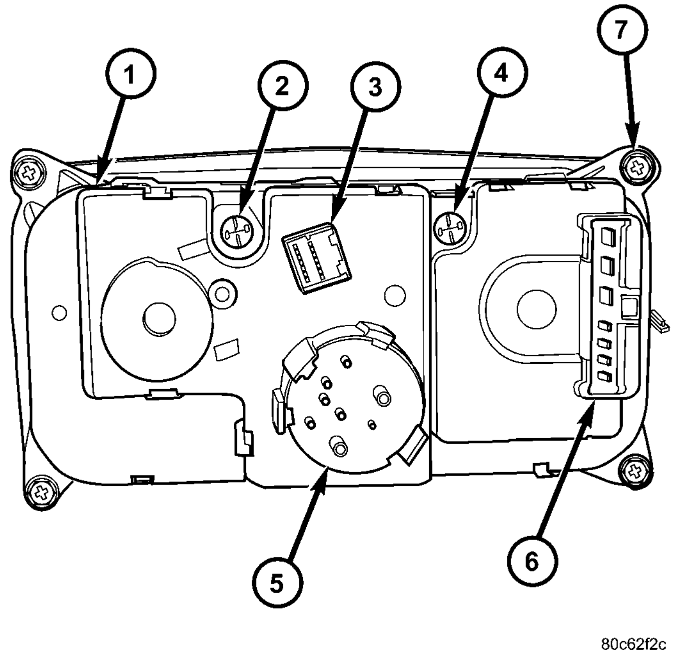


Fig. 12 A/C HEATER CONTROL HEAD (Rear View)

1 - A/C HEATER CONTROL HEAD
2 - A/C HEATER CONTROL HEAD LIGHT
3 - REAR WINDOW DEFOGGER SWITCH AND TEMPERATURE BLEND DOOR- CONNECTOR B (12 PIN)
4 - A/C HEATER CONTROL HEAD LIGHT
5 - MODE SELECT CONTROL
6 - BLOWER SPEED CONTROL- CONNECTOR A (7 PIN)
7 - MOUNTING SCREWS (4)

INSTALLATION

(1) Plug the two wire harness connectors and one vacuum connector into the back of the A/C Heater control.

(2) Position the A/C Heater control in the instrument panel bezel and secure it with four screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reinstall the center bezel onto the instrument panel(Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).

(4) Connect the battery negative cable.

A/C HIGH PRESSURE SWITCH

DESCRIPTION

The A/C high pressure switch controls both A/C compressor clutch engagement/disengagement, and electric cooling fan operations. The switch is located on the discharge line near the compressor. The switch is screwed onto a fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The discharge line fitting is equipped with an O-ring to seal the switch connection.

A/C HIGH PRESSURE SWITCH (Continued)

OPERATION

The A/C high pressure switch is connected in series electrically with the A/C low pressure switch between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This prevents compressor operation when the discharge line pressure approaches high levels, and also reduces electrical surging from compressor clutch engagement.

The A/C high pressure switch controls the electric cooling fan operation by monitoring refrigerant line pressures. When the discharge line pressure rises above 1900 to 2200 kPa (280 to 320 psi) the fan will turn on. The cooling fan will turn off when the discharge line pressure drops to 1600 kPa (235 psi).

The A/C high pressure switch controls the A/C clutch operation by disengaging the clutch when the discharge line pressure rises above 3100 to 3375 kPa (450 to 490 psi). The switch contacts will close and allow A/C clutch engagement when the discharge line pressure drops to 1860 to 2275 kPa (270 to 330 psi).

The A/C high pressure switch is a factory-calibrated unit. The switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - A/C HIGH PRESSURE SWITCH

Before performing diagnosis of the A/C high pressure switch, verify that the refrigerant system has the correct refrigerant charge. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the A/C high pressure switch wire harness connector from the switch on the refrigerant system fitting.

(3) On the four terminal A/C high pressure switch, check for continuity between terminals C and D. On the two terminal A/C high pressure switch, check for continuity between both terminals of the switch. There should be continuity. If OK, test and repair the A/C switch sense circuit as required. If not OK, replace the faulty switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the A/C high pressure switch, which is mounted to a fitting on the non-flexible section of the discharge line nearest the compressor.

(3) Unscrew the A/C high pressure switch from the discharge line fitting.

(4) Remove the A/C high pressure switch from the vehicle.

(5) Remove the O-ring seal from the discharge line fitting and discard.

INSTALLATION

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the discharge line fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle(Refer to 24 - HEATING & AIR CONDITIONING - SPECIFICATIONS). (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION)

(2) Install and tighten the a/c high pressure switch on the discharge line fitting. The switch should be hand-tightened onto the discharge line fitting.

(3) Plug the wire harness connector into the a/c high pressure switch.

(4) Connect the battery negative cable.

A/C LOW PRESSURE SWITCH

DESCRIPTION

The a/c low pressure switch is located on the top of the accumulator. The switch is screwed onto an accumulator fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The accumulator fitting is equipped with an O-ring to seal the switch connection.

OPERATION

The a/c low pressure switch is connected in series electrically with the a/c high pressure switch, between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the a/c compressor clutch on and off. This regulates the refrigerant system pressure and controls evaporator temperature. Controlling the evaporator temperature prevents condensate water on the evaporator fins from freezing and obstructing air conditioning system air flow.

The a/c low pressure switch contacts are open when the suction pressure is approximately 141 kPa (20.5 psi) or lower. The switch contacts will close when the suction pressure rises to approximately 234 to 262 kPa (34 to 38 psi) or above. Lower ambient temperatures, below approximately -1° C (30° F), will also cause the switch contacts to open. This is due to

A/C LOW PRESSURE SWITCH (Continued)

the pressure/temperature relationship of the refrigerant in the system.

The a/c low pressure switch is a factory-calibrated unit. It cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - A/C LOW PRESSURE SWITCH

Before performing diagnosis of the a/c low pressure switch, be certain that the switch is properly installed on the accumulator fitting. If the switch is too loose it may not open the Schrader-type valve in the accumulator fitting, which will prevent the switch from correctly monitoring the refrigerant system pressure. Remember that lower ambient temperatures, below about -1° C (30° F), during cold weather will open the switch contacts and prevent compressor operation due to the pressure/temperature relationship of the refrigerant.

Also verify that the refrigerant system has the correct refrigerant charge. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - A/C PERFORMANCE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS).

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the a/c low pressure switch wire harness connector from the switch on the accumulator fitting.

(3) Install a jumper wire between the two cavities of the a/c low pressure switch wire harness connector.

(4) Connect a manifold gauge set to the refrigerant system service ports. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT) and (Refer to 24 - HEATING & AIR CONDITIONING - DESCRIPTION - REFRIGERANT SYSTEM SERVICE PORT)

(5) Connect the battery negative cable.

(6) Place the A/C Heater mode control switch knob in any A/C position and start the engine.

(7) Check for continuity between the two terminals of the a/c low pressure switch. There should be continuity with a suction pressure reading of 262 kPa (38 psi) or above, and no continuity with a suction pressure reading of 141 kPa (20.5 psi) or below. If OK, test and repair the A/C switch sense circuit as required. If not OK, replace the faulty switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the a/c low pressure switch on the top of the accumulator (Fig. 13).

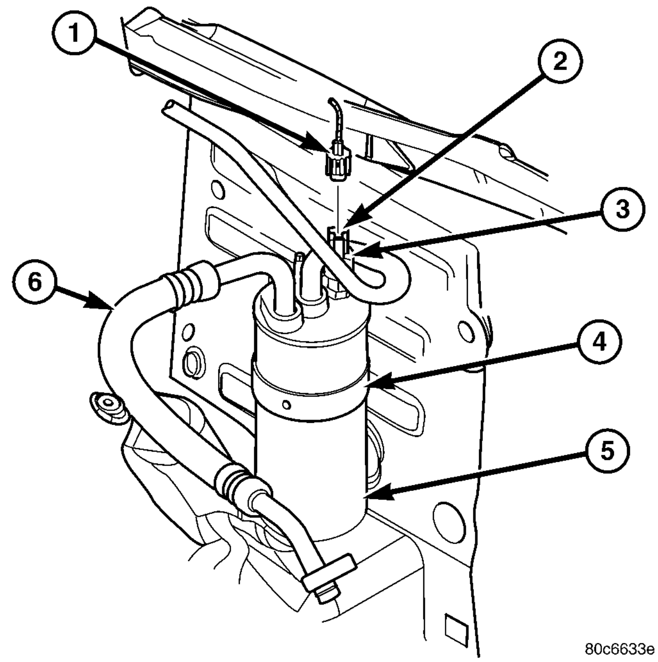


Fig. 13 A/C LOW PRESSURE SWITCH

1 - WIRING HARNESS CONNECTOR
2 - A/C LOW PRESSURE SWITCH
3 - A/C LINE TO EVAPORATOR
4 - ACCUMULATOR MOUNTING BRACKET
5 - ACCUMULATOR
6 - A/C LOW PRESSURE LINE

(3) Unscrew the a/c low pressure switch from the fitting on the top of the accumulator.

(4) Remove the O-ring seal from the accumulator fitting and discard.

INSTALLATION

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the accumulator fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION)

(2) Install and tighten the a/c low pressure switch on the accumulator fitting. The switch should be hand-tightened onto the accumulator fitting.

(3) Plug the wire harness connector into the a/c low pressure switch.

(4) Connect the battery negative cable.

BLEND DOOR ACTUATOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: With the ignition key in the on position put the HVAC Control Head in the mid-temperature position and wait 10 seconds before turning the ignition key to the off position. Then proceed to step 1.

(1) Disconnect and isolate the battery negative cable.

(2) Remove A/C housing from vehicle(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HVAC HOUSING - REMOVAL).

(3) Remove the screws that secure the blend door actuator to the top of the HVAC housing. (Fig. 14).

(4) Remove the blend door actuator.

INSTALLATION

(1) Install the blend door actuator.

(2) Install and tighten the screws that secure the blend door actuator to the housing. Tighten the mounting screws to 2.4 (±.34) N·m (21 (±3) in. lbs.).

(3) Install the HVAC housing into the vehicle(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

(4) Install the blend door actuator electrical connector from the wiring harness through the glove box.

(5) Connect the battery negative cable.

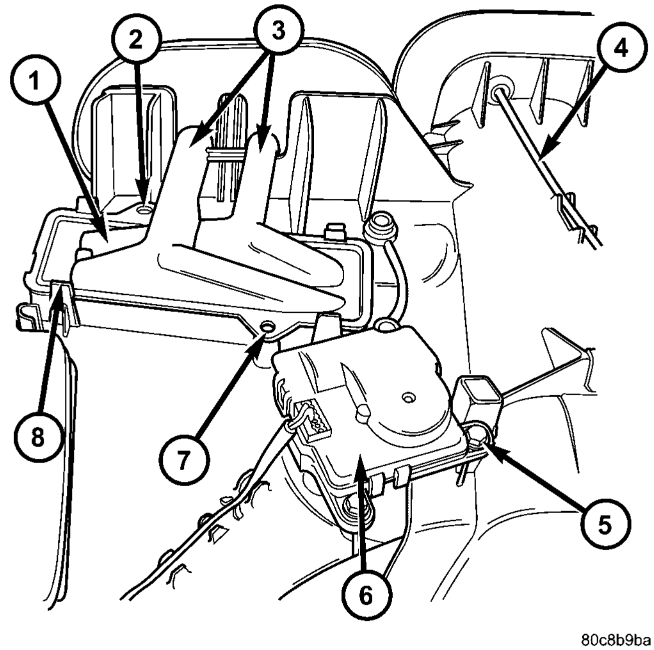


Fig. 14 HEATER CORE REMOVAL/INSTALLATION

1 - HEATER CORE
2- MOUNTING SCREW HOLE
3- INLET AND OUTLET TUBES
4- VACUUM HARNESS
5- ACTUATOR SCREWS (3)
6- ELECTRIC BLEND DOOR ACTUATOR
7- MOUNTING SCREW HOLE
8- HEATER CORE RETAINER TABS (4)

BLOWER MOTOR RELAY

DESCRIPTION

The blower motor relay is a International Standards Organization (ISO)-type relay. The relay is a electromechanical device that switches battery current from a fuse in the Power Distribution Center (PDC) directly to the blower motor. The relay is energized when the relay coil is provided a voltage signal by the ignition switch. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/BLOWER MOTOR RELAY - DIAGNOSIS AND TESTING)

OPERATION

The blower motor relay is installed in a wire harness connector that is secured to the passenger side outboard end of the HVAC housing in the passenger compartment, next to the HVAC wire harness connector.

The blower motor relay cannot be repaired and, if faulty or damaged, it must be replaced.

BLOWER MOTOR RELAY (Continued)

DIAGNOSIS AND TESTING - BLOWER MOTOR RELAY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

RELAY TEST

The blower motor relay (Fig. 15) is located in the PDC which is located under the hood.. Remove the relay from the PDC to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 60.7 to 80.3 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test. If not OK, replace the faulty relay.

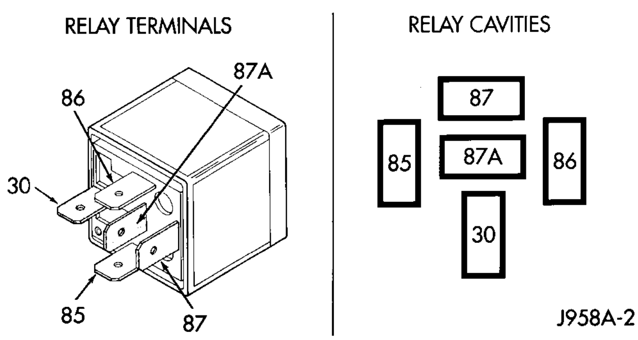


Fig. 15 BLOWER MOTOR RELAY

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

RELAY CIRCUIT TEST

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

(1) The relay common feed terminal cavity (30) is connected to fused battery feed directly from a fuse in the Power Distribution Center (PDC), and should be hot at all times. Check for battery voltage at the connector cavity for relay terminal 30. If OK, go to Step 2. If not OK, repair the open circuit to the PDC fuse as required.

(2) The relay normally closed terminal cavity (87A) is not used for this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the blower motor. When the relay is energized, terminal 87 is connected to terminal 30 and provides full battery current to the blower motor feed circuit. There should be continuity between the connector cavity for terminal 87 and the blower motor at all times. If OK, go to Step 4. If not OK, repair the open circuit to the blower motor as required.

(4) The coil battery terminal cavity (86) is connected to the ignition switch. When the ignition switch is placed in the On position, fused ignition switch output is directed from a fuse in the junction block to the relay electromagnetic coil to energize the relay. There should be battery voltage at the connector cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the junction block fuse as required.

(5) The coil ground terminal cavity (85) is connected to ground. This terminal supplies the ground for the relay electromagnet coil. There should be continuity between the connector cavity for relay terminal 85 and a good ground at all times. If not OK, repair the open circuit as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

BLOWER MOTOR RELAY (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the blower motor relay from the PDC located under the hood.

(3) Remove the blower motor relay.

INSTALLATION

(1) Install the blower motor relay by aligning the relay terminals with the cavities in the PDC and pushing the relay firmly into place.

(2) Connect the battery negative cable.

(3) Test the relay operation.

BLOWER MOTOR RESISTOR BLOCK

DESCRIPTION

The blower motor resistor is mounted to the rear side of the HVAC housing on the passenger side of the vehicle.

OPERATION

The resistor is a credit card resistor that utilizes resistor circuit tracers to reduce current flow to the blower. The blower motor switch directs the ground path through the correct resistor circuit to obtain the selected speed.

The blower motor resistor cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - BLOWER MOTOR RESISTOR

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box door and reach in and unplug the wire harness connector from the blower motor resistor.

(3) Check for continuity between each of the blower motor switch input terminals of the resistor and the resistor output terminal. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor relay as required. If not OK, replace the faulty blower motor resistor.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box door to gain access to the blower motor resistor.

(3) Pull out the lock on the blower motor resistor wire harness connector to unlock the connector latch.

(4) Depress the latch on the blower motor resistor wire harness connector and unplug the connector from the resistor.

(5) Remove the two screws that secure the resistor to the HVAC housing.

(6) Remove the resistor from the HVAC housing.

INSTALLATION

(1) Install the new resistor in the HVAC housing.

(2) Install the two screws that secure the resistor to the HVAC housing and tighten to 2.2 N·m (20 in. lbs.).

(3) Plug in the blower motor harness connector.

(4) Push in the lock on the blower motor resistor harness connector.

(5) Close the glove box door.

(6) Connect the battery negative cable.

BLOWER MOTOR SWITCH

DESCRIPTION

The heater-only or A/C Heater blower motor is controlled by a four position rotary-type blower motor switch, mounted in the A/C Heater control panel. The switch allows the selection of one of four blower motor speeds, but can only be turned off by selecting the Off position with the heater-only or A/C Heater mode control switch knob.

OPERATION

The blower motor switch directs the blower motor ground path through the mode control switch to the blower motor resistor, or directly to ground, as required to achieve the selected blower motor speed.

The blower motor switch cannot be repaired and, if faulty or damaged, the entire heater-only or A/C Heater control unit must be replaced.

DIAGNOSIS AND TESTING - BLOWER MOTOR SWITCH

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check for battery voltage at the fuse in the Power Distribution Center (PDC). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the A/C Heater control from the instrument panel. Check for continuity between the ground circuit cavity of the A/C Heater control wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to ground as required.

(3) With the A/C Heater control wire harness connector unplugged, place the A/C Heater mode control switch knob in any position except the Off position. Check for continuity between the ground circuit terminal and each of the blower motor driver circuit terminals of the A/C Heater control as you move the blower motor switch knob to each of the four speed positions. There should be continuity at each driver circuit terminal in only one blower motor switch speed position. If OK, test and repair the blower driver circuits between the A/C Heater control connector and the blower motor resistor as required. If not OK, replace the faulty A/C Heater control unit.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The blower motor switch cannot be repaired and, if faulty or damaged, the entire heater-only or A/C Heater control unit must be replaced. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) The blower motor switch cannot be repaired and, if faulty or damaged the entire heater-only or A/C heater control unit must be replaced(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - INSTALLATION).

MODE DOOR ACTUATOR

REMOVAL

REMOVAL - PANEL DOOR ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Unplug the vacuum harness connector from the defrost door actuator (Fig. 16).

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the HVAC housing actuator mount. Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount.

(5) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the defrost door lever.

(6) Remove the defrost door vacuum actuator from the vehicle.

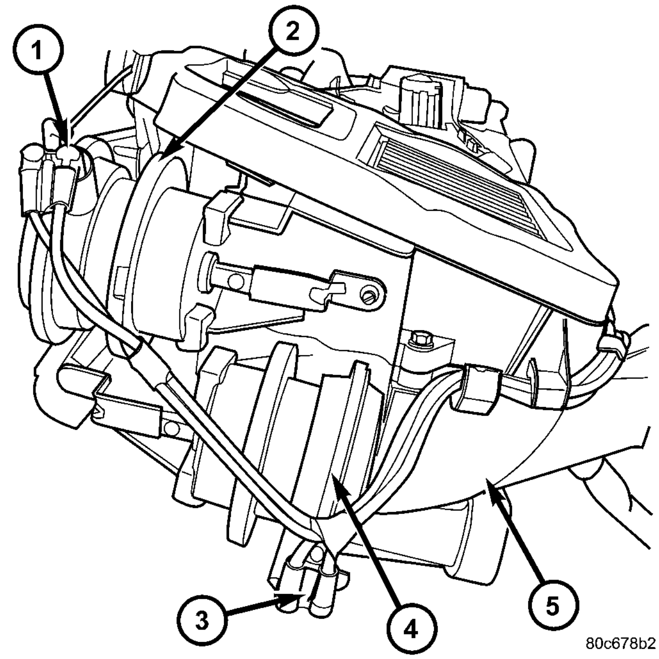


Fig. 16 HVAC DOOR VACUUM ACTUATORS

1 - VACUUM LINE AND CONNECTOR
2 - PANEL DOOR ACTUATOR
3 - VACUUM LINE AND CONNECTOR
4 - FLOOR-DEFROST DOOR ACTUATOR
5 - HVAC ASSEMBLY

REMOVAL - FLOOR - DEFROST DOOR ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

MODE DOOR ACTUATOR (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Unplug the vacuum harness connector from the floor door actuator (Fig. 17).

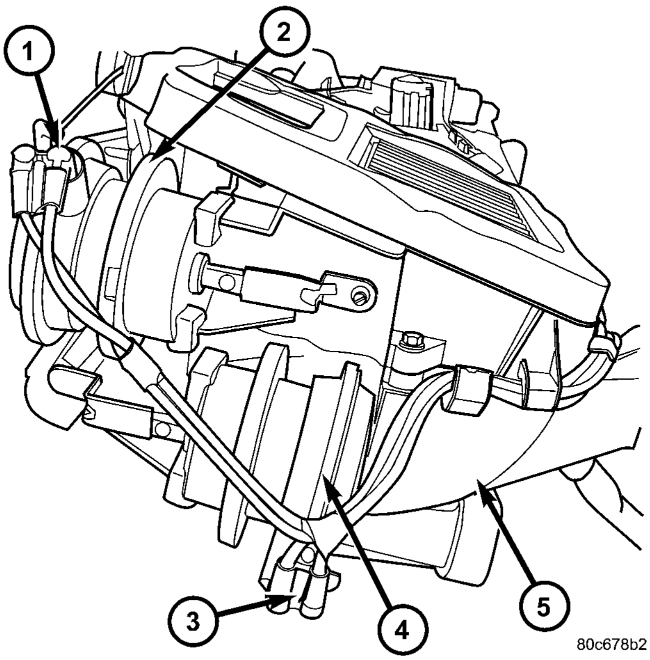


Fig. 17 HVAC DOOR VACUUM ACTUATORS

1 - VACUUM LINE AND CONNECTOR
2 - PANEL DOOR ACTUATOR
3 - VACUUM LINE AND CONNECTOR
4 - FLOOR-DEFROST DOOR ACTUATOR
5 - HVAC ASSEMBLY

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the HVAC housing actuator mount. Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount. (Fig. 18)

(5) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the floor door lever.

(6) Remove the floor door vacuum actuator from the vehicle.

INSTALLATION

INSTALLATION - PANEL DOOR ACTUATOR

(1) Install the defrost door vacuum actuator by snapping it into place, engage the hole on the end of the actuator link with the hooked pin on the end of the panel/demist door lever.

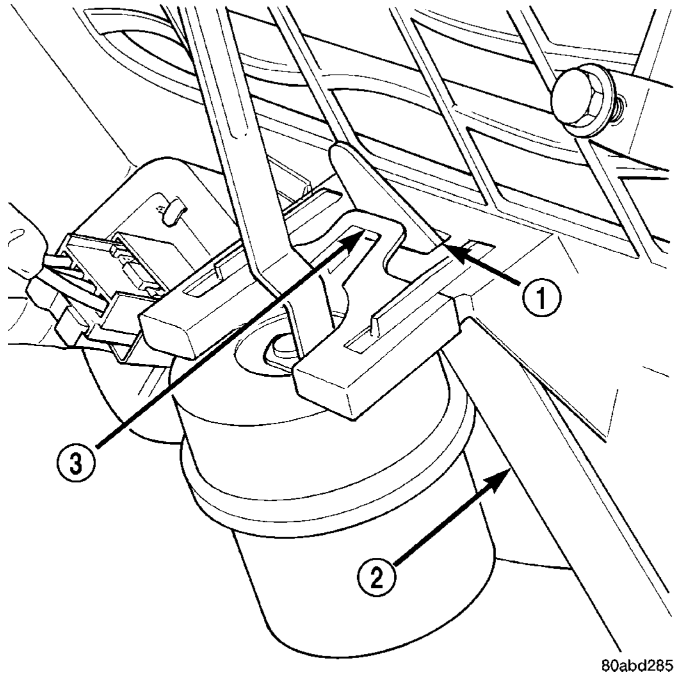


Fig. 18 VACUUM ACTUATOR REMOVE/INSTALL - TYPICAL

1 - ACTUATOR MOUNT LATCH HOLE
2 - TRIM STICK
3 - ACTUATOR LATCH

(2) Plug in the vacuum harness connector to the defrost door actuator.

(3) Install the instrument panel assembly in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(4) Connect the battery negative cable.

INSTALLATION - FLOOR - DEFROST DOOR ACTUATOR

(1) Engage the hole on the end of the actuator link to the hooked pin. Install the floor-defrost door vacuum actuator to the HVAC assembly. on the end of the floor door lever.

(2) Install the floor door vacuum actuator to the HVAC assembly.

(3) Install the instrument panel assembly into the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

(4) Connect the battery negative cable.

RECIRCULATION DOOR ACTUATOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the vacuum harness connector from the recirculation door actuator (Fig. 19).

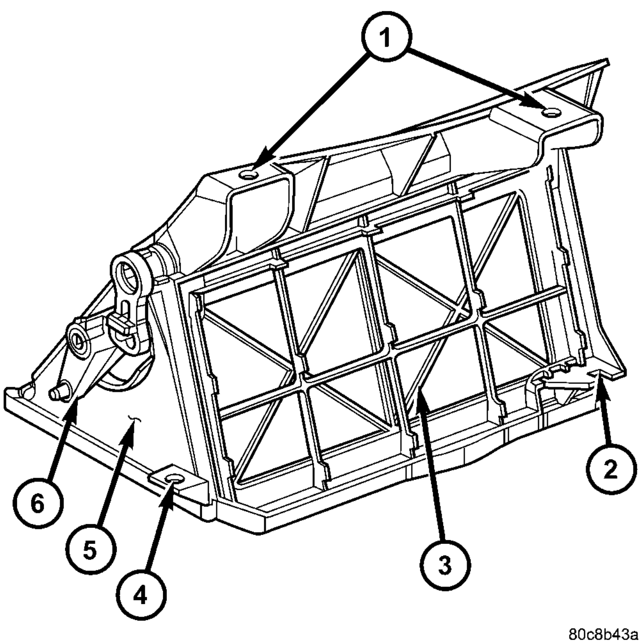


Fig. 19 RECIRCULATION DOOR ASSEMBLY

1- INSTRUMENT PANEL ELECTRICAL HARNESS MOUNTING TABS
2- MOUNTING TAB
3- RECIRCULATION DOOR
4- MOUNTING TAB
5- RECIRCULATION DOOR ASSEMBLY
6- RECIRCULATION DOOR LEVER

(3) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the HVAC housing actuator mount (Fig. 20).

(4) Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount (Fig. 21).

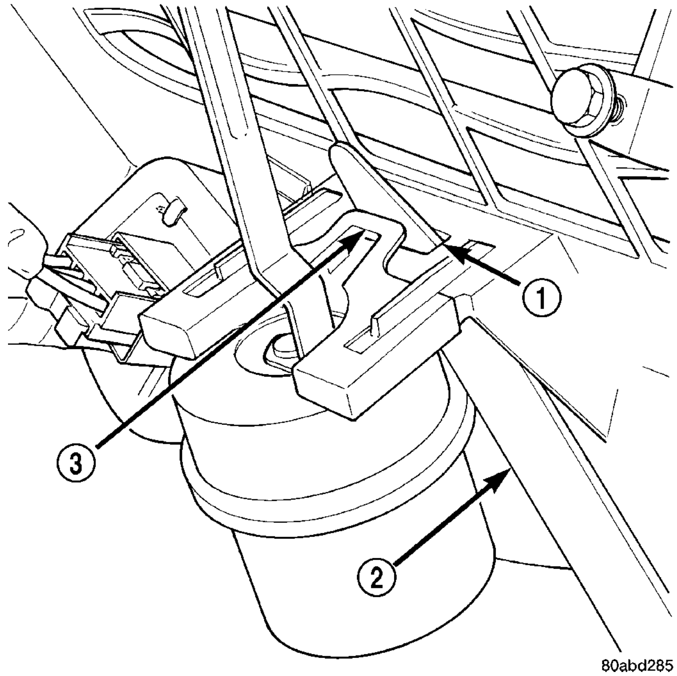


Fig. 20 VACUUM ACTUATOR REMOVE/INSTALL - TYPICAL

1 - ACTUATOR MOUNT LATCH HOLE
2 - TRIM STICK
3 - ACTUATOR LATCH

(5) Disengage the hole on the end of the actuator link from the hooked pin on the end of the recirculation door lever.

(6) Remove the recirculation door vacuum actuator from the vehicle.

INSTALLATION

(1) Install the recirculation door vacuum actuator by slipping the arm on to the hole on the end of the actuator link with the hooked pin on the end of the panel/demist door lever.

(2) Snap the actuator back into its mount.

(3) Plug in the vacuum harness connector to the recirculation door actuator.

(4) Connect the battery negative cable.

RECIRCULATION DOOR ACTUATOR (Continued)

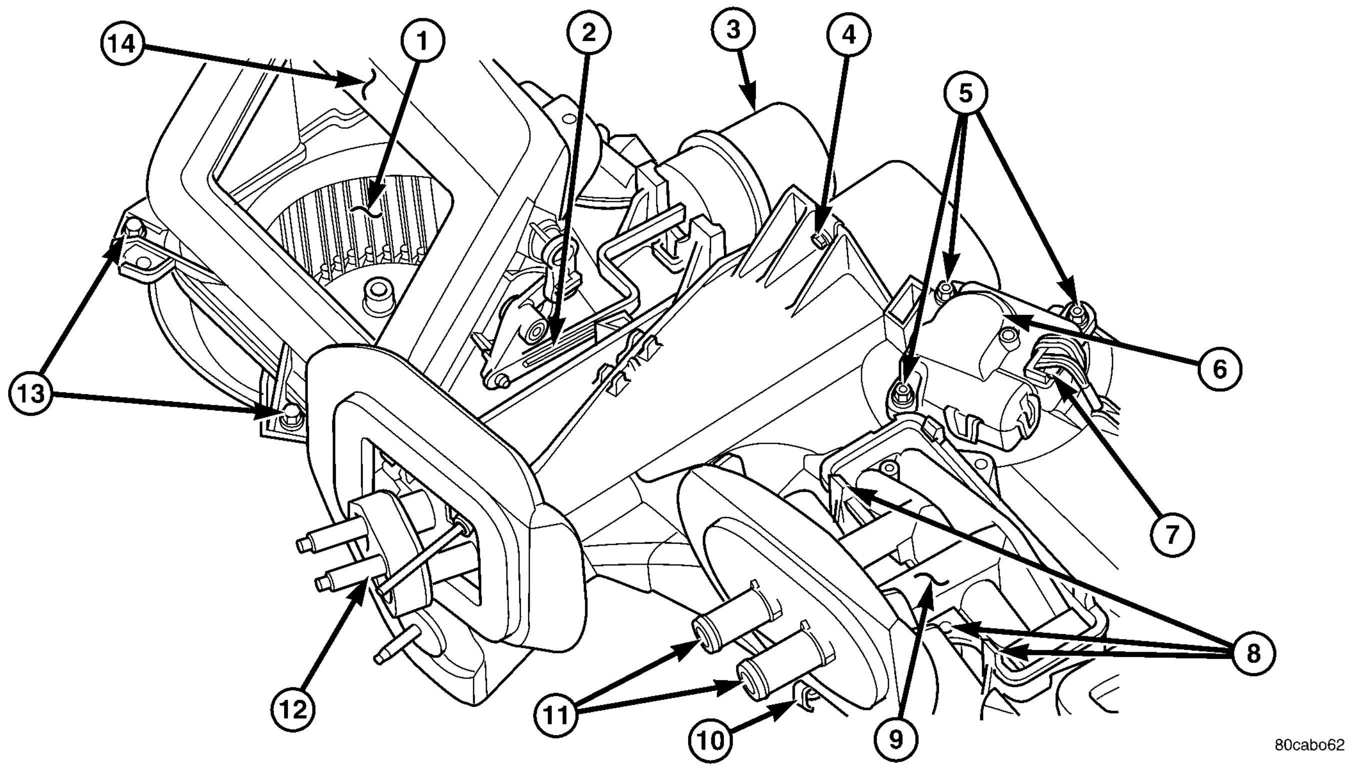


Fig. 21 HVAC CASE ASSEMBLY

1 - BLOWER MOTOR AND CAGE
2 - RECIRCULATION DOOR ACTUATOR LINKAGE
3 - RECIRCULATION DOOR VACUUM ACTUATOR
4 - CASE RETAINER SCREW
5 - BLEND DOOR ACTUATOR MOUNTING SCREWS
6 - ELECTRIC BLEND DOOR ACTUATOR
7 - ELECTRICAL CONNECTOR FOR BLEND DOOR ACTUATOR
8 - HEATER CORE RETAINER TABS (4) AND SCREWS (2)
9 - HEATER CORE
10 - HVAC CASE RETAINER CLIP
11 - HEATER CORE INPUT AND OUTPUT CONNECTIONS
12 - EVAPORATOR CONNECTION FLANGE
13 - HVAC CASE RETAINER SCREWS
14 - HVAC HOUSING

VACUUM CHECK VALVE

DESCRIPTION

A vacuum check valve is installed in the accessory vacuum supply line in the engine compartment, near the vacuum tap on the engine intake manifold, and at the HVAC unit takeout. The vacuum check valve is designed to allow vacuum to flow in only one direction through the accessory vacuum supply circuits.

OPERATION

The use of a vacuum check valve helps to maintain the system vacuum needed to retain the selected A/C Heater mode settings. The check valve will prevent the engine from bleeding down system vacuum through the intake manifold during extended heavy engine load (low engine vacuum) operation.

The vacuum check valve cannot be repaired and, if faulty or damaged, it must be replaced.

VACUUM CHECK VALVE (Continued)

REMOVAL

(1) Unplug the HVAC vacuum supply line connector at the vacuum check valve. The check valve is located behind the glove box on the passengers side of the vehicle (Fig. 22).

(2) Note the orientation of the check valve in the vacuum supply line for correct reinstallation.

(3) Unplug the vacuum check valve from the vacuum supply line fittings.

INSTALLATION

(1) Plug in the vacuum check valve at the vacuum supply line fittings making sure of proper orientation.

(2) Plug in the vacuum check valve at the HVAC vacuum supply line connector.

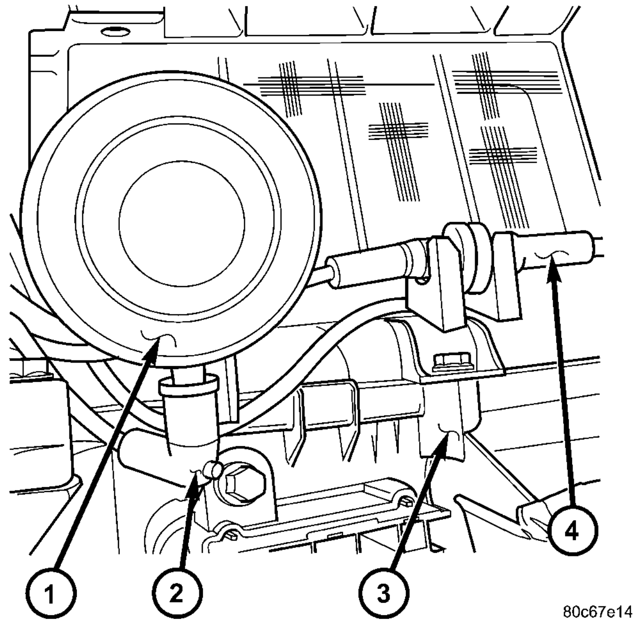


Fig. 22 RECIRCULATION ACTUATOR AND CHECK VALVE

1 - RECIRCULATION ACTUATOR
2 - VACUUM LINE TO RESEVOIR
3 - HVAC HOUSING
4 - VACUUM CHECK VALVE

DISTRIBUTION

TABLE OF CONTENTS

AIR OUTLETS

DESCRIPTION - DEMISTER OUTLETS

The side window demister outlets are integral to the instrument panel end caps(Refer to 23 - BODY/ INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL) and (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).

REMOVAL - PANEL OUTLET BARRELS

(1) Use a trim stick or another suitable wide flat-bladed tool to gently pry the panel outlet barrels out of the panel outlet housing (Fig. 1). The barrel is retained by a light snap fit.

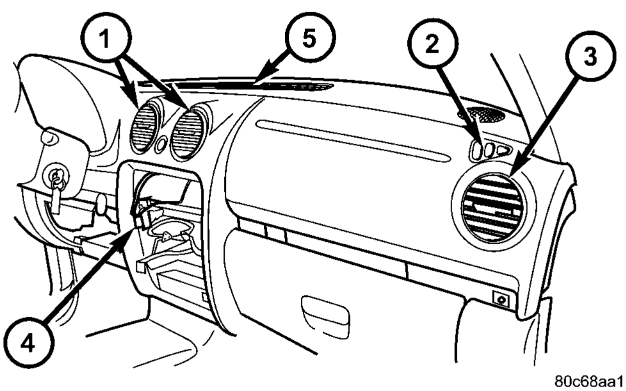


Fig. 1 DASH PANEL OUTLETS

1 - CENTER OUTLETS
2 - SIDE WINDOW DEMISTER OUTLETS
3 - SIDE OUTLETS
4 - WIRING FOR HVAC CONTROL ASSEMBLY
5 - WINDSHIELD DEFROSTER OUTLET

INSTALLATION - PANEL OUTLET BARRELS

To install, position the barrel in the panel outlet housing and press firmly until the barrel snaps into place.

BLEND DOOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Lift the blend door pivot shaft out of the pivot hole in the bottom of the lower half of the HVAC housing (Fig. 2).

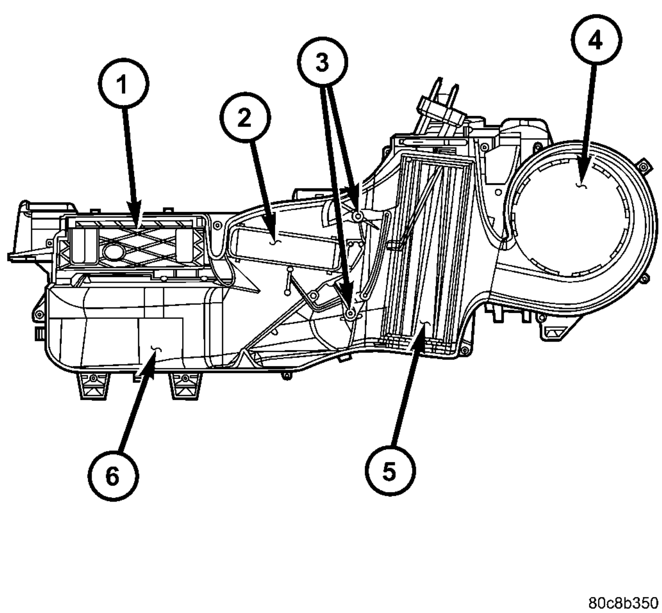


Fig. 2 Blend Door

1 - DEFROSTER DOOR
2- HEATER CORE
3- BLEND DOORS
4- BLOWER MOTOR HOUSING
5- EVAPORATOR (A/C ONLY)
6- LOWER HVAC CASE ASSEMBLY

INSTALLATION

(1) Place the blend door pivot shaft into the pivot hole in the bottom of the lower half of the HVAC housing.

(2) Assemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HVAC HOUSING - ASSEMBLY)

(3) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

BLOWER MOTOR

DESCRIPTION

The blower motor and blower wheel are located in the passenger side end of the HVAC housing, below the glove box. The blower motor controls the velocity of air flowing through the HVAC housing by spinning a squirrel cage-type blower wheel within the housing at the selected speed. The blower motor and wheel can be removed from the housing inside the vehicle without removing the dash or HVAC housing assembly.

OPERATION

The blower motor will only operate when the ignition switch is in the On position, and the A/C Heater mode control switch knob is in any position, except Off. The blower motor receives a fused battery feed through the blower motor relay whenever the ignition switch is in the On position. The blower motor battery feed circuit is protected by a fuse in the Power Distribution Center (PDC). Blower motor speed is controlled by regulating the ground path through the A/C Heater control blower motor switch and the blower motor resistor.

The blower motor and blower motor wheel cannot be repaired and, if faulty or damaged, they must be replaced. The blower motor and blower wheel are serviced only as a unit.

BLOWER MOTOR (Continued)

DIAGNOSIS AND TESTING - BLOWER MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information). Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor resistor
- Faulty blower motor relay
- Faulty blower motor switch
- Faulty A/C Heater mode control switch
- Faulty blower motor.

Possible causes of the blower motor not operating in all speeds include:

- Faulty blower motor switch
- Faulty blower motor resistor
- Faulty blower motor circuit wiring or wire harness connectors.

VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or bent
- Blower motor faulty.

NOISE

To verify that the blower is the source of the noise, unplug the blower motor wire harness connector and operate the HVAC system. If the noise goes away, possible causes include:

- Foreign material in the HVAC housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The blower motor is located on the passenger side of the vehicle under the dash

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the blower motor wire harness connector (Fig. 3).

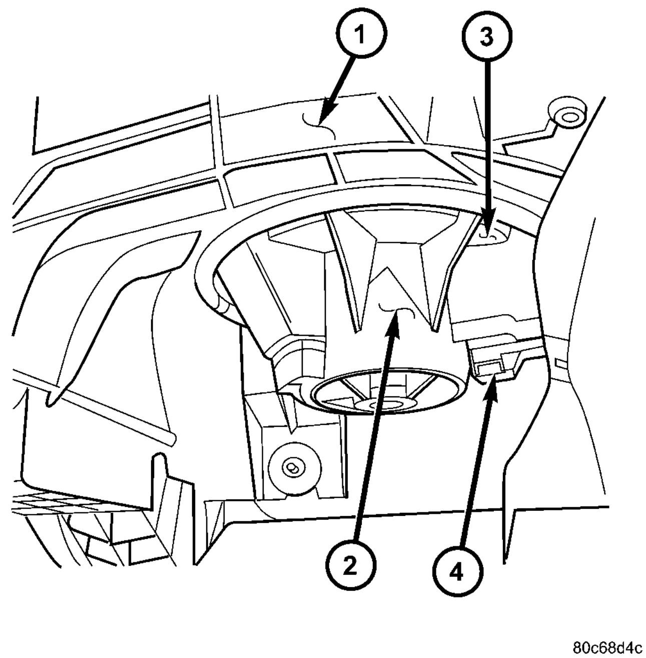


Fig. 3 HVAC BLOWER MOTOR

1 - HVAC HOUSING
2 - BLOWER MOTOR
3 - RETAINER-LOCKING TAB
4 - BLOWER MOTOR ELECTRICAL CONNECTOR

(3) Release the locking tab that secures the blower motor and wheel assembly to the HVAC housing.

(4) Rotate and tilt the blower motor unit as needed for clearance to remove the blower motor and wheel from the HVAC housing.

INSTALLATION

(1) Align and install the blower motor and wheel assembly into the HVAC housing.

(2) Rotate the blower assembly until all of the locking tabs have secured the blower motor and wheel assembly to the HVAC housing.

BLOWER MOTOR (Continued)

NOTE: Failure to install the blower motor assembly correctly could result in an air leak or the blower motor assembly becoming completely disengaged from the HVAC housing.

(3) Plug in the blower motor wire harness connector.

(4) Connect the battery negative cable.

(5) Test the blower motor for proper installation by turning the blower motor speed to its fastest position and checking around the outer edges of the blower assembly for air leaks. If any are found remove and reinstall the blower motor assembly.

DEFROST - DEMISTER DUCT

REMOVAL - DEFROST DUCT/DEMISTER ADAPTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the instrument panel assembly from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(2) Remove the three screws that secure the defrost duct/demister adapter to the instrument panel (Fig. 4).

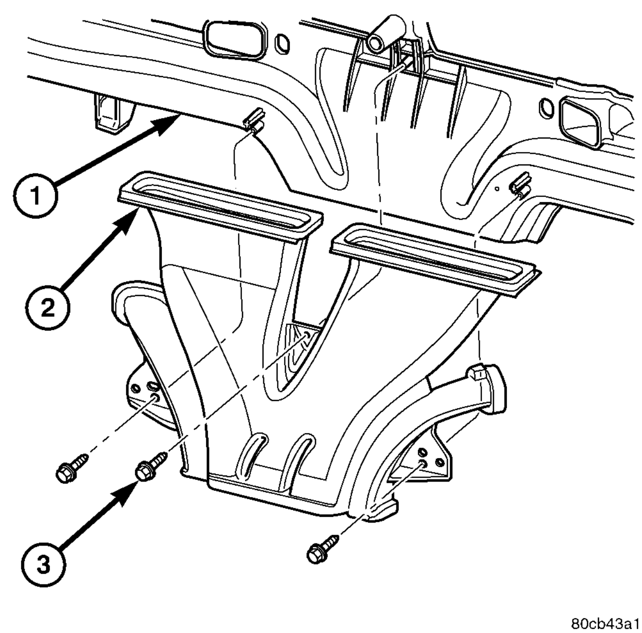


Fig. 4 DEFROST/DEMISTER DUCT

1 - INSTRUMENT PANEL
2 - DEFROST DUCT/ DEMISTER ADAPTOR
3 - SCREW

(3) Remove the defrost duct/demister duct from the instrument panel.

INSTALLATION - DEFROST/DEMISTER DUCT

(1) Install the defrost/demister duct in the instrument panel.

(2) Install the three screws that secure the defrost/ demister duct to the instrument panel.

(3) Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(4) Install the instrument panel assembly in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

FLOOR CONSOLE DUCT

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the floor console from the sled (Fig. 5). Refer to Floor Console for the procedures(Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

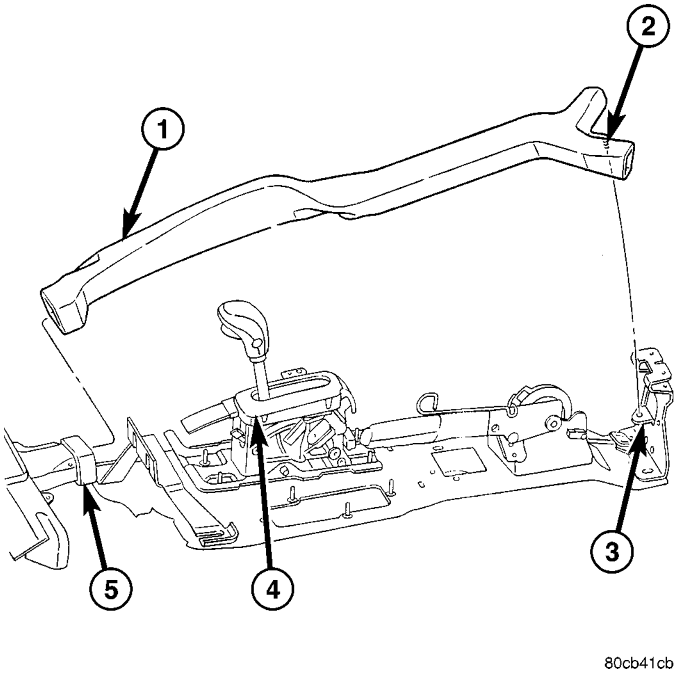


Fig. 5 CONSOLE DUCT REMOVE/INSTALL

1 - REAR DUCT ASSEMBLY
2 - REAR DUCT RETAINER SCREW
3 - REAR DUCT MOUNTING FLANGE
4 - TRANSMISSION SHIFT LEVER ASSEMBLY
5 - FRONT TO REAR DUCT CONNECTING POINT

(3) Lift the rear of the console duct out of the console rear mounting bracket on the sled and slide the duct rearward to disengage it from the floor duct and adapter.

(4) Remove the console rear duct from the vehicle.

INSTALLATION

(1) Push the console duct forward in place on the HVAC floor duct.

(2) Align the rear tab of the console duct with the hole on the sled bracket.

(3) Insert the push pin in the hole on the sled.

(4) Install the floor console on the floor panel transmission tunnel(Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(5) Connect the battery negative cable.

FLOOR DUCT

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the instrument panel from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(2) Remove the three screws that secure the floor duct to the HVAC housing.

(3) Remove the floor duct from the HVAC housing.

INSTALLATION

(1) Install the floor duct on the HVAC housing.

(2) Install the three screws that secure the floor duct to the HVAC housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Install the instrument panel in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

HVAC HOUSING

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

HVAC HOUSING (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) If the vehicle is not equipped with air conditioning, go to Step 6. If the vehicle is equipped with air conditioning, recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(4) Disconnect the liquid line refrigerant line fitting from the evaporator inlet tube (Fig. 6). (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(5) Disconnect the accumulator inlet tube refrigerant line fitting from the evaporator outlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Drain the engine cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).

(7) Disconnect the heater hoses from the heater core tubes. Install plugs in, or tape over the opened heater core tubes.

(8) Unplug the HVAC system vacuum supply line connector from the engine side harness.

(9) Remove the nuts from the HVAC housing mounting studs.

(10) Remove the HVAC housing from inside the vehicle taking care not to allow any remaining coolant to drain on the vehicles interior.

DISASSEMBLY

(1) Remove the HVAC housing from the vehicle and place it on a workbench. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Unplug the vacuum harness connectors from the mode and recirculation door actuators and the recirculation door actuator.

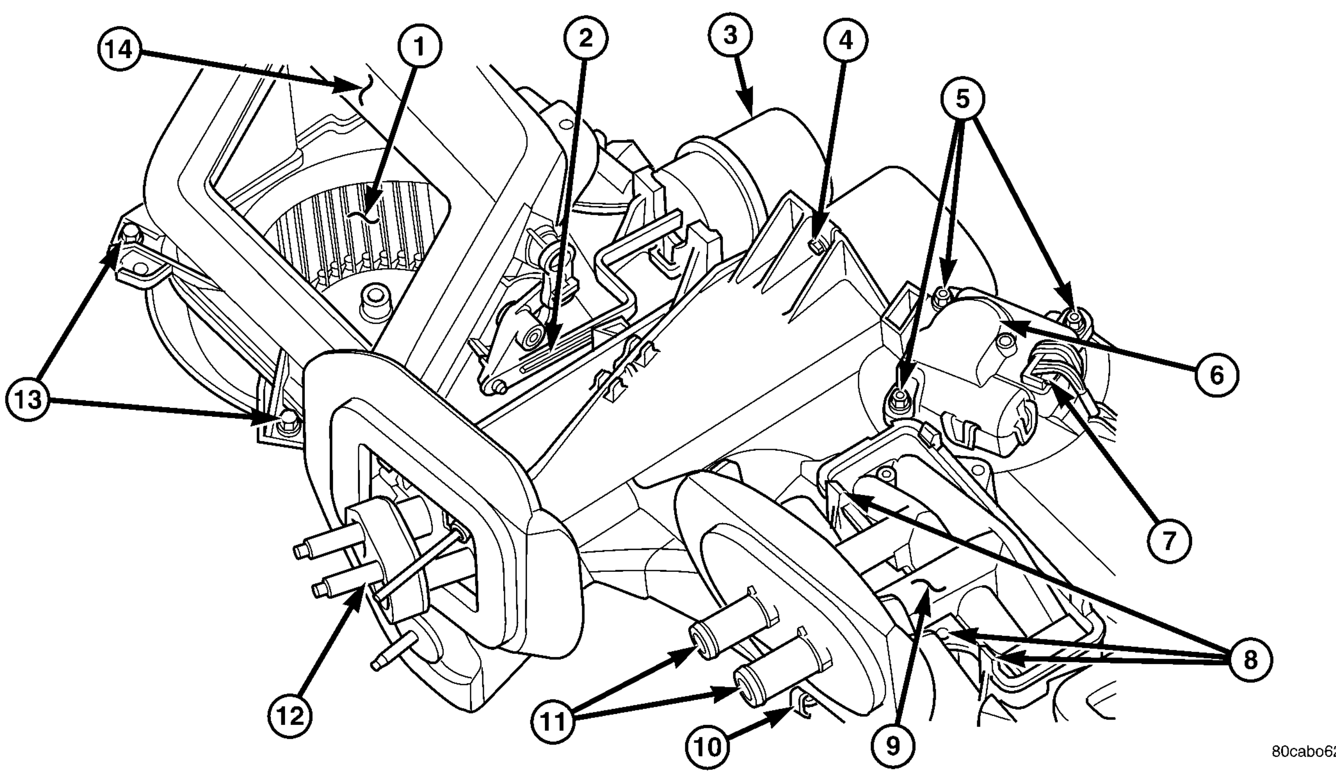


Fig. 6 HVAC CASE ASSEMBLY

1 - BLOWER MOTOR AND CAGE
2 - RECIRCULATION DOOR ACTUATOR LINKAGE
3 - RECIRCULATION DOOR VACUUM ACTUATOR
4 - CASE RETAINER SCREW
5 - BLEND DOOR ACTUATOR MOUNTING SCREWS
6 - ELECTRIC BLEND DOOR ACTUATOR
7 - ELECTRICAL CONNECTOR FOR BLEND DOOR ACTUATOR
8 - HEATER CORE RETAINER TABS (4) AND SCREWS (2)
9 - HEATER CORE
10 - HVAC CASE RETAINER CLIP
11 - HEATER CORE INPUT AND OUTPUT CONNECTIONS
12 - EVAPORATOR CONNECTION FLANGE
13 - HVAC CASE RETAINER SCREWS
14 - HVAC HOUSING

HVAC HOUSING (Continued)

(3) Disengage the vacuum harness from any routing clips located on the lower half of the HVAC housing.

(4) Remove the blower motor and blower wheel unit from the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/BLOWER MOTOR - REMOVAL)

(5) Pop out the grommet onl the vacuum supply line and slide hole in housing.

(6) Carefully remove the foam seals from the heater core and evaporator coil tube mounting flange of the HVAC housing. If either seal is deformed or damaged it must be replaced.

(7) Use a screwdriver to pry off the four snap clips that help secure the upper and lower HVAC housing halves together.

(8) Remove the screws that secure the upper and lower HVAC housing halves together.

(9) Carefully separate the upper HVAC housing from the lower half.

ASSEMBLY

(1) Assemble the upper HVAC housing half to the lower half. During assembly, be certain of the following.

(a) That each of the mode door pivot shaft ends and the two temperature blend door shafts are properly engaged in there pivot holes.

(b) That the blower motor venturi ring is properly indexed and installed.

(c) If the unit is equipped with air conditioning, that the evaporator coil tube rubber seal is properly positioned in the grooves in both the upper and lower HVAC housing halves.

(2) Install the screws and four snap clips that secure the upper and lower HVAC housing halves to each other. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Install the blower motor and wheel unit in the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/BLOWER MOTOR - INSTALLATION)

(4) Install the foam seals on the flanges around the heater core and evaporator coil tube mounting flange of the HVAC housing.

(5) Insert the vacuum supply line and connector through the foam seal on the heater core and evaporator coil tube mounting flange of the HVAC housing. Check that the vacuum grommet is securely seated into the housing hole flange.

(6) Engage the vacuum harness to the routing clips and plug in the vacuum harness connector at the floor door actuator and, if the unit is so equipped, at the recirculation air door actuator.

INSTALLATION

WARNING: IF THE VEHICLE IS EQUIPPED WITH AIR CONDITIONING, REVIEW THE WARNINGS AND CAUTIONS IN PLUMBING BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Position the HVAC housing to the dash panel. Be certain that the evaporator condensate drain tube and the housing mounting studs are inserted into their correct mounting holes.

(2) Install and tighten the nuts onto the HVAC housing mounting studs. Tighten the nuts to 6.2 N·m (55 in.lbs.).

(3) Connect the HVAC system vacuum supply line connector.

(4) Unplug or remove the tape from the heater core tubes. Connect the heater hoses to the heater core tubes and fill the engine cooling system(Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(5) If the vehicle is not equipped with air conditioning, go to Step 10.

(6) Unplug or remove the tape from the liquid line and the evaporator inlet tube fittings. Connect the liquid line coupler to the evaporator inlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(7) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(8) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(9) Install the instrument panel in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(10) Connect the battery negative cable.

(11) Start the engine and check for proper operation of the heating and air conditioning systems.

MODE DOOR

REMOVAL

REMOVAL - DEFROST DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Insert a screwdriver into the latch hole (Fig. 7) of the panel door pivot shaft to release the latch of the panel door lever, and pull the lever out of the pivot shaft from the outside of the upper half of the HVAC housing.

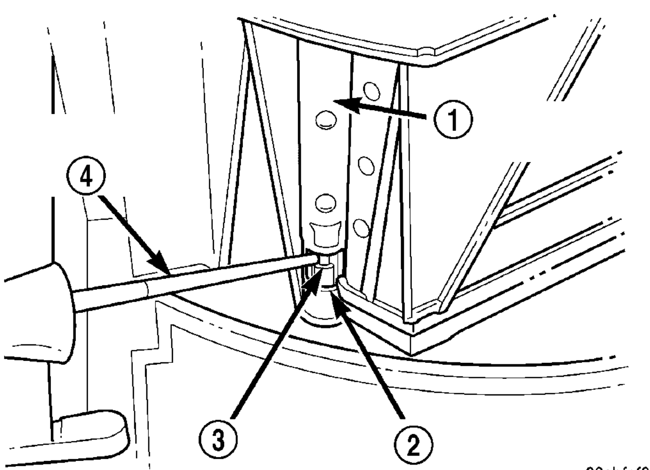


Fig. 7 PANEL DOOR REMOVE/INSTALL

1 - DOOR PIVOT SHAFT
2 - LATCH HOLE
3 - CRANK ARM LATCH
4 - FLAT BLADE PRY TOOL

(3) Remove the defrost door from the HVAC housing.

REMOVAL - FLOOR - DEFROST DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Remove the floor door vacuum actuator from the lower HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODE DOOR ACTUATOR - REMOVAL - FLOOR DOOR ACTUATOR)

(3) Insert a screwdriver into the latch hole (Fig. 8) of the floor door pivot shaft to release the latch of the floor door lever, and pull the lever out of the pivot shaft from the outside of the lower half of the HVAC housing.

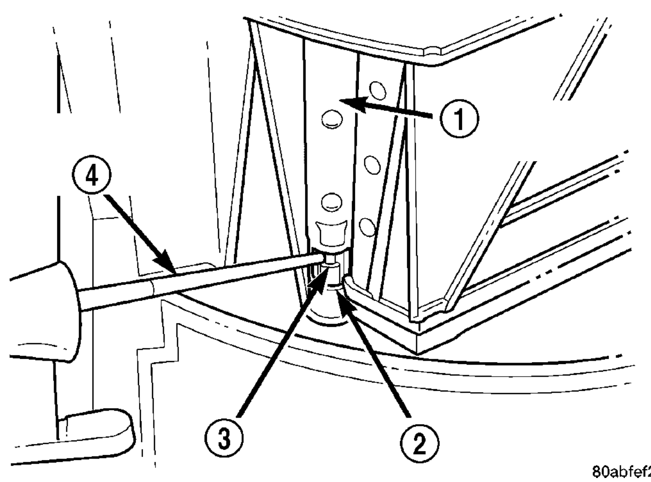


Fig. 8 FLOOR DOOR REMOVE/INSTALL (typical)

1 - DOOR PIVOT SHAFT
2 - LATCH HOLE
3 - CRANK ARM LATCH
4 - FLAT BLADE PRY TOOL

MODE DOOR (Continued)

(4) Reach inside the lower half of the HVAC housing and carefully flex the floor door (Fig. 9) enough so that the door pivot clears the pivot hole in the housing.

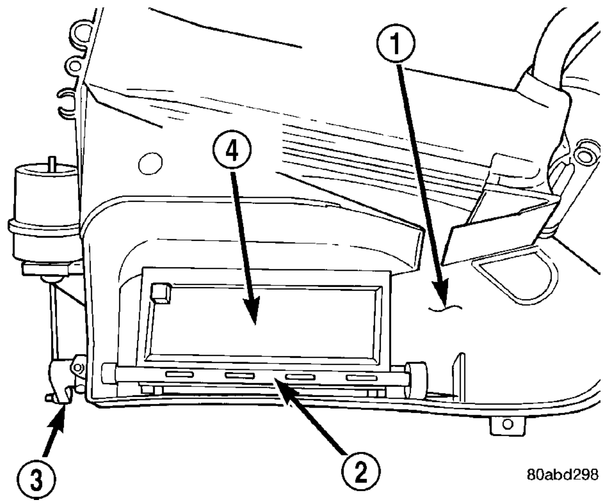


Fig. 9 FLOOR DOOR (typical)

1 - LOWER HVAC HOUSING
2 - PIVOT SHAFT
3 - CRANK ARM
4 - FLOOR DOOR

(5) Remove the floor door from the HVAC housing.

INSTALLATION

INSTALLATION - PANEL DOOR

(1) Install the panel door in the HVAC housing.

(2) Snap the panel door pivot shaft over the latch of the panel door lever.

(3) Attach the demist door and lever to the upper HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/MODE DOOR - INSTALLATION - PANEL/DEMIST DOOR)

(4) Assemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY)

(5) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

INSTALLATION - FLOOR - DEFROST DOOR

(1) Install the floor-defrost door in the HVAC housing by placing the door in the lower housing.

(2) Assemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY)

(3) Install the floor door vacuum actuator in the lower HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODE DOOR ACTUATOR - INSTALLATION - FLOOR DOOR ACTUATOR)

(4) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

RECIRCULATION DOOR

REMOVAL

A recirculation door and vacuum actuator are used only on models with the optional air conditioning system.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: IF THE VEHICLE IS EQUIPPED WITH AIR CONDITIONING, REVIEW THE WARNINGS AND CAUTIONS IN PLUMBING BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Remove the HVAC housing and disassemble. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Remove the four screws to remove the recirculation door assembly. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/RECIRCULATION DOOR ACTUATOR - REMOVAL)

(3) Insert a screwdriver into the latch hole of the panel door pivot shaft to release the latch of the panel door lever and pull the lever out of the pivot shaft from the outside of the upper half of the HVAC housing.

RECIRCULATION DOOR (Continued)

INSTALLATION

(1) Guide the recirculation door lever through the air intake grille of the HVAC housing while installing the door in the housing.

(2) Assemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HVAC HOUSING - ASSEMBLY)

(3) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

(4) Install the recirculation door vacuum actuator on the lower HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/RECIRCULATION DOOR ACTUATOR - INSTALLATION)

PLUMBING

TABLE OF CONTENTS

PLUMBING

DESCRIPTION - REFRIGERANT LINE

The refrigerant lines and hoses are used to carry the refrigerant between the various air conditioning system components. A barrier hose design with a nylon tube, which is sandwiched between rubber layers, is used for the R-134a air conditioning system on this vehicle. This nylon tube helps to further contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant hoses are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose.

PLUMBING (Continued)

In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from an exhaust manifold.

WARNING

SERVICE WARNINGS

WARNING: THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT UNDER HIGH PRESSURE. SEVERE PERSONAL INJURY MAY RESULT FROM IMPROPER SERVICE PROCEDURES. REPAIRS SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

AVOID BREATHING THE REFRIGERANT AND REFRIGERANT OIL VAPOR OR MIST. EXPOSURE MAY IRRITATE THE EYES, NOSE, AND/OR THROAT. WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM DIRECT CONTACT WITH THE REFRIGERANT. IF EYE CONTACT OCCURS, SEEK MEDICAL ATTENTION IMMEDIATELY.

DO NOT EXPOSE THE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC LEAK DETECTOR IS RECOMMENDED.

IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE THE WORK AREA BEFORE RESUMING SERVICE. LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.

THE EVAPORATION RATE OF R-134a REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT THE SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH THE REFRIGERANT.

THE R-134a SERVICE EQUIPMENT OR THE VEHICLE REFRIGERANT SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR AND R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS, AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

CAUTION

SERVICE CAUTIONS

CAUTION: Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with the service equipment being used.

Never add R-12 to a refrigerant system designed to use R-134a. Damage to the system will result.

R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible.

Do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.

Do not overcharge the refrigerant system. This will cause excessive compressor head pressure and can cause noise and system failure.

Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

Do not remove the secondary retention clip from any spring-lock coupler connection while the refrigerant system is under pressure. Recover the refrigerant before removing the secondary retention clip. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

The refrigerant system must always be evacuated before charging.

Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system.

Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.

Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.

Before connecting an open refrigerant fitting, always install a new seal or gasket. Coat the fitting and seal with clean refrigerant oil before connecting.

Do not remove the sealing caps from a replacement component until it is to be installed.

When installing a refrigerant line, avoid sharp bends that may restrict refrigerant flow. Position the refrigerant lines away from exhaust system components or any sharp edges, which may damage the line.

Tighten refrigerant fittings only to the specified torque. The aluminum fittings used in the refrigerant system will not tolerate overtightening.

When disconnecting a refrigerant fitting, use a wrench on both halves of the fitting. This will prevent twisting of the refrigerant lines or tubes.

Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.

Keep service tools and the work area clean. Contamination of the refrigerant system through careless work habits must be avoided.

PLUMBING (Continued)

CAUTION - REFRIGERANT HOSES/LINES/ TUBES PRECAUTIONS

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

There are two types of refrigerant fittings:

- All fittings with O-rings need to be coated with refrigerant oil before installation. Use only O-rings that are the correct size and approved for use with R-134a refrigerant. Failure to do so may result in a leak.
- Unified plumbing connections with gaskets cannot be serviced with O-rings. The gaskets are not reusable and new gaskets do not require lubrication before installing.

Using the proper tools when making a refrigerant plumbing connection is very important. Improper tools or improper use of the tools can damage the refrigerant fittings. Always use two wrenches when loosening or tightening tube fittings. Use one wrench to hold one side of the connection stationary, while loosening or tightening the other side of the connection with a second wrench.

The refrigerant must be recovered completely from the system before opening any fitting or connection. Open the fittings with caution, even after the refrigerant has been recovered. If any pressure is noticed as a fitting is loosened, tighten the fitting and recover the refrigerant from the system again.

Do not discharge refrigerant into the atmosphere. Use an R-134a refrigerant recovery/recycling device that meets SAE Standard J2210.

The refrigerant system will remain chemically stable as long as pure, moisture-free R-134a refrigerant and refrigerant oil is used. Dirt, moisture, or air can upset this chemical stability. Operational troubles or serious damage can occur if foreign material is present in the refrigerant system.

When it is necessary to open the refrigerant system, have everything needed to service the system ready. The refrigerant system should not be left open to the atmosphere any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are to be installed.

All tools, including the refrigerant recycling equipment, the manifold gauge set, and test hoses should be kept clean and dry. All tools and equipment must be designed for R-134a refrigerant.

STANDARD PROCEDURE

STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

When servicing the air conditioning system, a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used. Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

A manifold gauge set may be needed with some recovery/recycling/charging equipment (Fig. 1). The service hoses on the gauge set being used should have manual (turn wheel), or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

LOW PRESSURE GAUGE HOSE The low pressure hose (Blue with Black stripe) attaches to the suction service port. This port is located on the suction line between the accumulator outlet and the compressor.

HIGH PRESSURE GAUGE HOSE The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the discharge line between the compressor and the condenser inlet.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

PLUMBING (Continued)

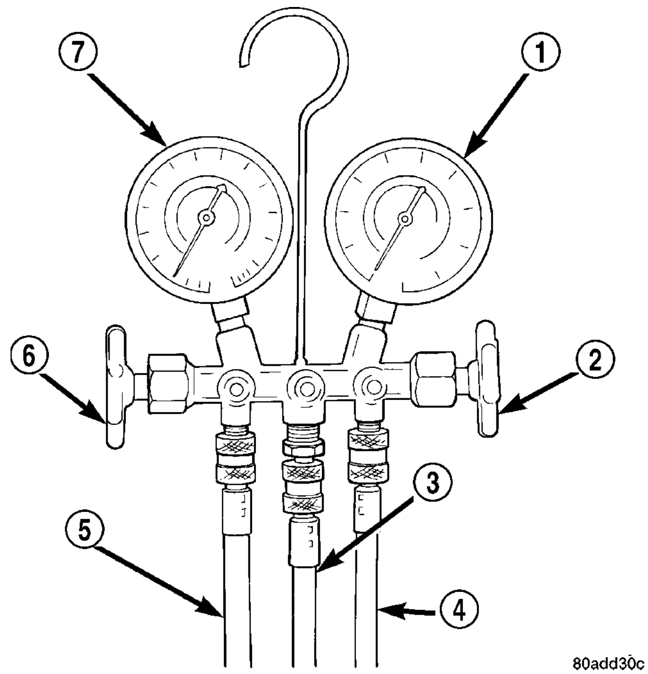


Fig. 1 MANIFOLD GAUGE SET - TYPICAL

1 - HIGH PRESSURE GAUGE
2 - VALVE
3 - VACUUM/REFRIGERANT HOSE (YELLOW W/ BLACK STRIPE)
4 - HIGH PRESSURE HOSE (RED W/ BLACK STRIPE)
5 - LOW PRESSURE HOSE (BLUE W/ BLACK STRIPE)
6 - VALVE
7 - LOW PRESSURE GAUGE

STANDARD PROCEDURE - REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to recover the refrigerant from an R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.

STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be charged. If moisture and air enters the system and becomes mixed with the refrigerant, the compressor head pressure will rise above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating the refrigerant system will remove the air and boil the moisture out of the system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 and a manifold gauge set to the refrigerant system of the vehicle.

(2) Recover the refrigerant(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(3) Open the low and high side valves and start the charging station vacuum pump. When the suction gauge reads 88 kPa (26 in. Hg.) vacuum or greater, close all of the valves and turn off the vacuum pump.

(a) If the refrigerant system fails to reach the specified vacuum, the system has a leak that must be corrected. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS)

(b) If the refrigerant system maintains the specified vacuum for five minutes, restart the vacuum pump, open the suction and discharge valves and evacuate the system for an additional ten minutes.

(4) Close all of the valves, and turn off the charging station vacuum pump.

(5) The refrigerant system is now ready to be charged with R-134a refrigerant. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

After the refrigerant system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS).

PLUMBING (Continued)

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

SPECIFICATIONS - CHARGE CAPACITY

The R-134a refrigerant system charge capacity for this vehicle is 0.737 kilograms (1.63 pounds).

A/C COMPRESSOR

DESCRIPTION

DESCRIPTION

The air conditioning system uses a Sanden SD-7, reciprocating swash plate-type compressor on all models. This compressor has a fixed displacement of 160 cubic centimeters and has both the suction and discharge ports located on the cylinder head. A label identifying the use of R-134a refrigerant is located on the compressor.

DESCRIPTION - HIGH PRESSURE RELIEF VALVE

A high pressure relief valve is located on the compressor cylinder head, which is on the rear of the compressor. This mechanical valve is designed to vent refrigerant from the system to protect against damage to the compressor and other system components, caused by condenser air flow restriction or an overcharge of refrigerant.

OPERATION

OPERATION

The compressor is driven by the engine through an electric clutch, drive rotor and belt arrangement. The compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The compressor draws in low-pressure refrigerant vapor from the evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the condenser through the compressor discharge port.

The compressor cannot be repaired. If faulty or damaged, the entire compressor assembly must be replaced. The compressor clutch, pulley and clutch coil are available for service.

OPERATION - HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents the system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The valve closes when a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the system. If the valve vents refrigerant, it does not mean that the valve is faulty.

The high pressure relief valve is a factory-calibrated unit. The valve cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the compressor assembly.

DIAGNOSIS AND TESTING - A/C COMPRESSOR NOISE

When investigating an air conditioning related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during air conditioning operation can often be misleading. For example: What sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose compressor clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon belt tension, belts can develop noises that are mistaken for a compressor noise. Improper belt tension can cause a misleading noise when the compressor clutch is engaged, which may not occur when the compressor clutch is disengaged. Check the serpentine drive belt condition and tension as described in Cooling before beginning this procedure.

(1) Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise. Listen to the compressor while the clutch is engaged and disengaged. Probe the compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.

(2) Loosen all of the compressor mounting hardware and retighten. Tighten the compressor clutch mounting nut. Be certain that the clutch coil is mounted securely to the compressor, and that the clutch plate and rotor are properly aligned and have the correct air gap. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C COMPRESSOR CLUTCH - INSTALLATION)

A/C COMPRESSOR (Continued)

(3) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).

(4) Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines for kinks or sharp bends that will restrict refrigerant flow, which can cause noises. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(5) If the noise is from opening and closing of the high pressure relief valve, evacuate and recharge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE) If the high pressure relief valve still does not seat properly, replace the compressor.

(6) If the noise is from liquid slugging on the suction line, replace the accumulator. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR - REMOVAL) Check the refrigerant oil level and the refrigerant system charge. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS - CHARGE CAPACITY) If the liquid slugging condition continues following accumulator replacement, replace the compressor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL)

(7) If the noise continues, replace the compressor and repeat Step 1.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

(1) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(2) Disconnect and isolate the battery negative cable.

(3) Remove the serpentine drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(4) Unplug the compressor clutch coil wire harness connector.

(5) Remove the suction and discharge refrigerant line manifold from the compressor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/SUCTION LINE - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - REMOVAL) Install plugs in, or tape over all of the opened refrigerant fittings.

(6) Remove the bolts that secure the compressor to the mounting bracket (Fig. 2) or (Fig. 3) or (Fig. 4).

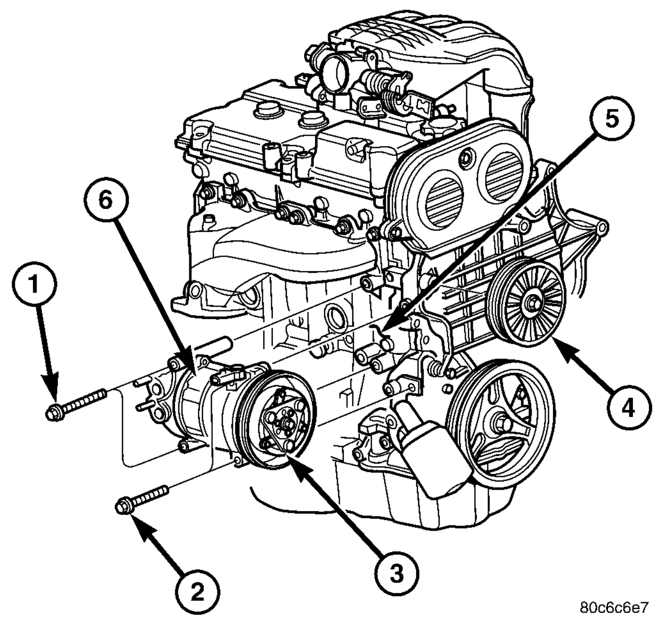


Fig. 2 A/C COMPRESSOR - 2.4L ENGINE

1 - COMPRESSOR BOLT
2 - COMPRESSOR BOLT
3 - COMPRESSOR CLUTCH AND PULLY
4 - IDLER PULLEY
5 - ENGINE BLOCK
6 - A/C COMPRESSOR

(7) Remove the compressor from the mounting bracket.

A/C COMPRESSOR (Continued)

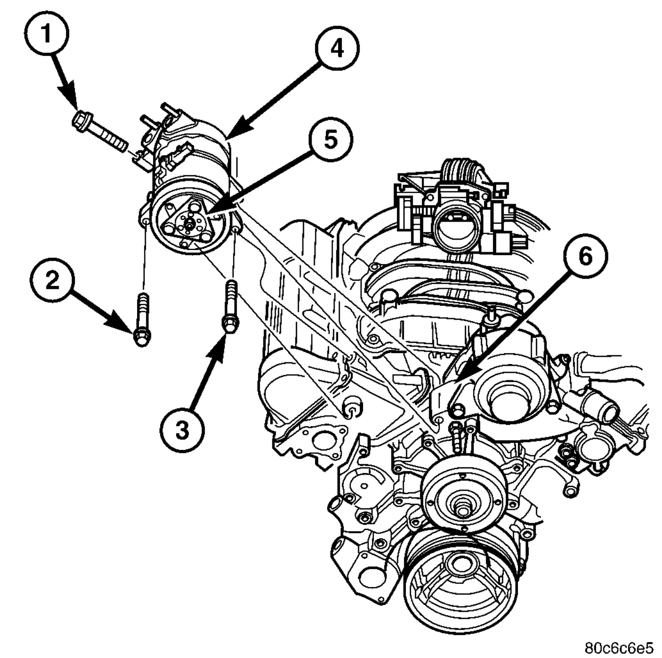


Fig. 3 A/C COMPRESSOR - 3.7L ENGINE- (typical 4.7, 5.7 & 8.0L)

1 - COMPRESSOR BOLT #1
2 - COMPRESSOR BOLT #2
3 - COMPRESSOR BOLT #3
4 - A/C COMPRESSOR
5 - A/C COMPRESSOR CLUTCH AND PULLEY
6 - COMPRESSOR MOUNT

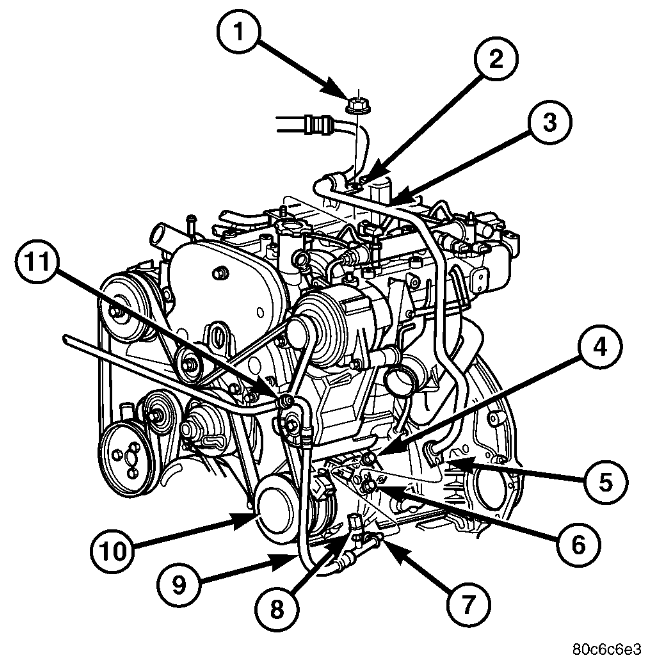


Fig. 4 A/C COMPRESSOR - 2.5L DIESEL ENGINE

1 - SUCTION LINE MOUNTING NUT
2- SUCTION LINE MOUNTING CLIP
3- SUCTION LINE
4- MOUNTING SCREW FOR SUCTION LINE
5- SUCTION LINE MOUNTING FLANG
6- MOUNTING SCREW FOR DISCHARGE LINE
7- DISCHARGE LINE MOUNTING FLANG
8- A/C PRESSURE SENSOR
9- A/C DISCHARGE LINE
10- A/C COMPRESSOR ASSEMBLY
11- A/C DISCHARGE LINE SERVICE PORT

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

NOTE: If a replacement compressor is being installed, be certain to check the refrigerant oil level. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL) Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION)

(1) Install the compressor to the mounting bracket. Tighten the three mounting bolts to 27 N·m (20 ft. lbs.), (2.4L gasoline and 2.5L diesel engines only).

(2) On the 3.7L gasoline engine install and tighten the bolts in the following sequence (Fig. 5):

- The number one bolt (rear) is hand tightened first then tightened to 55 N·m (41 ft. lbs.)
- The number three bolt is then hand tightened and torqued to 40 N·m (30 ft. lbs.)
- The number two bolt is also hand tightened and torqued to 55 N·m (41 ft. lbs.)

(3) Remove the tape or plugs from all of the opened refrigerant line fittings. Install the suction and discharge line manifold to the compressor. Tighten the fastener to 28 N·m (250 in. lbs.).(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/SUCTION LINE - INSTALLATION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - INSTALLATION)

(4) Install the serpentine drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(5) Plug in the compressor clutch coil wire harness connector.

A/C COMPRESSOR (Continued)

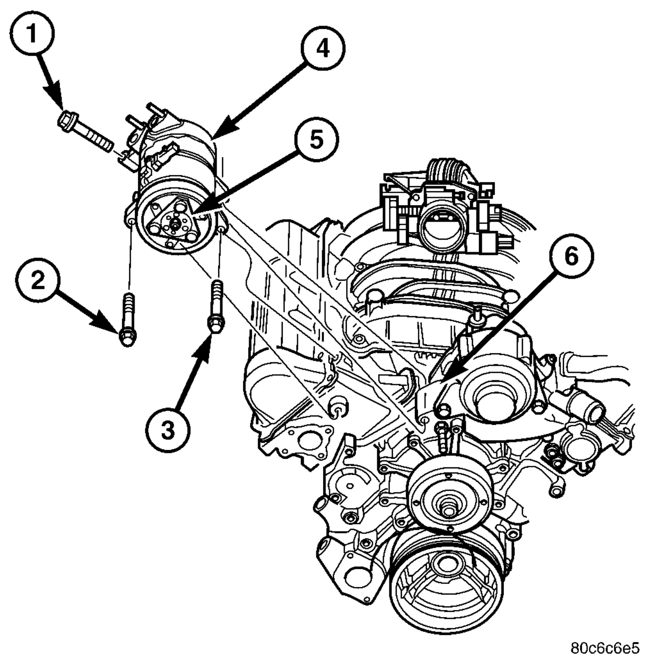


Fig. 5 A/C COMPRESSOR - 3.7L ENGINE- (typical 4.7, 5.7 & 8.0L)

1 - COMPRESSOR BOLT #1
2 - COMPRESSOR BOLT #2
3 - COMPRESSOR BOLT #3
4 - A/C COMPRESSOR
5 - A/C COMPRESSOR CLUTCH AND PULLEY
6 - COMPRESSOR MOUNT

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(8) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

A/C CONDENSER

DESCRIPTION

The condenser is located in the air flow in front of the engine cooling radiator. The condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the compressor to give up its heat to the air passing over the condenser fins.

OPERATION

When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it has become a high-pressure liquid refrigerant. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings in the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or condenser service.

The condenser cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Disconnect the discharge line refrigerant line fitting at the condenser inlet. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(4) Disconnect the liquid line (Left-Hand Drive) or liquid line jumper (Right-Hand Drive) refrigerant line fitting at the condenser outlet. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the radiator and the condenser from the vehicle as a unit. Refer to Cooling for the procedures.

A/C CONDENSER (Continued)

(6) Remove the two nuts that secure the condenser studs to the upper brackets of the radiator (Fig. 6).

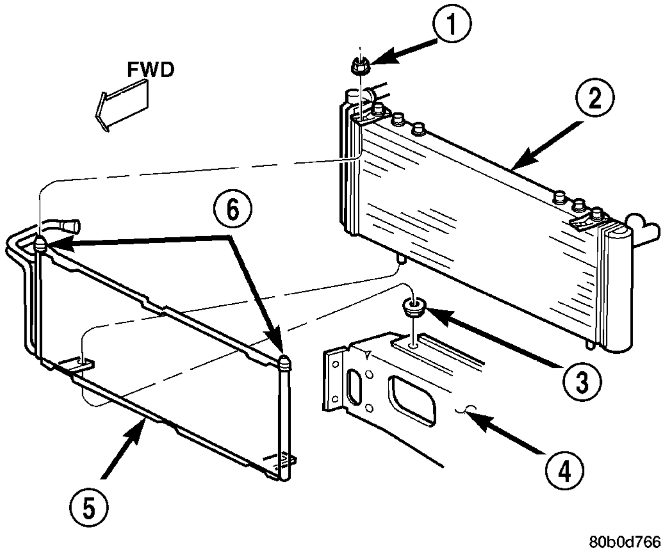


Fig. 6 CONDENSER REMOVE/INSTALL

1 - NUT
2 - RADIATOR
3 - GROMMET
4 - LOWER CROSSMEMBER
5 - CONDENSER
6 - STUDS

(7) Slide the condenser down from the radiator far enough for the condenser studs to clear the upper radiator bracket holes, and for the lower condenser bracket holes to clear the dowel pins on the bottom of the radiator.

(8) Remove the condenser from the radiator.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Install the holes of the condenser lower brackets over the dowel pins on the bottom of the radiator.

(2) Slide the condenser upwards until both of the condenser studs are installed through the holes in the radiator upper brackets. Tighten the mounting nuts to 5.3 N·m (47 in. lbs.).

(3) Reinstall the radiator and condenser unit in the vehicle(Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).

(4) Remove the tape or plugs from the refrigerant line fittings on the condenser outlet and the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive). Install the liquid line or the liquid line jumper to the condenser outlet. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(5) Remove the tape or plugs from the refrigerant line fittings on the condenser inlet and the discharge line. Connect the discharge line to the condenser inlet. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(8) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

NOTE: If the condenser is replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION)

A/C DISCHARGE LINE

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Unplug the wire harness connector from the high pressure cut-off switch.

(4) Disconnect the discharge line refrigerant line fitting from the condenser inlet tube (Fig. 7). (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

A/C DISCHARGE LINE (Continued)

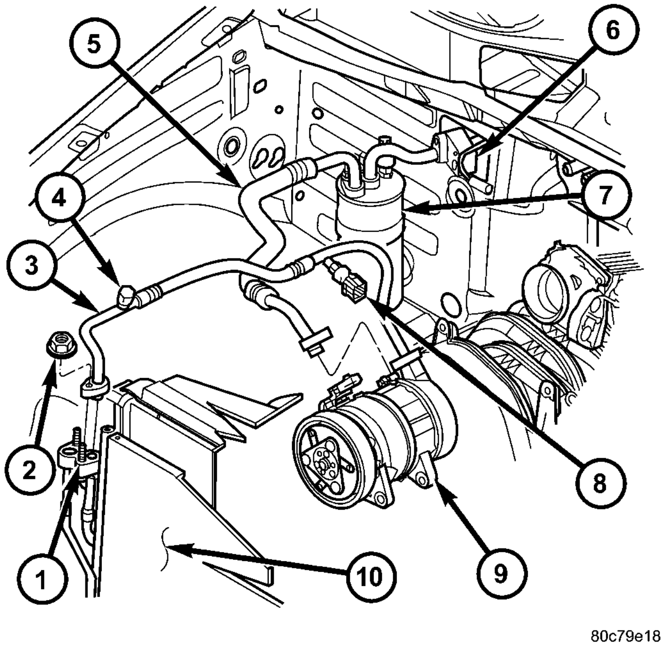


Fig. 7 SUCTION AND DISCHARGE LINE REMOVAL

1 - Condensor connection
2- Discharge line to condensor mounting nut
3- Discharge line
4- Discharge line charging port
5- Suction line
6- Evaporator mounting ports
7- Accumulator
8- High pressure cut off switch
9- AC compressor
10- AC condensor

(5) Remove the nut that secures the suction line block fitting to the accumulator outlet. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Remove the screw that secures the suction and discharge line manifold to the compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Remove the suction and discharge line assembly from the vehicle.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Remove the tape or plugs from the suction and discharge line manifold and the compressor. Install the suction and discharge line manifold to the compressor. Tighten the fastener to 28 N·m (250 in. lbs.).

(2) Remove the tape or plugs from the suction line and the accumulator outlet block fittings. Install the suction line to the accumulator outlet and tighten the mounting nut to 9 N·m (80 in. lbs.).

(3) Remove the tape or plugs from the refrigerant line fittings on the discharge line and the condenser inlet tube. Connect the discharge line refrigerant line coupler to the condenser inlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(4) Plug in the wire harness connector to the high pressure cut-off switch.

(5) Connect the battery negative cable.

(6) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(7) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

A/C LIQUID LINE

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant.(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Disconnect the liquid line refrigerant line couplers at the evaporator inlet and the condenser outlet (Fig. 8). (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(4) Remove the liquid line from the vehicle.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

A/C LIQUID LINE (Continued)

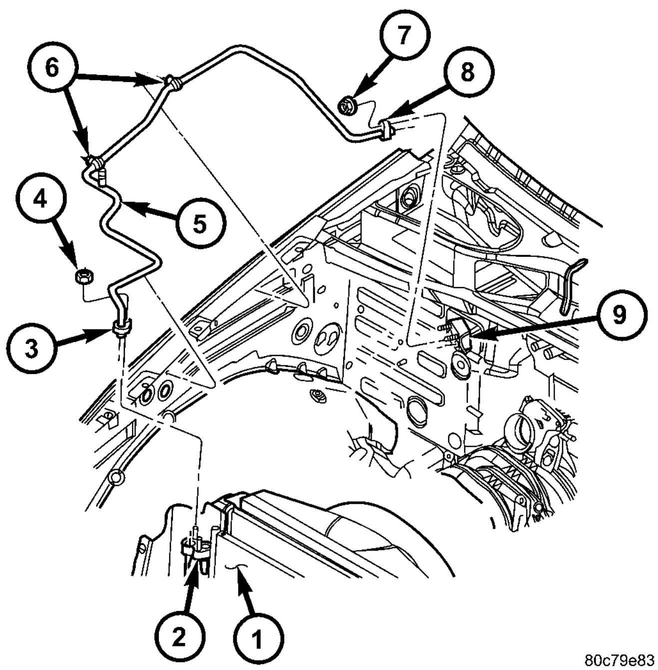


Fig. 8 LIQUID LINE REMOVE/INSTALL

1 - AC condensor
2- AC condensor connector ports
3- Liquid line to condensor connector
4- Mounting nut
5- Liquid line
6- Liquid line mounting clips (2)
7- Mounting nut
8- Liquid line to evaporator connection
9- Evaporator connection

(1) Remove the tape or plugs from the refrigerant line fittings on the liquid line, the evaporator inlet and the condenser outlet. Connect the liquid line to the evaporator inlet and condenser outlet refrigerant line couplers. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(2) Connect the battery negative cable.

(3) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(4) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

A/C SUCTION LINE

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the negative battery cable.

(2) Recover the refrigerant. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Unplug the wire harness connector from the a/c high pressure switch (Fig. 9).

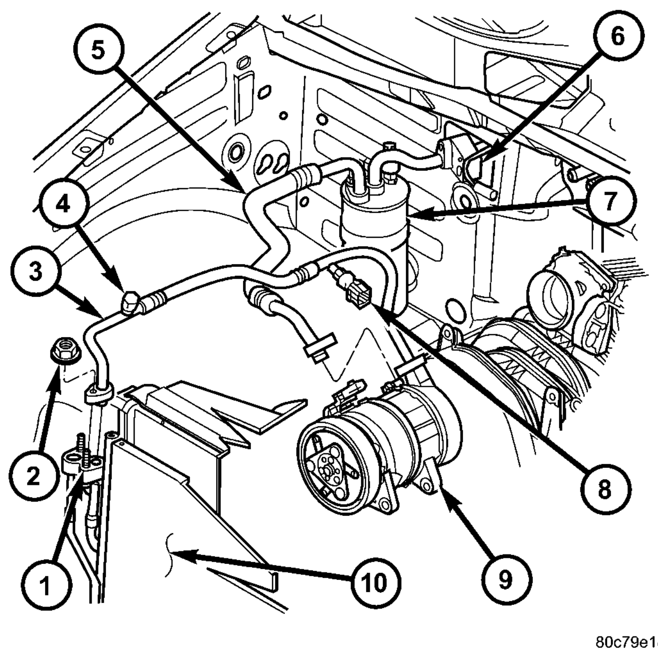


Fig. 9 SUCTION AND DISCHARGE LINE REMOVAL

1 - Condensor connection
2- Discharge line to condensor mounting nut
3- Discharge line
4- Discharge line charging port
5- Suction line
6- Evaporator mounting ports
7- Accumulator
8- High pressure cut off switch
9- AC compressor
10- AC condensor

(4) Disconnect the discharge line refrigerant fitting from the condenser inlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the nut that secures the suction line block fitting to the accumulator outlet. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Remove the fastener that secures the suction and discharge line manifold to the compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Remove the suction and discharge line assembly from the vehicle.

A/C SUCTION LINE (Continued)

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT IF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Remove the tape or plugs from the suction and discharge line manifold and the compressor. Install the suction and discharge line manifold to the compressor. Tighten the fastener to 28 N·m (250 in. lbs.).

(2) Remove the tape or plugs from the suction line and the accumulator outlet block fittings. Install the suction line to the accumulator outlet and tighten the mounting nut to 9 N·m (80 in. lbs.).

(3) Remove the tape or plugs from the refrigerant line fittings on the discharge line and the condenser inlet tube. Connect the discharge line refrigerant line coupler to the condenser inlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(4) Plug in the wire harness connector on the a/c high pressure switch.

(5) Connect the battery negative cable.

(6) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(7) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(8) Check the affected areas of the system for leaks.

A/C EVAPORATOR

DESCRIPTION

The evaporator coil is located in the HVAC housing, under the instrument panel. The evaporator coil is positioned in the HVAC housing so that all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator coil fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

OPERATION

Refrigerant enters the evaporator from the fixed orifice tube as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the evaporator.

The evaporator coil cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Lift the evaporator coil unit out of the lower half of the HVAC housing. (Fig. 10).

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

A/C EVAPORATOR (Continued)

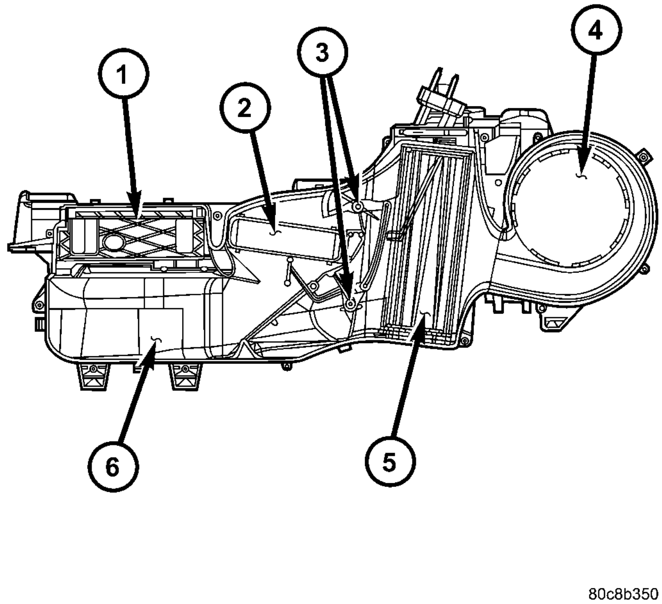


Fig. 10 Blend Door

1 - DEFROSTER DOOR
2- HEATER CORE
3- BLEND DOORS
4- BLOWER MOTOR HOUSING
5- EVAPORATOR (A/C ONLY)
6- LOWER HVAC CASE ASSEMBLY

(1) Install the evaporator coil unit into of the lower half of the HVAC housing. Be certain that the evaporator foam insulator wrap and rubber tube seal are reinstalled.

(2) Reassemble and install the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - INSTALLATION)

NOTE: If the evaporator was replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/REFRIGERANT OIL - DESCRIPTION)

A/C ORIFICE TUBE

DESCRIPTION

The fixed orifice tube is installed in the liquid line (left-hand drive) or liquid line jumper (right-hand drive) between the outlet of the condenser and the inlet of the evaporator. The fixed orifice tube is located in the end of the liquid line or liquid line jumper that is closest to the condenser outlet tube.

The inlet end of the fixed orifice tube has a nylon mesh filter screen, which filters the refrigerant and helps to reduce the potential for blockage of the metering orifice by refrigerant system contaminants (Fig. 11). The outlet end of the tube has a nylon mesh diffuser screen. The O-rings on the plastic body of the fixed orifice tube seal the tube to the inside of the liquid line and prevent the refrigerant from bypassing the fixed metering orifice.

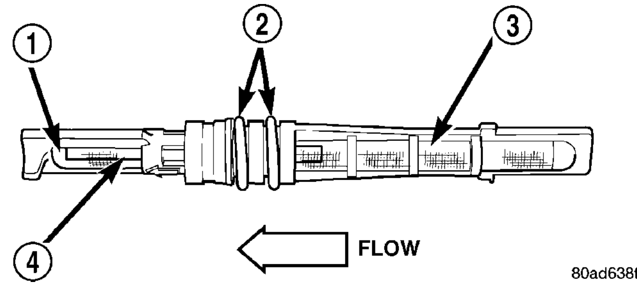


Fig. 11 FIXED ORIFICE TUBE - TYPICAL

1 - DIFFUSER SCREEN
2 - ″O″ RINGS
3 - INLET FILTER SCREENS
4 - ORIFICE

OPERATION

The fixed orifice tube is used to meter the flow of liquid refrigerant into the evaporator coil. The high-pressure liquid refrigerant from the condenser expands into a low-pressure liquid as it passes through the metering orifice and diffuser screen of the fixed orifice tube.

The fixed orifice tube cannot be repaired and, if faulty or plugged, the liquid line and fixed orifice tube unit or liquid line jumper and fixed orifice tube unit must be replaced.

REMOVAL

The fixed orifice tube is located in the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive) near the condenser. The orifice has filter screens on the inlet and outlet ends of the tube body. If the fixed orifice tube is faulty or plugged, the liquid line unit or liquid line jumper unit must be replaced. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LIQUID LINE - REMOVAL)

INSTALLATION

The fixed orifice tube is located in the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive) near the condenser. The orifice has filter screens on the inlet and outlet ends of the tube body. If the fixed orifice tube is faulty or plugged, the liquid line unit or liquid line jumper unit must be replaced(Refer to 24 - HEATING & AIR CONDI-

A/C ORIFICE TUBE (Continued)

TIONING/PLUMBING/LIQUID LINE - INSTALLATION).

ACCUMULATOR

DESCRIPTION

The accumulator is mounted in the engine compartment between the evaporator coil outlet tube and the compressor inlet.

OPERATION

Refrigerant enters the accumulator canister as a low pressure vapor through the inlet tube. Any liquid, oil-laden refrigerant falls to the bottom of the canister, which acts as a separator. A desiccant bag is mounted inside the accumulator canister to absorb any moisture which may have entered and become trapped within the refrigerant system (Fig. 12).

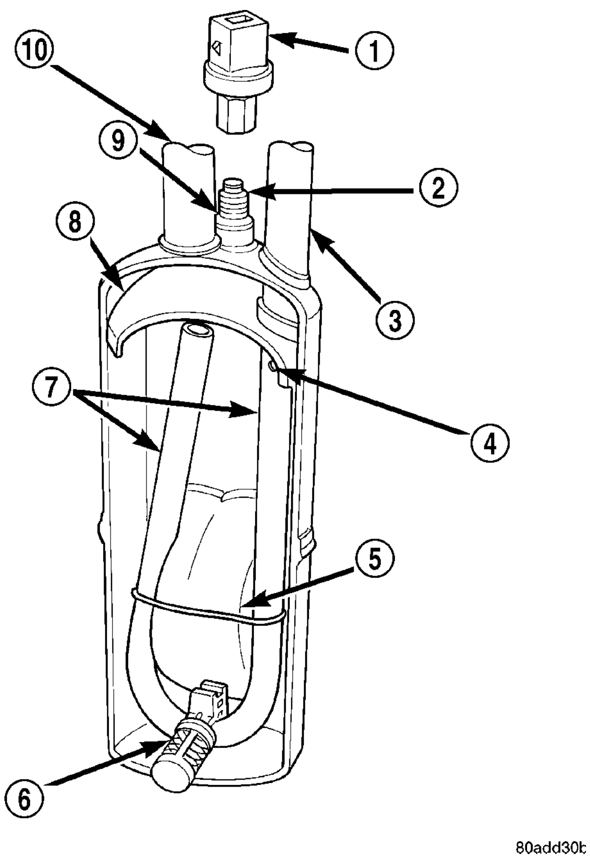


Fig. 12 ACCUMULATOR - TYPICAL

1 - A/C LOW PRESSURE SWITCH
2 - PRESSURE SWITCH FITTING
3 - OUTLET TO COMPRESSOR
4 - ANTI-SIPHON HOLE
5 - DESICCANT BAG
6 - OIL RETURN ORIFICE FILTER
7 - VAPOR RETURN TUBE
8 - ACCUMULATOR DOME
9 - O-RING SEAL
10 - INLET FROM EVAPORATOR

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Unplug the wire harness connector from the low pressure cycling clutch switch.

(4) Loosen the screw that secures the accumulator retaining band to the support bracket on the dash panel (Fig. 13).

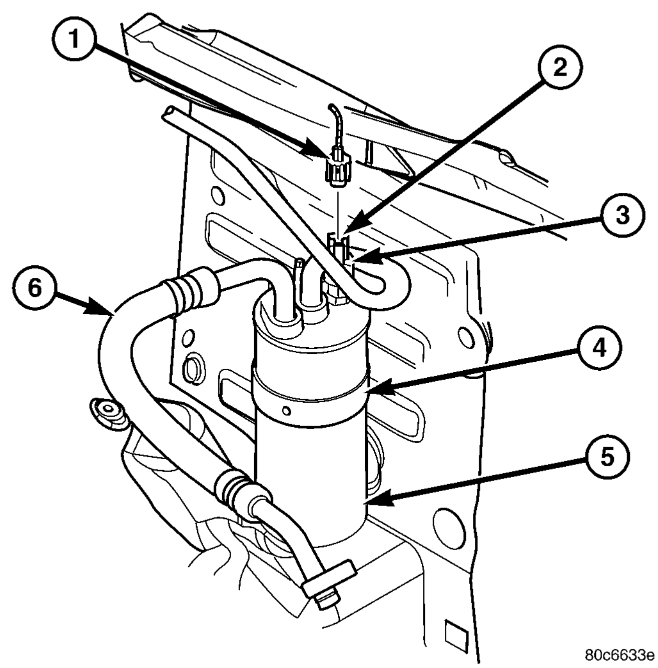


Fig. 13 A/C LOW PRESSURE SWITCH

1 - WIRING HARNESS CONNECTOR
2 - A/C LOW PRESSURE SWITCH
3 - A/C LINE TO EVAPORATOR
4 - ACCUMULATOR MOUNTING BRACKET
5 - ACCUMULATOR
6 - A/C LOW PRESSURE LINE

(5) Disconnect the suction line from the accumulator outlet tube refrigerant line fitting. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

ACCUMULATOR (Continued)

(6) Disconnect the accumulator inlet tube refrigerant line fitting from the evaporator outlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS) Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Pull the accumulator and retaining band unit forward until the screw in the band is clear of the slotted hole in the support bracket on the dash panel.

(8) Remove the accumulator from the vehicle.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Install the accumulator and retaining band as a unit by sliding the screw in the band into the slotted hole in the support bracket on the dash panel.

(2) Remove the tape or plugs from the refrigerant line fittings on the accumulator inlet tube and the evaporator outlet tube. Connect the accumulator inlet tube refrigerant line coupler to the evaporator outlet tube. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(3) Tighten the accumulator retaining band screw to 5 N·m (45 in. lbs.).

(4) Remove the tape or plugs from the refrigerant line fittings on the suction line and the accumulator outlet tube. Connect the suction line to the accumulator outlet tube refrigerant line coupler. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - A/C LINE COUPLERS)

(5) Plug the wire harness connector into the low pressure cycling clutch switch.

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(8) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

NOTE: If the accumulator is replaced, add 120 milliliters (4 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/REFRIGERANT OIL - DESCRIPTION)

HEATER CORE

DESCRIPTION

The heater core is located in the HVAC housing, under the instrument panel. It is a heat exchanger made of rows of tubes and fins and uses warm engine coolant as its heat source.

OPERATION

Engine coolant is circulated through heater hoses to the heater core at all times. As the coolant flows through the heater core, heat removed from the engine is transferred to the heater core fins and tubes. Air directed through the heater core picks up the heat from the heater core fins. The temperature control door allows control of the heater output air temperature by controlling how much of the air flowing through the HVAC housing is directed through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced. Refer to Cooling for more information on the engine cooling system, the engine coolant and the heater hoses.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: IF THE VEHICLE IS EQUIPPED WITH AIR CONDITIONING, REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

HEATER CORE (Continued)

(1) Remove the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).

(2) Remove the two heater core retaining screws (if equipped). (Fig. 14).

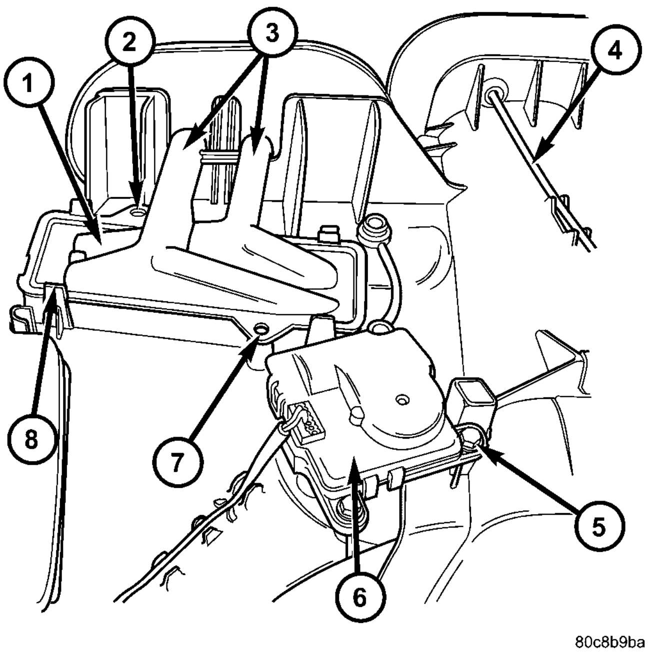


Fig. 14 HEATER CORE REMOVAL/INSTALLATION

1 - HEATER CORE
2- MOUNTING SCREW HOLE
3- INLET AND OUTLET TUBES
4- VACUUM HARNESS
5- ACTUATOR SCREWS (3)
6- ELECTRIC BLEND DOOR ACTUATOR
7- MOUNTING SCREW HOLE
8- HEATER CORE RETAINER TABS (4)

(3) Gently push back on two of the heater core retaining tabs and pull up on heater core to remove.

INSTALLATION

WARNING: IF THE VEHICLE IS EQUIPPED WITH AIR CONDITIONING, REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(1) Install the heater core into the top of the HVAC housing.

(2) Push on top of heater core until all for tabs are locked into place.

(3) Install the two heater core retainer screws.

(4) Install the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

REFRIGERANT

DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

OPERATION

R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. Even a small amount of R-12 added to an R-134a refrigerant system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance. In addition, the PolyAlkylene Glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the compressor identifying to service technicians that the air conditioning system is equipped with R-134a.

REFRIGERANT OIL

DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, PolyAlkylene Glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The Saden SD-7 compressor used in this vehicle is designed to use an SP–15 PAG refrigerant oil. Use only refrigerant oil of this same type to service the refrigerant system.

REFRIGERANT OIL (Continued)

OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause compressor damage, and too much can reduce air conditioning system performance.

PAG refrigerant oil is much more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

STANDARD PROCEDURE - REFRIGERANT OIL LEVEL

When an air conditioning system is assembled at the factory, all components except the compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the compressor is dispersed throughout the refrigerant system. The accumulator, evaporator, condenser, and compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of oil in the refrigerant system. This ensures proper lubrication of the compressor. Too little oil will result in damage to the compressor. Too much oil will reduce the cooling capacity of the air conditioning system.

It will not be necessary to check the oil level in the compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when a accumulator, evaporator coil, or condenser are replaced. See the Refrigerant Oil Capacities chart. When a compressor is replaced, the refrigerant oil must be drained from the old compressor and measured. Drain all of the refrigerant oil from the new compressor, then fill the new compressor with the same amount of refrigerant oil that was drained out of the old compressor.

Refrigerant Oil Capacities		
Component	ml	fl oz
Complete A/C System	240	8
Accumulator	90	3
Condenser	22	.75
Evaporator	45	1.5
Compressor	drain and measure the oil from the old compressor as noted	

EMISSIONS CONTROL

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EMISSIONS CONTROL

DESCRIPTION

DESCRIPTION - EMISSION CONTROL SYSTEM

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warm-up cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). The MIL is displayed as an engine icon on the instrument panel. Refer to Malfunction Indicator Lamp (MIL) in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example** , assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

Technicians must retrieve stored DTC's by connecting the DRB scan tool (or an equivalent scan tool) to the 16–way data link connector (Fig. 1).

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, connect the DRB scan tool to the 16–way data link connector to erase all DTC's and extinguish the MIL.

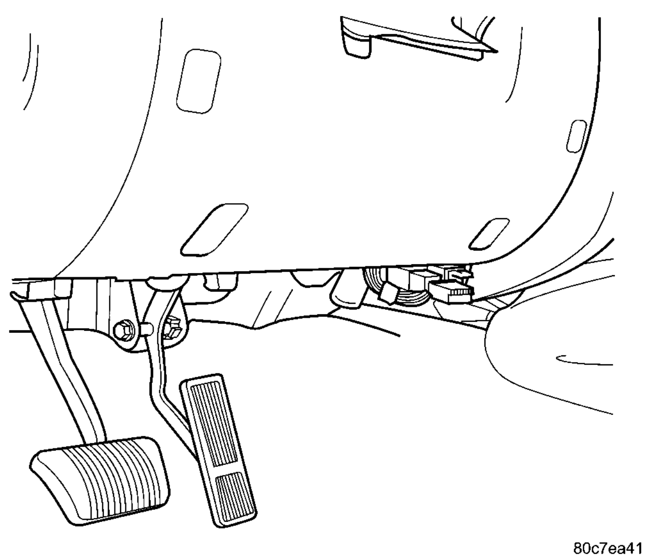

Fig. 1 DATA LINK CONNECTOR LOCATION

EMISSIONS CONTROL (Continued)

DESCRIPTION - STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. Connect the DRB scan tool to the data link connector and access the state display screen. Then access either State Display Inputs and Outputs or State Display Sensors.

DESCRIPTION - CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly. Connect the DRB scan tool to the data link connector and access the Actuators screen.

DESCRIPTION - DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

Remember that DTC's are the results of a system or circuit failure, but do not directly identify the failed component or components.

BULB CHECK

Each time the ignition key is turned to the ON position, the malfunction indicator (check engine) lamp on the instrument panel should illuminate for approximately 2 seconds then go out. This is done for a bulb check.

OBTAINING DTC'S USING DRB SCAN TOOL

(1) Obtain the applicable Powertrain Diagnostic Manual.

(2) Obtain the DRB Scan Tool.

(3) Connect the DRB Scan Tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.

(4) Turn the ignition switch on and access the “Read Fault” screen.

(5) Record all the DTC's and “freeze frame” information shown on the DRB scan tool.

(6) To erase DTC's, use the “Erase Trouble Code” data screen on the DRB scan tool. **Do not erase any DTC's until problems have been investigated and repairs have been performed.**

DESCRIPTION - TASK MANAGER

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is referred to as the 'Task Manager'.

DESCRIPTION - MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator Lamp (MIL) will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the MIL or a scan tool.

The following is a list of the system monitors:

- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Leak Detection Pump Monitor (if equipped)

All these system monitors require two consecutive trips with the malfunction present to set a fault.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

The following is an operation and description of each system monitor:

OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio,

EMISSIONS CONTROL (Continued)

the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the Catalyst and Fuel Monitors.

The O2S can fail in any or all of the following manners:

- slow response rate
- reduced output voltage
- dynamic shift
- shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) shorted to voltage DTC, as well as a O2S heater DTC, the O2S fault MUST be repaired first. Before checking the O2S fault, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S sensor are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O2S sensor is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S sensor must be tested to ensure that it is heating the sensor properly.

The O2S sensor circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S sensor output voltage from the other effects.

LEAK DETECTION PUMP MONITOR (IF EQUIPPED)

The leak detection assembly incorporates two primary functions: it must detect a leak in the evaporative system and seal the evaporative system so the leak detection test can be run.

The primary components within the assembly are: A three port solenoid that activates both of the functions listed above; a pump which contains a switch, two check valves and a spring/diaphragm, a canister vent valve (CVV) seal which contains a spring loaded vent seal valve.

Immediately after a cold start, between predetermined temperature thresholds limits, the three port solenoid is briefly energized. This initializes the pump by drawing air into the pump cavity and also closes the vent seal. During non test conditions the vent seal is held open by the pump diaphragm assembly which pushes it open at the full travel position. The vent seal will remain closed while the pump is cycling due to the reed switch triggering of the three port solenoid that prevents the diaphragm assembly from reaching full travel. After the brief initialization period, the solenoid is de-energized allowing atmospheric pressure to enter the pump cavity, thus permitting the spring to drive the diaphragm which forces air out of the pump cavity and into the vent system. When the solenoid is energized and de energized, the cycle is repeated creating flow in typical diaphragm pump fashion. The pump is controlled in 2 modes:

Pump Mode: The pump is cycled at a fixed rate to achieve a rapid pressure build in order to shorten the overall test length.

Test Mode: The solenoid is energized with a fixed duration pulse. Subsequent fixed pulses occur when the diaphragm reaches the Switch closure point.

The spring in the pump is set so that the system will achieve an equalized pressure of about 7.5” water. The cycle rate of pump strokes is quite rapid as the system begins to pump up to this pressure. As the pressure increases, the cycle rate starts to drop off. If there is no leak in the system, the pump would eventually stop pumping at the equalized pressure. If there is a leak, it will continue to pump at a rate representative of the flow characteristic of the size of the leak. From this information we can determine if the leak is larger than the required detection limit (currently set at .040” orifice by CARB). If a leak is revealed during the leak test portion of the test, the test is terminated at the end of the test mode and no further system checks will be performed.

After passing the leak detection phase of the test, system pressure is maintained by turning on the LDP’s solenoid until the purge system is activated. Purge activation in effect creates a leak. The cycle rate is again interrogated and when it increases due to the flow through the purge system, the leak check portion of the diagnostic is complete.

The canister vent valve will unseal the system after completion of the test sequence as the pump diaphragm assembly moves to the full travel position.

Evaporative system functionality will be verified by using the stricter evap purge flow monitor. At an appropriate warm idle the LDP will be energized to seal the canister vent. The purge flow will be clocked up from some small value in an attempt to see a shift in the 02 control system. If fuel vapor, indicated by a shift in the 02 control, is present the test is passed. If not, it is assumed that the purge system is not functioning in some respect. The LDP is again turned off and the test is ended.

MISFIRE MONITOR

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic convertor damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

FUEL SYSTEM MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the Air Fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio of 14.7 to 1. This is done by making short term corrections in the fuel injector pulse width based on the O2S sensor output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual fuel-air ratio with the O2S sensor (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's sensor strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL will be illuminated.

DESCRIPTION - TRIP DEFINITION

The term “Trip” has different meanings depending on what the circumstances are. If the MIL (Malfunction Indicator Lamp) is OFF, a Trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.

When any Emission DTC is set, the MIL on the dash is turned ON. When the MIL is ON, it takes 3

EMISSIONS CONTROL (Continued)

good trips to turn the MIL OFF. In this case, it depends on what type of DTC is set to know what a “Trip” is.

For the Fuel Monitor or Mis-Fire Monitor (continuous monitor), the vehicle must be operated in the “Similar Condition Window” for a specified amount of time to be considered a Good Trip.

If a Non-Contiuous OBDII Monitor fails twice in a row and turns ON the MIL, re-running that monitor which previously failed, on the next start-up and passing the monitor, is considered to be a Good Trip. These will include the following:

- Oxygen Sensor
- Catalyst Monitor
- Purge Flow Monitor
- Leak Detection Pump Monitor (if equipped)
- EGR Monitor (if equipped)
- Oxygen Sensor Heater Monitor

If any other Emission DTC is set (not an OBDII Monitor), a Good Trip is considered to be when the Oxygen Sensor Monitor and Catalyst Monitor have been completed; or 2 Minutes of engine run time if the Oxygen Sensor Monitor or Catalyst Monitor have been stopped from running.

It can take up to 2 Failures in a row to turn on the MIL. After the MIL is ON, it takes 3 Good Trips to turn the MIL OFF. After the MIL is OFF, the PCM will self-erase the DTC after 40 Warm-up cycles. A Warm-up cycle is counted when the ECT (Engine Coolant Temperature Sensor) has crossed 160°F and has risen by at least 40°F since the engine has been started.

DESCRIPTION - COMPONENT MONITORS

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (MIL) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks. Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum if the TPS indicates a small throttle opening.

All open/short circuit checks or any component that has an associated limp in will set a fault after 1 trip with the malfunction present. Components without an associated limp in will take two trips to illuminate the MIL.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

DESCRIPTION - NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems and conditions that could have malfunctions causing driveability problems. The PCM might not store diagnostic trouble codes for these conditions. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor or fuel system diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables.

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system, although it may set a fuel system fault.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

EMISSIONS CONTROL (Continued)

THROTTLE BODY AIRFLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, also during diagnostic.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

DESCRIPTION - HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

DESCRIPTION - LOAD VALUE

ENGINE	IDLE/NEUTRAL	2500 RPM/NEUTRAL
All Engines	2% to 8% of Maximum Load	9% to 17% of Maximum Load

OPERATION - TASK MANAGER

The Task Manager determines which tests happen when and which functions occur when. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are know as 'two trip monitors.' Other tests that turn the MIL lamp on after a single failure are known as 'one trip monitors.' A trip is defined as 'start the vehicle and operate it to meet the criteria necessary to run the given monitor.'

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- Pending

Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.

For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.

- Conflict

There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.

For example, if the Fuel System Monitor is in progress, the Task Manager does not run the EGR Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.

- Suspend

Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **sus-**

EMISSIONS CONTROL (Continued)

pend the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precis diagnosis.

For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the EGR monitor, the Task Manager may still run the EGR Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the EGR system is actually failing or if an Oxygen Sensor is failing.

MIL Illumination

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a third trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the third key cycle) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MIL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

Diagnostic Trouble Codes (DTCs)

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

Priorities

- Priority 0 —Non-emissions related trouble codes
- Priority 1 — One trip failure of a two trip fault for non-fuel system and non-misfire.
- Priority 2 — One trip failure of a two trip fault for fuel system (rich/lean) or misfire.
- Priority 3 — Two trip failure for a non-fuel system and non-misfire or matured one trip comprehensive component fault.
- Priority 4 — Two trip failure or matured fault for fuel system (rich/lean) and misfire or one trip catalyst damaging misfire.

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

DTC Self Erasure

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within ±375 RPM and load is within ±10% of when the fault occurred.

NOTE: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.

DTCs can be erased anytime with a DRB III. Erasing the DTC with the DRB III erases all OBD II information. The DRB III automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

Trip Indicator

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

Good Trip

The Good Trip counters are as follows:

- Specific Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on DRB III)
    - Comprehensive Components
    - Major Monitor
- Warm-Up Cycles

Specific Good Trip

The term Good Trip has different meanings depending on the circumstances:

- If the MIL is OFF, a trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.

EMISSIONS CONTROL (Continued)

• If the MIL is ON and a DTC was set by the Fuel Monitor or Misfire Monitor (both continuous monitors), the vehicle must be operated in the Similar Condition Window for a specified amount of time.

• If the MIL is ON and a DTC was set by a Task Manager commanded once-per-trip monitor (such as the Oxygen Sensor Monitor, Catalyst Monitor, Purge Flow Monitor, Leak Detection Pump Monitor, EGR Monitor or Oxygen Sensor Heater Monitor), a good trip is when the monitor is passed on the next start-up.

• If the MIL is ON and any other emissions DTC was set (not an OBD II monitor), a good trip occurs when the Oxygen Sensor Monitor and Catalyst Monitor have been completed, or two minutes of engine run time if the Oxygen Sensor Monitor and Catalyst Monitor have been stopped from running.

Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the DRB III. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 160° F
- Engine coolant temperature must rise by 40° F
- No further faults occur

Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.

CAUTION: Erasing DTCs, either with the DRB III or by disconnecting the battery, also clears all Freeze Frame data.

Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

FUEL SYSTEM

• **Fuel System Similar Conditions Window** — An indicator that ’Absolute MAP When Fuel Sys Fail’ and ’RPM When Fuel Sys Failed’ are all in the same range when the failure occurred. Indicated by switching from ’NO’ to ’YES’.

• **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.

• **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.

• **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.

• **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.

• **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.

• **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.

• **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.

• **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor

EMISSIONS CONTROL (Continued)

must stay below that threshold for a calibrated amount of time.

- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 160° F).
- **In Similar Misfire Window** — An indicator that 'Absolute MAP When Misfire Occurred' and 'RPM When Misfire Occurred' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.
- **Misfire Data**— Data collected during test.
- **Test Done This Trip**— Indicates YES when the test is done.

EVAPORATIVE EMISSIONS

TABLE OF CONTENTS

EVAPORATIVE EMISSIONS

DESCRIPTION - EVAPORATION CONTROL SYSTEM

The evaporation control system prevents the emission of fuel tank vapors into the atmosphere. When fuel evaporates in the fuel tank, the vapors pass through the control valve located in the top section of the fuel pump module, through the fuel management valve, and through vent hoses and tubes to a charcoal filled evaporative canister. The canister temporarily holds the vapors. The Powertrain Control Module (PCM) allows intake manifold vacuum to draw vapors into the combustion chambers during certain operating conditions.

Gas powered engines use a duty cycle purge system. The PCM controls vapor flow by operating the duty cycle EVAP purge solenoid. Refer to Duty Cycle EVAP Canister Purge Solenoid.

When equipped with certain emissions packages, a Leak Detection Pump (LDP) will be used as part of the evaporative system for OBD II requirements. Also refer to Leak Detection Pump.

Vehicles powered with gasoline engines are also equipped with ORVR (On-Board Refueling Vapor Recovery). Refer to ORVR for additional information.

NOTE: The evaporative system uses specially manufactured lines/hoses. If replacement becomes necessary, only use fuel resistant, low permeation hose.

Certain components can be found in (Fig. 1).

EVAPORATIVE EMISSIONS (Continued)

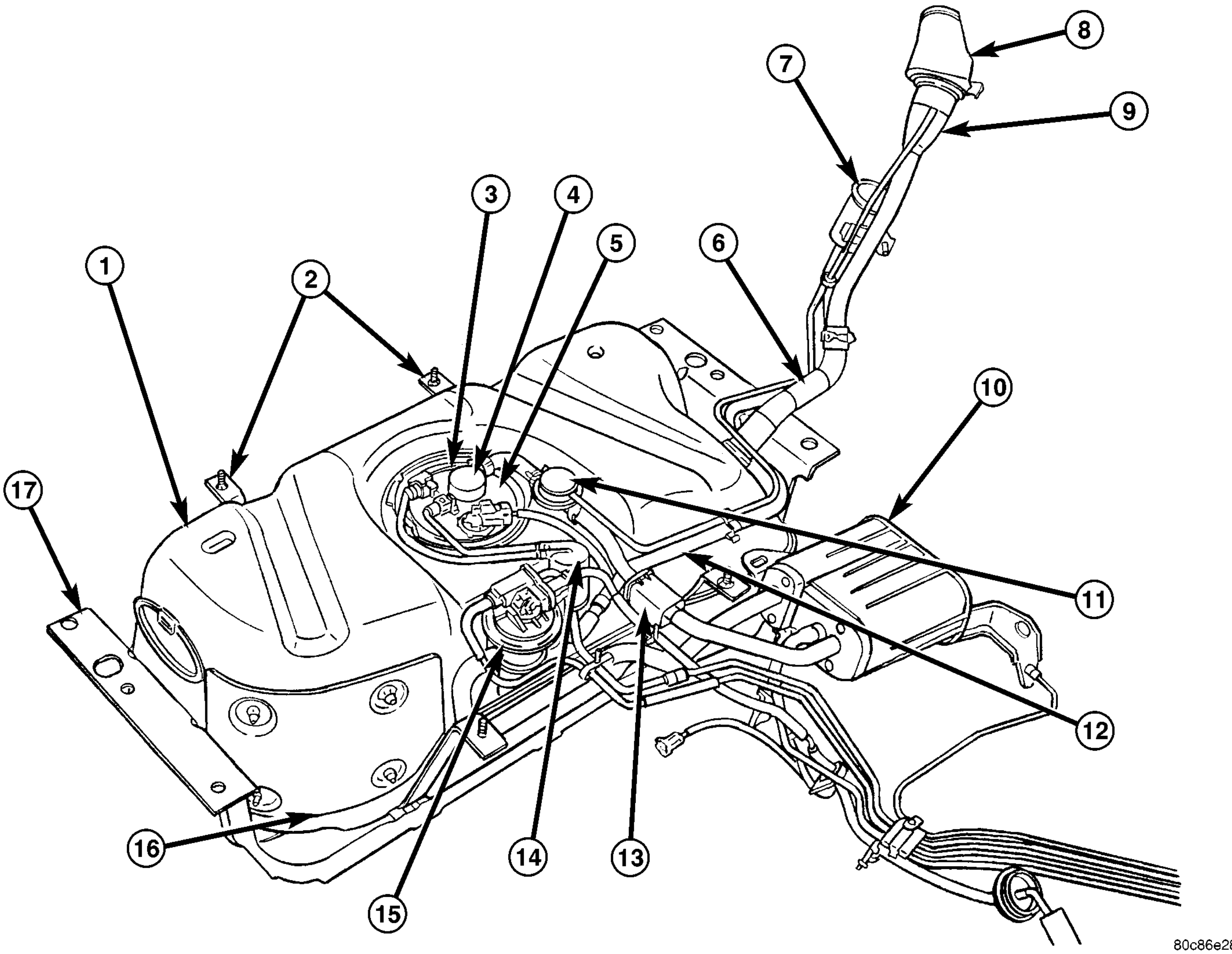

Fig. 1 FUEL DELIVERY COMPONENTS

1 - FUEL TANK
2 - FUEL TANK STRAPS
3 - FUEL PUMP MODULE LOCK RING
4 - CHECK (CONTROL) VALVE
5 - FUEL PUMP MODULE FLANGE
6 - FUEL FILL HOSE
7 - FRESH AIR FILTER
8 - FUEL FILL CAP/BEZEL
9 - FUEL FILL TUBE
10 - EVAP CANISTER
11 - FLOW MANAGEMENT VALVE
12 - FRESH AIR TUBE
13 - HOSE SLEEVE
14 - FUEL FILTER
15 - LEAK DETECTION PUMP
16 - HEAT SHIELD
17 - SKID PLATE

EVAPORATIVE EMISSIONS (Continued)

SPECIFICATIONS

TORQUE

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Accelerator Pedal Bracket Mounting Nuts	12	-	105
Crankshaft Position Sensor - 2.4L	28	21	-
Crankshaft Position Sensor - 3.7L	28	21	-
Camshaft Position Sensor - 2.4L	12	-	106
Camshaft Position Sensor - 3.7L	12	-	106
Engine Coolant Temperature Sensor	11	-	96
EVAP Canister-to-Body Bolts	48	35	-
EVAP Canister-to-Canis. Bracket Bolt/Nut	11	-	100
Fuel Filler Hose Clamp at Tank	3	-	30
Fuel Filler Housing-to-Body Screws	2	-	17
Fuel Filter Mounting Nut at Tank	5.5	-	49
Fuel Pump Module Access Plate Nuts	3	-	26
Fuel Rail Mounting Bolts - 3.7L	11	-	100
Fuel Rail Mounting Bolts - 2.4L	28	-	250
Fuel Tank Heat Sheild Nuts	5.5	-	49
Fuel Tank Mounting Strap Bolts	61	45	-
Fuel Tank Skid Plate and Trailer Hitch	88	65	-
IAC Motor Mounting Screws	7	-	60
Leak Detection Pump Mounting Bracket-to-Fuel Tank Nuts	5.5	-	49
Leak Detection Pump-to-Bracket Nuts	1.2	-	11
Map Sensor Mounting Screws	3	-	25

EVAPORATIVE EMISSIONS (Continued)

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
PCM-to-Mounting Bracket Mounting Screws	4	-	35
Power Steering Pressure Switch	14-22	-	124-195
TPS Mounting Screws	7	-	60
Throttle Body Mounting Bolts	11	-	100
Oxygen Sensors	30	22	-

EVAP/PURGE SOLENOID

DESCRIPTION

The duty cycle EVAP canister purge solenoid (DCP) is located in the engine compartment. It is attached to a bracket located between the battery and the Power Distribution Center (PDC). The EVAP system test port is located near the solenoid.

OPERATION

The duty cycle EVAP canister purge solenoid (DCP) regulates the rate of vapor flow from the EVAP canister to the intake manifold. The Powertrain Control Module (PCM) operates the solenoid.

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged. The PCM de-energizes the solenoid during open loop operation.

The engine enters closed loop operation after it reaches a specified temperature and the time delay ends. During closed loop operation, the PCM cycles (energizes and de-energizes) the solenoid 5 or 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse width. Pulse width is the amount of time that the solenoid is energized. The PCM adjusts solenoid pulse width based on engine operating condition.

REMOVAL

The duty cycle EVAP canister purge solenoid (DCP) is located in the engine compartment (Fig. 2). It is attached to a bracket located between the battery and the Power Distribution Center (PDC). The EVAP system test port is located near the solenoid (Fig. 2).

(1) Disconnect electrical wiring connector at solenoid.

(2) Disconnect vacuum harness at solenoid.

(3) Remove solenoid and its support bracket (pull straight up).

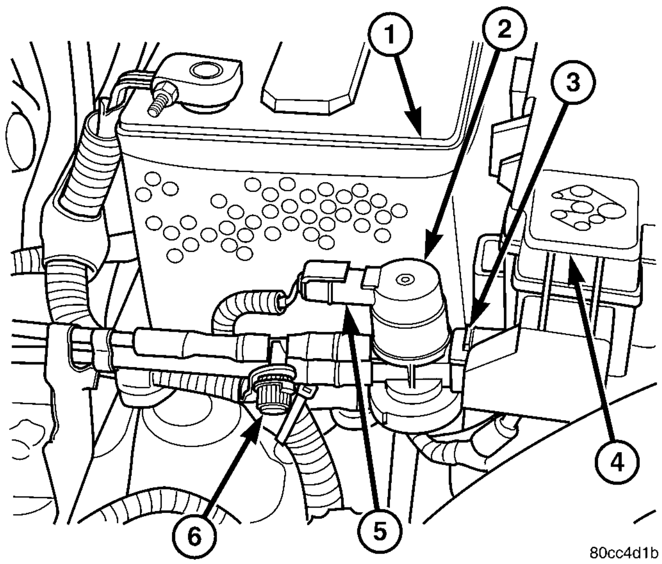

Fig. 2 EVAP / PURGE SOLENOID LOCATION

1 - BATTERY
2 - EVAP/PURGE SOLENOID LOCATION
3 - MOUNTING BRACKET
4 - POWER DISTRIBUTION CENTER (PDC)
5 - SOLENOID ELECTRICAL CONNECTOR
6 - EVAP SYSTEM TEST PORT

INSTALLATION

(1) Slip EVAP canister purge solenoid onto its mounting bracket.

(2) Connect vacuum harness to solenoid.

(3) Connect electrical connector to solenoid.

FUEL FILLER CAP

DESCRIPTION

The plastic fuel tank filler tube cap is threaded onto the end of the fuel fill tube. All models are equipped with a 1/4 turn cap.

OPERATION

The loss of any fuel or vapor out of fuel filler tube is prevented by the use of a pressure-vacuum fuel fill cap. Relief valves inside the cap will release fuel tank

FUEL FILLER CAP (Continued)

pressure at predetermined pressures. Fuel tank vacuum will also be released at predetermined values. This cap must be replaced by a similar unit if replacement is necessary. This is in order for the system to remain effective.

CAUTION: Remove fill cap before servicing any fuel system component to relieve tank pressure. If equipped with an ORVR system and a Leak Detection Pump (LDP), the cap must be tightened securely. If cap is left loose, a Diagnostic Trouble Code (DTC) may be set.

LEAK DETECTION PUMP

DESCRIPTION

The Leak Detection Pump (LDP) is bolted to the front of the fuel tank (Fig. 1).

The Leak Detection Pump (LDP) is used only with certain emission packages.

The LDP is a device used to detect a leak in the evaporative system.

The pump contains a 3 port solenoid, a pump that contains a switch, a spring loaded canister vent valve seal, 2 check valves and a spring/diaphragm.

OPERATION

Immediately after a cold start, engine temperature between 40°F and 86°F, the 3 port solenoid is briefly energized. This initializes the pump by drawing air into the pump cavity and also closes the vent seal. During non-test test conditions, the vent seal is held open by the pump diaphragm assembly which pushes it open at the full travel position. The vent seal will remain closed while the pump is cycling. This is due to the operation of the 3 port solenoid which prevents the diaphragm assembly from reaching full travel. After the brief initialization period, the solenoid is de-energized, allowing atmospheric pressure to enter the pump cavity. This permits the spring to drive the diaphragm which forces air out of the pump cavity and into the vent system. When the solenoid is energized and de-energized, the cycle is repeated creating flow in typical diaphragm pump fashion. The pump is controlled in 2 modes:

PUMP MODE: The pump is cycled at a fixed rate to achieve a rapid pressure build in order to shorten the overall test time.

TEST MODE: The solenoid is energized with a fixed duration pulse. Subsequent fixed pulses occur when the diaphragm reaches the switch closure point.

The spring in the pump is set so that the system will achieve an equalized pressure of about 7.5 inches of water.

When the pump starts, the cycle rate is quite high. As the system becomes pressurized pump rate drops. If there is no leak the pump will quit. If there is a leak, the test is terminated at the end of the test mode.

If there is no leak, the purge monitor is run. If the cycle rate increases due to the flow through the purge system, the test is passed and the diagnostic is complete.

The canister vent valve will unseal the system after completion of the test sequence as the pump diaphragm assembly moves to the full travel position.

REMOVAL

The Leak Detection Pump (LDP) is attached (bolted) to the front of the fuel tank (Fig. 3). The LDP fresh air filter is located on the end of a hose. This hose is attached to the fuel fill tube assembly below and near the fuel fill opening (Fig. 1). The LDP and LDP filter are typically replaced (serviced) as one unit.

(1) Raise vehicle.

(2) Carefully remove two 3/4” vent hoses at sides of LDP.

(3) Carefully remove other vapor/vacuum hoses from LDP.

(4) Place a hydraulic jack under fuel tank.

(5) Loosen 2 fuel tank strap mounting bolts at front of tank about 10 turns.

(6) Lower front of fuel tank about 1/2”.

(7) Remove 2 LDP mounting nuts (Fig. 3) and lower LDP slightly to gain access to electrical connector (Fig. 4).

(8) Disconnect electrical connector at LDP. To disconnect: Slide red colored tab upward. Push on black colored tab while removing connector.

(9) Remove LDP from vehicle.

INSTALLATION

The Leak Detection Pump (LDP) is attached (bolted) to the front of the fuel tank. The LDP filter is located on the end of a hose. This hose is attached to the fuel fill tube assembly below and near the fuel fill opening. The LDP and LDP filter are replaced (serviced) as one unit.

(1) Install electrical connector to LDP. Push red colored tab downward to lock connector to LDP.

(2) Position LDP and LDP bracket to fuel tank mounting studs and install 2 nuts. Tighten nuts to 1 N·m (11 in. lbs.) torque.

(3) Raise fuel tank to body and tighten 2 strap bolts to 61 N·m (45 ft. lbs.) torque.

(4) Carefully install vapor/vacuum lines to LDP, and install hose to LDP filter. **The vapor/vacuum lines and hoses must be firmly connected. Check the vapor/vacuum lines at the LDP, LDP**

LEAK DETECTION PUMP (Continued)

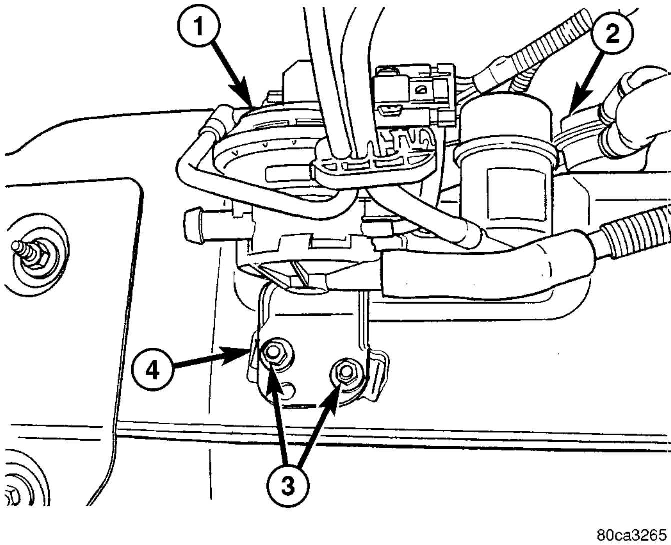

Fig. 3 LDP LOCATION / MOUNTING

1 - LDP
2 - FLOW MANAGEMENT VALVE
3 - MOUNTING NUTS
4 - FRONT OF FUEL TANK

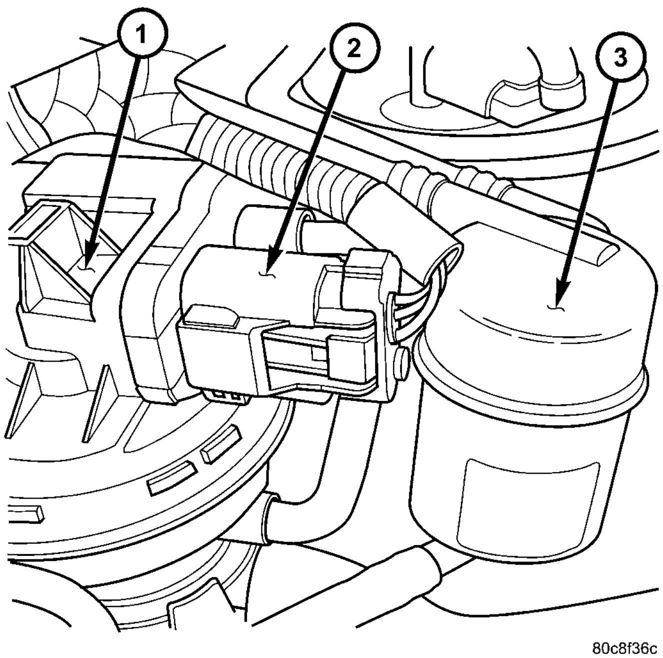

Fig. 4 LDP ELECTRICAL CONNECTOR

1 - LEAK DETECTION PUMP (LDP)
2 - ELECTRICAL CONNECTOR
3 - FUEL FILTER

filter and EVAP canister duty cycle purge solenoid for damage or leaks. If a leak is present, a Diagnostic Trouble Code (DTC) may be set.

ORVR

DESCRIPTION

The ORVR (On-Board Refueling Vapor Recovery) system consists of a unique fuel tank, flow management valve, fluid control valve, one-way check valve and vapor canister (Fig. 1).

OPERATION

The ORVR (On-Board Refueling Vapor Recovery) system is used to remove excess fuel tank vapors. This is done while the vehicle is being refueled. Certain ORVR components can be found in (Fig. 1).

Fuel flowing into the fuel filler tube (approx. 1” I.D.) creates an aspiration effect drawing air into the fuel fill tube. During refueling, the fuel tank is vented to the EVAP canister to capture escaping vapors. With air flowing into the filler tube, there are no fuel vapors escaping to the atmosphere. Once the refueling vapors are captured by the EVAP canister, the vehicle's computer controlled purge system draws vapor out of the canister for the engine to burn. The vapor flow is metered by the purge solenoid so that there is no, or minimal impact on driveability or tailpipe emissions.

As fuel starts to flow through the fuel fill tube, it opens the normally closed check valve and enters the fuel tank. Vapor or air is expelled from the tank through the control valve and on to the vapor canister. Vapor is absorbed in the EVAP canister until vapor flow in the lines stops. This stoppage occurs following fuel shut-off, or by having the fuel level in the tank rise high enough to close the control valve. This control valve contains a float that rises to seal the large diameter vent path to the EVAP canister. At this point in the refueling process, fuel tank pressure increases, the check valve closes (preventing liquid fuel from spiting back at the operator), and fuel then rises up the fuel filler tube to shut off the dispensing nozzle.

PCV VALVE

DESCRIPTION

2.4L

The 2.4L 4-cylinder engine is equipped with a closed crankcase ventilation system and a Positive Crankcase Ventilation (PCV) valve.

This system consists of:

- a PCV valve attached to the left/front side of the valve cover (Fig. 5). It is secured with 1 bolt. An o-ring is used to seal valve to valve cover (Fig. 6).
- the air cleaner housing

PCV VALVE (Continued)

• tubes and hoses to connect the system components.

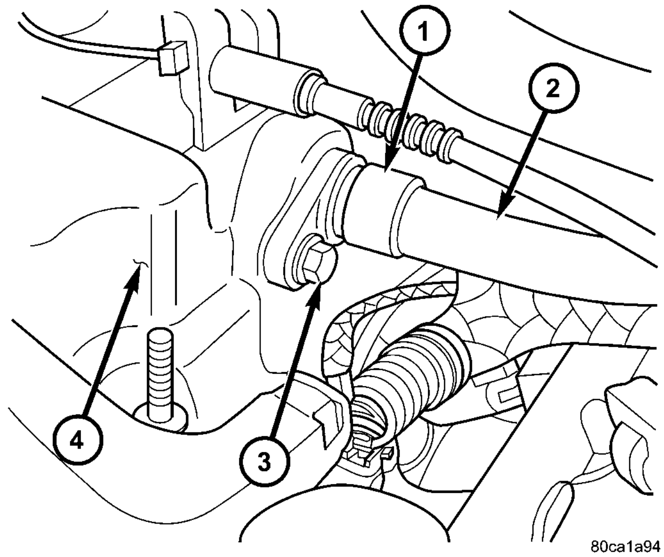

Fig. 5 PCV VALVE LOCATION - 2.4L

1 - PCV VALVE
2 - HOSE
3 - MOUNTING BOLT
4 - VALVE COVER (LEFT SIDE)

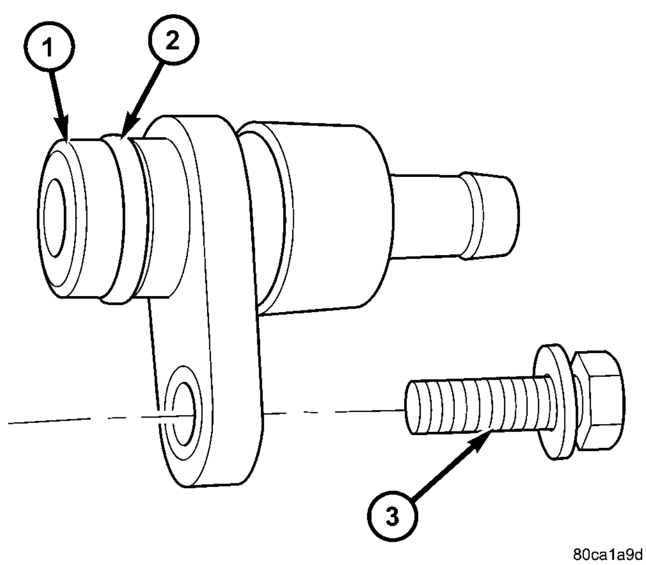

Fig. 6 PCV VALVE AND O-RING - 2.4L

1 - PCV VALVE
2 - O-RING
3 - MOUNTING BOLT

3.7L

The 3.7L V-6 engine is equipped with a closed crankcase ventilation system and a Positive Crankcase Ventilation (PCV) valve.

This system consists of:

• a PCV valve mounted to the oil filler housing (Fig. 7). The PCV valve is sealed to the oil filler housing with an o-ring.
• the air cleaner housing
• two interconnected breathers threaded into the rear of each cylinder head (Fig. 8).
• tubes and hoses to connect the system components.

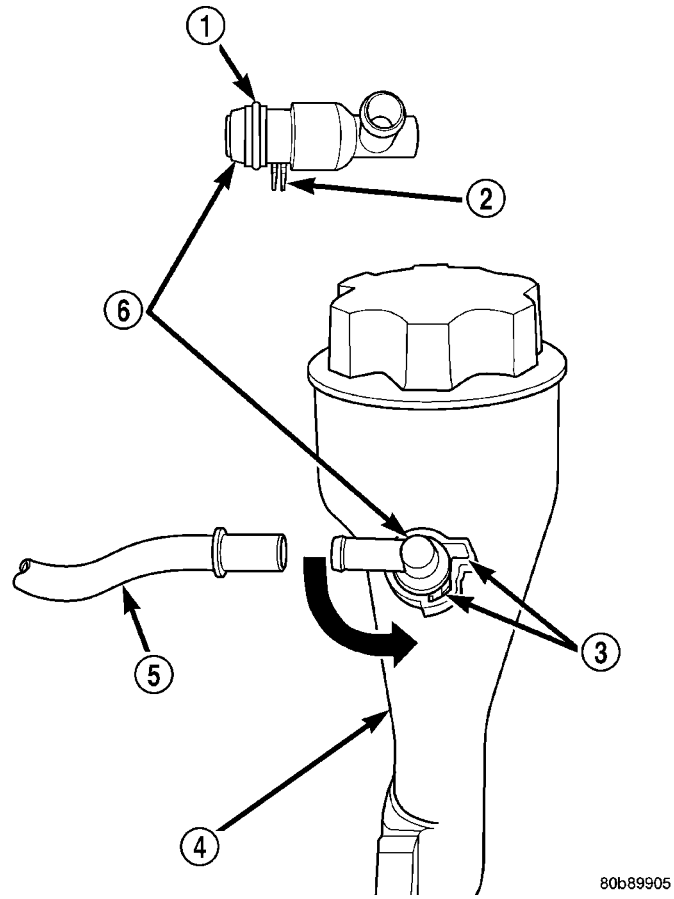

Fig. 7 PCV VALVE - 3.7L

1 - O-RING
2 - LOCATING TABS
3 - CAM LOCK
4 - OIL FILLER TUBE
5 - PCV LINE/HOSE
6 - PCV VALVE

OPERATION

The PCV system operates by engine intake manifold vacuum. Filtered air is routed into the crankcase through the air cleaner hose and crankcase breather(s) (if used). The metered air, along with crankcase vapors, are drawn through the PCV valve and into a passage in the intake manifold. The PCV system manages crankcase pressure and meters blow-by gases to the intake system, reducing engine sludge formation.

The PCV valve contains a spring loaded plunger. This plunger meters the amount of crankcase vapors

PCV VALVE (Continued)

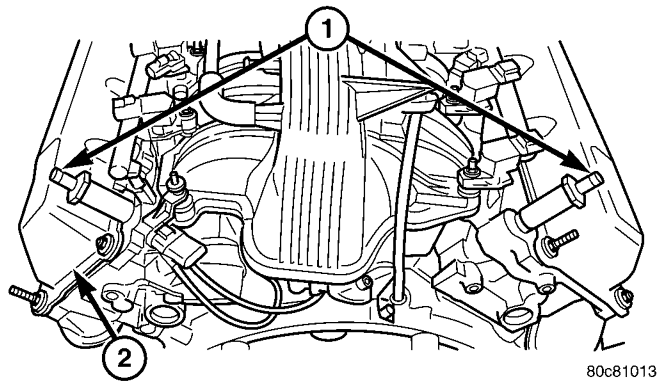

Fig. 8 CRANKCASE BREATHERS (2) - 3.7L

1 - CRANKCASE BREATHERS (2)
2 - REAR OF ENGINE

routed into the combustion chamber based on intake manifold vacuum.

TYPICAL PCV valves are shown in (Fig. 9), (Fig. 10) and (Fig. 11).

When the engine is not operating, or during an engine pop-back, the spring forces the plunger back against the seat (Fig. 9). This will prevent vapors from flowing through the valve.

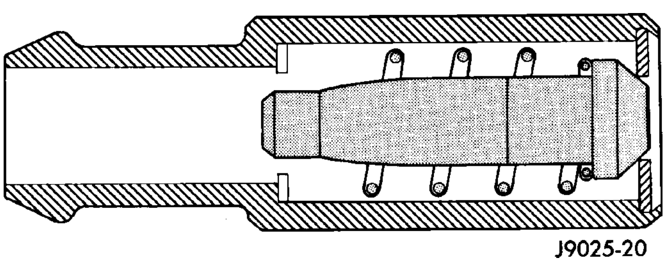

Fig. 9 Engine Off or Engine Pop-Back—No Vapor Flow

During periods of high manifold vacuum, such as idle or cruising speeds, vacuum is sufficient to completely compress spring. It will then pull the plunger to the top of the valve (Fig. 10). In this position there is minimal vapor flow through the valve.

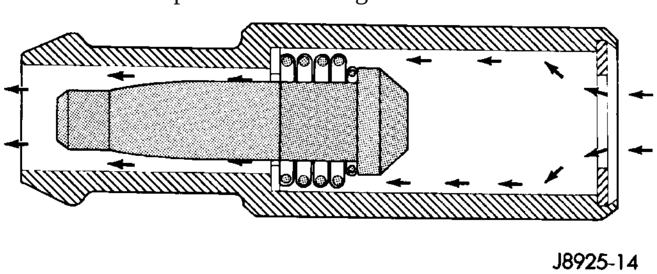

Fig. 10 High Intake Manifold Vacuum—Minimal Vapor Flow

During periods of moderate manifold vacuum, the plunger is only pulled part way back from inlet. This results in maximum vapor flow through the valve (Fig. 11).

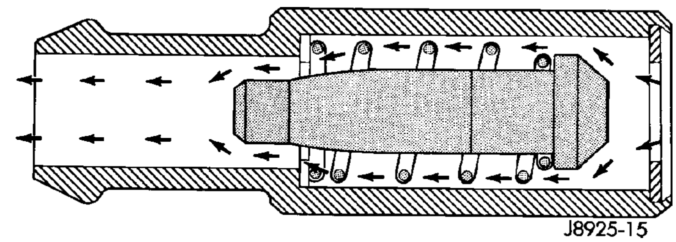

Fig. 11 Moderate Intake Manifold Vacuum—Maximum Vapor Flow

DIAGNOSIS AND TESTING - PCV VALVE

3.7L

(1) Disconnect PCV line/hose (Fig. 7) by disconnecting rubber connecting hose at PCV valve fitting.

(2) Remove PCV valve at oil filler tube by rotating PCV valve downward until locating tabs have been freed at cam lock (Fig. 7). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**

(3) After valve is removed, check condition of valve o-ring (Fig. 7). Also, PCV valve should rattle when shaken.

(4) Reconnect PCV valve to its connecting line/hose.

(5) Start engine and bring to idle speed.

(6) If valve is not plugged, a hissing noise will be heard as air passes through valve. Also, a strong vacuum should be felt with a finger placed at valve inlet.

(7) If vacuum is not felt at valve inlet, check line/hose for kinks or for obstruction. If necessary, clean out intake manifold fitting at rear of manifold. Do this by turning a 1/4 inch drill (by hand) through the fitting to dislodge any solid particles. Blow out the fitting with shop air. If necessary, use a smaller drill to avoid removing any metal from the fitting.

(8) **Do not attempt to clean the old PCV valve.**

(9) Return PCV valve back to oil filler tube by placing valve locating tabs (Fig. 7) into cam lock. Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.

(10) Connect PCV line/hose and connecting rubber hose to PCV valve.

(11) Disconnect rubber hose from fresh air fitting at air cleaner resonator box. Start engine and bring to idle speed. Hold a piece of stiff paper (such as a parts tag) loosely over the opening of the disconnected rubber hose.

(12) The paper should be drawn against the hose opening with noticeable force. This will be after allowing approximately one minute for crankcase pressure to reduce.

PCV VALVE (Continued)

(13) If vacuum is not present, disconnect each PCV system hose at top of each crankcase breather (Fig. 8). Check for obstructions or restrictions.

(14) If vacuum is still not present, remove each PCV system crankcase breather (Fig. 8) from each cylinder head. Check for obstructions or restrictions. If plugged, replace breather. Tighten breather to 12 N·m (106 in. lbs.) torque. Do not attempt to clean breather

(15) If vacuum is still not present, disconnect each PCV system hose at each fitting and check for obstructions or restrictions.

REMOVAL

2.4L

The PCV valve is attached to the left/front side of the valve cover (Fig. 5). It is secured with 1 bolt. An o-ring is used to seal valve to valve cover (Fig. 6).

(1) Remove hose from valve (Fig. 5). Check condition of hose.

(2) Remove 1 bolt.

(3) Remove PCV valve from valve cover.

(4) Check condition of valve o-ring.

3.7L

The PCV valve is located on the oil filler tube (Fig. 12). Two locating tabs are located on the side of the valve (Fig. 12). These 2 tabs fit into a cam lock in the oil filler tube. An o-ring seals the valve to the filler tube.

(1) Disconnect PCV line/hose (Fig. 12) by disconnecting rubber hose at PCV valve fitting.

(2) Remove PCV valve at oil filler tube by rotating PCV valve downward (counter-clockwise) until locating tabs have been freed at cam lock (Fig. 12). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**

(3) After valve is removed, check condition of valve o-ring (Fig. 12).

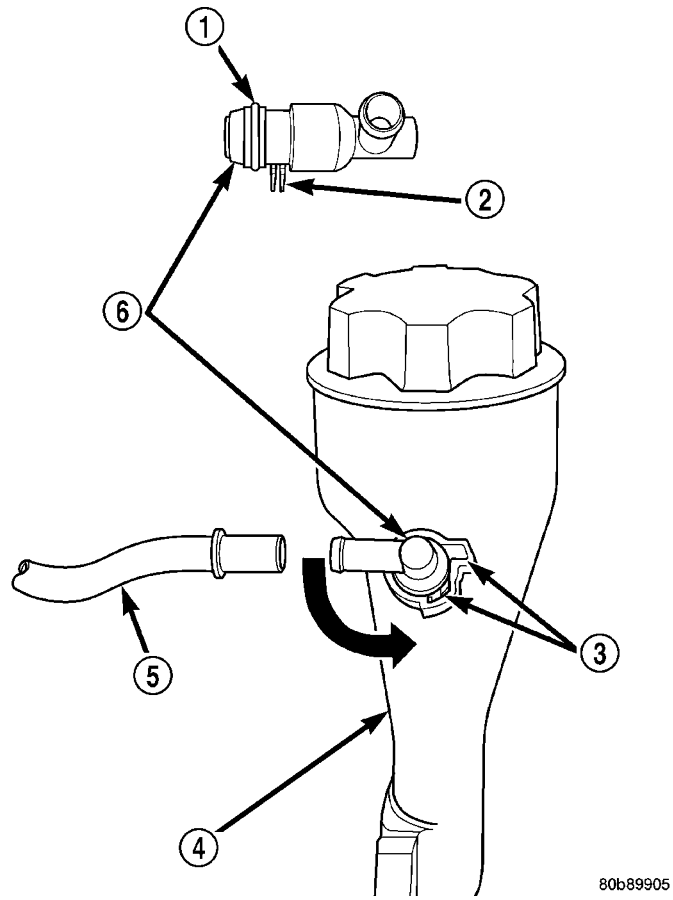

Fig. 12 PCV VALVE/OIL FILLER TUBE LOCATION - 3.7L V-6 / 4.7L V-8

1 - O-RING
2 - LOCATING TABS
3 - CAM LOCK
4 - OIL FILLER TUBE
5 - PCV LINE/HOSE
6 - PCV VALVE

INSTALLATION

2.4L

(1) Check condition of PCV valve o-ring.

(2) Install PCV valve into valve cover.

(3) Install PCV valve mounting bolt.

(4) Install hose to valve.

3.7L

The PCV valve is located on the oil filler tube. Two locating tabs are located on the side of the valve. These 2 tabs fit into a cam lock in the oil filler tube. An o-ring seals the valve to the filler tube.

(1) Return PCV valve back to oil filler tube by placing valve locating tabs into cam lock. Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.

(2) Connect PCV line/hose and rubber hose to PCV valve.

VACUUM LINES

DESCRIPTION

A vacuum schematic for emission related items can be found on the VECI label. Refer to Vehicle Emission Control Information (VECI) Label for label location.

VAPOR CANISTER

DESCRIPTION

A maintenance free, EVAP canister is used on all gasoline powered models. The EVAP canister is located near the left/front corner of the fuel tank.

OPERATION

The EVAP canister is filled with granules of an activated carbon mixture. Fuel vapors entering the EVAP canister are absorbed by the charcoal granules.

The canister serves two functions: as a temporary fuel vapor storage point while refueling the vehicle for the ORVR system, as a temporary vapor storage point while the engine is running.

Fuel tank pressure vents into the EVAP canister. Fuel vapors are temporarily held in the canister until they can be drawn into the intake manifold. The duty cycle EVAP canister purge solenoid allows the EVAP canister to be purged at predetermined times and at certain engine operating conditions.

Refer to ORVR for additional information.

REMOVAL

The EVAP canister is located near front of fuel tank and next to left/rear spring. (Fig. 13).

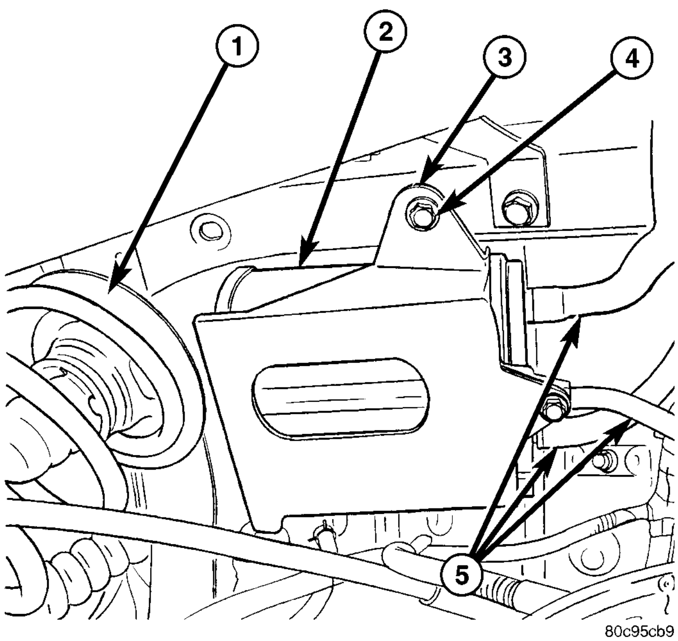

Fig. 13 EVAP CANISTER LOCATION

1 - LEFT/REAR SPRING
2 - EVAP CANISTER
3 - MOUNTING BRACKET
4 - BRACKET BOLTS
5 - VACUUM LINES

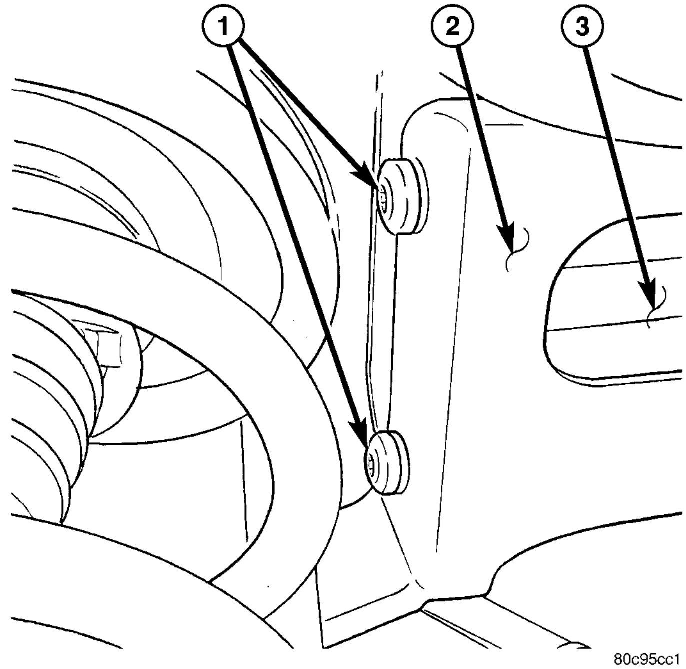

Fig. 14 EVAP CANISTER MOUNTING PINS

1 - MOUNTING PINS
2 - MOUNTING BRACKET
3 - EVAP CANISTER

(1) Raise vehicle.

(2) Disconnect vacuum hoses/lines at EVAP canister. Note location of lines before removal.

(3) Remove EVAP canister and mounting bracket assembly from body (2 bolts).

(4) Remove canister-to-mounting bracket bolt.

(5) Slide 2 canister mounting pins from mounting bracket (Fig. 14).

INSTALLATION

(1) Slide 2 canister mounting pins into mounting bracket (Fig. 14).

(2) Install canister-to-mounting bracket bolt.

(3) Position canister and bracket assembly to body.

(4) Install 2 mounting bracket bolts. Tighten to 47 N·m (35 ft. lbs.) torque.

(5) Connect vacuum hoses/lines at EVAP canister.

(6) Lower vehicle.

Description	Group-Page

Description	Group-Page

Description	Group-Page

Description	Group-Page

SERVICE MANUAL COMMENTS

What features do you find most useful? ______________________________

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What errors have you found? Please include page number. ______________________________

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What topics are hard to locate, confusing, or not covered completely? ______________________________

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What comments or suggestions do you have? ______________________________

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Your Name: ______________________________ Dealership/Distributor: ______________________________

Address: ______________________________

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Vehicle Identification Number ______________________________

Manual Name, Year, Language and Number: ______________________________

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1.0 INTRODUCTION

The procedures contained in this manual include specifications, instructions, and graphics needed to diagnose the PCM Powertrain System. The diagnostics in this manual are based on the failure condition or symptom being present at the time of diagnosis.

Please follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the appropriate modules; i.e., if the DRBIII® displays a "No Response" condition, you must diagnose this first before proceeding.
2. Read DTCs (diagnostic trouble codes) with the DRBIII®.
3. If no DTCs are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

All component location views are in Section 8.0. All connector pinouts are in Section 9.0. All system schematic diagrams are in Section 10.0. All charts and graphs are in section 11.0.

An * placed before the symptom description indicates a customer complaint.

When repairs are required, refer to the appropriate service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; current systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE DTC. It is recommended that you review the entire manual to become familiar with all new and enhanced diagnostic procedures.

After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

1.1 SYSTEM COVERAGE

This diagnostic procedure manual covers the 2003 KJ with 2.4L and 3.7L Engines.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the Powertrain Control Module (PCM) is done in six basic steps:

- verification of complaint
- verification of any related symptoms
- symptom analysis
- problem isolation
- repair of isolated problem
- verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

The Powertrain Control Module (PCM) monitors and controls:

- fuel system
- ignition system
- charging system
- speed control system
- automatic transmission ("XXRE,45RFE" transmissions)

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 GENERAL DESCRIPTION

The on-board OBDII/EUROIII diagnostics incorporated with the PCM controller are intended to assist the field technician in repairing vehicle problems by the quickest means.

3.2 FUNCTION OPERATION

3.2.1 FUEL CONTROL (GAS)

The PCM controls the air/fuel ratio of the engine by varying fuel injector-on time. Mass air flow is calculated by the speed density method using engine speed and manifold absolute pressure (IAT is a modifier in Speed Density).

Different fuel calculation strategies are used depending on the operational state of the engine. During crank mode, a prime shot fuel pulse is delivered followed by fuel pulses determined by a crank time strategy. Cold engine operation is determined via an open loop strategy until the O2 sensors have reached operating temperature. At this point, the strategy enters a closed loop mode where fuel requirements are based upon the state of the O2 sensors, engine speed, MAP, throttle position, air temperature, battery voltage, and coolant temperature.

3.2.2 ON BOARD DIAGNOSTICS

The PCM has been programmed to monitor any circuit or system that has an effect on vehicle emissions, or is used by the PCM to determine the proper functionality of these systems. This monitoring is called “on-board diagnosis.”

Certain criteria or, “arming conditions,” must be met for a trouble code to be entered into the PCM memory. The criteria may be a range of: engine rpm, engine temperature, and/or input voltage to the PCM. If a problem is detected with a monitored circuit, and all of the criteria or arming conditions are met, a trouble code will be stored in the PCM.

It is possible that a trouble code for a monitored circuit may not be entered into the PCM memory even though a malfunction has occurred. This may happen because one of the trouble code criteria (arming conditions) has not been met.

The PCM compares input signal voltages from each input device with specifications (the established high and low limits of the range) that are preprogrammed for that device. If the input voltage is not within specifications, and other trouble code criteria (arming conditions) are met, a trouble code will be stored in the PCM memory.

The On Board Diagnostics have evolved to the second Generation of Diagnostics referred to as OBDII/EUROIII. These OBDII/EUROIII Diagnostics control the functions necessary to meet the requirements of California OBDII/EUROIII and Federal OBD regulations. These requirements specify the inclusion of a Malfunction Indicator Light (MIL) located on the instrument panel for all 1994 and subsequent model-year passenger cars, light duty trucks, and medium-duty vehicles. The purpose of the MIL is to inform the vehicle operator in the event of the malfunction of any emission systems and components which can affect emissions and which provide input to, or receive output from, the PCM.

The following table summarizes the various OBDII/EUROIII monitors operation.

OBD II / EURO III MONITOR OPERATION

Comprehensive Components Monitor	**Major Monitors Non Fuel Control & Non Misfire**	**Major Monitors Fuel Control & Misfire**
Run constantly	Run Once Per Trip	Run constantly
Includes All Engine Hardware • Sensors, Switches, Solenoids, etc.	Monitors Entire Emission System	Monitors Entire System
Most are One Trip Faults - Usually Turns On The MIL and Sets DTC After One Failure	Most are Two Trip Faults - Turns On The MIL and Sets DTC After Two Consecutive Failure	Two Trip Faults - Turns On The MIL and Sets DTC After Two Consecutive Failure
Priority 3	**Priority 1 or 3**	**Priority 2 or 4**
All Checked For Continuity Open Short To Ground Short To Voltage Inputs Checked For Rationality Outputs Checked For Functionality	Done Stop Testing = Yes Oxygen Sensor Heater Oxygen Sensor Response Catalytic Converter Efficiency Except EWMA • up to 6 tests per trip and a one trip fault (SBEC) and a two-trip fault on JTEC EGR System Evaporative Emission System (Purge and Leak) Non-LDP or LDP	**Fuel Control Monitor** Monitors Fuel Control System For: Fuel System Lean Fuel System Rich Requires 3 Consecutive *Fuel System Good Trips* to Extinguish The MIL **Misfire Monitor** Monitors For Engine Misfire at: 4 x 1000 RPM Counter (4000 Revs) (Type B) **200 x 3 (600) RPM Counter (Type A)
Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL*	Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL*	Requires 3 Consecutive *Global Good Trips* To Extinguish the MIL **Type A misfire is a one trip failure on pre-1999, 2 Trip failure on 1999 and later. The MIL will illuminate at the first or second failure, based on MY.

***40 Warm Up Cycles** are required to erase DTCs *after* the MIL has been extinguished.

OBDII/EUROIII MONITOR RUN PROCESS, JTEC

The following procedure has been established to assist Chrysler Dealer Technicians in the field with enabling and running OBDII/EUROIII Monitors. The order listed in the following procedure is intended to allow the technician to effectively complete each monitor and to set the CARB Readiness Status in the least time possible.

NOTE:
A. Once the monitor run process has begun, do not turn off the ignition. By turning the ignition key off, monitor enabling conditions will be lost.
B. By performing a Battery Disconnect, or Selecting Erase DTCs, the CARB Readiness and all additional OBD information will be cleared.

Monitor Preliminary Checks:

1. Plug a DRBIII® into the vehicle's DLC.
2. Turn the ignition, KEY ON - ENGINE OFF. Watch for MIL lamp illumination during the bulb check. MIL lamp must have illuminated, if not, repair MIL lamp.
3. On the DRBIII® Select #1 DRBIII® Standalone.
4. Select #1 1998-2002 Diagnostics
5. Select #1 Engine.
6. Select #2 DTCs and Related Functions
7. Select #1 Read DTCs

* Verify that No Emissions Related DTCs are Present.

* If an Emissions DTC is Present, the OBDII Monitors may not run and the CARB Readiness will not update.

*The Emissions related DTC, will need to be repaired, then cleared. By clearing DTCs, the OBD Monitors will need to be run and completed to set the CARB Readiness Status.

8. Return to Engine Select Function Menu and Select #9, OBDII/EUROIII Monitors.
9. Select #3 CARB Readiness Status.

Do all the CARB Readiness Status Locations read YES?

*YES, then all monitors have been completed and this vehicle is ready to be I/M or Emission Tested.

*NO, then the following procedure needs to be followed to run/complete all available monitors.

NOTE:
A. Only the monitors, which are <u>not</u> YES in the CARB Readiness Status, need to be completed.
B. Specific criteria need to be met for each monitor. Each monitor has a Pre-Test screen to assist in running the monitor. For additional information, refer to the Chrysler Corporation Technical Training Workbook titled <u>On Board Diagnostics</u>, part number 81-699-97094.

The most efficient order to run the monitors has been outlined below, including suggestions to aid the process. The first two monitors have very similar enable criteria; it is possible that the Evaporative Leak Detection Monitor will run during the O2 Sensor Heater Monitor.

1. **O2 Sensor Heater Monitor**
   This monitor requires a cold start, usually an overnight soak or parked for at least 8 hours without the engine running. The engine coolant temperature must be within 10 degrees of ambient/battery temperature, and the sensed Ambient (outside) Temperature must be between approximately 0° F and 100° F. For the monitor run conditions, select the O2S HEATER MON PRE-TEST in the DRBIII®, OBDII/EUROIII Monitors Menu
2. **Evaporative Leak Detection Monitor (If the vehicle is equipped with an LDP system)**
   This monitor requires a cold start, usually an overnight soak or parked for at least 8 hours without the engine running. The engine coolant temperature must be within 10 degrees of ambient/battery temperature, and the sensed Ambient (outside) Temperature must be between approximately 40° F and 90° F. For the monitor run conditions select the EVAP LDP MON PRE-TEST in the DRBIII®, OBDII/EUROIII Monitors Menu.
3. **Catalyst Monitor**
   The vehicle will need to be driven at highway speed for a few minutes. If the vehicle is equipped with a manual transmission, using 4th gear may assist in meeting the monitor running criteria. For the monitor run conditions, select the EWMA CAT MON PRE-TEST in the DRBIII®, OBDII/EUROIII Monitors Menu.
4. **O2 Sensor Monitor**
   The vehicle will need to be driven for a period of time and brought to a stop for a short period of time with the Automatic Transmission left in Drive. The O2S Monitor will not run in Park or Neutral on an Automatic Transmission equipped vehicle. For the monitor run conditions, select

the O2S MON PRE-TEST in the DRBIII®, OBDII/EUROIII Monitors Menu.

5. **Purge Monitor**
   All the Purge Free (PF) cells must update on the ADAPTIVE MEMORY screen before the Purge Flow Monitor will run. For the monitor run conditions, select the PURGE FLOW MON PRE-TEST in the DRBIII®, OBDII/EUROIII Monitors Menu. The Purge Flow Monitor will not run in Park or Neutral on an Automatic Transmission equipped vehicle. The Purge Flow Monitor will attempt to run every **other** throttle closure. If all of the parameters are met and it still does not run, with your foot firmly on the Service Brake, slightly (1/4) open the Throttle and quickly close the Throttle. This will allow the Purge Free update to happen, and then the Purge Flow Monitor will Run.

3.2.3 TRANSMISSION CONTROL

The automatic transmission used on this vehicle is a 45RFE model electronically controlled which incorporates its own control module (TCM).

3.2.4 OTHER CONTROLS

Charging System

The charging system is turned on when the engine is started and ASD relay energized. When the ASD relay is on, ASD output voltage is supplied to the ASD sense circuit at the PCM. This voltage is connected in some cases, through the PCM and supplied to one of the generator field terminals (Generator Source +). All others, the Generator field is connected directly to the ASD output voltage. The amount of current produced by the generator is controlled by the Electronic Voltage Regulator (EVR) circuitry, in the PCM. Battery temperature is determined either by IAT, Ambient or Battery temperature sensor. This temperature along with sensed line voltage is used by the PCM to vary battery charging. This is accomplished by cycling the path to ground to the other generator field terminal (Generator field driver).

Speed Control

The PCM controls vehicle speed by operation of the speed control servo vacuum and vent solenoids. Energizing the vacuum solenoid applies vacuum to the servo to increase throttle position. Operation of the vent solenoid slowly releases the vacuum allowing throttle position to decrease. A special dump solenoid allows immediate release of throttle position caused by braking, cruise control turn off, shifting into neutral, excessive RPM (tires spinning) or ignition key off.

Fuel Vapor Recovery System (Duty Cycle Purge Control) Gas Engine

Duty Cycle Purge is a system that feeds fuel gases from the purge canister and gasoline tank into the throttle body for mixing with incoming air. Metering of the gases is performed by duty cycling the purge solenoid by the PCM.

The system is disabled during wide-open throttle conditions and while the engine is below a specified coolant temperature. When engine temperature becomes greater than a calibrated parameter, duty cycle purge is delayed for a calibrated time. Once purge delay is over, purge will be ramped in to soften the effect of dumping additional fuel into the engine.

The PCM provides a modulated 5 Hz signal (at closed throttle) or 10 Hz signal (at open throttle) to control this system. Modulation of the signal is based upon a calculated air flow (based upon known fuel flow through the injector at a given pulse width and RPM) and is adjusted to compensate for changes in flow due to varying engine vacuum.

LEAK DETECTION PUMP

LEAK DETECTION PUMP OPERATION

The evaporative emission system is designed to prevent the escape of fuel vapors from the fuel system. Leaks in the system, even small ones, can allow fuel vapors to escape into the atmosphere. Government regulations require onboard testing to make sure that the evaporative (EVAP) system is functioning properly. The leak detection system tests for EVAP system leaks and blockage. It also performs self-diagnostics. During self-diagnostics, the Powertrain Control Module (PCM) first checks the Leak Detection Pump (LDP) for electrical and mechanical faults. If the first checks pass, the PCM then uses the LDP to seal the vent valve and pump air into the system to pressurize it. If a leak is present, the PCM will continue pumping the LDP to replace the air that leaks out. The PCM determines the size of the leak based on how fast/long it must pump the LDP as it tries to maintain pressure in the system.

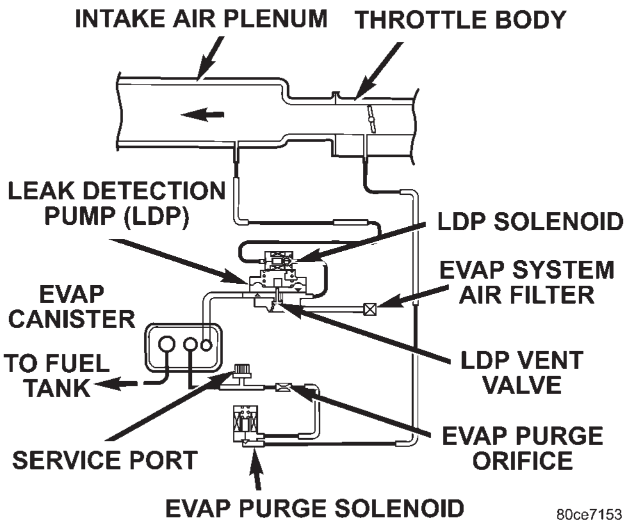
EVAP LEAK DETECTION SYSTEM COMPONENTS (FIGURE 1)

Service Port: Used with special tools like the Miller Evaporative Emissions Leak Detector (EELD) to test for leaks in the system.

EVAP Purge Solenoid: The PCM uses the EVAP purge solenoid to control purging of excess fuel vapors stored in the EVAP canister. It remains closed during leak testing to prevent loss of pressure.

EVAP Canister: The EVAP canister stores fuel vapors from the fuel tank for purging.

EVAP Purge Orifice: Limits purge volume.
EVAP System Air Filter: Provides air to the LDP for pressurizing the system. It filters out dirt while allowing a vent to atmosphere for the EVAP system.



LEAK DETECTION PUMP (LDP) COMPONENTS

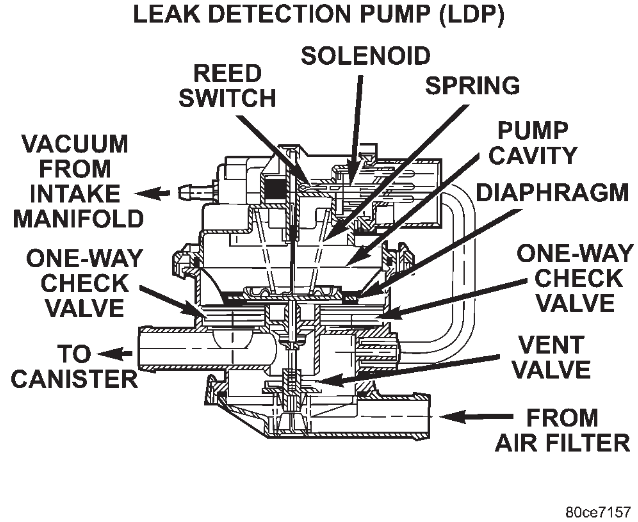
The main purpose of the LDP is to pressurize the fuel system for leak checking. It closes the EVAP system vent to atmospheric pressure so the system can be pressurized for leak testing. The diaphragm is powered by engine vacuum. It pumps air into the EVAP system to develop a pressure of about 7.5″ H_2O (1/4) psi. A reed switch in the LDP allows the PCM to monitor the position of the LDP diaphragm. The PCM uses the reed switch input to monitor how fast the LDP is pumping air into the EVAP system. This allows detection of leaks and blockage.

The LDP assembly consists of several parts (Figure 2). The solenoid is controlled by the PCM, and it connects the upper pump cavity to either engine vacuum or atmospheric pressure. A vent valve closes the EVAP system to atmosphere, sealing the system during leak testing. The pump section of the LDP consists of a diaphragm that moves up and down to bring air in through the air filter and inlet check valve, and pump it out through an outlet check valve into the EVAP system.

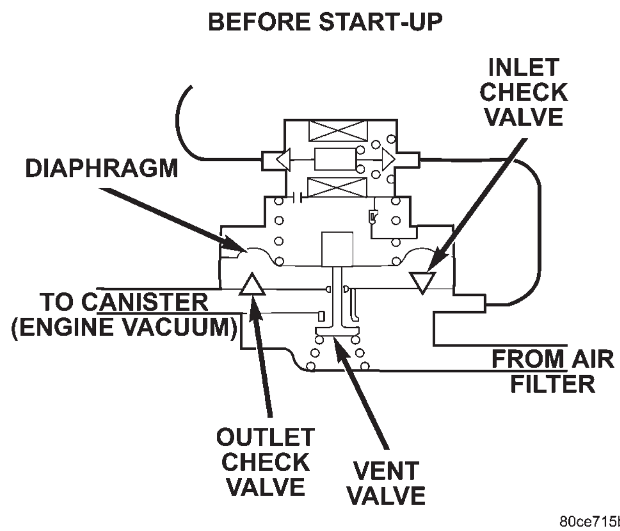
The diaphragm is pulled up by engine vacuum, and pushed down by spring pressure, as the LDP solenoid turns on and off. The LDP also has a magnetic reed switch to signal diaphragm position to the PCM. When the diaphragm is down, the switch is closed, which sends a 12 V (system voltage) signal to the PCM. When the diaphragm is up, the switch is open, and there is no voltage sent to the PCM. This allows the PCM to monitor LDP pumping action as it turns the LDP solenoid on and off.

LDP AT REST (NOT POWERED)

When the LDP is at rest (no electrical/vacuum) the diaphragm is allowed to drop down if the

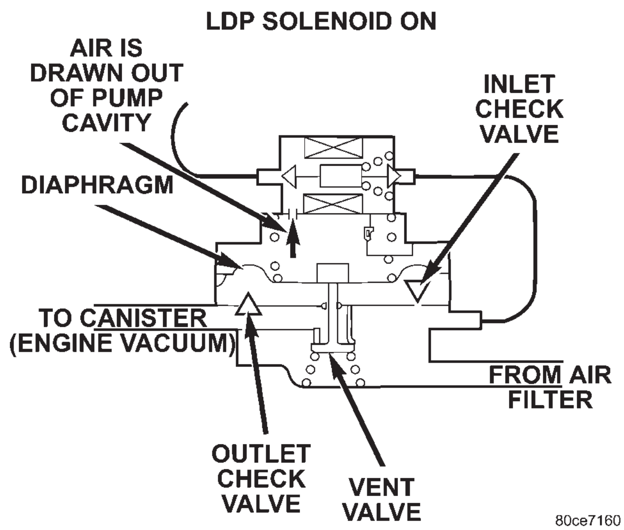


internal (EVAP system) pressure is not greater than the return spring. The LDP solenoid blocks the engine vacuum port and opens the atmospheric pressure port connected through the EVAP system air filter. The vent valve is held open by the diaphragm. This allows the canister to see atmospheric pressure (Figure 3).



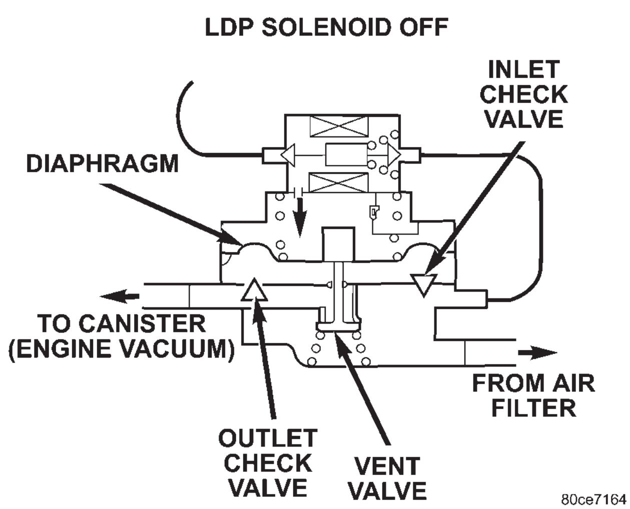
DIAPHRAGM UPWARD MOVEMENT

When the PCM energizes the LDP solenoid, the solenoid blocks the atmospheric port leading through the EVAP air filter and at the same time opens the engine vacuum port to the pump cavity above the diaphragm. The diaphragm moves upward when vacuum above the diaphragm exceeds spring force. This upward movement closes the vent valve. It also causes low pressure below the diaphragm, unseating the inlet check valve and allowing air in from the EVAP air filter. When the diaphragm completes its upward movement, the LDP reed switch turns from closed to open (Figure 4).



DIAPHRAGM DOWNWARD MOVEMENT

Based on reed switch input, the PCM de-energizes the LDP solenoid, causing it to block the vacuum port, and open the atmospheric port. This connects the upper pump cavity to atmosphere through the EVAP air filter. The spring is now able to push the diaphragm down. The downward movement of the diaphragm closes the inlet check valve and opens the outlet check valve pumping air into the evaporative system. The LDP reed switch turns from open to closed, allowing the PCM to monitor LDP pumping (diaphragm up/down) activity (Figure 5). During the pumping mode, the diaphragm will not move down far enough to open the vent valve.



The pumping cycle is repeated as the solenoid is turned on and off. When the evaporative system begins to pressurize, the pressure on the bottom of the diaphragm will begin to oppose the spring pressure, slowing the pumping action. The PCM watches the time from when the solenoid is de-energized, until the diaphragm drops down far enough for the reed switch to change from opened to closed. If the reed switch changes too quickly, a leak may be indicated. The longer it takes the reed switch to change state, the tighter the evaporative system is sealed. If the system pressurizes too quickly, a restriction somwehere in the EVAP system may be indicated.

PUMPING ACTION

During portions of this test, the PCM uses the reed switch to monitor diaphragm movement. The solenoid is only turned on by the PCM after the reed switch changes from open to closed, indicating that the diaphragm has moved down. At other times during the test, the PCM will rapidly cycle the LDP solenoid on and off to quickly pressurize the system. During rapid cycling, the diaphragm will not move enough to change the reed switch state. In the state of rapid cycling, the PCM will use a fixed time interval to cycle the solenoid.

If the system does not pass the EVAP Leak Detection Test, the following DTCs may be set:

- P0442 – EVAP LEAK MONITOR 0.040″ LEAK DETECTED
- P0455 – EVAP LEAK MONITOR LARGE LEAK DETECTED
- P0456 – EVAP LEAK MONITOR 0.020″ LEAK DETECTED
- P1486 – EVAP LEAK MON PINCHED HOSE FOUND
- P1494 – LEAK DETECTION PUMP SW OR MECH FAULT
- P1495 – LEAK DETECTION PUMP SOLENOID CIRCUIT

ENABLING CONDITIONS TO RUN EVAP LEAK DETECTION TEST

1. Cold start: with ambient temperature (obtained from modeling the inlet air temperature sensor on passenger vehicles and the battery temperature sensor on Jeep & truck vehicles) between 4°C (40°F) and 32°C (90°F) for 0.040 leak. Between 4°C (40°F) and 29°C (85°F) for 0.020 leak.
2. Engine coolant temperature within: -12° to -8°C (10° to 18°F) of battery/ambient.
3. Battery voltage between 10 and 15 volts.

NOTE: If battery voltage drops below 10 volts for more than 5 seconds during engine cranking, the EVAP leak detection test will not run.

4. Low fuel warning light off (fuel level must be between 15% and 85%).
5. MAP sensor reading 22 in Hg or above (This is the manifold absolute pressure, not vacuum).
6. No engine stall during test.

NOTE: The following values are approximate and vehicle specific. Use the values seen in pre test/monitor test screen on the DRBIII®. See TSB 25-02-98 for more detail.

A DTC will not set if a one-trip fault is set or if the MIL is illuminated for any of the following:

- Purge Solenoid
- All engine Controller Self Test Faults
- All Cam and/or Crank Sensor Faults
- MAP Sensor Faults
- Ambient/Battery Temperature Sensor Electrical Faults
- All Coolant Sensor Faults
- All TPS Faults
- LDP Pressure Switch Faults
- EGR Solenoid Electrical Faults
- All Injector Faults
- Baro Out Of Range
- Vehicle Speed Faults
- LDP Solenoid Circuit

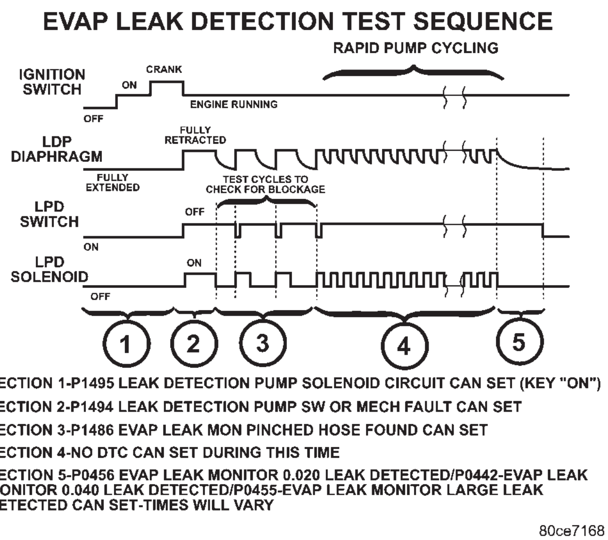


FIGURE 6 SECTION 1

When the ignition key is turned to “ON”, the LDP diaphragm should be in the down position and the LDP reed switch should be closed. If the EVAP system has residual pressure, the LDP diaphragm may be up. This could result in the LDP reed switch being open when the key is turned to “ON” and a P1494 fault could be set because the PCM is expecting the reed switch to be closed.

After the key is turned “ON”, the PCM immediately tests the LDP solenoid circuit for electrical faults. If a fault is detected, DTC P1495 will set, the MIL will illuminate, and the remaining EVAP Leak Detection Test is canceled.

NOTE: If battery temperature is not within range, or if the engine coolant temperature is not within a specified range of the battery temperature, the PCM will not run tests for DTC P1494, P1486, P0442, P0455 and P04441. These temperature calibrations may be different between models.

FIGURE 6 SECTION 2

If DTC P1495 is not set, the PCM will check for DTC P1494. If the LDP reed switch was closed when the key was turned to “ON”, the PCM energizes the LDP solenoid for up to 8 seconds and monitors the LDP switch. As the LDP diaphragm is pulled up by engine vacuum, the LDP reed switch should change from closed to open. If it does not, the PCM sets a temporary fault (P1494) in memory, and waits until the next time the Enabling Conditions are met to run the test again. If this is again detected, P1494 is stored and the MIL is illuminated. If the problem is not detected during the next enabling cycle, the temporary fault will be cleared.

However, if the PCM detects the reed switch open when the key is turned to “ON”, the PCM must determine if this condition is due to residual pressure in the EVAP system, or an actual fault. The PCM stores information in memory on EVAP system purging from previous engine run or drive cycles.

If little or no purging took place, residual pressure could be holding the LDP diaphragm up, causing the LDP switch to be open. Since this is not a malfunction, the PCM cancels the EVAP Leak Detection Test without setting the temporary fault.

If there was sufficient purging during the previous cycle to eliminate EVAP system pressure, the PCM judges that this is a malfunction and sets a temporary fault in memory. The next time that the Enabling Conditions are met, the test will run again. If the fault is again detected, the MIL will illuminate and DTC 1494 will be stored. If the fault is not detected, the temporary fault will be cleared.

FIGURE 6 SECTION 3

If no fault has been detected so far, the PCM begins testing for possible blockage in the EVAP system between the LDP and the fuel tank. This is done by monitoring the time required for the LDP to pump air into the EVAP system during two to three pump cycles. If no blockage is present, the LDP diaphragm is able to quickly pump air out of the LDP each time the PCM turns off the LDP solenoid. If a blockage is present, the PCM detects that the LDP takes longer to complete each pump cycle. If the pump cycles take longer than expected (approximately 6 to 10 seconds) the PCM will suspect a blockage. On the next drive when Enabling Conditions are met, the test will run again. If blockage is again detected, P1486 is stored, and the MIL is illuminated.

FIGURE 6 SECTION 4

After the LDP blockage tests are completed, the PCM then tests for EVAP system leakage. First, the PCM commands the LDP to rapidly pump for 20 to 50 seconds (depending on fuel level) to build pressure in the EVAP system. This evaluates the system to see if it can be sufficiently pressurized. This evaluation (rapid pump cycling) may occur several times prior to leak checking. The LDP reed switch does not close and open during rapid pumping because the diaphragm does not travel through its full range during this part of the test.

FIGURE 6 SECTION 5

Next, the PCM performs one or more tests cycles by monitoring the time required for the LDP reed switch to close (diaphragm to drop) after the LDP solenoid is turned off.

If the switch does not close, or closes after a long delay, it means that the system does not have any significant leakage and the EVAP Leak Detection Test is complete.

However, if the LDP reed switch closes quickly, there may be a leak or the fuel level may be low enough that the LDP must pump more to finish pressurizing the EVAP system. In this case, the PCM will rapidly pump the LDP again to build pressure in the EVAP system, and follow that by monitoring the time needed for several LDP test cycles. This process of rapid pumping followed by several LDP test cycles may repeat several times before the PCM judges that a leak is present.

When leaks are present, the LDP test cycle time will be inversely proportional to the size of the leak. The larger the leak, the shorter the test cycle time. The smaller the leak, the longer the test cycle time. DTC's may be set when a leak as small as 0.5 mm (0.020″) diameter is present.

If the system detects a leak, a temporary fault will be stored in PCM memory. The time it takes to detect a .020, .040, or large leak is based on calibrations that vary from model to model. The important point to remember is if a leak is again detected on the next EVAP Leak Detection Test, the MIL will illuminate and a DTC will be stored based on the size of leak detected. If no leak is detected during the next test, the temporary fault will be cleared.

DIAGNOSTIC TIPS

During diagnosis, you can compare the LDP solenoid activity with the monitor sequence in Figure 6. If the PCM detects a problem that could set a DTC, the testing is halted and LDP solenoid activity will stop. As each section of the test begins, it indicates that the previous section passed successfully. By watching to see which tests complete, you can see if any conditions are present that the PCM considers abnormal.

For example, if the LDP solenoid is energized for the test cycles to test for blockage (P1486), it means that the LDP has already passed its test for P1494. Then, if the PCM detects a possible blockage, it will set a temporary fault without turning on the MIL and continue the leak portion of the test. However, the PCM will assume that the system is already pressurized and skip the rapid pump cycles.

Always diagnose leaks, if possible, before disconnecting connections. Disconnecting connections may mask a leak condition.

Keep in mind that if the purge solenoid seat is leaking, it could go undetected since the leak would end up in the intake manifold. Disconnect the purge solenoid at the manifold when leak checking. In addition, a pinched hose fault (P1486) could set if the purge solenoid does not purge the fuel system properly (blocked seat). The purge solenoid must vent the fuel system prior to the LDP system test. If the purge solenoid cannot properly vent the system the LDP cannot properly complete the test for P1486 and this fault can be set due to pressure being in the EVAP system during the test sequence.

Multiple actuation's of the DRBIII® Leak Detection Pump (LDP) Monitor Test can hide a 0.020 leak because of excess vapor generation. Additionally, any source for additional vapor generation can hide a small leak in the EVAP system. Excess vapor generation can delay the fall of the LDP diaphragm thus hiding the small leak. An example of this condition could be bringing a cold vehicle into a warm shop for testing or high ambient temperatures.

Fully plugged and partially plugged underhood vacuum lines have been known to set MIL conditions. P1494 and P0456 can be set for this reason. Always, thoroughly, check plumbing for pinches or blockage before condemning components.

TEST EQUIPMENT

The Evaporative Emission Leak Detector (EELD) Miller Special Tool 8404 is capable of visually detecting leaks in the evaporative system and will take the place of the ultrasonic leak detector 6917A. The EELD utilizes shop air and a smoke generator to visually detect leaks down to 0.020 or smaller. The food grade oil used to make the smoke includes an UV trace dye that will leave telltale signs of the leak under a black light. This is helpful when components have to be removed to determine the exact leak location. For detailed test instructions, follow the operators manual packaged with the EELD.

IMPORTANT

Be sure that the PCM has the latest software update. Reprogram as indicated by any applicable Technical Service Bulletin. After LDP repairs are completed, verify the repair by running the DRBIII® Leak Detection Pump (LDP) Monitor Test as described in Technical Service Bulletin 18-12-99.

3.2.5 NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems, and conditions even though they could have malfunctions that result in driveability problems. A diagnostic code may not be displayed for the following conditions. However, problems with these systems may cause a diagnostic code to be displayed for other systems. For example, a fuel pressure problem will not register a diagnostic code directly, but could cause a rich or lean condition. This could cause an oxygen sensor, fuel system, or misfire monitor trouble code to be stored in the PCM.

Engine Timing - The PCM cannot detect an incorrectly indexed timing chain, camshaft sprocket, or crankshaft sprocket. The PCM also cannot detect an incorrectly indexed distributor or Cam sensor.(*)

Fuel Pressure - Fuel pressure is controlled by the fuel pressure regulator. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line filter, or a pinched fuel supply.(*)

Fuel Injectors - The PCM cannot detect a clogged fuel injector, a sticking pintle, or that an incorrect injector is installed.(*)

Fuel Requirements - Poor quality gasoline can cause problems such as hard starting, stalling, and stumble. Use of methanol-gasoline blends may result in starting and driveability problems. (See individual symptoms and their definitions in Section 6.0 (Glossary of Terms).

PCM Grounds - The PCM cannot detect a poor system ground.

However, a diagnostic trouble code may be stored in the PCM as a result of this condition.

Throttle Body Air Flow - The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.(*)

Exhaust System - The PCM cannot detect a plugged, restricted, or leaking exhaust system.(*)

Cylinder Compression - The PCM cannot detect uneven, low, or high engine cylinder compression.(*)

Excessive Oil Consumption - Although the PCM monitors the exhaust oxygen content through the oxygen sensor when the system is in a closed loop, it cannot determine excessive oil consumption.

NOTE: Any of these conditions could result in a rich or lean condition causing an oxygen sensor trouble code to be stored in the PCM, or the vehicle may exhibit one or more of the driveability symptoms listed in the Table of Contents.

3.2.6 SKIS OVERVIEW

The Sentry Key Immobilizer System (SKIS) is an immobilizer system designed to prevent unauthorized vehicle operation. The system consists of a Sentry Key Immobilizer Module (SKIM) sends a PCI Bus message to the engine controller indicating ignition key status. Upon receiving this message the PCM will terminate engine operation or allow the engine to continue to operate.

3.2.7 SKIM ON-BOARD DIAGNOSTICS

The SKIM has been programmed to transmit and monitor many different coded messages as well as PCI Bus messages. This monitoring is called “On Board Diagnosis”.

Certain criteria must be met for a diagnostic trouble code to be entered into the SKIM memory. The criteria may be a range of Input voltage, PCI Bus message, or coded messages to the SKIM. If all of the criteria for monitoring a circuit or function are met and a fault is sensed, a diagnostic trouble code will be stored in the SKIM memory.

3.2.8 SKIS OPERATION

When ignition power is supplied to the SKIM, the SKIM performs an internal self-test. After the self-test is completed, the SKIM energizes the antenna (this activates the transponder chip) and sends a challenge to the transponder chip. The transponder chip responds to the challenge by generating an encrypted response message using the following:

Secret Key - This is an electronically stored value (identification number) that is unique to each SKIS. The secret key is stored in the SKIM, PCM and all ignition key transponders.

Challenge - This is a random number that is generated by the SKIM at each ignition key cycle. The secret key and challenge are the two variables used in the algorithm that produces the crypto algorithm to receive, decode and respond to the message sent by the SKIM. After responding to the coded message, the transponder sends a transponder ID message to the SKIM. The SKIM compares the transponder ID to the available valid ignition key codes in the SKIM memory (8 key maximum). After validating the key, the SKIM sends a PCI Bus message called a “Seed Request” to the engine controller then waits for a PCM response. If the PCM does not respond, the SKIM will send the seed request again. After three failed attempts, the SKIM will stop sending the seed request and store a trouble code. If the PCM sends a seed response, the SKIM sends a valid/invalid key message to the PCM. This is an encrypted message that is generated using the following:

VIN - Vehicle Identification Number

Seed - This is a random number that is generated by the PCM at each ignition key cycle.

The VIN and Seed are the two variables used in the rolling code algorithm that encrypts the “valid/invalid key” message. The PCM used the rolling code algorithm to receive, decode and respond to the valid/invalid key message sent by the SKIM. After sending the valid/invalid key message the SKIM waits 3.5 seconds for a PCM status message from the PCM. If the PCM does not respond with a valid key message to the SKIM, a fault is detected and a trouble code is stored. The SKIS incorporates a warning lamp located in the instrument cluster. The lamp receives power and ground from the instrument cluster. The lamp is actuated when the SKIM sends a PCI Bus message to the instrument cluster requesting the lamp on. The SKIM will request warning lamp illumination for:

– bulb checks at ignition on
– to alert the vehicle operator to a SKIS malfunction
– customer key programming mode

For all faults except transponder faults and VIN mismatch, the lamp remains on steady. In the event of a transponder fault the light flashes at a rate of 1 Hz (once per second). If a fault is present the lamp will remain on or flashing for the complete ignition cycle. If a fault is stored in SKIM memory which prevents the system from operating properly, the PCM will allow the engine to start and run (for 2 seconds) up to six times. After the sixth attempt the PCM will not allow the engine to start.

3.2.9 PROGRAMMING THE POWERTRAIN CONTROL MODULE

Important Notice: Before replacing the PCM for a failed driver, control circuit or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal failure to components (i.e. relay and solenoids) and short circuits (i.e. 12-volt pull-ups, drivers and ground sensors). These failures are difficult to detect when a double fault has occurred and only one DTC has set.

NOTE: If the PCM and the SKIM are replaced at the same time, program the VIN into the PCM first. All vehicle keys will then need to be replaced and programmed to the new SKIM.

The SKIS “Secret Key” is an ID code that is unique to each SKIS. This code is programmed and stored in the SKIM, PCM and transponder chip (ignition key). When replacing the PCM it is necessary to program the secret key into the PCM.

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRBIII® and select “THEFT ALARM”, “SKIM” then “MISCELLANEOUS”.
3. Select “PCM REPLACED”.
4. Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: If three attempts are made to enter the secure access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit this lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned off. Also, monitor the battery state and connect a battery charger if necessary).

5. Press “ENTER” to transfer the secret key (the SKIM will send the secret key to the PCM).

3.2.10 PROGRAMMING THE SENTRY KEY IMMOBILIZER MODULE

NOTE: If the PCM and the SKIM are replaced at the same time, program the VIN into the PCM first. All vehicle keys will then need to be replaced and programmed to the new SKIM.

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRBIII® and select “THEFT ALARM”, “SKIM”, then MISCELLANEOUS.
3. Select “SKIM MODULE REPLACEMENT (GASOLINE)”.
4. Program the vehicle four-digit PIN into the SKIM.
5. Select “COUNTRY CODE” and enter the correct country.

NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, the SKIM must be replaced.

6. Select "UPDATE VIN" (the SKIM will learn the VIN from the PCM).
7. Press "ENTER" to transfer the VIN (the PCM will send the VIN to the SKIM).
8. The DRBIII® will ask if you want to transfer the secret key from the PCM. This will ensure the current vehicle ignition keys will still operate the SKIS system.

3.2.11 PROGRAMMING THE IGNITION KEYS TO THE SENTRY KEY IMMOBILIZER MODULE

1. Turn the ignition on (transmission in park/ neutral).
2. Use the DRBIII® and select "THEFT ALARM", "SKIM" then "MISCELLANEOUS".
3. Select "PROGRAM IGNITION KEYS".
4. Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM, the key cannot be transferred to another vehicle.

If ignition key programming is unsuccessful, the DRBIII® will display one of the following messages:

Programming Not Attempted – The DRBIII® attempts to read the programmed key status and there are not keys programmed in the SKIM memory.

Programming Key Failed – (Possible Used Key From Wrong Vehicle) - SKIM is unable to program key due to one of the following:

– faulty ignition key transponder

– ignition key is programmed to another vehicle.

8 Keys Already Learned, Programming Not Done – SKIM transponder ID memory is full.

– Obtain ignition keys to be programmed from customer (8 keys maximum).

– Using the DRBIII®, erase all ignition keys by selecting "MISCELLANEOUS" and "ERASE ALL CURRENT IGN. KEYS"

– Program all ignition keys.

Learned Key In Ignition – Ignition key transponder ID is currently programmed in SKIM memory.

3.3 DIAGNOSTIC TROUBLE CODES

Each diagnostic trouble code is diagnosed by following a specific testing procedure. The diagnostic test procedures contain step-by-step instructions for determining the cause of trouble codes as well as no trouble code problems. It is not necessary to perform all of the tests in this book to diagnose an individual code.

Always begin by reading the diagnostic trouble codes using the DRBIII®.

3.3.1 HARD CODE

A diagnostic trouble code that comes back within one cycle of the ignition key is a "hard" code. This means that the problem is present when the PCM checks that circuit or function. Procedures in this manual verify if the trouble code is a hard code at the beginning of each test. When it is not a hard code, an "intermittent" test must be performed.

Codes that are for OBDII/EUROIII monitors will not set with just the ignition key on. Comparing these to non-emission codes, they will seem like an intermittent. These codes require a set of parameters to be performed (The DRBIII® pre-test screens will help with this for MONITOR codes), this is called a "TRIP". All OBDII/EUROIII DTCs will set after two or in some cases one trip failures, and the MIL will be turned on. These codes require three successful, no failures, TRIPS to extinguish the MIL, followed by 40 warm-up cycles to erase the code. For further explanation of TRIPS, Pre-test screens, Warm-up cycles, and the use of the DRBIII®, refer to the On Board Diagnostic training booklet #81-699-97094.

3.3.2 INTERMITTENT CODE

A diagnostic trouble code that is not there every time the PCM checks the circuit is an "intermittent" code. Most intermittent codes are caused by wiring or connector problems. Intermittents that come and go like this are the most difficult to diagnose; they must be looked for under specific conditions that cause them. The following procedures may assist you in identifying a possible intermittent problem:

- Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.
- Refer to any S.T.A.R. Hotline Newsletters or technical service bulletins that may apply.
- Use the DRBIII® data recorder or co-pilot.

3.3.3 STARTS SINCE SET COUNTER

This reset counter counts the number of times the vehicle has been started since codes were last set or erased. This counter will count up to 255 start counts.

The number of starts helps determine when the trouble code actually happened. This is recorded by the PCM and can be viewed on the DRBIII® as STARTS since set.

When there are no trouble codes stored in memory, the DRBIII® will display "NO TROUBLE CODES FOUND" and the reset counter will show "STARTS since set = XXX."

OBDII/EUROIII vehicles will also display a DTC Specific or Global "Good Trip" counter which will indicate the number of "Good Trips" since the DTC was set. After 3 consecutive "Good Trips," the MIL is extinguished and the good trip counter is replaced by a "Warm Up Cycle" counter. 40 Warm-Up Cycles will erase the DTC and Freeze Frame information.

3.3.4 NO START INFORMATION

IMPORTANT NOTE: If the Powertrain Control Module has been programmed, a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting.

FOR ABS AND AIR BAG SYSTEMS:

1. Enter correct VIN and Mileage in PCM.
2. Erase codes in ABS and Air Bag modules.

FOR SKIM THEFT ALARM:

1. Connect the DRBIII® to the data link connector.
2. Go to Theft Alarm, SKIM, Misc. and place the SKIM in *secured acess* mode, by using the appropriate PIN code for this vehicle.
3. Select Update the Secret Key data, data will be transferred from the SKIM to the PCM (This is required to allow the vehicle to start with the new PCM).
4. If three attempts are made to enter *secured access* mode using the incorrect PIN, *secured access* mode will be locked out for one hour. To exit this lock out mode, leave the ignition key in the Run/Start position for one hour. Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary.

After reading Section 3.0 (System Description and Functional Operation), you should have a better understanding of the theory and operation of the on-board diagnostics, and how this relates to the diagnosis of a vehicle that may have a driveability-related symptom or complaint.

3.4 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading trouble codes, erasing trouble codes, and other DRBIII® functions.

3.5 DRBIII® ERROR MESSAGES AND BLANK SCREEN

Under normal operation, the DRBIII® will display one of only two error messages:

– User-Requested WARM Boot by pressing MORE and NO at the same time.

```
ver: 2.29
date: 1 Oct 93
file: key_itf.cc
date: Jan 12 1994
line: 544
err: 0x1 User-Requested WARM Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

or User-Requested COLD Boot by pressing MORE YES at the same time.

```
ver: 2.29
date: 1 Oct 99
file: key_HND1.CC
date: Mar 8 2000
line: 1297
err: 0x1
User-Requested COLD Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

If the DRBIII® should display any other error message, record the entire display and call the Star Center.

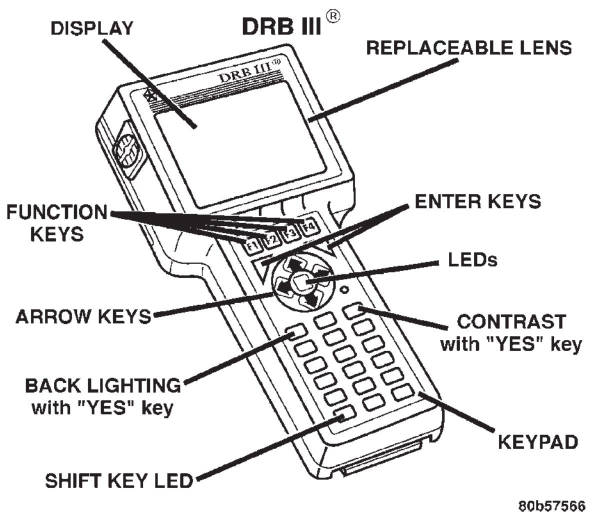
3.5.1 DRBIII® DOES NOT POWER UP

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage (data link connector cavity 16). Check for proper ground connection at DLC cavity. A minimum of 11 volts is required to adequately power the DRBIII® .

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, and inoperative DRBIII® may be the result of faulty cable or vehicle wiring. For a blank screen, refer to the appropriate body diagnostics manual.

3.5.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.



4.0 DISCLAIMERS, SAFETY, WARNINGS

4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the parking brake does not hold the drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing a powertrain system problem, it is important to follow approved procedures where applicable. These procedures can be found in the service manual procedures. Following these procedures is very important to the safety of individuals performing diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components in the powertrain system are intended to be serviced as a complete assembly. Attempting to remove or repair certain system sub-components may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATION LIMITS.

Follow the vehicle manufacturer's service specifications at all times.

- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0 - 500 peak volts AC 0 - 500 volts DC
Ohms (resistance)*	0 - 1.12 megohms
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-50 - 600°C -58 - 1100°F

* Ohms cannot be measured if voltage is present.

Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- A 10A fuse or circuit breaker must be used to protect the circuit being tested.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

4.3 WARNINGS AND CAUTIONS

4.3.1 ROAD TEST WARNINGS

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read the DRBIII® screen while in motion. Do not hang the DRBIII® from the rear view mirror or operate it yourself. Have an assistant available to operate the DRBIII®.

4.3.2 VEHICLE DAMAGE CAUTIONS

Before disconnecting any control module, make sure the ignition is “off”. Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal end (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage the insulation and wire and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second DTC could be set, making diagnosis of the original problem more difficult.

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box) scan tool
Evaporative Emissions Leak Detector #8404
Fuel pressure kit #8978
fuel filler adapter #8382
fuel pressure adapter (C-6631) or #6539
fuel pressure kit (C-4799-B) or #5069
fuel release hose (C-4799-1)
Mirco 420 battery system tester
Min air flow fitting #6714
jumper wires
ohmmeter
oscilloscope
vacuum gauge
voltmeter
12-volt test light minimum 25 ohms resistance with probe #6801

CAUTION: A 12-volt test light should not be used for the following circuits, damage to the Powertrain Controller will occur.

- 5-volt Supply
- J1850 PCI Bus
- CCD Bus
- CKP Sensor Signal
- CMP Sensor Signal
- Vehicle Speed Sensor Signal
- O2 Sensor Signal

6.0 ACRONYMS

A/C	Air Conditioning
ABS	Anti-lock Brake System
ASD Relay	Auto Shutdown Relay
APPS	Accelerator Pedal Position Sensor
Baro	Barometric Pressure
BCM	Body Control Module
BTS	Battery Temperature Sensor
CAA	Clean Air Act
CAB	Controller Antilock Brakes
CARB	California Air Resources Board
CCD BUS	Chrysler Collision Detection Bus
CKP Sensor	Crankshaft Position Sensor

CMP Sensor	Camshaft Position Sensor
CO	Carbon Monoxide
DCP Solenoid	Duty-Cycle Purge Solenoid
DLC	Data Link Connector
DRBIII®	Diagnostic Readout Box - 3rd Generation
DTC	Diagnostic Trouble Code
DVOM	Digital Volt Ohm Meter
EATX II	Electronic Automatic Transmission Controller 2nd Generation
EC	European Community
ECT Sensor	Engine Coolant Temperature Sensor
EEPROM	Electrically Erasable Programmable Read Only Memory
EGR Valve	Exhaust Gas Recirculation Valve
EMCC	Electronically Modulated Converter Clutch
EMI	Electro-Magnetic Interference
EOBD	European OBD (based upon Euro Stage III)
EPA	Environmental Protection Agency
EPP	Engine Position Pulse
EU	European Union
EVAP	Evaporative Emission System
EVR	Electronic Voltage Regulator
EWMA	Exponentially Weighted Moving Average
FTP	Federal Test Procedure
HC	Hydrocarbons
HO2S	Heated Oxygen Sensor
Generator	Previously called “alternator”
IAC Motor	Idle Air Control Motor
IAT Sensor	Intake Air Temperature Sensor
I/M	Inspection and Maintenance Testing
JTEC	Jeep/Truck Engine Controller
LDP	Leak Detection Pump
LSIACV	Linear Solenoid Idle Air Control Valve
MAF	Mass Air flow
MAP Sensor	Manifold Absolute Pressure Sensor
MDS_2®	Mopar Diagnostic System 2nd Generation
MIL	Malfunction Indicator Lamp
MTV	Manifold Tuning Valve
NGC	Next Generation Controller
NTC	Negative Temperature Coefficient
NVLD	Natural Vacuum Leak Detection
O_2 Sensor	Oxygen Sensor
O2S	Oxygen Sensor
OBD I	On Board Diagnostics 1st Generation
OBD II	On-Board Diagnostics 2nd Generation
ORVR	On-Board Refueling Vapor Recovery
PCI BUS	Programmable Communications Interface BUS (J1850)
PCM	Powertrain Control Module
PCV	Positive Crankcase Ventilation
PDC	Power Distribution Center
PEP	Peripheral Expansion Port
P/N	Park/Neutral
PPS	Proportional Purge Solenoid
PS	Power Steering
PSP	Power Steering Pressure (Switch)
PTC	Positive Temperature Coefficient
PWM	Pulse-Width Modulation
RAM	Random Access Memory
RFI	Radio Frequency Interference
RKE	Remote Keyless Entry
RPM	Revolutions Per Minute

SAE	Society of Automotive Engineers
SBEC	Single Board Engine Controller
SCW	Similar Conditions Window
SKIM	Sentry Key Immobilizer Module
SRV	Short Runner Valve
TCC	Torque Converter Clutch
TCM	Transmission Control Module
TDC	Top Dead Center
TPS	Throttle Position Sensor
TRS	Transmission Range Sensor
VSS	Vehicle Speed Sensor
WOT	Wide Open Throttle

NOTES

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom:
*NO RESPONSE FROM PCM (PCI BUS)

POSSIBLE CAUSES
PCM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, enter Body then Body Computer. With the DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, enter Passive Restraints then Airbag. Were you able to establish communications with any of the modules? Yes → Go To 2 No → Refer to symptom PCI Bus Communication Failure in the Communications category. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (PCI BUS) — Continued

TEST	ACTION	APPLICABILITY
2	With the DRB read PCM Diagnostic Trouble Codes. This is to ensure power and grounds to the PCM are operational. **NOTE: If the DRB will not read PCM DTC's, follow the NO RESPONSE TO PCM (SCI only) symptom path.** **NOTE: If the vehicle will not start and the DRBIII® displays a no response message, refer to the appropriate symptom in the powertrain diagnostic procedures.** Turn the ignition off. Disconnect the PCM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. Install DRBIII® SuperCard 2 CH8361 into DRBIII®. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the PCM ground. Connect the Red lead to the PCI Bus circuit in the PCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the PCI Bus circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM PCM (SCI ONLY)

POSSIBLE CAUSES
CHECK PCM POWERS AND GROUNDS
SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE
TRANSMISSION CONTROL MODULE
SCI RECEIVE CIRCUIT SHORTED TO VOLTAGE
SCI CIRCUITS SHORTED TOGETHER
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
SCI RECEIVE CIRCUIT SHORTED TO GROUND
SCI RECEIVE CIRCUIT OPEN
SCI TRANSMIT CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Perform the symptom Checking PCM Power and Ground Circuits in the Driveability category. **NOTE: With the DRBIII® in the generic scan tool mode, attempt to communicate with the PCM.** **NOTE: If the DRBIII® can communicate with the PCM in the generic scan tool mode, it may not be necessary to perform this step.** Did the vehicle pass this test? Yes → Go To 2 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the TCM harness connector (if equipped). **NOTE: If vehicle is not equipped with a TCM, answer yes to the question.** Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Transmit circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Transmission Control Module in accordance with the service information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (SCI ONLY) — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Disconnect the TCM harness connector (if equipped). Turn the ignition on. Measure the voltage of the SCI Transmit circuit at the DLC connector (cav 7). Is the voltage above 1.0 volt? Yes → Repair the SCI Transmit circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Turn the ignition on. Measure the voltage of the SCI Receive circuit at the DLC connector (cav 6). Is the voltage above 1.0 volt? Yes → Repair the SCI Receive circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Measure the resistance between the SCI Transmit circuit and the SCI Receive circuit at the PCM connector. Is the resistance below 5.0 ohms? Yes → Repair the short between the SCI Transmit and the SCI Receive circuits. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Receive circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Receive circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 8	All
8	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Receive circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the SCI Receive circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (SCI ONLY) — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Transmit circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the SCI Transmit circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM SENTRY KEY IMMOBILIZER MODULE

POSSIBLE CAUSES
ATTEMPT TO COMMUNICATE WITH THE BCM
GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
FUSED B(+) CIRCUIT OPEN
OPEN PCI BUS CIRCUIT
SENTRY KEY IMMOBILIZER MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, enter Body then Body Computer. Was the DRB able to I/D or communicate with the BCM? Yes → Go To 2 No → Refer to the symptom list for problems related to no communication with the BCM. Perform SKIS VERIFICATION.	All
2	Turn the ignition off. Disconnect the SKIM harness connector. Using a 12-volt test light connected to 12-volts, probe each ground circuit. Does the test light illuminate brightly for each circuit? Yes → Go To 3 No → Repair the ground circuit for an open. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Disconnect the SKIM harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused Ignition Switch Output circuit for an open. Perform SKIS VERIFICATION.	All
4	Turn the ignition off. Disconnect the SKIM harness connector. Using a 12-volt test light connected to ground, probe the Fused B(+) circuit. Does the test light illuminate brightly? Yes → Go To 5 No → Repair the Fused B+ circuit for an open. Perform SKIS VERIFICATION.	All

*NO RESPONSE FROM SENTRY KEY IMMOBILIZER MODULE — Continued

TEST	ACTION	APPLICABILITY
5	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the SKIM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the SKIM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 6 No → Repair the PCI Bus circuit for an open. Perform SKIS VERIFICATION.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All

Symptom:
*PCI BUS COMMUNICATION FAILURE

POSSIBLE CAUSES
WIRING HARNESS INTERMITTENT
OPEN PCI BUS CIRCUIT AT THE DATA LINK CONNECTOR (DLC)
PCI BUS CIRCUIT SHORTED TO VOLTAGE
MODULE SHORT TO VOLTAGE
PCI BUS CIRCUIT SHORTED TO GROUND
MODULE SHORT TO GROUND

TEST	ACTION	APPLICABILITY
1	**Note: Determine which modules this vehicle is equipped with before beginning.** **Note: When attempting to communicate with any of the modules on this vehicle, the DRB will display 1 of 2 different communication errors: a NO RESPONSE message or a BUS +/- SIGNALS OPEN message.** Turn the ignition on. Using the DRB, attempt to communicate with the following control modules: Airbag Control Module Body Control Module MIC (INSTRUMENT CLUSTER) Was the DRBIII® able to communicate with one or more Module(s)? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: If the DRB can not communicate with a single module, refer to the category list for the related symptom.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All
3	Turn the ignition off. Disconnect the PCM/ECM harness connector. Disconnect the DRB from the Data Link Connector (DLC). Disconnect the negative battery cable. Measure the resistance of the PCI Bus circuit between the Data Link Connector (DLC) and the PCM/ECM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Reconnect the PCM/ECM harness connector and the negative battery cable.** Turn the ignition on. Measure the voltage of the PCI Bus circuit at the Data Link Connector (DLC). Is the voltage above 7.0 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Using a voltmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. **Note: When performing the next step turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.** Turn the ignition on. While monitoring the voltmeter, disconnect each module the vehicle is equipped with one at a time. Is the voltage steadily above 7.0 volts with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to voltage was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the negative battery cable. Using a ohmmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. While monitoring the ohmmeter, disconnect each module the vehicle is equipped with one at a time. **NOTE: Total bus resistance to ground thru all of the modules is typically between 350 to 1000 ohms. The more modules on the bus, the lower the total bus resistance will be.** Is the resistance below 150.0 ohms with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to ground was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
INTERMITTENT CONDITION

POSSIBLE CAUSES
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Refer to any Technical Service Bulletins (TSBs) that may apply. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set. With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wire harness. Look for parameter values to change and/or a DTC to set. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals. Inspect and clean all PCM, engine, and chassis grounds that are related to the most current DTC. If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits For any Relay DTCs, actuate the Relay with the DRBIII® and wiggle the related wire harness to try to interrupt the actuation. For intermittent Evaporative Emission trouble codes perform a visual and physical inspection of the related parts including hoses and the Fuel Filler cap. For intermittent Misfire DTC's check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt. Use the DRBIII® to perform a System Test if one applies to failing component. A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions. Were any problems found during the above inspections? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW
P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH
P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW
P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH
P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW
P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW.

When Monitored and Set Condition:

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW

When Monitored: Battery voltage above 10.6 volts, ASD is up, and O2 heater is on.

Set Condition: Desired state does not equal actual state.

P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH

When Monitored: Battery voltage above 10.6 volts, ASD up, and O2 heater off.

Set Condition: Desired state does not equal actual state.

P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW

When Monitored: Battery voltage above 10.6 volts, ASD up, and O2 heater on.

Set Condition: Desired state doesn’t equal actual state.

P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH

When Monitored: Battery voltage above 10.6 volts, ASD is up, and O2 heater is off.

Set Condition: Desired state doesn’t equal actual state.

P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW

When Monitored: Battery voltage above 10.6 volts, ASD is up, and O2 heater is on.

Set Condition: Desired state doesn’t equal actual state.

P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH

When Monitored: Battery voltage above 10.6 volts, ASD is up, and O2 heater is off.

Set Condition: Desired state doesn’t equal actual state.

POSSIBLE CAUSES
O2 HEATER TEST

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW — Continued

POSSIBLE CAUSES
O2 SENSOR HEATER ELEMENT
(A71) FUSED ASD RELAY OUTPUT CIRCUIT
HEATER CONTROL CIRCUIT OPEN
HEATER CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, actuate the O2 Heater test. Monitor the O2 Heater Voltage for 5 minutes. Did the voltage drop down close to zero during the Heater test? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2 **NOTE: Stop the actuation before continuing.**	All
2	Turn the ignition off. Disconnect the O2 Sensor harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance of the O2 Heater element at the O2 Sensor connector(component side). Is the resistance value between 4.0 and 5.0 ohms at 70°F (21.1°C)? Yes → Go To 3 No → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. Measure the voltage on the (A71) Fused ASD Relay Output circuit at the O2 Sensor harness connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open or short to ground in the (A71) Fused ASD Relay circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. **NOTE: Stop the actuation before continuing.**	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the excessive resistance in the O2 Heater Control (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
5	Measure the resistance between ground and the O2 Heater Control (PWM) circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Heater Control (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE

When Monitored and Set Condition:

P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE

When Monitored: With the ignition on and no Battery Temperature Sensor Open or Short Faults present.

Set Condition: After 5 warm cycles have occurred (coolant increases at least 22°C (40°F) to a minimum of 71°C (160°F) and the odometer mileage has increased 196.6 miles and the Battery Temperature has changed less than 4°C (7.2°F) change in temperature. One trip fault.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(K118) BATTERY TEMP SIGNAL CIRCUIT SHORTED TO VOLTAGE
BATTERY TEMPERATURE SENSOR
RESISTANCE IN THE (K118) BATTERY TEMP SENSOR SIGNAL CIRCUIT
RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT
(K118) BATTERY TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the Battery Temp Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K118) Battery Temp Signal circuit in the Sensor connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage on the (K118) Batt Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, read the Battery Temp Sensor voltage with the Batt Temp Sensor still disconnected. Is the voltage above 4.6 volts? Yes → Go To 4 No → Go To 7	All
4	Connect a jumper wire between the (K118) Battery Temp Signal circuit and the (K4) Sensor ground circuit at the Sensor harness connector. With the DRBIII®, read the Battery Temp Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5 **NOTE: Remove the jumper wire before continuing.**	All
5	Turn the ignition off. Connect the Battery Temp Sensor harness connector. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Backprobe the (K118) Battery Temp Sensor Signal circuit at the Sensor harness connector and the PCM harness connector with both voltmeter leads. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 6 No → Repair the excessive resistance in the (K118) BatteryTemp Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Backprobe the (K4) Sensor ground circuit at the Battery Temperature Sensor harness connector and the PCM harness connector using both volt meter leads. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 8 No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Battery Temp Sensor harness connector. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K118) Battery Temp Signal circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K118) Battery Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0107-MAP SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P0107-MAP SENSOR VOLTAGE TOO LOW

When Monitored: With the engine RPM above 416 but less than 1500, the TPS voltage less than 1.13 volts, and battery voltage greater than 10.4 volts.

Set Condition: The MAP sensor signal voltage is below 0.1 of a volt for 2.0 seconds with the engine running.

POSSIBLE CAUSES
MAP SENSOR VOLTAGE BELOW 0.1 OF A VOLT
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAP SENSOR
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. With the DRBIII®, read the MAP Sensor voltage. Is the voltage below 0.1 of a volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 6	All

P0107-MAP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, monitor the MAP Sensor voltage with the ignition on and Map Sensor still disconnected. Is the voltage above 1.2 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to (K4) Sensor ground in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance in the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 100 ohms? Yes → Go To 7 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0108-MAP SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0108-MAP SENSOR VOLTAGE TOO HIGH

When Monitored: With the engine RPM above 400, the TPS voltage less than 1.13 volts, and battery voltage greater than 10.4 volts

Set Condition: The MAP Sensor signal voltage is greater than 4.88 volts at start or with the engine running for 2.2 seconds.

POSSIBLE CAUSES
MAP SENSOR VOLTAGE ABOVE 4.8 VOLTS
MAP SENSOR
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K1) MAP SENSOR SIGNAL CIRCUIT OPEN
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. With the DRBIII®, read the MAP Sensor voltage. Is the voltage above 4.8 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Connect a jumper wire between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit in the Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the MAP Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0108-MAP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connector. Ignition on, engine not running. Measure the voltage on the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Go To 7 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0111-INTAKE AIR TEMP SENSOR PERFORMANCE

When Monitored and Set Condition:

P0111-INTAKE AIR TEMP SENSOR PERFORMANCE

When Monitored: With the ignition on. No Intake Air Temperature Sensor Open or Short Faults present.

Set Condition: After 5 warm cycles have occurred (coolant increases from great than 22°C (40°F) to a minimum of 71°C (160°F) and the odometer mileage has increased 196.6 miles and the Intake Air Temperature has had less than 5°C (9°F) change in temperature.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
IAT SENSOR VOLTAGE BELOW 1.0 VOLT
RESISTANCE IN THE (K21) IAT SENSOR SIGNAL CIRCUIT
RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the Intake Air Temperature Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage above 4.6 volts? Yes → Go To 3 No → Go To 4	All
3	Connect a jumper wire across the IAT Sensor harness connector. With the DRBIII®, read the IAT voltage. Is the voltage below 1.0 volt? Yes → Replace the Intake Air Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4 **NOTE: Remove the jumper wire and connect the Sensor harness connector before continuing.**	All

P0111-INTAKE AIR TEMP SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop of the (K21) IAT Sensor Signal circuit, by backprobing the IAT Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the excessive resistance in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop test of the Sensor ground circuit by backprobing the Sensor ground circuit at the IAT Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 6 No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. **NOTE: Turn the ignition off before continuing.**	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Intake Air Temperature (IAT) sensor circuit voltage at the PCM goes below 0.8 of a volt.

POSSIBLE CAUSES
IAT SENSOR VOLTAGE BELOW 1.0 VOLT
IAT SENSOR
(K21) IAT SENSOR SIGNAL SHORTED TO GROUND
(K21) IAT SENSOR SIGNAL SHORTED TO (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the IAT voltage. Is the voltage below 1.0 volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the Intake Air Temp Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read IAT Sensor voltage. Is the voltage above 1.0 volt? Yes → Replace the IAT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K21) IAT Sensor Signal circuit at the IAT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Measure the resistance between the (K21) IAT Sensor Signal circuit and the (K4) Sensor ground circuit at the IAT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The intake air temperature (IAT) sensor circuit voltage at the PCM goes above 4.9 volts.

POSSIBLE CAUSES
IAT SENSOR VOLTAGE ABOVE 4.8 VOLTS
IAT SENSOR
(K21) IAT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K21) IAT SENSOR SIGNAL CIRCUIT OPEN
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the IAT voltage. Is the voltage above 4.8 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the IAT Sensor harness connector. Connect a jumper wire between the (K21) IAT Sensor Signal circuit and the (K4) Sensor ground circuit in the IAT harness connector. Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage below 1.0 volt? Yes → Replace the IAT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K21) IAT Sensor Signal circuit. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (K21) IAT Sensor Signal circuit from the IAT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance of the (K4) Sensor ground circuit from the IAT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM goes below 0.8 of a volt for more than 3 seconds.

POSSIBLE CAUSES
ECT VOLTAGE BELOW 1.0 VOLT
ECT SENSOR
(K2) ECT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT SENSOR SIGNAL SHORTED TO (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the ECT Sensor voltage. Is the ECT Sensor voltage below 1.0 volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the ECT harness connector. Ignition on, engine not running. With the DRBIII®, read ECT voltage. Is the voltage above 1.0 volt? Yes → Replace the ECT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K2) ECT Sensor Signal circuit at the ECT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Measure the resistance between the (K2) ECT Sensor Signal circuit and the (K4) Sensor ground circuit at the ECT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM goes above 4.94 volts for more than 3 seconds.

POSSIBLE CAUSES
ECT VOLTAGE ABOVE 4.9 VOLTS
ECT SENSOR
(K2) ECT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K2) ECT SENSOR SIGNAL CIRCUIT OPEN
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read ECT voltage. Is the voltage above 4.9 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the ECT harness connector. Ignition on, engine not running. Connect a jumper wire between the (K2) ECT Sensor Signal circuit and the (K4) Sensor ground circuit in the ECT harness connector. With the DRBIII®, read the ECT voltage. Is the voltage below 1.0 volt? Yes → Replace the ECT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K2) ECT Sensor Signal circuit at the ECT Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (K2) ECT Sensor Signal circuit from the ECT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance of the (K4) Sensor ground circuit from the ECT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP

When Monitored and Set Condition:

P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP

When Monitored: With the engine running and no MAP sensor or TPS DTCs set. Engine speed must be greater than 1600 RPM.

Set Condition: The PCM performs two separate tests. When the manifold vacuum is low, the TPS signal should be high and when the manifold vacuum is high, the TPS signal should be low. If the proper TPS voltage is not detected when the two conditions are met, a DTC will be set after 4 seconds.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
RESISTANCE IN (K7) MAP 5-VOLT SUPPLY CIRCUIT
(K7) MAP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAP SENSOR
RESISTANCE IN THE (K1) MAP SENSOR SIGNAL CIRCUIT
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN (K4) MAP SENSOR GROUND CIRCUIT
TP SENSOR OPERATION
RESISTANCE IN THE (K7) TP SENSOR 5-VOLT SUPPLY CIRCUIT
(K7) TP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
THROTTLE POSITION SENSOR
RESISTANCE IN (K22) TP SENSOR #1 SIGNAL CIRCUIT
(K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN (K4) SENSOR GROUND CIRCUIT
PCM

P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Diagnose any TP Sensor or MAP component DTCs first before continuing.** **NOTE: If the P0500 - No Vehicle Speed Signal is set along with this DTC, refer to the P0500 diagnostics before continuing.** **NOTE: The throttle plate and linkage should be free of binding and carbon build up.** **NOTE: Ensure the throttle plate is at the idle position.** Ignition on, engine not running. **NOTE: Repair any vacuum leaks that are present before continuing.** With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Start the engine. With the DRBIII®, monitor the MAP Sensor voltage. Snap the throttle. Does the DRBIII® display MAP voltage from below 2.0 volts at idle to above 3.5 volts at WOT? Yes → Go To 3 No → Go To 10	All
3	Ignition on, engine not running. With the DRBIII®, monitor the TP Sensor voltage while slowly depressing the throttle pedal from the idle position to the wide open throttle position. Does the voltage start at approximately 0.8 of a volt and go above 3.5 volts smoothly? Yes → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the TP Sensor harness connector. Disconnect the PCM harness connectors. Measure the resistance of the (K7) 5-volt Supply circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the excessive resistance in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All

P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Connect the PCM harness connectors. Ignition on, engine not running. With the DRBIII®, monitor the TP Sensor voltage. Connect a jumper wire between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit. Does the DRBIII® display TP Sensor voltage from approximately 4.9 volts to below 0.5 of a volt? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7 **NOTE: Remove the jumper wire before continuing.**	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K22) TP Sensor #1 Signal circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the excessive resistance in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Measure the resistance between ground and the (K22) TP Sensor #1 Signal circuit at the TP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the short to ground in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	Measure the resistance of the (K4) Sensor ground circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 16 No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connectors. Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the excessive resistance in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
11	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the resistance above 100k ohms? Yes → Go To 12 No → Repair the short to ground in the (K7) MAP 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	Turn the ignition off. Connect the PCM harness connector. Ignition on, engine not running. With the DRBIII®, monitor the MAP Sensor voltage. Connect a jumper wire between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit . Cycle the ignition switch from off to on. Does the DRBIII® display MAP voltage from approximately 4.9 volts to below 0.5 of a volt? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13 **NOTE: Remove the jumper wire before continuing.**	All
13	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 14 No → Repair the excessive resistance in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
14	Measure the resistance between ground and the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Go To 15 No → Repair the short to ground in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
15	Measure the resistance of the (K4) Sensor ground circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 16 No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
16	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0122-THROTTLE POSITION SENSOR #1 VOLTAGE TOO LOW

When Monitored and Set Condition:

P0122-THROTTLE POSITION SENSOR #1 VOLTAGE TOO LOW

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: Throttle Position Sensor voltage at the PCM is lower than 0.1 of a volt for 1.3 seconds.

POSSIBLE CAUSES
TP SENSOR SWEEP
INTERMITTENT CONDITION
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
TP SENSOR
(K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND
TCM INTERNALLY SHORTED THROTTLE POSITION SIGNAL CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the Throttle Position Sensor voltage. Is the voltage below 0.2 of a volt? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the TP Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 7	All
3	Ignition on, engine not running, and the TP Sensor still disconnected. With the DRBIII®, monitor the TP Sensor voltage with the Sensor disconnected. Is the voltage above 4.5 volts? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0122-THROTTLE POSITION SENSOR #1 VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K22) TP Sensor #1 Signal circuit at the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Measure the resistance between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit at the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: If the vehicle is not equipped with a TCM, answer No to this test and continue.** Connect the PCM harness connector and leave the TP Sensor disconnected. Disconnect the TCM harness connector. Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Is the voltage above 4.5 volts? Yes → Replace the Transmission Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K7) 5-volt Supply circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All

P0122-THROTTLE POSITION SENSOR #1 VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Slowly open the throttle from the idle position to the wide open throttle position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0123-THROTTLE POSITION SENSOR #1 VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0123-THROTTLE POSITION SENSOR #1 VOLTAGE TOO HIGH

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: Throttle Position Sensor signal voltage at the PCM goes above 4.5 volts for 3.2 seconds.

POSSIBLE CAUSES
TP SENSOR SWEEP
INTERMITTENT CONDITION
TP SENSOR
(K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K22) TP SENSOR #1 SIGNAL CIRCUIT OPEN
(K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. **NOTE: Ensure the throttle is fully closed and free from binding or carbon build up.** Start the engine. With the DRBIII®, read the Throttle Position Sensor voltage. Is the voltage above 4.5 volts? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Connect a jumper wire between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit. Ignition on, engine not running. With the DRBIII®, monitor the TP Sensor voltage. Is the voltage below 0.5 of a volt? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0123-THROTTLE POSITION SENSOR #1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Measure the voltage on the (K22) TP Sensor #1 Signal circuit at the TP Sensor harness connector. **NOTE: If the voltage reading is below 5.3 volts answer NO to this test and continue.** If the voltage is above 5.3 volts, disconnect the Clock Spring harness connectors per Service Information. With the Clock Spring harness disconnected and if the TP Sensor voltage drops to 5.0 volts, replace the Clock Spring. Is the voltage still above 5.3 volts with the Clock Spring harness disconnected? Yes → Repair the short to voltage in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4 **NOTE: Turn the ignition off and connect the Clockspring harness connectors before continuing.**	All
4	Disconnect the PCM harness connectors. Measure the resistance of the (K22) TP Sensor #1 Signal circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between the (K22) TP Sensor #1 Signal circuit and the (K7) 5-volt Supply circuit at the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Measure the resistance of the (K4) Sensor ground circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0123-THROTTLE POSITION SENSOR #1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
8	Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Slowly open the throttle from the idle position to the wide open throttle position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0125-CLOSED LOOP TEMP NOT REACHED

When Monitored and Set Condition:

P0125-CLOSED LOOP TEMP NOT REACHED

When Monitored: With battery voltage greater than 10.4 volts, after engine is started, for ten minutes.

Set Condition: The engine temperature does not go above 18 deg. F after the engine has been running for 10 minutes. Two trips are required to set this DTC.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
LOW COOLANT LEVEL
THERMOSTAT OPERATION
ECT SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	**NOTE: If a ECT DTC set along with this code, diagnose the ECT DTC first.** **NOTE: Inspect the ECT terminals and related PCM terminals. Ensure the terminals are free from corrosion and damage.** **NOTE: The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.** **Note: Extremely cold outside ambient temperatures may have caused this DTC to set.** **WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Extreme burns or scalding may result. Allow the engine to cool before opening the cooling system.** Check the coolant system to make sure that the coolant is in good condition and at the proper level. Is the coolant level and condition OK? Yes → Go To 3 No → Inspect the vehicle for a coolant leak and add the necessary amount of coolant. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0125-CLOSED LOOP TEMP NOT REACHED — Continued

TEST	ACTION	APPLICABILITY
3	**Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. With the DRBIII®, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F) . Also monitor the actual coolant temperature with a thermometer. **NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the Eng Coolant Tmp Deg in the DRBIII® values should stay relatively close to each other.** Using the appropriate service information, determine the proper opening temperature of the thermostat. Did the thermostat open at the proper temperature? Yes → Go To 4 No → Replace the thermostat. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	**Note: For this test to be valid, the thermostat must be operating correctly.** Ignition on, engine not running. With the DRBIII® in sensors, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the surrounding temperature (ambient temperature). **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the engine. During engine warm-up, monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F). Was the Eng Coolant Tmp Deg value increase a smooth transition and did it reach at least 180°? Yes → Test Complete. No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0131-O2 SENSOR 1/1 VOLTAGE TOO LOW
P0137-O2 SENSOR 1/2 VOLTAGE TOO LOW
P0151-O2 SENSOR 2/1 VOLTAGE TOO LOW
P0157-O2 SENSOR 2/2 VOLTAGE TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0131-O2 SENSOR 1/1 VOLTAGE TOO LOW.

When Monitored and Set Condition:

P0131-O2 SENSOR 1/1 VOLTAGE TOO LOW

When Monitored: At a cold start, engine coolant below 98°F, ambient/battery sensor reading within 27°F, and engine coolant temperature above 170°F on the previous key off.

Set Condition: The oxygen sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

P0137-O2 SENSOR 1/2 VOLTAGE TOO LOW

When Monitored: At a cold start, engine coolant below 98°F, ambient/battery sensor reading within 27°F, and engine coolant temperature above 170°F on the previous key off.

Set Condition: The oxygen sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

P0151-O2 SENSOR 2/1 VOLTAGE TOO LOW

When Monitored: At a cold start, engine coolant below 98°F, ambient/battery sensor reading within 27°F, and engine coolant temperature above 170°F on the previous key off.

Set Condition: The oxygen sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

P0157-O2 SENSOR 2/2 VOLTAGE TOO LOW

When Monitored: At a cold start, engine coolant below 98°F, ambient/battery sensor reading within 27°F, and engine coolant temperature above 170°F on the previous key off.

Set Condition: The oxygen sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

POSSIBLE CAUSES
O2 SENSOR BELOW 0.16 OF A VOLT
O2 SENSOR OPERATION
O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT

P0131-O2 SENSOR 1/1 VOLTAGE TOO LOW — Continued

POSSIBLE CAUSES
O2 SENSOR SIGNAL SHORTED TO HEATER GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. Allow the engine to idle for 4 to 5 minutes. With the DRBIII®, read the O2 Sensor voltage. Is the voltage below 0.16 of a volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Disconnect the O2 Sensor harness connector. Start the engine. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 0.16 of a volt? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the O2 Sensor Signal circuit at the O2 Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Measure the resistance between the O2 Sensor Signal circuit and the (K4) Sensor ground circuit at the O2 Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground circuit and the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P0131-O2 SENSOR 1/1 VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: There may be two types of O2 Sensor Heater ground circuits used on this vehicle. One type uses an engine ground and the other type uses the PCM as a ground through the Pulse Width Modulated circuit.** * Measure the resistance between the PWM O2 Sensor Heater Control circuit and the O2 Sensor Signal circuit if it applies to the O2 Sensor being tested. OR * Measure the resistance between the O2 Sensor Signal circuit and the O2 Heater ground circuit if it applies to the O2 Sensor being tested. Is the resistance below 100 ohms? Yes → Repair the short between the O2 Sensor Signal circuit and the Heater ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0132-O2 SENSOR 1/1 VOLTAGE TOO HIGH
P0138-O2 SENSOR 1/2 VOLTAGE TOO HIGH
P0152-O2 SENSOR 2/1 VOLTAGE TOO HIGH
P0158-O2 SENSOR 2/2 VOLTAGE TOO HIGH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0132-O2 SENSOR 1/1 VOLTAGE TOO HIGH.

When Monitored and Set Condition:

P0132-O2 SENSOR 1/1 VOLTAGE TOO HIGH

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

P0138-O2 SENSOR 1/2 VOLTAGE TOO HIGH

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

P0152-O2 SENSOR 2/1 VOLTAGE TOO HIGH

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

P0158-O2 SENSOR 2/2 VOLTAGE TOO HIGH

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

POSSIBLE CAUSES
O2 SENSOR ABOVE 1.5 VOLTS
O2 SENSOR OPERATION
O2 SENSOR SIGNAL CIRCUIT OPEN
O2 SENSOR SIGNAL CIRCUIT SHORTED TO O2 HEATER SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
O2 SENSOR SIGNAL SHORTED TO VOLTAGE
O2 SENSOR HEATER CONTROL CIRCUIT OPEN

P0132-O2 SENSOR 1/1 VOLTAGE TOO HIGH — Continued

POSSIBLE CAUSES
O2 SENSOR HEATER GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. Allow the engine to idle for 4 to 5 minutes. With the DRBIII®, read the O2 Sensor voltage. Is the voltage above 1.5 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Turn the ignition off. Disconnect the O2 Sensor harness connector. Start the engine. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage below 1.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the O2 Sensor Signal circuit from the O2 Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	**NOTE: Two relays may be used on this vehicle for the different types of Heated O2 Sensors. One uses the ASD Relay which is only used with PWM O2 Sensor Heaters and the other uses the O2 Heater Relay.** Verify which relay is used to supply power for the O2 Sensor Heater being tested. Measure the resistance between the O2 Sensor Signal circuit and the O2 Heater Supply circuit at the O2 Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the O2 Sensor Signal circuit and the (A71) ASD Relay Output or (F18) O2 Heater Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P0132-O2 SENSOR 1/1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
5	Measure the resistance of the (K4) Sensor ground circuit from the O2 Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Connect the PCM harness connector. Ignition on, engine not running. With the DRBIII® actuate the O2 Heater Test. Measure the voltage on the O2 Heater Supply circuit. Is the voltage above 11.0 volts? No → Repair the open in the O2 Sensor (PWM) Heater Control or Heater ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. Yes → Go To 7	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the O2 Sensor Signal circuit at the O2 Sensor harness connector. Does the test light illuminate brightly? Yes → Repair the short to voltage in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Turn the ignition off. **NOTE: The O2 Sensor Heater ground may be a Pulse Width Modulated circuit or a chassis ground depending on the type of O2 Sensor being tested.** * Measure the resistance of the PWM O2 Sensor Heater Control circuit from the O2 Sensor harness connector to the PCM harness connector if it applies to the O2 Sensor being tested OR * Measure the resistance of the O2 Sensor Heater ground circuit from the O2 Sensor harness connector to the PCM harness connector if it applies to the O2 Sensor being tested. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the O2 Sensor Heater ground (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0133-O2 SENSOR 1/1 SLOW RESPONSE
P0139-O2 SENSOR 1/2 SLOW RESPONSE
P0153-O2 SENSOR 2/1 SLOW RESPONSE
P0159-O2 SENSOR 2/2 SLOW RESPONSE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0133-O2 SENSOR 1/1 SLOW RESPONSE.

When Monitored and Set Condition:

P0133-O2 SENSOR 1/1 SLOW RESPONSE

When Monitored: With ECT greater than 147°F, after reaching a vehicle speed of 10 mph, and the throttle remaining open (off idle) for 2 minutes, bring the vehicle to a stop and allow the engine to idle with the transmission in DRIVE.

Set Condition: The oxygen sensor signal voltage is switching from below 0.27 of a volt to above 0.62 of a volt and back fewer times than required.

P0139-O2 SENSOR 1/2 SLOW RESPONSE

When Monitored: Start engine. Allow engine to idle. For 1st part of test, if limits are exceeded, test passes. If not, 2nd part of test runs. amb/batt temp >44°F, Baro >22.13″ H2O, battery >10.5 volts, MAP >11.79 & <18.15″ H2O, RPM >1350 & <2200 and vss >50 and <65.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.58 of a volt and back fewer times than required.

P0153-O2 SENSOR 2/1 SLOW RESPONSE

When Monitored: With ECT greater than 147°F, after reaching a vehicle speed of 10 mph, and the throttle remaining open (off idle) for 2 minutes, bring the vehicle to a stop and allow the engine to idle with the transmission in DRIVE.

Set Condition: The oxygen sensor signal voltage is switching from below 0.27 of a volt to above 0.62 of a volt and back fewer times than required.

P0159-O2 SENSOR 2/2 SLOW RESPONSE

When Monitored: Start engine. Allow engine to idle. For 1st part of test, if limits are exceeded, test passes. If not, 2nd part of test runs. amb/batt temp >44°F, Baro >22.13″ H2O, battery >10.5 volts, MAP >11.79 & <18.15″ H2O, RPM >1350 & <2200 and vss >50 and <65.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.58 of a volt and back fewer times than required.

P0133-O2 SENSOR 1/1 SLOW RESPONSE — Continued

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
EXHAUST LEAK
RESISTANCE IN THE O2 SENSOR SIGNAL CIRCUIT
RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT
O2 SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Start the engine. Inspect the exhaust for leaks between the engine and the related O2 Sensor. Are there any exhaust leaks? Yes → Repair or replace the leaking exhaust parts as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Back probe the O2 Sensor Signal circuit at the O2 Sensor harness connector and PCM harness connector. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection and are connected for positive polarity.** Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 4 No → Repair the excessive resistance in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0133-O2 SENSOR 1/1 SLOW RESPONSE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Back probe the (K4) Sensor ground circuit at the O2 Sensor harness connector and PCM harness connector. **NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. **NOTE: Turn the ignition off before continuing.**	All
5	If there are no possible causes remaining, view repair. Repair Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0135-O2 SENSOR 1/1 HEATER FAILURE
P0141-O2 SENSOR 1/2 HEATER FAILURE
P0155-O2 SENSOR 2/1 HEATER FAILURE
P0161-O2 SENSOR 2/2 HEATER FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0135-O2 SENSOR 1/1 HEATER FAILURE.

When Monitored and Set Condition:

P0135-O2 SENSOR 1/1 HEATER FAILURE

When Monitored: With battery voltage greater than 10.5 volts, at a cold start, ECT less than 104°F, battery temperature sensor equal to or less than 20°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 50 seconds.

P0141-O2 SENSOR 1/2 HEATER FAILURE

When Monitored: With battery voltage greater than 10.5 volts, at a cold start, ECT less than 104°F, battery temperature sensor equal to or less than 20°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 75 seconds.

P0155-O2 SENSOR 2/1 HEATER FAILURE

When Monitored: With battery voltage greater than10.5 volts, at a cold start, ECT less than 104°F, battery temperature sensor equal to or less than 20°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 50 seconds.

P0161-O2 SENSOR 2/2 HEATER FAILURE

When Monitored: With battery voltage greater than 10.5 volts, at a cold start, ECT less than 104°F, battery temperature sensor equal to or less than 20°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 75 seconds.

POSSIBLE CAUSES
O2 SENSOR HEATER OPERATION
O2 HEATER ELEMENT
O2 HEATER SUPPLY CIRCUIT OPEN
HEATER CONTROL CIRCUIT OPEN

P0135-O2 SENSOR 1/1 HEATER FAILURE — Continued

POSSIBLE CAUSES
HEATER CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stabilize between 0.1 and 0.3 of a volt during the Heater test? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All
2	Turn the ignition off. **NOTE: Allow the O2 Sensor to cool to room temperature.** Disconnect the O2 Sensor harness connector. Measure the resistance across the O2 Sensor Heater element component side. **NOTE: The resistance value increases with temperature.** Is the resistance between 4.0 and 5.0 ohms? Yes → Go To 3 No → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	**NOTE: The O2 Heater Supply circuit may be a fused ASD Relay Output or an O2 Sensor Heater Relay Output, depending on the O2 Sensor being tested.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. Measure the voltage on the O2 Heater Supply circuit at the O2 Sensor harness connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open in the O2 Sensor Heater Supply cricuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Remove the O2 Heater Relay, if it applies to the O2 Sensor being tested. * Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor to the PCM harness connector if it applies to the O2 Sensor being tested. OR * Measure the resistance of the (K512) O2 Heater Relay Control circuit from the O2 Heater Relay to the PCM harness connector, if it applies to the O2 Sensor being tested. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the excessive resistance in the O2 Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0135-O2 SENSOR 1/1 HEATER FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Before beginning this test, verify what type of Heated O2 Sensor is being tested, either the PWM Heated O2 Sensor or the Heater Relay controlled Heated O2 Sensor.** * Measure the resistance between ground and the PWM circuit if it applies to the Heated O2 Sensor being tested. OR * Measure the resistance between ground and the (K512) Heater Control circuit if it applies to the Heated O2 Sensor being tested. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION

When Monitored and Set Condition:

P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION

When Monitored: Ignition ON, with battery voltage greater than 10.4 volts.

Set Condition: The state of the PCM relay control circuit, between the PCM and relay coil, does not match the desired state.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
O2 SENSOR HEATER RELAY
(A71) FUSED ASD RELAY OUTPUT CIRCUIT
(K512) O2 HEATER RELAY CONTROL CIRCUIT OPEN
(K512) O2 HEATER RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Remove the Heater Relay from the PDC. Measurement is taken at the Heater Relay component. Measure the resistance of the O2 Sensor Heater Relay Coil. Is the resistance above 100 ohms? Yes → Replace the O2 Sensor Heater Relay. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, probe the (A71) Fused ASD Relay Output circuit of the O2 Heater Relay in the PDC. Does the test light illuminate brightly when the relay actuates? Yes → Go To 4 No → Repair the open or short to ground in the (A71) ASD Relay Output circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K512) O2 Heater Relay Control circuit from the PDC (Heater Relay) connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K512) O2 Heater Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between ground and the (K512) O2 Heater Relay Control circuit at the PDC connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K512) O2 Sensor Heater Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are not possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:
P0171-1/1 FUEL SYSTEM LEAN
P0174-2/1 FUEL SYSTEM LEAN

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0171-1/1 FUEL SYSTEM LEAN.

When Monitored and Set Condition:

P0171-1/1 FUEL SYSTEM LEAN

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

P0174-2/1 FUEL SYSTEM LEAN

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
FUEL PRESSURE OUT OF SPECS
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
O2 SENSOR
O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR HEATER OPERATION
TP SENSOR VOLTAGE GREATER THAN 0.92 OF A VOLT WITH THROTTLE CLOSED
TP SENSOR SWEEP
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL PROBLEM
FUEL FILTER/PRESSURE REGULATOR
INTERMITTENT CONDITION
PCM

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	**Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install a fuel pressure gauge. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Turn the ignition off. Choose a conclusion that best matches your fuel pressure reading. Below Specification Go To 3 Within Specification Go To 6 Above Specification Replace the fuel filter/pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 5. **CAUTION: Stop All Actuations.**	All
3	Turn the ignition off. **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module. Install special 5/16 fuel line adapter tool #6539 or #6631 between disconnected fuel line and the fuel pump module. Attach a fuel pressure test gauge to the T fitting on tool #6539 or #6631. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Is the fuel pressure within specification? Yes → Repair or replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4 **Caution: Stop All Actuations.**	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. **WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor and Exhaust System to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, read the O2 Sensor voltage. Is the voltage above 4.5 volts? Yes → Go To 7 No → Go To 13	All
7	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stay above 4.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Ignition on, engine not running. With the DRBIII®, read TP Sensor voltage. **NOTE: The throttle must be against the stop.** Is the voltage 0.92 of a volt or less with the Throttle closed? Yes → Go To 9 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	With the DRBIII®, read the TP Sensor voltage. While monitoring the DRBIII®, slowly open and close the throttle. Does the voltage increase and decrease smoothly? Yes → Go To 10 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Connect a Vacuum Gauge to a Manifold Vacuum source. Start the engine. Allow the engine to idle. **Note: If engine will not idle, maintain a constant RPM above idle.** With the DRBIII® in Sensors, read the MAP Sensor vacuum value. Is the DRBIII® reading within 1″ of the Vacuum Gauge reading? Yes → Go To 11 No → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. **NOTE: Remove the vacuum gauge before continuing.**	All
11	**Note: For this test to be valid, the thermostat must be operating correctly.** **Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. With the DRBIII®, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F). Did the Engine Coolant Temperature increase smoothly and did it reach at least 82°C (180°F)? Yes → Go To 12 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	Check for any of the following conditions/mechanical problems. AIR INDUCTION SYSTEM - must be free from leaks. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
13	**NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. Disconnect the O2 Sensor harness connector. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 14	All
14	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the O2 Sensor Signal circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All
15	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:
P0172-1/1 FUEL SYSTEM RICH
P0175-2/1 FUEL SYSTEM RICH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0172-1/1 FUEL SYSTEM RICH.

When Monitored and Set Condition:

P0172-1/1 FUEL SYSTEM RICH

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and the result is below a certain value for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

P0175-2/1 FUEL SYSTEM RICH

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and the result is below a certain value for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
O2 SENSOR
O2 SENSOR SIGNAL CIRCUIT OPEN
O2 SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
O2 SENSOR HEATER OPERATION
EVAP SYSTEM OPERATION
TP SENSOR VOLTAGE GREATER THAN 0.92 OF A VOLT WITH THROTTLE CLOSED
TP SENSOR SWEEP
FUEL FILTER/PRESSURE REGULATOR
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL PROBLEM
INTERMITTENT CONDITION
PCM

P0172-1/1 FUEL SYSTEM RICH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. **NOTE: Any O2 Sensor, TPS, ECT, MAP, or EVAP DTCs must be repaired before continuing.** Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install a fuel pressure gauge. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Choose a conclusion that best matches your fuel pressure reading. Within Specification Go To 3 Above Specification Replace the fuel filter/pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Caution: Stop All Actuations.**	All
3	Ignition on, engine not running. With the DRBIII®, read the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4 and 5 volts.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stay above 4.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P0172-1/1 FUEL SYSTEM RICH — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: The engine must be at operating temperature and in closed loop to perform this test.** Start the engine. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Allow the engine to reach normal operating temperature. With the DRBIII® select System Tests, perform the Purge Vapors Test. Observe the Short Term Adaptive value and press 3 to flow. **NOTE: Short Term Adaptive value change.** Did the Short Term Adaptive value change? Yes → Go To 6 No → Refer to the Driveability category and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Ignition on, engine not running. With the DRBIII®, read TP Sensor voltage. **NOTE: The throttle must be against the stop.** Is the voltage 0.92 of a volt or less with the Throttle closed? Yes → Go To 7 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	With the DRBIII®, read the TP Sensor voltage. While monitoring the DRBIII®, slowly open and close the throttle. Does the voltage increase and decrease smoothly? Yes → Go To 8 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off. Connect a Vacuum Gauge to a Manifold Vacuum source. Start the engine. Allow the engine to idle. **Note: If engine will not idle, maintain a constant RPM above idle.** With the DRBIII® in Sensors, read the MAP Sensor vacuum value. Is the DRBIII® reading within 1″ of the Vacuum Gauge reading? Yes → Go To 9 No → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. **NOTE: Remove the vacuum gauge before continuing.**	All

P0172-1/1 FUEL SYSTEM RICH — Continued

TEST	ACTION	APPLICABILITY
9	**Note: For this test to be valid, the thermostat must be operating correctly.** **Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. With the DRBIII®, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F). Did the Engine Coolant Temperature value increase smoothly and reach at least 82°C? Yes → Go To 10 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Check for any of the following conditions/mechanical problems. AIR INDUCTION SYSTEM - must be free from restrictions. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	Turn the ignition off. Disconnect the O2 Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All

P0172-1/1 FUEL SYSTEM RICH — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the O2 Sensor Signal circuit from the PCM harness connector to the O2 Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 13 No → Repair the open in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
13	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Ignition on, engine not running. Leave the O2 Sensor and PCM harness connectors disconnected. Measure the voltage on the O2 Sensor Signal circuit at the O2 Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 14 **NOTE: Turn the ignition off before continuing.**	All
14	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0201-INJECTOR #1 CONTROL CIRCUIT
P0202-INJECTOR #2 CONTROL CIRCUIT
P0203-INJECTOR #3 CONTROL CIRCUIT
P0204-INJECTOR #4 CONTROL CIRCUIT
P0205-INJECTOR #5 CONTROL CIRCUIT
P0206-INJECTOR #6 CONTROL CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0201-INJECTOR #1 CONTROL CIRCUIT.

When Monitored and Set Condition:

P0201-INJECTOR #1 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

P0202-INJECTOR #2 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

P0203-INJECTOR #3 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

P0204-INJECTOR #4 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

P0205-INJECTOR #5 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

P0201-INJECTOR #1 CONTROL CIRCUIT — Continued

P0206-INJECTOR #6 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(F142) ASD RELAY OUTPUT CIRCUIT
FUEL INJECTOR
FUEL INJECTOR CONTROL CIRCUIT OPEN
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **NOTE: Diagnose any Misfire DTCs before continuing. If a Misfire is detected for a particular cylinder, the PCM will shut down that Injectors Control circuit.** With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the Fuel Injector harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, backprobe the (F142) ASD Relay Output circuit at the Fuel Injector harness connector. With the DRBIII®, actuate the ASD Relay. Did the test light illuminate brightly when the ASD Relay was actuating? Yes → Go To 3 No → Repair the open or short to ground in the (F142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0201-INJECTOR #1 CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Using a 12-volt test light connected to 12-volts, backprobe the Fuel Injector Control circuit. With the DRBIII®, actuate the Fuel Injector. What is the state of the test light while actuating the Fuel Injector? Brightly blinking. Replace the Fuel Injector. Perform POWERTRAIN VERIFICATION TEST VER - 5. ON constantly. Go To 4 OFF constantly. Go To 5	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the Fuel Injector Control circuit in the Fuel Injector harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Fuel Injector Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
5	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the Fuel Injector Control circuit from the Fuel Injector harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Fuel Injector Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair. Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0300-MULTIPLE CYLINDER MIS-FIRE
P0301-CYLINDER #1 MISFIRE
P0302-CYLINDER #2 MISFIRE
P0303-CYLINDER #3 MISFIRE
P0304-CYLINDER #4 MISFIRE
P0305-CYLINDER #5 MISFIRE
P0306-CYLINDER #6 MISFIRE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0300-MULTIPLE CYLINDER MIS-FIRE.

When Monitored and Set Condition:

P0300-MULTIPLE CYLINDER MIS-FIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

P0301-CYLINDER #1 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

P0302-CYLINDER #2 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip..

P0303-CYLINDER #3 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

P0304-CYLINDER #4 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

P0305-CYLINDER #5 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip..

P0306-CYLINDER #6 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

POSSIBLE CAUSES
INTERMITTENT MISFIRE
VISUAL INSPECTION
IGNITION WIRE
ASD RELAY OUPUT CIRCUIT
ENGINE MECHANICAL PROBLEM
IGNITION COIL
COIL CONTROL CIRCUIT
SPARK PLUG
CHECKING FUEL PRESSURE
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
CHECKING FUEL LEAK DOWN
FUEL INJECTOR
INJECTOR CONTROL CIRCUIT
PCM

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Check for any TSB's that apply to a Misfire condition. Review the vehicle repair history for any misfire condition repairs that have been performed.** Read and record the FREEZE FRAME DATA. Select OBD II MONITORS. Read and record the MIS-FIRE SIMILAR CONDITIONS WINDOW DATA. With these screens, attempt to duplicate the condition(s) that has set this DTC. When the vehicle is operating in the SIMILAR CONDITIONS WINDOW, refer to the WHICH CYLINDER IS MISFIRING screen. Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute. Is there a misfire present? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	**NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.** **NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.** - Visually inspect the engine for any of the following conditions. - Worn serpentine belt - Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump. - Misalignment Water pump, P/S Pump and A/C Compressor pulleys - Corroded PCM power and ground circuits. - Improper CKP, CMP, MAP, and TP Sensor mounting - Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc. - Vacuum leaks - Restricted Air Induction system or Exhaust system. Were any of the above conditions present? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the Ignition Coil harness connector. Disconnect the Fuel Injector harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, probe the ASD Relay Output circuit at the Ignition Coil harness connector and Fuel Injector harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the excessive resistance or short to ground in the ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Ignition wire from the spark plug. Disconnect the Fuel Injector harness connector of the cylinder being tested. **NOTE: Before continuing inspect the ignition wire for damage or carbon tracking. Replace as necessary.** Install a spark tester on the ignition wire. While cranking the engine observe the spark coming from the spark tester. **NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.** Is good spark present? Yes → Go To 5 No → Go To 14	All
5	Turn the ignition off. Remove the Spark Plug. Inspect the Spark Plug for the following conditions. - Cracks - Carbon Tracking - Foreign Material - Gap size out of specifications - Loose or broke electrode **NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.** Were any of the above condition present? Yes → Replace the Spark Plug. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install a fuel pressure gauge. Start the engine and observe the fuel pressure reading. **NOTE: Fuel pressure specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Choose a conclusion that best matches your fuel pressure reading. Within Specification Go To 7 Below Specification Go To 12 Above Specification Replace the fuel filter/pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
7	**NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.** Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install special tool #6539 (5/16″) fuel line adapter. Install the fuel pressure gauge. Start the engine and allow the fuel system to reach maximum pressure. Turn the ignition off. **NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine. Monitor the fuel pressure gauge for a minimum of 5 minutes. **NOTE: The pressure should not fall below 241 KPa (35 psi)** Does the Upstream gauge fall below the above specification? Yes → Replace the leaking Fuel Injector(s). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	**Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** **CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.** Remove special tool #C4390. Start the engine and allow the fuel pressure to reach maximum pressure. Ignition on, engine not running. Using the DRBIII®, actuate the Fuel Injector for the cylinder that indicated the misfire. Monitor the fuel pressure gauge. Does the fuel pressure gauge indicate a drop in fuel pressure? Yes → Go To 9 No → Go To 10 **NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.**	All
9	Check for any of the following conditions/mechanical problems. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL - must be free of contamination CAM LOBES - must not be worn excessively CYLINDER LEAKAGE TEST - must be within specifications VALVE SPRINGS - cannot be weak or broken Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 17	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the Fuel Injector harness connector. Ignition on, engine not running. **NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.** With the DRBIII®, erase DTCs. Using a 12-volt test light connected to 12-volts, probe the Injector Control circuit. With the DRBIII®, actuate the Fuel Injector. Does the test light blink/flicker? Yes → Replace the Fuel Injector. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Disconnect the PCM harness connectors. Check the Injector Control circuit for an open, short to ground, and short to voltage. Was a problem found with the Injector Control circuit? Yes → Repair the excessive resistance or shorts in the Injector Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 17	All
12	Turn the ignition off. **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module. Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49 psi +/- 5 psi).** Is the fuel pressure within specification? Yes → Repair or replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
13	Turn the ignition off. **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose,fitting or line, the fuel system pressure must be released.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → NOTE: Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Ensure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
14	Turn the ignition off. Remove the ignition wire. Measure the resistance of the ignition wire. Is the resistance below 10K ohms? Yes → Go To 15 No → Replace the Ignition Wire. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
15	Turn the ignition off. Disconnect the Ignition Coil harness connector. Remove the Fuel Pump Relay or ASD Relay. Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Control circuit. Crank the engine for 5 second while observing the test light. **NOTE: The resistance of the primary Ignition Coil on a 2.4L is 0.51 to 0.61 of an ohm and the 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).** Does the test light brightly blink/flicker? Yes → Replace the Ignition Coil. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 16	All
16	Turn the ignition off. Disconnect the PCM harness connectors. Check the Coil Control circuit for an open, short to ground, and short to voltage. Was a problem found with the Coil Control circuit? Yes → Repair the Coil Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 17	All
17	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0320-NO CRANK REFERENCE SIGNAL AT PCM

When Monitored and Set Condition:

P0320-NO CRANK REFERENCE SIGNAL AT PCM

When Monitored: With the ignition on.

Set Condition: No signal from the Crankshaft Position Sensor is present during engine cranking, and at least 3 Camshaft Position Sensor signals have occurred.

POSSIBLE CAUSES
INTERMITTENT CRANK POSITION SIGNAL
CAM POSITION SENSOR SIGNAL
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K24) CKP SENSOR SIGNAL CIRCUIT OPEN
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED GROUND
(K24) CKP SENSOR SIGNAL SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
CRANKSHAFT POSITION SENSOR
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, erase DTCs. Start the engine. If the DTC does not set right away it may be necessary to test drive vehicle. Does the DTC return? Yes → Go To 2 No → Go To 14	All
2	Turn the ignition off. Disconnect the CKP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit in the CKP Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 3 No → Go To 10	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
3	Measure the voltage on the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector. Is the voltage between 4.5 and 5.0 volts? Yes → Go To 4 No → Go To 6	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K4) Sensor ground circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Inspect the slots on the flywheel for damage. If a problem is found repair as necessary.** If there are no possible causes remaining, view repair. Repair Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector. Did the voltage increase above 5.2 volts with the Ignition on? Yes → Repair the short to voltage in the (K24) CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Measure the resistance of the (K24) CKP Sensor Signal circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (K24) CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Measure the resistance between ground and the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K24) CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
9	Measure the resistance between the (K24) CKP Sensor Signal circuit and the (K7) 5-volt Supply circuit in the CKP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K24) CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
10	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the CKP Sensor harness connector. Did the voltage increase above 5.2 volts with the Ignition on? Yes → Repair the short to voltage in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Measure the resistance of the (K7) 5-volt Supply circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the CKP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
13	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
14	**NOTE: The following tests may help in identifying a possible intermittent condition with the Crank Sensor or its related wire harness.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crank Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and the related wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CKP Sensor. Did the CKP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All
15	**NOTE: An intermittent failure with the Cam Position Sensor may cause the P0320 code to set.** Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP Sensor connector and the PCM harness connector. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Ignition on, engine not running. Wiggle the related wire harness and gently tap on the Cam Position Sensor. Monitor the lab scope screen. Start the engine. Lightly tap on the CMP Sensor and wiggle the related wire harness. Observe the lab scope screen, looking for any erratic pulses generated by the CMP Sensor. Did the CMP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

P0325-KNOCK SENSOR #1 CIRCUIT
P0330-KNOCK SENSOR #2 CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0325-KNOCK SENSOR #1 CIRCUIT.

When Monitored and Set Condition:

P0325-KNOCK SENSOR #1 CIRCUIT

When Monitored: Ignition on and battery voltage greater than 10 volts.

Set Condition: Knock Sensor #1 signal below minimum acceptable threshold voltage at particular engine speeds or above 5.0 volts.

P0330-KNOCK SENSOR #2 CIRCUIT

When Monitored: Ignition on and battery voltage greater than 10 volts.

Set Condition: Knock Sensor #2 signal below minimum acceptable threshold voltage at particular engine speeds or above 5.0 volts.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
KNOCK SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K73) OR (K74) KNOCK SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K73) OR (K74) KNOCK SENSOR SIGNAL CIRCUIT OPEN
(K73) OR (K74) KNOCK SENSOR SIGNAL CIRCUIT SHORTED TO THE (K4) SENSOR GROUND
(K4) SENSOR GROUND CIRCUIT OPEN
KNOCK SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: Record the Freeze Frame Information that set along with the DTC.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0325-KNOCK SENSOR #1 CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: (K73) is the Knock Sensor No 1. Signal circuit and (K74) is the Knock Sensor No.2 Signal circuit.** Turn the ignition off. Disconnect the Knock Sensor harness connector. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K73) or (K74) Knock Sensor Signal circuit in the Knock Sensor harness connector. Is the voltage above 2.0 volts? Yes → Repair the short to voltage in the (K73) or (K74) Knock Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Measure the resistance between ground and the appropriate Knock Sensor Signal circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K73) or (K74) Knock Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Measure the resistance of the (K73) or (K74) Knock Sensor Signal circuit from the Knock Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K73) or (K74) Knock Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between the (K73) or (K74) Knock Sensor Signal circuit and the (K4) Sensor ground circuit in the Knock Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K73) or (K74) Knock Sensor Signal circuit and the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Measure the resistance of the (K4) Sensor ground circuit from the Knock Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0325-KNOCK SENSOR #1 CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Replace the Knock Sensor. Ignition on, engine not running. With the DRBIII®, erase DTC. Attempt to operate the vehicle within the operating range of the information in Freeze Frame. With the DRBIII®, read DTC's. Does the Knock Sensor DTC return? Yes → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0340-NO CAM REFERENCE SIGNAL AT PCM

When Monitored and Set Condition:

P0340-NO CAM REFERENCE SIGNAL AT PCM

When Monitored: Engine cranking/running.

Set Condition: At least 5 seconds have elapsed with Crankshaft Position Sensor signals present but no Camshaft Position Sensor signal.

POSSIBLE CAUSES
CHECKING INTERMITTENT CMP SIGNAL WITH LAB SCOPE
CRANK POSITION SENSOR SIGNAL
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K44) CMP SENSOR SIGNAL CIRCUIT OPEN
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED GROUND
(K44) CMP SENSOR SIGNAL SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
CAMSHAFT POSITION SENSOR
PCM

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, erase DTCs. Start the engine. If the DTC does not set right away it may be necessary to test drive the vehicle. Does the DTC return? Yes → Go To 2 No → Go To 14	All
2	Turn the ignition off. Disconnect the CMP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the CMP Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 3 No → Go To 10	All

P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
3	Measure the voltage on the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the voltage between 4.5 and 5.0 volts? Yes → Go To 4 No → Go To 6	All
4	Turn the Ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K4) Sensor ground circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Inspect the Camshaft sprocket for damage per the Service Information. If a problem is found repair as necessary.** If there are no possible causes remaining, view repair. Repair Replace the Camshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (K44) CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Measure the resistance of the (K44) CMP Sensor Signal circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (K44) CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Measure the resistance between ground and the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K44) CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All

P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
9	Measure the resistance between the (K44) CMP Sensor Signal circuit and the (K7) 5-volt Supply circuit in the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K44) CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
10	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the CMP Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Measure the resistance of the (K7) 5-volt Supply circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
13	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
14	**NOTE: The following tests may help in identifying a possible intermittent condition with the Cam Sensor or its related wire harness.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the Cam Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Lightly tap on the Cam Sensor and wiggle the CMP Sensor connector and wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CMP Sensor. Did the CMP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All
15	**NOTE: An intermittent Crank Position Sensor failure may cause the P0340 code to set.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crank Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CKP Sensor. Did the CKP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:
P0351-IGNITION COIL #1 PRIMARY CIRCUIT
P0352-IGNITION COIL #2 PRIMARY CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0351-IGNITION COIL #1 PRIMARY CIRCUIT.

When Monitored and Set Condition:

P0351-IGNITION COIL #1 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0352-IGNITION COIL #2 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(A142) ASD RELAY OUTPUT CIRCUIT
IGNITION COIL
IGNITION COIL DRIVER CIRCUIT OPEN
IGNITION COIL DRIVER CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 2.4L POWER TECH DOHC I-4

P0351-IGNITION COIL #1 PRIMARY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the coil rail harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, check the (A142) ASD Relay Output circuit at the coil rail harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open or short to ground in the (A142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Stop All Actuations**	ENGINE - 2.4L POWER TECH DOHC I-4
3	Turn the ignition off. Disconnect the Ignition Coil harness connector. Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Driver circuit. Crank the engine for 5 second while observing the test light. What is the state of the test light while cranking? Brightly flashing. Replace the Ignition Coil. Perform POWERTRAIN VERIFICATION TEST VER - 5. ON constantly. Go To 4 OFF constanly. Go To 5	ENGINE - 2.4L POWER TECH DOHC I-4
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between the ignition coil driver circuit and ground. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	ENGINE - 2.4L POWER TECH DOHC I-4
5	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the Ignition Coil Driver circuit from the Ignition Coil connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 2.4L POWER TECH DOHC I-4

P0351-IGNITION COIL #1 PRIMARY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 2.4L POWER TECH DOHC I-4

Symptom List:

P0351-IGNITION COIL #1 PRIMARY CIRCUIT
P0352-IGNITION COIL #2 PRIMARY CIRCUIT
P0353-IGNITION COIL #3 PRIMARY CIRCUIT
P0354-IGNITION COIL #4 PRIMARY CIRCUIT
P0355-IGNITION COIL #5 PRIMARY CIRCUIT
P0356-IGNITION COIL #6 PRIMARY CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0351-IGNITION COIL #1 PRIMARY CIRCUIT.

When Monitored and Set Condition:

P0351-IGNITION COIL #1 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0352-IGNITION COIL #2 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0353-IGNITION COIL #3 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0354-IGNITION COIL #4 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0351-IGNITION COIL #1 PRIMARY CIRCUIT — Continued

P0355-IGNITION COIL #5 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

P0356-IGNITION COIL #6 PRIMARY CIRCUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(A142) ASD RELAY OUTPUT CIRCUIT OPEN
IGNITION COIL ON PLUG
CAPACITOR(S) SHORTED TO GROUND
(A142) ASD RELAY OUTPUT CIRCUIT SHORTED TO GROUND
COIL ON PLUG RESISTANCE
COIL DRIVER CIRCUIT SHORTED TO GROUND
COIL DRIVER CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero for? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6

P0351-IGNITION COIL #1 PRIMARY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the coil on plug harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, probe the (A142) ASD Relay Output circuit at the Coil on plug harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Go To 8 **Stop All Actuations**	ENGINE - 3.7L POWER TECH V6
3	Turn the ignition off. Disconnect the coil on plug harness connector. **Note: The following resistance measurement should be taken at 70-80 degrees F.** Measure the primary resistance of the Coil on plug. Is the resistance between 0.6 and 0.9 of an ohm? Yes → Go To 4 No → Replace the coil on plug. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6
4	Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Driver circuit. Crank the engine for 5 second while observing the test light. What is the state of the test light while cranking the engine? Brightly blinking. Replace the Ignition Coil on Plug. Perform POWERTRAIN VERIFICATION TEST VER - 5. ON constantly. Go To 5 OFF constantly. Go To 6	ENGINE - 3.7L POWER TECH V6
5	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between the Coil Driver circuit and known good ground. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	ENGINE - 3.7L POWER TECH V6
6	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the Coil Driver circuit from the Coil on plug harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6

P0351-IGNITION COIL #1 PRIMARY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6
8	Turn the ignition off. Disconnect the Ignition Coil harness connector. Remove the ASD Relay from the IPM. Measure the resistance of the (A142) ASD Relay Output circuit between the ASD Relay connector and the Ignition Coil harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the (A142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6
9	**NOTE: Repeat the following test for both capacitors** **NOTE: The Capacitors are attached to the side of each valve cover.** Disconnect the Capacitor harness connector. Install a good INJ/COIL fuse. With the DRBIII®, actuate the ASD Relay. **NOTE: If the above test results in an open fuse for both capacitor tests, the problem is a short to ground in the (A142) ASD Relay Output circuit. Repair the short to ground in the (A142) ASD Relay Output circuit and refer to VER-5** Is the INJ/COIL fuse OK for both capacitor tests? Yes → Replace the Capacitor(s) Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Repair the short to ground in the (A142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	ENGINE - 3.7L POWER TECH V6

Symptom List:

P0420-1/1 CATALYTIC CONVERTER EFFICIENCY
P0432-2/1 CATALYTIC CONVERTER EFFICIENCY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0420-1/1 CATALYTIC CONVERTER EFFICIENCY.

When Monitored and Set Condition:

P0420-1/1 CATALYTIC CONVERTER EFFICIENCY

When Monitored: After engine warm up to 147° F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

Set Condition: As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one.

P0432-2/1 CATALYTIC CONVERTER EFFICIENCY

When Monitored: After engine warm up to 147° F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

Set Condition: As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
VISUALLY INSPECT CATALYTIC CONVERTER
EXHAUST LEAK
ENGINE MECHANICAL PROBLEM
UPSTREAM O2 SENSOR OLDER THAN DOWNSTREAM O2 SENSOR
CATALYTIC CONVERTER

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0420-1/1 CATALYTIC CONVERTER EFFICIENCY — Continued

TEST	ACTION	APPLICABILITY
2	Inspect the Catalytic Converter for the following damage. Damage Catalytic Converter, dent and holes. Severe discoloration caused by overheating the Catalytic Converter. Catalytic Converter broke internally. Leaking Catalytic Converter. Were any problems found? Yes → Replace the Catalytic Converter. Repair the condition that may have caused the failure. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Start Engine and let idle. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Check for exhaust leaks between the engine and the appropriate downstream O2 Sensor. Is there any exhaust leaks? Yes → Repair or replace leaking exhaust parts as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	**Check the exhaust for excessive smoke from internal oil or coolant leaks.** Is there an oil or coolant consumption condition present? Yes → Repair engine mechanical condition as necessary and replace Catalytic Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	**NOTE: A new Downstream O2 Sensor along with an aging Upstream O2 Sensor may cause this trouble code to set.** Review vehicle repair history. Has the Downstream O2 Sensor been replaced without replacing the Upstream O2 Sensor? Yes → Replace the appropriate Upstream Oxygen Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace the Catalytic Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0441-EVAP PURGE FLOW MONITOR

When Monitored and Set Condition:

P0441-EVAP PURGE FLOW MONITOR

When Monitored: With engine temperature greater than 170° F, fuel control in closed loop, engine idling for 2 minutes, no low fuel, MAP less than 15.7 inches mercury and barometric altitude less than 8,000 feet.

Set Condition: After having passed the Leak Detection Pump (LDP) test, no air flow through the evaporative system is detected by the EVAP monitor.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
INTERMITTENT CONDITION
VISUAL INSPECTION
EVAP PURGE HOSE (SOLENOID TO CANISTER)
EVAP PURGE HOSE (CANISTER TO FUEL TANK)
EVAP PURGE SOLENOID VACUUM SUPPLY
EVAP PURGE SOLENOID (LEAKY/STUCK OPEN)
EVAP PURGE SOLENOID

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Visually inspect the Evap canister. Look for any physical damage or any signs of fuel that has entered the canister. Any signs of fuel may indicate a bad rollover valve. Were any problems found? Yes → Repair or Replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0441-EVAP PURGE FLOW MONITOR — Continued

TEST	ACTION	APPLICABILITY
3	Visually inspect the Evap purge hose that goes from the Purge Solenoid to the Evap Canister. Look for any physical damage such as a pinched, plugged, ripped or dry rotted hose. Were any problems found? Yes → Repair or replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Visually inspect the Evap Purge hose that goes between the Evap canister and the fuel tank. Look for any physical damage such as a pinched, plugged, ripped or dry rotted hose. Were any problems found? Yes → Repair or replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing. Also check for a pinched or plugged hose from the throttle body to the Purge Solenoid. Inspect the vacuum nipple at the throttle body for any damage or plugging. Make sure vacuum fitting at the purge solenoid is not over installed. Is the vacuum supply hose and throttle body vacuum nipple free from defects? Yes → Go To 6 No → Repair the vacuum supply hose/tube as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**Note: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty rollover valve. Replace purge solenoid if contamination is found** Disconnect the vacuum hoses at the EVAP Purge Solenoid. Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port. (component side) Does the Evap Purge Solenoid hold vacuum? Yes → Go To 7 No → Replace the Evap Purge Solenoid and the Evap Canister and clean out Evap lines as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port. (component side) Ignition on, engine not running. With the DRBIII®, actuate the EVAP Purge Solenoid and observe the vacuum gauge. Does the vacuum drop when the solenoid is actuated? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:

P0442-EVAP LEAK MONITOR MEDIUM 0.040 LEAK DETECTED
P0455-EVAP LEAK MONITOR LARGE LEAK DETECTED
P0456-EVAP LEAK MONITOR .020 LEAK DETECTED

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0442-EVAP LEAK MONITOR MEDIUM 0.040 LEAK DETECTED.

When Monitored and Set Condition:

P0442-EVAP LEAK MONITOR MEDIUM 0.040 LEAK DETECTED

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: If there is a leak larger than 0.040″ and smaller than 0.080″ in the evaporative system.

P0455-EVAP LEAK MONITOR LARGE LEAK DETECTED

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: There is a leak larger than 0.080″ in the evaporative system.

P0456-EVAP LEAK MONITOR .020 LEAK DETECTED

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: There is a leak larger than 0.020″ and smaller than 0.040″ in the evaporative system.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
INTERMITTENT CONDITION
EVAPORATIVE EMISSION LEAK DETECTION
EVAP PURGE SOLENOID

P0442-EVAP LEAK MONITOR MEDIUM 0.040 LEAK DETECTED — Continued

TEST	ACTION	APPLICABILITY
1	**Note: A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Ensure the gas cap meets OEM specifications.** **NOTE: Engine vacuum at must be present at the LDP vacuum port.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
2	To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD). **WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.** **NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity and the fuel must be cool to properly test the Evap system.** Disconnect the vacuum supply hose at the Leak Detection Pump. Connect and apply a continuous vacuum supply (i.e. 20″Hg) to the Leak Detection Pump. A vacuum pump such as an A/C recovery unit works well. Using the DRBIII®, select Engine/System Tests and actuate the Leak Detect Pump Test (Option 3/Hold PSI). **NOTE: The above energizes the LDP solenoid and allows the constant vacuum source to apply vacuum to the LDP pump diaphragm. This lifts the diaphragm up and seals the atmospheric canister vent valve at the bottom of the Leak Detection Pump.** Connect the red power lead of Miller Tool #8404 to the battery positive terminal and the black ground lead to battery negative terminal. **NOTE: See Charts and Graph support material EELD Calibration Setup for an example.** Connect shop air to the #8404 EELD. Set the smoke/air control switch to AIR. Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size). Press the remote smoke/air start button. Position the red flag on the air flow meter so it is aligned with the indicator ball. When the calibration is complete, release the remote button. The EELD is now calibrated the flow meter in liters per minute to the size leak indicated by the DTC set in the PCM. Install the service port adapter #8404-14 on the vehicle's service port. Connect the Air supply hose from the EELD to the service port. Press the remote button to activate AIR flow. **NOTE: Larger volume fuel tanks, and/or those with less fuel, may require 4 to 5 minutes to fill.** Compare the flow meter indicator ball reading to the red flag. ABOVE the red flag indicates a leak present. BELOW the red flag indicates a sealed system. Is the indicator ball above the red flag? Yes → Go To 3 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P0442-EVAP LEAK MONITOR MEDIUM 0.040 LEAK DETECTED — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.** To continue testing, you will need Miller Tool #8404 Evaporative Emissions Leak Detector (EELD). Remove the Air supply hose from the service port. Connect the SMOKE supply tip (black hose) to the service port. Set the smoke/air control switch to SMOKE. **NOTE: The flow meter indicator ball will not move at this point.** Press the remote smoke/air start button. **NOTE: Ensure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.** **NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.** While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke. If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke. The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light. Was a leak found? Yes → Repair or replace the leaking component as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 4	All
4	**NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty rollover valve. Replace/repair as necessary.** Turn the ignition off. Disconnect the vacuum hoses at the Evap Purge Solenoid. Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side. **NOTE: Monitor the vacuum gauge for at least 15 seconds.** Does the Evap Purge Solenoid hold vacuum? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

Symptom:
P0443-EVAP PURGE SOLENOID CIRCUIT

When Monitored and Set Condition:

P0443-EVAP PURGE SOLENOID CIRCUIT

When Monitored: Continuously after the ignition is turned on and the battery voltage is above 10.4 volts.

Set Condition: Not powering down, not in limp-in and time since last solenoid activation is greater than 72 micro seconds. The PCM will set a trouble code if the actual state of the solenoid does not match the intended state on two consecutive key cycles.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
EVAP PURGE SOLENOID
(F1) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT OPEN
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the Evap Purge Solenoid connector. Measure the resistance between the terminals of the Evap Purge Solenoid. Is the resistance between 29.0 and 44.0 ohms? Yes → Go To 3 No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	Ignition on, engine not running. Measure the voltage on the (F1) Fused Ignition Switch Output circuit at the EVAP Purge Solenoid harness connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open in the (F1) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0443-EVAP PURGE SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K52) Evap Purge Solenoid Control circuit from the PCM harness connector to the Evap Purge Solenoid harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K52) Evap Purge Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K52) Evap Purge Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom List:
P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES
P0461-FUEL LEVEL UNIT NO CHANGE OVER TIME

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES.

When Monitored and Set Condition:

P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES

When Monitored: Engine running and fuel level either below 15% or above 85% of capacity.

Set Condition: The PCM sees low fuel, less than 15%, for more than 120 miles or fuel level does not change by at least 4% for more than 250 miles.

P0461-FUEL LEVEL UNIT NO CHANGE OVER TIME

When Monitored: Engine running and fuel level either below 15% or above 85% of capacity.

Set Condition: The PCM sees low fuel, less than 15%, for more than 120 miles or fuel level does not change by at least 4% for more than 250 miles.

POSSIBLE CAUSES
PHYSICALLY DAMAGED/DEFORMED/OBSTRUCTED FUEL TANK
FUEL LEVEL SENSOR

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Inspect the outside of the fuel tank for defects. Remove the fuel tank. Remove the fuel pump module from the fuel tank. Inspect the inside of the fuel tank for any obstructions or deformities. Is the fuel tank free from defects? Yes → Go To 2 No → Repair or replace the fuel tank as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	If there are no possible causes remaining, view repair. Repair Replace the Fuel Level Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0462-FUEL LEVEL SENDING UNIT VOLTS TOO LOW

When Monitored and Set Condition:

P0462-FUEL LEVEL SENDING UNIT VOLTS TOO LOW

When Monitored: Ignition on and battery voltage above 10.4 volts.

Set Condition: The fuel level sensor signal voltage goes below 0.2 of a volt at the PCM for more than 5 seconds.

POSSIBLE CAUSES
FUEL LEVEL SENSOR VOLTAGE BELOW 0.2 OF A VOLT
FUEL LEVEL SENSOR
(K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the Fuel Level Sensor voltage. Is the Fuel Level Sensor voltage below 0.2 of a volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Ignition on, engine not running. With the DRBIII®, read the Fuel Level Sensor voltage. Did the Fuel Level Sensor voltage change from below 0.2 of a volt to above 4.0 volts? Yes → Replace the Fuel Level Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K226) Fuel Level Sensor Signal circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K226) Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P0462-FUEL LEVEL SENDING UNIT VOLTS TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Measure the resistance between the (K226) Fuel Level Sensor Signal circuit and the (K4) Sensor ground circuit. Is the resistance below 5.0 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K226) Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	**NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

When Monitored and Set Condition:

P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

When Monitored: Ignition on and battery voltage above 10.4 volts.

Set Condition: The fuel level sensor signal voltage at the PCM goes above 4.95 volts for more than 90 seconds.

POSSIBLE CAUSES
FUEL LEVEL SENSOR VOLTAGE ABOVE 4.9 VOLTS
FUEL LEVEL SENSOR
(K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT OPEN
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the Fuel Level Sensor voltage. Is the Fuel Level Sensor voltage above 4.9 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the Fuel Pump Module electrical harness connector. Ignition on, engine not running. Connect a jumper wire between the (K226) Fuel Level Sensor Signal circuit and the (K4) Sensor ground circuit at the Fuel Pump Module harness connector. With the DRBIII®, read the Fuel Level Sensor voltage. Did the Fuel Level Sensor voltage change from above 4.8 volts to below 0.4 of a volt? Yes → Replace the Fuel Level Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K226) Fuel Sensor Signal circuit at the Fuel Pump harness connector. Is the voltage above 10.0 volts? Yes → Repair the short to voltage in the (K226) Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (K226) Fuel Level Sensor Signal circuit from the PCM harness connector to the Fuel Pump Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K226) Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the Fuel Pump Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0500-NO VEHICLE SPEED SIGNAL

When Monitored and Set Condition:

P0500-NO VEHICLE SPEED SIGNAL

When Monitored: Engine Temperature greater than 104 deg F. , MAP vacuum approximately 15″ to 16″ inches of mercury and Engine RPM between 1400 and 3000 rpm.

Set Condition: No Vehicle Speed Signal for more than 15 seconds on two consecutive trips.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(B22) VEHICLE SPEED SIGNAL CIRCUIT OPEN
(B22) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND
(B22) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. **NOTE: Any VSS DTCs in the CAB Module or Body Controller must be properly diagnosed before continuing.** Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Body Control Module harness connector. Measure the resistance of the (B22) Vehicle Speed Signal circuit between the PCM harness connector and the BCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the open (B22) Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Measure the resistance between ground and the (B22) Vehicle Speed Signal circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (B22) Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0500-NO VEHICLE SPEED SIGNAL — Continued

TEST	ACTION	APPLICABILITY
4	Ignition on, engine not running. Measure the voltage on the (B22) Vehicle Speed Signal circuit at the PCM harness connector. Is the voltage above 4.8 volts? Yes → Repair the short to voltage in the (B22) Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5 **NOTE: Turn the ignition off before continuing.**	All
5	**NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0505-IDLE AIR CONTROL MOTOR CIRCUITS

When Monitored and Set Condition:

P0505-IDLE AIR CONTROL MOTOR CIRCUITS

When Monitored: At power-up and battery voltage greater than 11.5 volts.

Set Condition: The PCM senses a short to ground or battery voltage on any of the four Idle Air Control (IAC) driver circuits for 100 msec while the IAC motor is active.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
IAC #1 DRIVER CIRCUIT SHORTED TO #2, #3, OR #4
IAC #2 DRIVER CIRCUIT SHORTED TO #3 OR #4
IAC #3 DRIVER CIRCUIT SHORTED TO #4
IAC DRIVER CIRCUIT SHORTED TO VOLTAGE
IAC DRIVER CIRCUITS SHORTED TO GROUND
IAC MOTOR OPERATION
IAC MOTOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the IAC Motor harness connector. Disconnect the PCM harness connectors. **Note: The following steps are checking for a short between the IAC Driver circuits.** Measure the resistance between the IAC #1 Driver circuit and #2, #3, #4 Driver circuits. Is the resistance below 100 ohms on any of the Drivers? Yes → Repair the short between the IAC Driver circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0505-IDLE AIR CONTROL MOTOR CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
3	**Note: The following steps are checking for a short between the IAC Driver circuits.** Measure the resistance between the IAC #2 Driver circuit and #3, #4 Driver circuits. Is the resistance below 100 ohms on any of the Drivers? Yes → Repair the shorted IAC Driver circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Measure the resistance between the IAC #3 Driver circuit and the #4 Driver circuit. Is the resistance below 100 ohms? Yes → Repair the short between the IAC Driver circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Remove the ASD Relay. Using a jumper wire, jumper between the Fused B+ circuit and ASD Relay Output circuit in the PDC. Ignition on, engine not running. Measure the voltage on each of the IAC Driver circuits. Is the voltage above 1.0 volt at any IAC Driver circuits? Yes → Repair the short to voltage on the IAC Driver circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6 **NOTE: Remove the jumper wire and install the ASD Relay before continuing.**	All
6	Turn the ignition off. Measure the resistance between ground and each IAC Driver circuit. Is the resistance below 100 ohms at any IAC Driver circuit? Yes → Repair the short to ground in the appropriate IAC Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Connect the PCM harness connectors. Start and idle the engine. Using a test light connected to ground, probe the IAC Driver #1 circuit for 10 seconds. Repeat the above test for the remaining IAC Motor Driver circuits. Does the test light turn on and off while probing each IAC Motor Driver circuits? Yes → Replace the Idle Air Control Motor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0523-OIL PRESSURE VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0523-OIL PRESSURE VOLTAGE TOO HIGH

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: The oil pressure sensor signal at PCM goes above 4.9 volts.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
OIL PRESSURE SWITCH
(G60) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G60) OIL PRESSURE SIGNAL CIRCUIT OPEN
(G60) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the Oil Pressure Switch harness connector. Ignition on, engine not running. Connect a jumper wire to the (G60) Oil Pressure Signal circuit in the Sensor harness connector. With the DRBIII® monitor the Oil Pressure Switch state. Touch the other end of the jumper wire to the Ground circuit at the Oil Pressure Switch harness connector several times. Did the Oil Pressure Switch state change from High to Low? Yes → Replace the Oil Pressure Switch. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0523-OIL PRESSURE VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (G60) Oil Pressure Signal circuit at the Switch harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage on the (G60) Oil Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (G60) Oil Pressure Signal circuit from the Oil Pressure Switch harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (G60) Oil Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between (G60) Oil Pressure Signal circuit and ground at the Switch connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (G60) Oil Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Measure the resistance between Ground and the Ground circuit at the Oil Pressure Switch connector. Is the resistance below 100 ohms? Yes → Go To 7 No → Repair the open in the Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0551-POWER STEERING SWITCH FAILURE

When Monitored and Set Condition:

P0551-POWER STEERING SWITCH FAILURE

When Monitored: With the ignition key on and engine running.

Set Condition: With the vehicle above 40 mph for over 30 seconds, the power steering pressure switch remains open.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
POWER STEERING PRESSURE SWITCH
(K10) POWER STEERING SWITCH SENSE CIRCUIT OPEN
(K10) POWER STEERING PRESSURE SWITCH SENSE CIRCUIT SHORTED TO GROUND
POWER STEERING PRESSURE SWITCH GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the Power Steering Pressure Switch harness connector. Ignition on, engine not running. Connect a jumper wire to the (K10) P/S Pressure Switch Signal circuit at harness connector. Using the DRBIII®, while monitoring the Power Steering Pressure Switch. Touch the jumper wire to the (Z1) Ground circuit at the Power Steering Pressure Switch harness connector several times. Did the Power Steering Pressure Switch status change from Hi to Low? Yes → Replace the Power Steering Pressure Switch. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P0551-POWER STEERING SWITCH FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure resistance of (K10) P/S Pressure Switch Signal circuit from PCM harness connector to P/S Pressure Switch harness connector. Is the resistance below 100 ohms? Yes → Go To 4 No → Repair the open in the (K10) Power Steering Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Measure the resistance between the (K10) Power Steering Pressure Switch Sense circuit and ground from the Pressure Switch harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K10) Power Steering Pressure Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Using a 12-volt test light connected to 12 volts, probe the ground circuit in the Power Steering Pressure Switch harness connector. Does the test light illuminate? Yes → Go To 6 No → Repair the open in the Power Steering Pressure Switch ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0601-PCM INTERNAL CONTROLLER FAILURE

When Monitored and Set Condition:

P0601-PCM INTERNAL CONTROLLER FAILURE

When Monitored: With the ignition key on.

Set Condition: Internal checksum for software failed, does not match calculated value.

POSSIBLE CAUSES
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: This DTC indicates an internal PCM problem.** If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0622-GENERATOR FIELD NOT SWITCHING PROPERLY

When Monitored and Set Condition:

P0622-GENERATOR FIELD NOT SWITCHING PROPERLY

When Monitored: With the ignition key on and the engine running.

Set Condition: When the PCM tries to regulate the generator field with no result during monitoring.

POSSIBLE CAUSES
GENERATOR FIELD PERFORMANCE
(K125) GEN FIELD SOURCE CIRCUIT OPEN
(K20) GENERATOR FIELD DRIVER CIRCUIT OPEN
(K20) GENERATOR FIELD DRIVER CIRCUIT SHORTED TO GROUND
GENERATOR
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Record all DTCs and the related Freeze Frame data. Using a 12-volt test light connected to ground, backprobe the (K20) Gen Field Control circuit at the back of the Generator. With the DRBIII®, actuate the Generator Field Driver. Does the test light blink? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 2	All
2	Ignition on, engine not running. Carefully inspect all connectors for corrosion or spread terminals before continuing. Backprobe the (K125) Generator Field Source circuit at back of Generator with a volt meter. With the DRBIII® actuate the Generator Field Driver. Is the voltage above 10.0 volts? Yes → Go To 3 No → Repair the open in the (K125) Gen Field Source circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

P0622-GENERATOR FIELD NOT SWITCHING PROPERLY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance of the (K20) Generator Field Driver circuit from the Generator Field harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the (K20) Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
4	Measure the resistance between ground and the (K20) Gen Field Driver circuit in the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K20) Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	Measure the resistance across the Generator Field Terminals at the Generator. Is the resistance between 0.5 of an ohm and 15 ohms? Yes → Go To 6 No → Replace the Generator. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom:
P0645-A/C CLUTCH RELAY CIRCUIT

When Monitored and Set Condition:

P0645-A/C CLUTCH RELAY CIRCUIT

When Monitored: With the ignition key in the run position and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the A/C clutch relay control circuit.

POSSIBLE CAUSES
A/C CLUTCH RELAY OPERATION
A/C CLUTCH RELAY
(F1) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN
(C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, actuate the A/C Clutch Relay. Is the A/C Clutch Relay clicking? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Measure the resistance between Terminals 1(85) and 2 (86) of the A/C Clutch Relay. Is the resistance between 50.0 and 90.0 ohms? Yes → Go To 3 No → Replace the A/C Clutch Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Ignition on, engine not running. Measure the voltage on the (F1) Fused Ignition Switch Output circuit voltage at the A/C Clutch Relay connection. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open in the (F1) Fused Ignition Switch Output circuit. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P0645-A/C CLUTCH RELAY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (C13) A/C Clutch Relay Control circuit from the Relay connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair open in the (C13) A/C Clutch Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between ground and the (C13) A/C Clutch Relay Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (C13) A/C Clutch Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0700-EATX CONTROLLER DTC PRESENT

When Monitored and Set Condition:

P0700-EATX CONTROLLER DTC PRESENT

When Monitored: With the ignition key on.

Set Condition: This DTC is an indicator that a transmission DTC has previously been set.

POSSIBLE CAUSES
TCM DTC PRESENT SET IN PCM

TEST	ACTION	APPLICABILITY
1	This DTC is an indicator that a Trans DTC has previously been set. A code may not currently be present in the TCM if a Trans repair was made. If after reading transmission DTC's there are no codes in the TCM, this code can be erased from the PCM. Trans DTC present? Continue A DTC was registered in the Transmission Control Module. With the DRB, go to the TCM and read codes. Refer to the appropriate symptom (Diagnostic Procedure).	All

Symptom List:

P1195-O2 SENSOR 1/1 SLOW DURING CATALYST MONITOR
P1196-O2 SENSOR 2/1 SLOW DURING CATALYST MONITOR

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1195-O2 SENSOR 1/1 SLOW DURING CATALYST MONITOR.

When Monitored and Set Condition:

P1195-O2 SENSOR 1/1 SLOW DURING CATALYST MONITOR

When Monitored: 2.4L With the engine running, coolant greater than 170°F, open throttle, steady to slightly increasing vehicle speed greater than 18 mph but less than 55 mph, with a light load on the engine, for a period no less than 5 minutes. 3.7L At idle after the engine has reached 147°F, and sufficient engine operation for the predicted catalyst temperature to reach 528°C (982°F).

Set Condition: The oxygen sensor signal voltage is switching from lean to rich and back fewer times than required.

P1196-O2 SENSOR 2/1 SLOW DURING CATALYST MONITOR

When Monitored: At idle, after the engine temperature has reached 147°F, and sufficient engine operation for the predicted catalyst temperature to reach 528°C (982°F).

Set Condition: The oxygen sensor signal voltage is switching from lean to rich and back fewer times than required.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
EXHAUST LEAK
RESISTANCE IN THE O2 SENSOR SIGNAL CIRCUIT
RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT
O2 SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1195-O2 SENSOR 1/1 SLOW DURING CATALYST MONITOR — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine. Inspect the exhaust for leaks between the engine and the appropriate O2 Sensor. Are there any exhaust leaks? Yes → Repair or replace the leaking exhaust parts as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Backprobe the O2 Sensor Signal circuit at the O2 Sensor harness connector and PCM harness connector. **NOTE: Ensure the voltmeter leads are connected for positive polarity, meet the terminals in the connector, and that there is good terminal to wire connection.** Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 4 No → Repair the excessive resistance on the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Backprobe the (K4) Sensor ground circuit at the O2 Sensor harness connector and PCM harness connector. **NOTE: Ensure the voltmeter leads are connected for positive polarity, meet the terminals in the connector, and that there is good terminal to wire connection.** Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the excessive resistance on the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. If there are no possible causes remaining, view repair. Repair Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P1281-ENGINE IS COLD TOO LONG

When Monitored and Set Condition:

P1281-ENGINE IS COLD TOO LONG

When Monitored: The ignition key on, engine running, Ambient Temperatur greater than 20°F, and Vacuum is less than 17″Hg.

Set Condition: The engine does not warm to 85° C (181° F) while driving for more than 3 minutes and less than 1 hour depending on Engine load and Start up Temperature.

POSSIBLE CAUSES
ENGINE COLD TOO LONG

TEST	ACTION	APPLICABILITY
1	**Note: The best way to diagnose this DTC is to allow the vehicle to remain outside overnight in order to have a completely cold soaked engine.** **Note: Extremely cold outside ambient temperatures may cause this DTC to set.** Verify that the coolant level is not low and correct as necessary. Start the engine. With the DRBIII®, set the engine RPM to 1500 and allow the engine to warm up for 10-15 minutes. With the DRBIII®, monitor the ENG COOLANT TMP DEG value during the warm up cycle. Make sure the transition of temperature change is smooth. Did the engine temperature reach a minimum of 80° C (176° F)? Yes → Test Complete. No → Refer to the Service Information for cooling system performance diagnosis. The most probable cause is a Thermostat problem. Also, refer to any related TSBs. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT

When Monitored and Set Condition:

P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the fuel pump relay control circuit.

POSSIBLE CAUSES
FUEL PUMP RELAY OPERATION
FUEL PUMP RELAY
(F1) FUSED IGNITION SWITCH OUTPUT CIRCUIT
(K31) FUEL PUMP RELAY CONTROL CIRCUIT OPEN
(K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, actuate the Fuel Pump Relay. Is the Fuel Pump Relay clicking? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Remove the Fuel Pump Relay. Measure the resistance between terminals 1 (85) and 2 (86) of the Fuel Pump Relay. Is the resistance between 50 and 90 ohms? Yes → Go To 3 No → Replace the Fuel Pump Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Ignition on, engine not running. With a 12-volt test light connect to ground, probe the (F1) Fused Ignition Switch output circuit in the Fuel Pump Relay connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the open or short to ground in the (F1) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K31) Fuel Pump Relay Control circuit from the PDC terminal to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K31) Fuel Pump Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between ground and the (K31) Fuel Pump Relay Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K31) Fuel Pump Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1294-TARGET IDLE NOT REACHED

When Monitored and Set Condition:

P1294-TARGET IDLE NOT REACHED

When Monitored: With the engine idling and in drive, if automatic. There must not be a MAP sensor trouble code or a throttle position sensor trouble code.

Set Condition: Engine idle is not within100 rpm above or below target idle for 14 seconds. Three separate failures are required to set a bad trip. Two bad trips are required to set the code.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
VACUUM LEAK
AIR INDUCTION SYSTEM
THROTTLE BODY AND THROTTLE LINKAGE
IAC DRIVER CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **NOTE: All MAP Sensor, IAC, and/or TPS codes present must be diagnosed first before proceeding.** With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Inspect the Intake Manifold for vacuum leaks. Inspect the Power Brake Booster for any vacuum leaks. Inspect the PCV system for proper operation or any vacuum leaks. Were any problems found? Yes → Repair vacuum leak as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All

P1294-TARGET IDLE NOT REACHED — Continued

TEST	ACTION	APPLICABILITY
3	Inspect the Air Induction System for the following problems. Restrictions: Dirty Air Cleaner, Foreign material in the air intake tube, etc. Leaks: Air Intake tube connection, Air Cleaner housing, etc. Were any problems found? Yes → Repair or replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Inspect the throttle body plate for carbon build up or other restrictions. Inspect the throttle linkage for binding and smooth operation. Ensure the throttle plate is resting on the stop at idle. Remove IAC, inspect the pintle and its seating surface inside the throttle body. Were any problems found? Yes → Repair the reason for the carbon build up and replace the Throttle Body as needed. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Turn the ignition off. Disconnect IAC Motor harness connector. Disconnect the PCM harness connectors. Measure the resistance of each of the IAC Driver circuit from the IAC Motor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the appropriate IAC Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1296-NO 5-VOLTS TO MAP SENSOR

When Monitored and Set Condition:

P1296-NO 5-VOLTS TO MAP SENSOR

When Monitored: During power-down and battery voltage greater than 10.4 volts.

Set Condition: The MAP sensor signal voltage goes below 2.35 volts with the key off for 5 seconds.

POSSIBLE CAUSES
MAP SENSOR VOLTS BELOW 2.3 VOLTS
SHORTED SENSOR
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
MAP SENSOR
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: If the P0107 - MAP Sensor Voltage Too Low is also set, diagnose it first before continuing with P1296 - No 5-volts To MAP Sensor.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII® in Sensors, read the MAP Sensor voltage. Is the voltage below 2.35 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the voltage above 4.5 volts? Yes → Go To 3 No → Go To 4	All
3	With the DRBIII® in Sensors, read the MAP Sensor voltage while the Sensor harness connector is disconnected. Is the voltage above 4.5 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All

P1296-NO 5-VOLTS TO MAP SENSOR — Continued

TEST	ACTION	APPLICABILITY
4	Measure the voltage on the (K7) 5-volt Supply circuit in the MAP Sensor harness connector while disconnecting the remaining Sensors that share the (K7) 5-volt Supply circuit. Does the voltage return to approximately 5.0 volts with any Sensor disconnected? Yes → Replace the Sensor that pulled the (K7) 5-volt Supply circuit low. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the PCM harness connector. Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open or excessive resistance in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Measure the resistance between ground and the (K7) 5-volt Supply circuit in the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P1297-NO CHANGE IN MAP FROM START TO RUN

When Monitored and Set Condition:

P1297-NO CHANGE IN MAP FROM START TO RUN

When Monitored: With engine RPM +/- 64 of target idle and the throttle blade at closed throttle.

Set Condition: Too small of a difference is seen between barometric pressure with ignition on (engine running) and manifold vacuum for 8.80 seconds.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
MAP SENSOR VACUUM PORT
MAP SENSOR VOLTAGE BELOW 3.19 VOLTS
(K7) 5-VOLT SUPPLY CIRCUIT OPEN
(K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAP SENSOR
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: If a MAP high or Low DTC set along with P1297, diagnose the High or Low DTC first before continuing.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. Remove the MAP Sensor. Inspect the vacuum port, check for restrictions or any foreign materials. Were any restriction found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3 **NOTE: Reinstall the MAP Sensor before continuing.**	All

P1297-NO CHANGE IN MAP FROM START TO RUN — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. With the DRBIII®, read the MAP Sensor voltage. **NOTE: If a MAP High or Low DTC was set along with P1297, diagnose the High or Low DTC first.** Is the voltage below 3.19 volts? Yes → Go To 4 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the MAP Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 5 No → Go To 8	All
5	With the DRBIII®, monitor the MAP Sensor voltage with the Sensor harness connector disconnected. Is the voltage above 1.2 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All
8	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1297-NO CHANGE IN MAP FROM START TO RUN — Continued

TEST	ACTION	APPLICABILITY
9	Measure the resistance between ground and the (K7) 5-volt Supply circuit in the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All
10	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P1299-VACUUM LEAK FOUND

When Monitored and Set Condition:

P1299-VACUUM LEAK FOUND

When Monitored: With the engine running.

Set Condition: If vacuum drops below 1.5″ Hg with engine RPM greaer than 2000 RPM and closed throttle.

POSSIBLE CAUSES
VACUUM LEAK
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: This code is enabled on engines with plastic intake manifolds and is intended to shut down the engine if a large crack occurs.** **NOTE: A large vacuum leak is mostly the cause of this DTC.** Inspect the Intake manifold for vacuum leaks. Inspect the Power Brake Booster for any vacuum leaks. Inspect the PCV system for proper operation or any vacuum leaks. Improperly installed MAP Sensor. Were any vacuum leaks found? Yes → Repair vacuum leak as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT

When Monitored and Set Condition:

P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT

When Monitored: With ignition key on and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the ASD Relay control circuit.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
ASD RELAY
(F1) FUSED IGNITION SWITCH OUTPUT CIRCUIT
(K51) ASD RELAY CONTROL CIRCUIT OPEN
(K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Remove the ASD Relay. Measure the resistance between terminals 85 and 86 of the ASD Relay. Is the resistance between 50 and 80 ohms? Yes → Go To 3 No → Replace the ASD Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the (F15) Fused Ignition Switch Output circuit at the ASD Relay connector in the PDC. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the open or short to ground in the (F1) Fused Ignition Output. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K51) ASD Relay Control circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K51) ASD Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between ground and the (K51) ASD Relay Control circuit at the PDC. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K51) ASD Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no more possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM

When Monitored and Set Condition:

P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM

When Monitored: With ignition key on, battery voltage above 10.4 volts, and engine RPM greater than 400.

Set Condition: No voltage sensed at the PCM when the ASD relay is energized.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
ASD RELAY
(A14) FUSED B+ CIRCUIT OPEN
(A142) ASD RELAY OUTPUT CIRCUIT OPEN
(A142) ASD OUTPUT CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Attempt to start the engine. Did the engine start? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the PCM harness connectors. Measure the resistance of the (A142) ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (A142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM — Continued

TEST	ACTION	APPLICABILITY
4	Install a substitute relay for the ASD Relay. Attempt to start the vehicle. Did the engine start? Yes → Replace the ASD Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Turn the ignition off. Remove the ASD Relay from the PDC. Using a 12-volt test light, probe the (A14) Fused B+ circuit at the ASD Relay connector. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the open or short to ground in the (A14) Fused B+ circuit. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	Disconnect the PCM harness connectors. Measure the resistance of the (A142) ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (A142) ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1391-INTERMITTENT LOSS OF CMP OR CKP

When Monitored and Set Condition:

P1391-INTERMITTENT LOSS OF CMP OR CKP

When Monitored: Engine running or cranking.

Set Condition: When the failure counter reaches 20 for 2 consecutive trips.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CMP WIRE HARNESS INSPECTION
TONE WHEEL/PULSE RING INSPECTION
CHECKING INTERMITTENT CMP SIGNAL WITH A LAB SCOPE
CKP WIRE HARNESS INSPECTION
TONE WHEEL/PULSE RING INSPECTION
CHECKING INTERMITTENT CKP SIGNAL WITH A LAB SCOPE
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine and run until operating temp is reached. (Closed Loop) It may be necessary to test drive the vehicle. Does the P1391 DTC reset? Yes → Go To 2 No → The condition that sets this DTC are not present at this time. For further assistance refer to TSB's and wire diagrams. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Turn the ignition off. With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Observe the lab scope screen. Are there any irregular or missing signals? Yes → Go To 3 No → Go To 6	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight. Refer to any TSBs that may apply. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Remove the Camshaft Position Sensor. Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement. Were any problems found? Yes → Repair or replace the Tone Wheel/Pulse Ring as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace the Camshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the PCM harness connector and in the CMP harness connector. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Observe the lab scope screen. Wiggle the related wire harness and gently tap on the Cam Position Sensor. Look for any differences between the Channel 1 and Channel 2 patterns, generated by the CMP Sensor. Does the DRBIII® screen display any missing or irregular patterns? Yes → Replace the Camshaft Position Sensor or repair the wiring/ connection concern.. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Observe the lab scope screen. Are there any irregular or missing signals? Yes → Go To 8 No → Go To 11	All
8	Turn the ignition off. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight. Refer to any TSBs that may apply. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
9	Remove the Crankshaft Position Sensor. Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement. Were any problems found? Yes → Repair or replace the Tone Wheel/Flex Plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All
10	If there are no possible causes remaining, view repair. Repair Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
11	**NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.** Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the PCM harness connector and CKP harness connector. Both of the graphs should be identical. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Monitor the DRBIII® lab scope screen, both patterns should be the same. Wiggle the related wire harness and gently tap on the Crank Position Sensor. Look for any differences between Channel 1 and Channel 2 patterns generated by the CKP Sensor. Were any erratic or missing signals noticed? Yes → Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT

When Monitored and Set Condition:

P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT

When Monitored: Under closed throttle decel and Fuel Pulse Width equal to zero for 30 seconds.

Set Condition: One of the CKP sensor target windows has more than 2.86% variance from the reference window.

POSSIBLE CAUSES
ADAPTIVE NUMERATOR RELEARN
CMP SENSOR CONNECTOR/WIRING
CKP SENSOR CONNECTOR/WIRING
DAMAGED TONE WHEEL/FLEX PLATE (CRANKSHAFT)
CRANKSHAFT POSITION SENSOR
PCM

TEST	ACTION	APPLICABILITY
1	**Note: Check for any TSB's that may apply to this symptom.** Read and record the Freeze Frame Data. Use this information to help you duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load. Ignition on, engine not running. With the DRBIII® in the miscellaneous menu, choose ″Clear PCM (battery disconnect)″ to reset the PCM. With the DRBIII®, choose the ″Misfire Pretest screen. Road test the vehicle and re-learn the adaptive numerator. The adaptive numerator is learned when the ″Adaptive Numerator Done Learning″ line on the Mis-fire Pre-test screen changes to ″Yes″. Did the adaptive numerator re-learn? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All

P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT — Continued

TEST	ACTION	APPLICABILITY
2	Turn ignition off. **Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Verify the Camshaft Position Sensor is properly installed.** **Note: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	**Note: Visually inspect the Crankshaft Position Sensor and related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Verify the Crank Position Sensor is properly installed.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Disconnect and remove the Crankshaft Position Sensor. Inspect the tone wheel/flexplate slots for damage, foreign material, or excessive movement. Is the tone wheel/flexplate free from defects? Yes → Go To 5 No → Repair/replace tone wheel/flex plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	With the DRBIII® lab scope probe and the Miller special tool #6801, back probe the CKP Signal circuit in the PCM harness connector. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING..** Start the engine and observe the lab scope screen for any erratic CKP Sensor pulses. Were any erratic Crank Position signals detected? Yes. Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No. Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND

When Monitored and Set Condition:

P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40 deg. F and 90 deg. F and coolant temperature within 10 deg. F of battery/ ambient.

Set Condition: LDP test must pass first. If the PCM suspects a pinched hose it will not set a fault until it runs the evap purge flow monitor. If the purge monitor does not pass then the pinched hose fault will be set.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
EVAP CANISTER OBSTRUCTED
OBSTRUCTION IN HOSE/TUBE BETWEEN EVAP CANISTER AND PURGE SOLENOID
LDP PRESSURE HOSE OBSTRUCTED
LEAK DETECTION PUMP

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the DTC Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
2	Pressurize the EVAP System. On Miller Tool #8404, set the Pressure/Hold switch to Open and set the Vent switch to Closed. Turn the pump timer On and watch the gauge. The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized. Disconnect the LDP Pressure hose at the EVAP Canister. The LDP Pressure hose is the hose that connects the Evap Canister to the Leak Detection Pump. Did the pressure drop when the hose was disconnected? Yes → Go To 3 No → Replace the EVAP Canister. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND — Continued

TEST	ACTION	APPLICABILITY
3	**Note: Connect all previously disconnected hose(s).** Re-pressurize the EVAP System. On Miller Tool #8404, set the Pressure/Hold switch to Open and set the Vent switch to Closed. Turn the pump timer On and watch the gauge. The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized. Disconnect the EVAP hoses at the Purge Solenoid. Did the pressure drop when the hose was disconnected? Yes → Go To 4 No → Repair or replace hose/tube as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
4	Disconnect and remove the LDP pressure hose. The LDP pressure hose is the hose that connects the EVAP Canister to the Leak Detection Pump. Inspect the LDP pressure hose for any obstructions or physical damage. Is the LDP pressure hose free from defects? Yes → Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Repair/replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

Symptom:
P1491-COOLING FAN RELAY CONTROL CIRCUIT

POSSIBLE CAUSES
RADIATOR FAN RELAY OPERATION
(C24) FUSED B+ OUTPUT CIRCUIT
(Z212) GROUND CIRCUIT
(K173) RADIATOR FAN RELAY CONTROL CIRCUIT OPEN
(K173) RADIATOR FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, actuate the Radiator Fan Relay. Is the Radiator Fan operating? Yes → Refer to the INTERITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Remove the Cooling Fan Relay. Using a 12-volt test light connected to ground, probe the (C24) Fused B+ circuit of the Cooling Fan Relay connector. Is the voltage above 11.0 volts? Yes → Go To 3 No → Repair the open or short to ground in the (C24) Fused B+ circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Using a 12-volt test light connected to 12-volts, probe the (Z212) Ground circuit in the Cooling Fan Relay harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the open in the (Z212) Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Disconnect the PCM harness connectors. Measure the resistance of the (K173) Cooling Fan Relay Control circuit between the Radiator Fan Relay connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the open in the (K173) Radiator Fan Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All

P1491-COOLING FAN RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
5	Measure the resistance between ground and the (K173) Radiator Fan Relay Control circuit at Relay connector. Is the resistance below 100 ohms? Yes → Go To 6 No → Repair the short to ground in the (K173) Radiator Fan Relay control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1492-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P1492-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO HIGH

When Monitored: With the ignition key on.

Set Condition: The PCM senses the voltage from the AMBIENT/BATT Temperature Sensor above 4.9 volts for 3 seconds.

POSSIBLE CAUSES
BATTERY TEMP SENSOR VOLTAGE ABOVE 4.8 VOLTS
BATTERY TEMPERATURE SENSOR
(K118) BATTERY TEMP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K118) BATTERY TEMP SIGNAL CIRCUIT OPEN
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Record all DTCs and the related Freeze Frame data. With the DRBIII®, monitor the Battery Temperature Sensor voltage. Is the voltage above 4.8 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the Ambient/Battery Temperature Sensor connector. Ignition on, engine not running. With the DRBIII®, read the Ambient/Batt Tmp Vlt value. Connect a jumper wire between the (K118) Ambient/Batt Temp Signal circuit and the (K4) Sensor ground circuit at the Sensor harness connector. Did the Battery Temp Sensor voltage change from greater than 4.5 volts to less than 1.0 volt? Yes → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P1492-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K118) Battery Temp Signal circuit at the Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (K118) Battery Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (K118) Battery Temp Signal circuit from the Battery Temp Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K118) Battery Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance of the (K4) Sensor ground circuit from the Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1493-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P1493-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The PCM senses the voltage from the AMBIENT/BATT Temperature Sensor below 0.5 of a volt for 3 seconds.

POSSIBLE CAUSES
BATTERY TEMP SENSOR VOLTS BELOW 0.5 OF A VOLT
BATTERY TEMPERATURE SENSOR
(K118) BATTERY TEMP SIGNAL CIRCUIT SHORTED TO GROUND
(K118) BATTERY TEMP SIGNAL CIRCUIT SHORTED TO THE (K4) SENSOR GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Record all DTCs and the related Freeze Frame data. With DRBIII®, monitor the Ambient/Battery Temperature Sensor voltage. Is the voltage below 0.5 of a volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
2	Turn the ignition off. Disconnect the Ambient/Batt Temperature Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read Ambient/Battery Temperature Sensor voltage. Is the voltage above 1.0 volt? Yes → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K118) Battery Temp Signal circuit at the Battery Temp Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K118) Battery Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 4	All

P1493-AMBIENT/BATTERY TEMP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Measure the resistance between the (K118) Battery Temp Signal circuit and the (K4) Sensor ground circuit at the Battery Temp Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground circuit and the (K118) Battery Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom:
P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT

When Monitored and Set Condition:

P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40 deg. F and 90 deg. F and coolant temperature within 10 deg. F of battery/ ambient.

Set Condition: The state of the switch does not change when the solenoid is energized.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
LDP VACUUM SUPPLY
LEAK DETECTION PUMP
(K107) LDP SWITCH SIGNAL CIRCUIT OPEN
(K107) LDP SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
2	Turn the ignition off. Disconnect the vacuum supply hose at the Leak Detection Pump. Connect a vacuum gauge to the disconnected vacuum supply hose at the Leak Detection Pump. Start the engine and read the vacuum gauge. Does the vacuum gauge read at least 13″ Hg? Yes → Go To 3 No → Repair leak or obstruction in vacuum hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Connect the vacuum supply hose at the LDP. Disconnect the Leak Detection Pump electrical harness connector. Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Leak Detect Pump Switch state. Connect a jumper wire between 12-volts and the (K107) LDP Switch Signal circuit. Did the Leak Detect Pump Sw state change when the jumper was connected? Yes → Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 4 **NOTE: Remove the jumper wire before continuing.**	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K107) LDP Switch Signal circuit from the PCM harness connector to LDP harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K107) Leak Detection Pump Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
5	Measure the resistance between ground and the (K107) LDP Switch Signal circuit at the LDP harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K107) LDP Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

Symptom:
P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT

When Monitored and Set Condition:

P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT

When Monitored: Continuously when the ignition is on and battery voltage is greater than 10.4 volts.

Set Condition: The state of the solenoid circuit does not match the PCM's desired state.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
(K125) GENERATOR SOURCE CIRCUIT OPEN
LEAK DETECTION PUMP
(K106) LDP SOLENOID CONTROL CIRCUIT OPEN
(K106) LDP SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
2	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Leak Detection Pump. Using a 12-volt test light connected to ground, check the (K125) Generator Source circuit at the LDP connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open in the (K125) Generator Source circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Connect a 12-volt test light to a good 12-volt source. Ignition on, engine not running. With the DRBIII®, actuate the Leak Detection Pump. Probe the (K106) LDP Solenoid Control circuit with the test light while the Pump is actuating. Does the test light blink? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
5	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K106) LDP Solenoid Control circuit from the PCM harness connector to the LDP harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K106) Leak Detection Pump Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
6	Measure the resistance between ground and the (K106) LDP Solenoid Control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K106) LDP Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 7	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

Symptom:
P1594-CHARGING SYSTEM VOLTAGE TOO HIGH

When Monitored and Set Condition:

P1594-CHARGING SYSTEM VOLTAGE TOO HIGH

When Monitored: With the ignition key on and the engine speed greater than 0 RPM.

Set Condition: When the PCM regulates the generator field and there are no detected field problems, but the voltage output does not decrease.

POSSIBLE CAUSES
CHARGING SYSTEM OPERATION
(K20) GENERATOR FIELD DRIVER CIRCUIT SHORTED TO GROUND
GENERATOR FIELD COIL SHORTED TO GROUND
BATTERY TEMPERATURE SENSOR
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Battery must be fully charged and be capable of passing a load test.** **Note: Generator Belt tension and condition must be checked before continuing.** Ignition on, engine not running. With the DRBIII®, read DTCs and the related Freeze Frame data then clear the DTCs. Start the engine. With the DRBIII®, read DTCs. Does the Generator light illuminate and is a DTC set? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field Harness connector. Carefully inspect the related connectors for corrosion or spread terminals before continuing. Measure the resistance between ground and the (K20) Generator Field Driver circuit at the Generator harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K20) Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All

P1594-CHARGING SYSTEM VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Measure the resistance between ground and the Generator Field terminals on the Generator. Is the resistance below 100 ohms? Yes → Replace or repair the Generator. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 4	All
4	Connect the PCM harness connectors and the Generator harness connector. Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Batt Temp Sensor value. Using a thermometer measure under hood temperature near Battery tray. Is the thermometer temperature within 10 deg of DRBIII® Battery temperature? Yes → Go To 5 No → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom List:

P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS
P1683-SPEED CONTROL POWER CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS.

When Monitored and Set Condition:

P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS

When Monitored: With the ignition key on, the speed control switched on, the SET switch pressed and the vehicle in drive gear moving above 35 MPH.

Set Condition: The powertrain control module actuates the vacuum and vent solenoids but they do not respond.

P1683-SPEED CONTROL POWER CIRCUIT

When Monitored: With the ignition key on and the speed control switched on.

Set Condition: The speed control power supply circuit is either open or shorted to ground.

POSSIBLE CAUSES
(Z212) GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
(V30) S/C BRAKE SWITCH OUTPUT CIRCUIT
(V30) S/C BRAKE SWITCH OUTPUT CIRCUIT OPEN
BRAKE LAMP SWITCH
(V32) S/C POWER SUPPLY CIRCUIT OPEN
S/C VACUUM SOLENOID
(V36) S/C VACUUM SOL CONTROL CIRCUIT OPEN
(V36) S/C VACUUM SOL CONTROL CIRCUIT SHORTED TO GROUND
S/C VENT SOLENOID
(V35) S/C VENT SOL CONTROL CIRCUIT OPEN
(V35) S/C VENT SOL CONTROL CIRCUIT SHORTED TO GROUND
PCM

P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. **NOTE: In the below step you will need to actuate both S/C solenoids separately. Note the operation of the each solenoid when actuated.** With the DRBIII®, actuate the Speed Control Vacuum Solenoid and note operation. With the DRBIII®, actuate the Speed Control Vent Solenoid and note operation. Choose the conclusion that best matches the solenoids operation. Vacuum Solenoid not operating Go To 2 Vent Solenoid not operating Go To 5 Both S/C Solenoids not operating Go To 8 Both S/C Solenoids operating Go To 13	All
2	Turn the ignition off. Disconnect the Speed Control Servo harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Speed Control Vacuum Solenoid. Using a 12-volt test light connected to 12-volts, probe the (V36) S/C Vacuum Sol Control circuit at the S/C Servo harness connector. Does the test light illuminate brightly and flash? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (V36) S/C Vacuum Sol Control circuit between the PCM harness connector and Speed Control Servo harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the (V36) S/C Vacuum Sol Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
4	Measure the resistance between ground and the (V36) S/C Vacuum Sol Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (V36) S/C Vacuum Sol Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 12	All

P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Speed Control Servo harness connector. Ignition on, engine not running. With the DRBIII®, actuate the S/C Vent Solenoid. Using a 12-volt test light connected to 12-volts, probe the (V35) S/C Vent Sol Control circuit in the Speed Control Servo harness connector. Does the test light illuminate brightly and flash? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 6	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (V35) S/C Vent Sol Control circuit between the PCM harness connector and S/C Servo harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (V35) S/C Vent Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
7	Measure the resistance between ground and the (V35) S/C Vent Sol Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (V35) S/C Vent Sol Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 12	All
8	Turn the ignition off. Disconnect the S/C Servo harness connector. Ignition on, engine not running. Turn the Cruise Control on, it may be necessary to hold the button in the On position. Using a 12-volt test light connected to ground, probe the (V30) S/C Brake Switch Output circuit in the S/C Servo harness connector. Does the test light illuminate brightly? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 9	All
9	Turn the ignition off. Disconnect the Brake Lamp Switch harness connectors. Measure the resistance of the (V30) S/C Brake Switch Output circuit from the S/C Servo harness connector to the Brake Lamp Switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the (V30) S/C Brake Switch Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1595-SPEED CONTROL SERVO SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
10	Ignition on, engine not running. Turn the Cruise Control on, it may be necessary to hold the On button down while checking the following circuit. Using a 12-volt test light connected to ground, probe the (V32) S/C Power Supply circuit in the Brake Lamp Switch harness connector. Does the test light illuminate brightly? Yes → Replace the Brake Lamp Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 11	All
11	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (V32) S/C Power Supply circuit between the PCM harness connector and the Brake Lamp Switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the open in the (V32) S/C Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
12	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If the there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
13	Turn the ignition off. Disconnect the S/C Servo harness connector. Using a 12-volt test light connected to 12-volts, probe the (Z1) Ground circuit in the S/C Servo harness connector. Does the test light illuminate brightly? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Repair the open in the (Z212) Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

Symptom:
P1596-SPEED CONTROL SWITCH ALWAYS HIGH

When Monitored and Set Condition:

P1596-SPEED CONTROL SWITCH ALWAYS HIGH

When Monitored: With the ignition key on.

Set Condition: An open circuit is detected in the speed control on/off switch circuit. The circuit must be above 4.8 volts for more than 2 minutes to set the DTC.

POSSIBLE CAUSES
SPEED CONTROL ON/OFF SWITCH OPERATION
S/C ON/OFF SWITCH
CLOCKSPRING
(V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V37) S/C SWITCH SIGNAL CIRCUIT OPEN BETWEEN PCM AND CLOCK SPRING
(K4) SENSOR GROUND CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING
(V37) S/C SWITCH SIGNAL CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH
(K4) SENSOR GROUND CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH
PCM

TEST	ACTION	APPLICABILITY
1	Engine Running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII® in Sensors, read the Speed Control inputs state. While monitoring the DRBIII®, push the Speed Control On/Off Switch several times, then leave it on. Did the DRBIII® show Speed Control Switching off and on? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 2	All
2	Turn the ignition off. Disconnect the S/C On/Off Switch 2-way harness connector only. Measure the resistance across the S/C On/Off Switch. Is the resistance between 20.3K and 20.7K ohms? Yes → Go To 3 No → Replace the On/Off Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Disconnect the upper and lower 6-way clockspring harness connectors per Service Information. Measure the resistance of the (K4) Sensor ground circuit between the upper and lower 6-way clockspring harness connectors. Measure the resistance of the (V37) S/C Switch Signal circuit between the upper and lower 6-way clockspring harness connectors. Was the resistance above 5.0 ohms for either circuit? Yes → Replace the clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 4	All
4	Connect the Clockspring harness connectors per Service Information. Disconnect the Speed Control On/Off Switch 2-way harness connector only. Ignition on, engine not running. Measure the voltage on the (V37) S/C Switch Signal circuit in the On/Off Switch 2-way connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (V37) S/C Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 5	All
5	Turn the ignition off. Disconnect the upper and lower Clockspring harness connectors per Service Information. Disconnect the PCM harness connectors. Measure the resistance of the (V37) S/C Switch Signal circuit from the PCM harness connector to the lower Clockspring harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (V37) S/C Switch Signal circuit between the PCM and Clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
6	Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the lower Clockspring harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open (K4) Sensor ground circuit between the PCM and Clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
7	Measure the resistance of the (V37) S/C Switch Signal circuit from the upper Clockspring harness connector to the On/Off switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (V37) S/C Switch Signal circuit, Clockspring to S/C Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

TEST	ACTION	APPLICABILITY
8	Measure the resistance of the (K4) Sensor ground circuit from the On/Off Switch 2-way harness connector to the upper Clockspring harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the (K4) Sensor ground circuit between the Clockspring and S/C Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

Symptom:
P1597-SPEED CONTROL SWITCH ALWAYS LOW

When Monitored and Set Condition:

P1597-SPEED CONTROL SWITCH ALWAYS LOW

When Monitored: With the ignition key on and battery voltage above 10.4 volts.

Set Condition: When switch voltage is less than 0.39 of a volt for 2 minutes.

POSSIBLE CAUSES
S/C SWITCH VOLTAGE BELOW 1.0 VOLT
S/C ON/OFF SWITCH
S/C RESUME/ACCEL SWITCH
CLOCKSPRING SHORTED TO GROUND
(V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
(V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. With the DRBIII®, read the S/C Switch volts status. Is the S/C Switch voltage below 1.0 volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
2	Turn the ignition off. Disconnect the S/C ON/OFF Switch harness connector. Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch volts. Did the S/C Switch volts change to 5.0 volts? Yes → Replace the S/C ON/OFF Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 3	All
3	Turn the ignition off. Disconnect the S/C RESUME/ACCEL Switch harness connector. Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch volts. Did the S/C Switch volts go above 4.0 volts? Yes → Replace the Resume/Accel Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 4	All

P1597-SPEED CONTROL SWITCH ALWAYS LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the clockspring 6-way harness connector (instrument panel wiring side) per Service Information. Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch voltage. Did the S/C Switch volts change to 5.0 volts? Yes → Replace the Clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 5	All
5	Turn the ignition off. Connect the Clockspring harness connector per Service Information. Disconnect the PCM harness connectors. Measure the resistance between the (V37) S/C Switch Signal circuit and ground at S/C ON/OFF Switch harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (V37) S/C Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 6	All
6	Measure the resistance between the (V37) S/C Signal circuit and the (K4) Sensor ground circuit at the ON/OFF Switch harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short between the (K4) Sensor ground and the (V37) S/C Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 7	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

Symptom:
P1598-A/C PRESSURE SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P1598-A/C PRESSURE SENSOR VOLTAGE TOO HIGH

When Monitored: With the engine running and the A/C Relay energized.

Set Condition: The A/C Pressure Sensor Signal at the PCM goes above 4.92 volts.

POSSIBLE CAUSES
A/C PRESSURE SENSOR VOLTAGE ABOVE 4.9 VOLTS
A/C PRESSURE SENSOR
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
(C18) A/C PRESSURE SIGNAL CIRCUIT OPEN
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO (K6) 5-VOLT SUPPLY CIRCUIT
(K4) SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the A/C refrigerant System is properly charged per the Service Information.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. With the DRBIII®, read the A/C Pressure Sensor voltage. Is the voltage above 4.9 volts? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Connect a jumper wire between the (C18) A/C Pressure Signal circuit and the (K4) Sensor ground circuit in the Sensor harness connector. With the DRBIII®, monitor the A/C Pressure Sensor voltage. Ignition on, engine not running. Is the voltage below 1.0 volt? Yes → Replace the A/C Pressure Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3 **NOTE: Remove the jumper wire before continuing.**	All

P1598-A/C PRESSURE SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (C18) A/C Pressure Signal circuit in the A/C Pressure Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (C18) A/C Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Measure the resistance of the (C18) A/C Pressure Sensor Signal circuit from the A/C Pressure Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (C18) A/C Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between the (C18) A/C Pressure Signal circuit and the (K6) 5-volt Supply circuit in the A/C Pressure Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short between the (K6) 5-volt Supply circuit and the (C18) A/C Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Measure the resistance of the (K4) Sensor ground circuit from the A/C Pressure Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1599-A/C PRESSURE SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P1599-A/C PRESSURE SENSOR VOLTAGE TOO LOW

When Monitored: With the engine running and the A/C Relay energized.

Set Condition: The A/C Pressure Sensor Signal voltage at the PCM goes below 0.58 volts for 2.6 seconds.

POSSIBLE CAUSES
A/C PRESSURE SENSOR VOLTAGE BELOW .60 OF A VOLT
(K6) 5-VOLT SUPPLY CIRCUIT OPEN
(K6) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
A/C PRESSURE SENSOR
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the A/C refrigerant System is properly charged per the Service Information.** Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame data. Start the engine. With the DRBIII®, read the A/C Pressure Sensor voltage. Is the voltage below 0.6 of a volt? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K6) 5-volt Supply circuit in the A/C Pressure Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 6	All

P1599-A/C PRESSURE SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, monitor the A/C Pressure Sensor voltage with the Sensor disconnected. Is the voltage above 0.6 of a volt? Yes → Replace the A/C Pressure Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (C18) A/C Pressure Signal circuit in the A/C Pressure Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (C18) A/C Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Measure the resistance between the (C18) A/C Pressure Signal circuit and the (K4) Sensor ground circuit in the A/C Pressure Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (C18) A/C Pressure Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 8	All
6	Turn the ignition off. Disconnect the PCM harness connector. Measure the resistance of the (K6) 5-volt Supply circuit between the A/C Pressure Sensor harness connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (K6) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	Measure the resistance between the (K6) 5-volt Supply circuit and ground in the A/C Pressure Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K6) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 8	All
8	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1682-CHARGING SYSTEM VOLTAGE TOO LOW

When Monitored and Set Condition:

P1682-CHARGING SYSTEM VOLTAGE TOO LOW

When Monitored: With the ignition key on and the engine running over 1500 RPM after 25 seconds.

Set Condition: When the battery sensed voltage is 1 volt below the charging goal for 13.47 seconds. The PCM senses the battery voltage, turns off the field driver, and senses the battery voltage again. If the voltages are the same, the code is set.

POSSIBLE CAUSES
CHARGING VOLTAGE BELOW 15.1 VOLTS
BATTERY TEMPERATURE SENSOR
RESISTANCE IN THE BATTERY POSITIVE CIRCUIT
RESISTANCE IN THE GENERATOR GROUND
(K125) GENERATOR FIELD SOURCE CIRCUIT OPEN
(K125) GENERATOR FIELD SOURCE CIRCUIT SHORTED TO GROUND
(K20) GENERATOR FIELD DRIVER CIRCUIT OPEN
RESISTANCE IN THE GENERATOR FIELD COIL
PCM

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: Battery must be fully charged and capable of passing a battery load test.** **Note: Generator Belt tension and condition must be checked before continuing.** **NOTE: Inspect the vehicle for any aftermarket accessories that may exceed the maximum Generator output.** **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Start the engine. Record all DTCs and the related Freeze Frame data. With the DRBIII®, read the target charging voltage. Is the target charging voltage above 15.1 volts? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 2	All

P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. **Note: Generator Belt tension and condition must be checked before continuing.** Start the engine. Allow the engine to reach normal operating temperature. With the DRBIII® in sensors, read the Battery Temp Sensor value. Using a Thermometer, measure under hood temperature. Is the temperature within 10° F of Battery temperature? Yes → Go To 3 No → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
3	Ignition on, engine not running. Measure the voltage between the Generator B+ Terminal and the Battery Positive Post. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **CAUTION: Ensure all wires are clear of the engine's moving parts.** Start the engine. Is the voltage above 0.4 of a volt? Yes → Repair the excessive resistance in the Battery Positive circuit between the Generator and Battery. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 4	All
4	Start the engine. **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Warm the engine to operating temperature. **Caution: Ensure all wires are clear of the engine's moving parts.** Measure the voltage between the Generator case and Battery Negative Post. Is the voltage above 0.1 of a volt? Yes → Repair the excessive resistance in the Generator Ground circuit between the Generator Case and Battery Negative side. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	Ignition on, engine not running. Carefully inspect all connectors for corrosion or spread terminals before continuing. With the DRBIII® actuate the Generator Field Driver. While backprobing, measure the voltage on the (K125) Generator Field Source circuit at back of Generator. Is the voltage above 10.0 volts? Yes → Go To 6 No → Repair the open in the (K125) Generator Field Source circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance between ground and the (K125) Generator Field Source circuit in the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K125) Generator Field Source circuit and replace the PCM. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 7	All
7	Measure the resistance of the (K20) Generator Field Driver circuit from the Generator harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (K20) Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
8	Measure resistance across the Generator Field Terminals at the Generator. Is the resistance above 15 ohms? Yes → Replace or repair the Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 9	All
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom:

P1685-WRONG OR INVALID KEY MSG RECEIVED FROM SKIM

POSSIBLE CAUSES
NO COMMUNICATION WITH SKIM
SKIM TROUBLE CODES SET
NO VIN PROGRAMMED IN THE PCM
INCORRECT VIN IN PCM
INVALID SKIM KEY NOT PRESENT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the PCM DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Ignition on, engine not running. With the DRBIII®, attempt to communicate with the SKIM. Can the DRBIII® communicate with the SKIM? Yes → Go To 3 No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category of the Body Diagnostic Manual. Perform SKIS VERIFICATION.	All
3	With the DRBIII®, check for SKIM DTCs. Are any DTCs present in the SKIM? Yes → Repair all SKIM DTCs. Perform SKIS VERIFICATION. No → Go To 4	All
4	With the DRBIII®, display the VIN that is programmed in the PCM. Has a VIN been programmed into the PCM? Yes → Go To 5 No → Program the correct VIN into the PCM and retest. Perform SKIS VERIFICATION.	All
5	With the DRBIII®, display the VIN that is programmed in the PCM. Was the correct VIN programmed into the PCM? Yes → Go To 6 No → Replace and program the Powertrain Control Module per Service Information. Perform SKIS VERIFICATION.	All

P1685-WRONG OR INVALID KEY MSG RECEIVED FROM SKIM — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Ignition on, engine not running. With the DRBIII®, erase all SKIM and PCM DTCs. Attempt to start and idle the engine. With the DRBIII®, read the PCM DTCs. Does the DRBIII® display this code? Yes → Replace and program the Powertrain Control Module per Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All
7	**NOTE: This DTC could have been set if the SKIM harness connector was disconnected, or if the SKIM was replaced recently.** **NOTE: All keys that the customer uses for this vehicle must be tested to verify they are operating properly.** **NOTE: Ensure the customer is not attempting to use a non-SKIM duplicate key.** Ignition on, engine not running. Verify the correct VIN is programmed into the PCM and SKIM. Turn the ignition off. With the next customer key turn the ignition key on and crank the engine to start. With the DRBIII®, read the PCM DTCs. Is the Good Trip counter displayed and equal to zero? Yes → Replace the Ignition Key. Perform SKIS VERIFICATION. No → Test Complete. **NOTE: If this DTC cannot be reset, it could have been an actual theft attempt.**	All

Symptom:
P1686-NO SKIM BUS MESSAGE RECEIVED

POSSIBLE CAUSES
NO SKIM BUS MESSAGES
LOSS OF SKIM COMMUNICATION
PCI BUS CIRCUIT OPEN FROM PCM TO SKIM
SKIM/PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the PCM DTCs and record the related Freeze Frame data. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform SKIS VERIFICATION.	All
2	With the DRBIII®, attempt to communicate with the SKIM. **NOTE: This test will indicate if the Bus is operational from the DLC to the SKIM.** Was the DRBIII® able to communicate with the SKIM? Yes → Go To 3 No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the SKIM harness connector. Measure the resistance of the PCI Bus circuit between the PCM harness connector and the SKIM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PCI Bus circuit between the PCM and the SKIM for an open. Perform SKIS VERIFICATION.	All

P1686-NO SKIM BUS MESSAGE RECEIVED — Continued

TEST	ACTION	APPLICABILITY
4	Connect the PCM harness connectors. Replace the Sentry Key Immobilizer Module in accordance with the Service Information. Ignition on, engine not running. Display and erase all PCM and SKIM DTCs. Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle. With the DRBIII®, display PCM DTCs. Does the DRBIII® display the same DTC? Yes → Replace and program the Powertrain Control Module per Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom:
P1687-NO CLUSTER BUS MESSAGE

When Monitored and Set Condition:

P1687-NO CLUSTER BUS MESSAGE

When Monitored: With the ignition on.

Set Condition: The PCM has not received an expected Cluster Status Bus message from the instrument cluster within the last 20 seconds.

POSSIBLE CAUSES
NO CLUSTER BUS MESSAGE
COMMUNICATE WITH CLUSTER
INSTRUMENT CLUSTER OPERATION
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, erase DTCs. Cycle the ignition key on and off several times. With the DRBIII®, read DTC's. Does the DTC reset? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	With the DRBIII®, attempt to communicate with the Instrument cluster. Can communication be established with the Instrument Cluster? Yes → Go To 3 No → Refer to the Communication Category of the Body Diagnostic Manual and perform the appropriate symptom related to no communication with cluster. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Start the engine Allow the engine to idle. Is the correct engine speed display in the instrument cluster (Tach)? Yes → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Refer to the Instrument Category in the Body Diagnostic Manual and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
P1696-PCM FAILURE EEPROM WRITE DENIED

When Monitored and Set Condition:

P1696-PCM FAILURE EEPROM WRITE DENIED

When Monitored: Ignition key on, Continuous.

Set Condition: An attempt to program/write to the internal EEPROM failed, Also checks at powerdown.

POSSIBLE CAUSES
DRBIII® DISPLAYS WRITE FAILURE
DRBIII® DISPLAYS WRITE REFUSED 2ND TIME
DRBIII® DISPLAYS SRI MILEAGE INVALID
COMPARE SRI MILEAGE WITH ODOMETER

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, perform the SRI Memory Test. Does the DRBIII® display Write Failure? Yes → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 2	All
2	With the DRBIII®, perform the SRI Memory Test. Does the DRBIII® display Write Refused? Yes → Go To 3 No → Go To 4	All
3	With the DRBIII®, perform the SRI Memory Test a second time. **NOTE: Retest the SRI Memory two more times.** Does the DRBIII® display Write Refused again? Yes → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Test Complete.	All
4	With the DRBIII®, perform the SRI Memory Test. Does the DRBIII® display SRI Mileage Invalid? Yes → Update the mileage and retest the SRI Memory. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 5	All

P1696-PCM FAILURE EEPROM WRITE DENIED — Continued

TEST	ACTION	APPLICABILITY
5	Compare the SRI Mileage stored with the Instrument Panel Odometer. Is the mileage within the specified range displayed on the DRBIII®? Yes → Test Complete. No → Update the mileage and retest the SRI Memory. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
P1698-NO BUS MESSAGE FROM TRANS CONTROL MODULE

POSSIBLE CAUSES
NO BUS MESSAGE FROM TRANS INTERMITTENT
NO BUS MESSAGE FROM TRANS
PCM PCI BUS CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, erase DTCs. Cycle the ignition key on and off several times. With the DRBIII®, read DTCs. Does the DTC reset? Yes → Go To 2 No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 1. **Note: This DTC could have been set when the TCM is disconnected for transmission Diagnostics.**	All
2	Connect the DRBIII® and access Powertrain Control Module. **Note: This test checks for other PCI BUS codes. That indicates diferent circuits in the BUS.** With the DRBIII®, read DTCs. Is a DTC also set for NO SKIM BUS MESSAGE and/or No MIC BUS MESSAGE? Yes → Go To 3 No → Refer to the Communication Category and perform the appropriate symptom related to the no communication with TCM. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

P1698-NO BUS MESSAGE FROM TRANS CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, read DTCs. This is to ensure power and grounds to the PCM are operational. **NOTE: If the DRBIII® will not read PCM DTC's, follow the ″NO RESPONSE TO PCM (SCI only)″ symptom path, if vehicle will start. For NO START Conditions follow symptom ″NO RESPONSE″ in Starting category .** Turn the ignition off. Disconnect the PCM harness connectors. Connect the DRBIII® to the Data Link connector Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable. Select DRBIII® Standalone. Select lab scope. Select Live. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Press F2 again when complete. Connect the Black lead to the PCM ground. Connect the Red lead to the PCM PCI Bus circuit Ignition on, engine not running. Observe the voltage displayed on the DRBIII® Lab Scope. What is the voltage displayed on the scope? Pulse from 0 to approximately 7.5 volts Test Complete. Steady 0 volts Repair the open PCI Bus circuit to PCM. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
P1830-CLUTCH OVERRIDE RELAY CONTROL CIRCUIT

When Monitored and Set Condition:

P1830-CLUTCH OVERRIDE RELAY CONTROL CIRCUIT

When Monitored: Continuously with the ignition key on.

Set Condition: When the PCM detects an Open or a Short to voltage on the Clutch Override Relay Control circuit.

POSSIBLE CAUSES
GOOD TRIP EQUAL TO ZERO
CLUTCH SWITCH OVERRIDE RELAY
FUSED IGNITION SWITCH OUTPUT CIRCUITS OPEN
(K90) CLUTCH SWITCH OVERRIDE RELAY CONTROL CIRCUIT OPEN
(K90) CLUTCH SWITCH OVERRIDE RELAY CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, record and erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs and record the related Freeze Frame data. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Refer to the INTEMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition on. With the DRBIII®, erase DTCs. Turn the ignition off. Install a substitute relay in place of the Clutch Switch Override Relay. Turn the ignition on. With the DRBIII®, read DTCs. Does the DTC reset? Yes → Go To 3 No → Replace the Clutch Switch Override Relay per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1830-CLUTCH OVERRIDE RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Clutch Switch Override Relay. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Output circuits at the Relay connection. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Repair the open or short to ground in the Fused Ignition Switch circuits. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Measure the resistance of the (K90) Clutch Switch Override Relay Control circuit. Is the resistance above 5.0 ohms? Yes → Repair the open in the (K90) Clutch Switch Override Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Measure the resistance between ground and the (K90) Clutch Switch Override Relay Control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K90) Clutch Switch Override Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P1899-P/N SWITCH PERFORMANCE

POSSIBLE CAUSES
DRBIII® DISPLAYS P/N & D/R NOT IN CORRECT POSITION
TRS T41 SENSE (P/N SENSE) CIRCUIT SHORTED TO GROUND
TRS T41 (P/N SENSE) CIRCUIT OPEN
TRS ASSEMBLY (P/N SWITCH)
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the PNP switch input state. While moving the gear selector through all gear positions Park to 1st and back to Park, watch the DRBIII® display. Did the DRBIII® display P/N and D/R in the correct gear positions? Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the TRS P/N switch harness connector. **Check connectors - Clean/repair as necessary** Measure the resistance between ground and the TRS T41 (P/N Sense) circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the TRS T41 Sense (P/N Sense) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Measure the resistance of the TRS T41 (P/N Sense) circuit between the PCM C1 harness connector and the TRS harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the TRS T41 (P/N Sense) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1899-P/N SWITCH PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	Connect the TRS (P/N) harness connector. Move the gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through the gear positions, measure the resistance between ground and the TRS T41 (P/N) Sense circuit in the PCM C1 harness connector. **NOTE: The circuit is grounded in Park and Neutral and open in the other positions.** Did the display change from above 100 kohms (open) to below 10.0 ohms (grounded)? Yes → Go To 5 No → Replace the TRS Assembly (P/N Switch) per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
*BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII®

POSSIBLE CAUSES
DRBIII® DOES NOT SHOW BRAKE SW PRESSED OR RELEASED
(F32) FUSED B+ CIRCUIT OPEN
(Z3) GROUND CIRCUIT OPEN
BRAKE LAMP SWITCH
(K29) BRAKE LAMP SWITCH SIGNAL CIRCUIT OPEN
(K29) BRAKE LAMP SWITCH SIGNAL CIRCUIT SHORT TO GROUND
(K29) BRAKE LAMP SWITCH SIGNAL LESS THAN 10.0 VOLTS
(V32) S/C POWER SUPPLY CIRCUIT BELOW 10 VOLTS AT BRAKE SWITCH CONN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Brake Switch state. While observing the DRBIII® display, press and release the brake pedal several times. Does the DRBIII® display Brake Switch PRESSED and RELEASED? Yes → The Brake Lamp Switch is operating properly at this time. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 2	All
2	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Using a 12-volt test light connected to ground, probe the (F32) Fused B+ circuit at the Brake Lamp Switch harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the excessive resistance or short to ground in the (F32) Fused B+ circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
3	Using a 12-volt test light connect to 12-volts, probe the (Z3) Brake Lamp Switch ground circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the open in the (Z3) Brake Lamp Switch Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

*BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII® — Continued

TEST	ACTION	APPLICABILITY
4	Measure the resistance across the Brake Lamp Switch Signal terminal and the Ground terminal (measurement taken across the switch). Apply and release the Brake Pedal while monitoring the ohmmeter. Does the resistance change from below 5.0 ohms to open circuit? Yes → Go To 5 No → Replace the Brake Lamp Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
5	Disconnect the PCM harness connectors. Measure the resistance of the (K29) Brake Lamp Switch Signal circuit from the Brake Switch harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K29) Brake Lamp Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
6	Disconnect the CAB harness connector. Measure the resistance between ground and the (K29) Brake Lamp Switch Signal circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K29) Brake Lamp Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 7	All
7	Brake pedal must be depressed in the next step. Connect the PCM harness connectors. Connect the CAB harness connector. Connect the Brake Lamp Switch harness connector. Using a 12-volt test light connected to ground, probe the (K29) Brake Lamp Switch Signal circuit at the Brake Lamp Switch harness connector. Ignition on, engine not running. Is the test light illuminated and bright? Yes → Go To 8 No → Replace or adjust the brake switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
8	Turn the ignition off. Disconnect the Brake Switch harness connector. Ignition on, engine not running. With the DRBIII®, actuate the S/C Vacuum Solenoid. Using a 12-volt test light, probe the (V32) S/C Power Supply circuit in the Brake Lamp Switch harness connector. Did the test light illuminate brightly? Yes → Go To 9 No → Repair the excesssive resistance in the (V32) S/C Power Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

*BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII® — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

Symptom:
*CHECKING A/C SYSTEM OPERATION WITH NO DTCS

POSSIBLE CAUSES
CHECK FOR PCM DTCS
REFRIGERATION SYSTEM NOT PROPERLY CHARGED
HIGH PRESS CUT-OFF SWITCH
LOW PRESSURE SWITCH
POWERTRAIN CONTROL MODULE
A/C CLUTCH COIL
A/C COMPRESSOR CLUTCH GROUND CIRCUIT OPEN
(C3) A/C CLUTCH RELAY OUTPUT CIRCUIT OPEN
A/C REQUEST CIRCUIT OPEN
(A17) FUSED B+ CIRCUIT OPEN
A/C CLUTCH RELAY

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, check for PCM DTCs. Are any DTCs present? Yes → Return to the symptom list and choose the symptom(s). Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Verify that the Refrigerant System is properly charged per Service Procedure. Is the Refrigerant System properly charged? Yes → Go To 3 No → Properly charge the Refrigerant System per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Verify the High Pressure Cut-Off Switch per Service Information. Is the High Pressure Cut-Off Switch OK? Yes → Go To 4 No → Replace the High Pressure Cut-Off Switch. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Verify the Low Pressure Switch operation per Service Information. Is the Low Pressure Switch OK? Yes → Go To 5 No → Replace the Low Pressure Switch. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

*CHECKING A/C SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
5	Ignition on, engine not running. Position the Mode switch on the A/C - Heater Control Module to the Panel position (A/C off). With the DRBIII® in BCM, select Inputs/Outputs. Monitor the A/C Select Switch state while turning the Mode switch from Panel (A/C off) to Bi-Level (A/C on) and then back to Panel (A/C off). Does the switch state change from ″Off″ to ″On″ and then back to ″Off″. Yes → Go To 6 No → Go To 7	All
6	Position the Mode switch on the A/C - Heater Control Module to the Panel position (A/C off). With the DRBIII® in Powertrain, select Engine and select Inputs/Outputs. Monitor the A/C Select Switch state while turning the Mode switch from Panel (A/C off) to Bi-Level (A/C on) and then back to Panel (A/C off). Does the switch state change from ″Off″ to ″On″ and then back to ″Off″. Yes → Go To 7 No → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	With the DRBIII®, actuate the A/C Clutch Relay. Connect a test light between the ground circuit and the A/C Clutch Relay Output circuit. Does the test light illuminate brightly on and off with the relay actuation? Yes → Replace the A/C Clutch Coil. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 8	All
8	Turn the ignition off. Disconnect the A/C Clutch harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the A/C Compressor Clutch ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the A/C Compressor Clutch ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
9	Turn the ignition off. Remove the A/C Clutch Relay. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the (C3) A/C Clutch Relay Output circuit between the Relay and the A/C Clutch Coil. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the (C3) A/C Clutch Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

*CHECKING A/C SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
10	Engine Running. Turn the A/C system on and the fan on high. With the DRBIII® in Inputs/Outputs, read the A/C request state. Does the A/C request state change? Yes → Go To 11 No → Repair the open in the A/C Request circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
11	Turn the ignition off. Remove the A/C Clutch Relay. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage of the (A17) Fused B+ circuit at the A/C Clutch Relay connector. Is the voltage above 11.0 volts? Yes → Go To 12 No → Repair the open in the (A17) Fused B+ circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
12	If there are no possible causes remaining, view repair. Repair Replace the A/C Clutch Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS

POSSIBLE CAUSES
GENERATOR BELT CONDITION
DTC RESET
WIRE HARNESS INSPECTION
RESISTANCE IN THE BATTERY POSITIVE CIRCUIT
(K125) GENERATOR FIELD SOURCE CIRCUIT OPEN
GENERATOR FIELD COIL HIGH RESISTANCE
(K20) GENERATOR FIELD DRIVER CIRCUIT OPEN
RESISTANCE IN THE GENERATOR GROUND
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Verify that the Battery is able to pass a load test before continuing.** Ignition on, engine not running. With the DRBIII®, read the Battery voltage and record the results. Measure Battery voltage between the Battery Positive and Negative Terminals and record the results. Compare the two voltage readings. Is the voltage difference less than one volt? Yes → Go To 2 No → Go To 8	All
2	Ignition on, engine not running. Measure the voltage between the Generator B+ Terminal and the Battery+ Post. **Caution: Ensure all wires are clear of the engine's moving parts.** Start the engine. Is the voltage above 0.4 of a volt? Yes → Repair the excessive resistance in the Battery Positive circuit between the Generator and Battery . Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All
3	Ignition on, engine not running. Record all DTCs and freeze frame data, now erase Codes. Carefully inspect all connectors for corrosion or spread terminals before continuing. With the DRBIII® actuate the Generator Field Driver. Measure the voltage of the (K125) Generator Field Source circuit by backprobing the back of Generator Field harness connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the (K125) Generator Field Source circuit for an open or short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
4	Start the engine. Warm the engine to operating temperature. **Caution: Ensure all wires are clear of the engine's moving parts.** Measure the voltage between the Generator case and Battery Negative Post. Is the voltage above 0.1 of a volt? Yes → Repair the excessive resistance in the Generator Ground circuit between the Generator Case and Battery Ground side. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	Turn the ignition off. Disconnect the Generator Field harness connector at back of the Generator. Measure resistance across the Generator Field Terminals at the Generator. Is the resistance above 15 ohms? Yes → Replace or repair the Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 6	All
6	Disconnect the PCM harness connectors. Measure the resistance of the (K20) Generator Field Driver circuit between the PCM harness connector and the Generator harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the (K20) Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
8	Turn the ignition off. **NOTE: Battery condition must be verified prior to this test.** Inspect the Generator Belt tension and condition. Is the Generator Belt OK? Yes → Go To 9 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
9	Start the engine. Turn on all accessories. Raise engine speed to 2000 RPM for 30 seconds then return to idle. With the DRBIII®, read DTCs. Are there any "Charging System" Trouble Codes? Yes → Refer to Symptom list for the related Charging DTCs. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 10	All

*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
10	Ignition on, engine not running. With the DRBIII®, actuate the Generator Field Driver. Using a 12-volt test light, backprobe the Generator Field Driver Terminal at the back of the Generator. **Note: The test light should blink On and Off every 1.4 seconds.** While monitoring the 12-volt test light, wiggle the Field Terminals back to the PCM and ASD Relay. Was there any interruption in the normal cycle of the test light? Yes → Repair the wire or connector where the wiggling interrupted the voltage cycle. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All

Symptom:
*CHECKING HARD TO FILL WITH FUEL

POSSIBLE CAUSES
NVLD FILTER PLUGGED

Repair Instructions:

NVLD FILTER PLUGGED

Replace the NVLD filter plugged and clean out the Hoses.

Perform POWERTRAIN VERIFICATION TEST VER - 2.

Symptom:
*CHECKING RADIATOR FAN OPERATION WITH NO DTCS

POSSIBLE CAUSES
(C24) FUSED B+ CIRCUIT
(K173) RADIATOR FAN RELAY CONTROL CIRCUIT
(C25) RADIATOR FAN RELAY OUTPUT CIRCUIT OPEN
(C25) RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO GROUND
RAD FAN MOTOR
RADIATOR FAN RELAY
(Z212) RADIATOR FAN GROUND CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Does the Radiator Fan Motor cycle on and off? Yes → Test Complete. No → Go To 2	All
2	Turn the ignition off. Remove the Radiator Fan Relay. Using a 12-volt test light connected to ground, probe the (C24) Fused B+ circuit in the Radiator Fan Relay connector. Did the light illuminate brightly? Yes → Go To 3 No → Repair the open or short to ground in the (C24) Fused B+ circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Disconnect the PCM harness connectors. Measure the resistance of the (K173) Radiator Fan Relay Control circuit from the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the (K173) Radiator Fan Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Connect the PCM harness connectors. Install the Radiator Fan Relay. Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Using a 12-volt test light connected to ground, backprobe the (C25) Radiator Fan Relay Output circuit in the Radiator Fan Motor harness connector. Does the test light cycle on and off? Yes → Go To 5 No → Go To 7	All

*CHECKING RADIATOR FAN OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Radiator Fan Motor harness connector. Measure the resistance between ground and the (Z212) Radiator Fan Motor ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (Z212) Radiator Fan ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	If there are no possible causes remaining, view repair. Repair Replace the Radiator Fan Motor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	Turn the ignition off. Disconnect the Radiator Fan Motor harness connector. Remove Rad Fan Relay. Measure the resistance of the (C25) Radiator Fan Relay Output circuit between the Radiator Fan Motor harness connector and the Radiator Fan Relay connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (C25) Radiator Fan Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
8	Measure the resistance between ground and the (C25) Radiator Fan Relay Output circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (C25) Radiator Fan Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 9	All
9	If there are no possible causes remaining, view repair. Repair Replace the Radiator Fan Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING THE PCM POWER AND GROUNDS

POSSIBLE CAUSES
PCM FUSED B+ CIRCUIT
PCM FUSED IGNITION SWITCH OUTPUT CIRCUIT
PCM GROUND CIRCUITS

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the PCM harness connectors. Using a 12-volt test light connected to ground, probe the PCM Fused B+ circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 2 No → Repair open in the Fused B+ circuits. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open in the Ignition Switch Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Turn the ignition off. Using a 12-volt test light connected to battery voltage, probe the PCM ground circuits in the PCM harness connector. Does the test light illuminate brightly? Yes → Test Complete. No → Repair the open in the PCM ground circuits. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom List:

ANTENNA FAILURE
COP FAILURE
EEPROM FAILURE
INTERNAL FAULT
RAM FAILURE
SERIAL LINK INTERNAL FAULT
STACK OVERFLOW FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ANTENNA FAILURE.

When Monitored and Set Condition:

ANTENNA FAILURE

When Monitored: Every 250 milliseconds with the ignition on.

Set Condition: The SKIM's microcontroller determines that an antenna circuit fault has occurred for 2.0 consecutive seconds.

COP FAILURE

When Monitored: With the ignition on.

Set Condition: The COP timer is not reset by the micro controller every 65.5 milliseconds.

EEPROM FAILURE

When Monitored: With the ignition on.

Set Condition: When the value written to EEPROM memory does not equal the value read back after the write operation.

INTERNAL FAULT

When Monitored: With the ignition on.

Set Condition: The SKIM has detected a fault during an internal self test.

RAM FAILURE

When Monitored: With the ignition on.

Set Condition: The RAM fails a test that checks the RAM's ability to retain memory.

SERIAL LINK INTERNAL FAULT

When Monitored: With the ignition on.

Set Condition: The SKIM fails an internal J1850 communication self test.

STACK OVERFLOW FAILURE

When Monitored: With the ignition on.

Set Condition: The micro controller has exceeded its stack space limit.

ANTENNA FAILURE — Continued

POSSIBLE CAUSES
SKIM INTERNAL DTC FAILURE

TEST	ACTION	APPLICABILITY
1	**Note: This trouble code indicates an internal SKIM fault.** With the DRBIII®, read and record the SKIM DTCs and then erase the SKIM DTCs Perform 10 ignition key cycles, leaving the ignition key on for a minimum of 90 seconds per cycle. With the DRBIII® , read the SKIM DTCs. Did the same SKIM DTC return? Yes → Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:
PCM STATUS FAILURE
SERIAL LINK EXTERNAL FAULT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be PCM STATUS FAILURE.

When Monitored and Set Condition:

PCM STATUS FAILURE

When Monitored: With the ignition on.

Set Condition: This DTC exists when a PCM STATUS message was not received from the PCM for at least 20.0 consecutive seconds.

SERIAL LINK EXTERNAL FAULT

When Monitored: At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM reset, or during SECRET KEY transfers to the PCM.

Set Condition: When the SKIM does not receive an expected PCI BUS message transmission acknowledgement from the PCM after 3 transmit attempts.

POSSIBLE CAUSES
INTERMITTENT WIRING HARNESS PROBLEM
WIRING HARNESS INSPECTION
SKIM/ECM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the ECM has proper power and ground connections before continuing.** With the DRBIII®, read and record the SKIM DTCs then erase the SKIM DTCs. Turn the ignition off. Wait 2 minutes. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 4	All

PCM STATUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. **NOTE: Visually inspect the related wiring harness and CCD/PCI Bus (whichever applicable) circuits. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair as necessary. Perform SKIS VERIFICATION. No → Go To 3	All
3	**NOTE: Before proceeding it will be necessary to obtain the SKIM PIN.** Turn the ignition on. With the DRBIII®, display and erase all ECM and SKIM DTCs. Perform 5 ignition key cycles, leaving the ignition key on for a minimum of 90 seconds per cycle. With the DRBIII®, read the SKIM DTCs. Does the code appear? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All
4	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:

ROLLING CODE FAILURE

VIN MISMATCH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ROLLING CODE FAILURE.

When Monitored and Set Condition:

ROLLING CODE FAILURE

When Monitored: At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.

Set Condition: When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

VIN MISMATCH

When Monitored: With the ignition on.

Set Condition: When the VIN received from the PCM does not match the VIN stored in the SKIM's EEPROM.

POSSIBLE CAUSES
VERIFYING ECM VIN
REPLACE SKIM AND CHECK DTC'S
INTERMITTENT WIRING HARNESS PROBLEM
ECM

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the SKIM DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on and wait 2 minutes. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 4	All

ROLLING CODE FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition on. With the DRBIII®, select Engine system from the main menu. Display and record the Vehicle Identification Number. **NOTE: Ensure that a VIN has been programmed into the ECM. If a VIN is not displayed, attempt to program the ECM with the correct vehicle VIN before continuing.** Does the VIN recorded from the ECM match the VIN of the vehicle? Yes → Go To 3 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Turn the ignition on. With the DRBIII®, display and clear all ECM and SKIM DTCs. Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle. With the DRBIII®, check for SKIM DTCs. Does the DRBIII® display the same DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → The repair is complete. Perform SKIS VERIFICATION.	All
4	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:

TRANSPONDER COMMUNICATION FAILURE
TRANSPONDER CYCLIC REDUNDANCY CHECK (CRC) FAILURE
TRANSPONDER ID MISMATCH
TRANSPONDER RESPONSE MISMATCH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be TRANSPONDER COMMUNICATION FAILURE.

When Monitored and Set Condition:

TRANSPONDER COMMUNICATION FAILURE

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the SKIM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

TRANSPONDER CYCLIC REDUNDANCY CHECK (CRC) FAILURE

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When 5 consecutive transponder signal transmissions are sent to the SKIM with the correct message format but with invalid data.

TRANSPONDER ID MISMATCH

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the transponder ID read by the SKIM does not match any of the transponder ID's stored in the SKIM's memory.

TRANSPONDER RESPONSE MISMATCH

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the transponder's crypto algorithm result fails to match the SKIM's result.

POSSIBLE CAUSES
CHECKING MULTIPLE KEY OPERATION
SKIM
INTERMITTENT WIRING HARNESS PROBLEM
REPLACE IGNITION KEY

TRANSPONDER COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read and record the SKIM DTCs. With the DRBIII®, erase the SKIM DTCs. **NOTE: Perform the following test several times to ensure the DTC is current.** Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 7	All
2	Are there multiple vehicle ignition keys available? Yes → Go To 3 No → Go To 4	All
3	**NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.** With the DRBIII®, erase the SKIM DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Is the DTC present for all ignition keys? Yes → Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Replace the ignition key(s) that cause the SKIM DTC. Perform SKIS VERIFICATION.	All
4	With the DRBIII®, attempt to reprogram the ignition keys to the SKIM. With the DRBIII®, erase the SKIM DTCs. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DTC set again? Yes → Go To 5 No → Test Complete.	All
5	Replace the ignition key with a new key. With the DRBIII®, program the new ignition key to the SKIM. With the DRBIII®, erase the SKIM DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DTC set again? Yes → Go To 6 No → Test Complete.	All

TRANSPONDER COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All
7	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom:
*CHECKING FUEL DELIVERY

POSSIBLE CAUSES
FUEL PUMP RELAY
FUEL PRESSURE OUT OF SPECIFICATION
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP
(A14) FUSED B+ CIRCUIT
(A141) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN
(Z211) FUEL PUMP GROUND CIRCUIT EXCESSIVE RESISTANCE
FUEL PUMP MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test. **Note: It may be necessary to use a mechanics stethoscope in the next step.** Listen for fuel pump operation at the fuel tank. Does the Fuel Pump operate? Yes → Go To 2 No → Go To 5 **Caution: Stop All Actuations.**	All
2	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install a fuel pressure gauge to the fuel rail test port. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Choose a conclusion that best matches your fuel pressure reading. Below Specification Go To 3 Within Specification Test Complete. Above Specification Replace the fuel filter/fuel pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 1. **Caution: Stop All Actuations.**	All

*CHECKING FUEL DELIVERY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module. Install special 5/16″ fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module. Attach a fuel pressure test gauge to the ″T″ fitting on tool #6539. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 334 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Is the fuel pressure within specification now? Yes → Repair/replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 4 **Caution: Stop All Actuations.**	All
4	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose,fitting or line, the fuel system pressure must be released.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
5	Turn the ignition off. Disconnect the fuel pump module harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test. Using a 12-volt test light connected to ground, probe the (A141) Fuel Pump Relay Output circuit at the Fuel Pump Module harness connector. Does the test light illuminate brightly? Yes → Go To 6 No → Go To 8 **Caution: Stop All Actuations.**	All
6	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Using a test light connected to 12-volts, backprobe the (Z211) Fuel Pump ground circuit at the Fuel Pump Module harness connector. Does the test light illuminate brightly? Yes → Go To 7 No → Repair the excessive resistance in the (Z211) Fuel Pump Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*CHECKING FUEL DELIVERY — Continued

TEST	ACTION	APPLICABILITY
7	If there are no possible causes remaining, view repair. Repair Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
8	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. Using a 12-volt test light connected to ground, backprobe the (A14) Fuel Pump Relay Fused B+ circuit at the PDC. Does the test light illuminate? Yes → Go To 9 No → Repair the open or short to ground in the (A14) Fuel Pump Realy Fused B+ circuit. Inspect the fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
9	Disconnect the Fuel Pump Module harness connector. Measure the resistance of the (A141) Fuel Pump Relay Output circuit from the relay connector to the Fuel Pump Module connector. Is the resistance below 5.0 ohms? Yes → Replace the Fuel Pump Relay. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the open in the (A141) Fuel Pump Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*CHECKING HARD START (FUEL DELIVERY SYSTEM)

POSSIBLE CAUSES
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
FAULTY FUEL PUMP MODULE
FUEL INJECTOR(S)
FUEL CONTAMINATION

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install a fuel pressure gauge at the engine. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Choose a conclusion that best matches your fuel pressure reading. Below Specification Go To 2 Within Specification Go To 4	All
2	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Raise vehicle on hoist, and disconnect the fuel supply line at the fuel pump module. Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49 psi +/- 5 psi).** Is the fuel pressure within specification? Yes → Visually and physically inspect the fuel supply lines between the fuel tank and the fuel rail. Repair/replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All

*CHECKING HARD START (FUEL DELIVERY SYSTEM) — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose,fitting or line, the fuel system pressure must be released.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	**NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.** Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install special tool #6539 (5/16″) fuel line adapter. Install the fuel pressure gauge. Start the engine and allow the fuel system to reach maximum pressure. Turn the ignition off. **NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine. Monitor the fuel pressure gauge for a minimum of 5 minutes. **NOTE: The pressure should not fall below 241 KPa (35 psi)** Does the fuel pressure drop? Yes → Replace Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Remove special tool #C4390. Start the engine and allow the fuel system to reach maximum pressure. Turn the ignition off. **NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Move special tool #C4390, Hose Clamp Pliers, from between the fuel pressure gauge and the engine to between the fuel pressure gauge and fuel pump module. Monitor the fuel pressure gauge for a minimum of 5 minutes. **NOTE: The pressure should not fall below 241 KPa (35 psi)** Does the fuel pressure drop? Yes → Replace the leaking fuel injectors. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Check the fuel for contaminants. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*ENGINE CRANKS BUT DOES NOT START

POSSIBLE CAUSES
NO START PRE-TEST
POWERTRAIN FUSES OPEN
SECONDARY INDICATORS PRESENT
NO CKP SENSOR SIGNAL WHEN CRANKING ENGINE
NO CMP SENSOR SIGNAL WHEN CRANKING ENGINE
ENGINE MECHANICAL PROBLEM
(A142) ASD RELAY OUTPUT CIRCUIT OPEN
FUEL CONTAMINATION

TEST	ACTION	APPLICABILITY
1	**Note: The following list of items must be checked before continuing with any no start tests.** The battery must be fully charged and in good condition. A low charged battery may produce invalid test results. If the battery is low, charge the battery and then attempt to start the vehicle by cranking the engine for 15 seconds, 3 consecutive times. This will allow any DTCs to set that may have been erased due to a dead battery. Try to communicate with PCM if not able to communicate check fuses. Ensure the Powers and Ground to the PCM are ok. Make sure the PCM communicates with the DRBIII® and that there are no DTCs stored in the PCM memory. If the PCM reports a No Response condition, refer to the Communication category for the proper tests. Read the PCM DTCs with the DRBIII®. If any DTCs are present, they must be repaired before continuing with any other No Start diagnostic tests. Refer to the Symptom list for the related P-code that is reported by the PCM. Ensure that the PCI bus is functional. Attempt to communicate with the Instrument Cluster and VTSS, If you are unable to establish communicate refer to the Communication category for the proper symptoms. The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the DRBIII® and check for DTCs that may be stored in the Sentry Key Immobilizer Module (SKIM). Repair the DTC(s) before continuing. If no DTCs are found, using the DRBIII®, select Clear PCM (BATT Disconnect). Crank the engine several times. Using the DRBIII®, read DTCs. If a DTC is present perform the DTC diagnostics before continuing. Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All
2	Check for any open fuses in the PDC or Junction Block that may be related to the No Start condition. Are any of the fuses open? Yes → Replace the open fuse and check the related circuit(s) for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

*ENGINE CRANKS BUT DOES NOT START — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. With the DRBIII®, under DTCs & Related Functions, read the Secondary Indicators while cranking the engine. Are there any Secondary Indicators present while cranking the engine? Yes → Refer to symptom list and perform tests related to the secondary indicator that is reported by the DRBIII®. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	With the DRBIII® in Sensors, check the Current CKP Count while cranking the engine. Does the CKP Counter change while cranking the engine? Yes → Go To 5 No → Refer to Driveability Symptom P0320-NO CRANK REFERENCE SIGNAL AT PCM. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	With the DRBIII® in Sensors, check the Current CMP Count while cranking the engine. Does the Current CMP Count change while cranking the engine? Yes → Go To 6 No → Refer to Driveability Symptom P0340-NO CAM SIGNAL AT PCM Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Check for any of the following conditions/mechanical problems. ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Remove the ASD relay from the PDC. Disconnect the PCM harness connectors. Verify the ASD Relay is getting Fused B+ voltage before continuing. Measure the resistance of the (A142) ASD Relay output circuit from the ASD Relay connector to the PCM harness connector, Ignition coil, and the fuel injectors. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open ASD Relay output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

*ENGINE CRANKS BUT DOES NOT START — Continued

TEST	ACTION	APPLICABILITY
8	Verify that the Fuel tank is not empty before continuing. Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual. Was the No Start condition solved after following the above diagnostic procedure? Yes → Test Complete. No → Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
*FUEL PRESSURE LEAK DOWN

POSSIBLE CAUSES
FAULTY FUEL PUMP MODULE
FUEL INJECTOR(S)

TEST	ACTION	APPLICABILITY
1	**NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.** Turn the ignition off. **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Install special tool #6539 (5/16″) fuel line adapter. Install the fuel pressure gauge. Start the engine and allow the fuel system to reach maximum pressure. Turn the ignition off. **NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine. Monitor the fuel pressure gauge for a minimum of 5 minutes. **NOTE: The pressure should not fall below 241 KPa (35 psi)** Does the fuel pressure drop? Yes → Replace Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Remove special tool #C4390. Start the engine and allow the fuel system to reach maximum pressure. Turn the ignition off. **NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).** Move special tool #C4390, Hose Clamp Pliers, from between the fuel pressure gauge and the engine to between the fuel pressure gauge and fuel pump module. Monitor the fuel pressure gauge for a minimum of 5 minutes. **NOTE: The pressure should not fall below 241 KPa (35 psi)** Does the fuel pressure drop? Yes → Replace the leaking fuel injectors. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All

Symptom:
*NO CRANK CONDITION

POSSIBLE CAUSES
MECHANICAL CONDITION
TRANSMISSION RANGE SENSOR
BATTERY CIRCUIT RESISTANCE TOO HIGH
CLUTCH INTERLOCK SWITCH
IGNITION SWITCH OUTPUT CIRCUIT
TRS T41 SENSE (P/N SENSE) CIRCUIT OPEN
(T40) STARTER RELAY OUTPUT CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
STARTER
STARTER RELAY

TEST	ACTION	APPLICABILITY
1	**NOTE: Verify the battery is fully charged and capable of passing a load test before continuing.** **WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING.** Turn the engine over by hand to ensure the engine is not seized. Is the engine able to turn over? Yes → Go To 2 No → Repair the mechanical condition preventing the starter motor from cranking. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Move the Gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through each gear, measure the resistance between ground and the TRS T41 Sense (P/N Sense) circuit. Did the resistance change from above 10.0 ohms to below 10.0 ohms? Yes → Go To 3 No → Replace the Transmission Range Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Check the Battery Cables for high resistance using the service information procedure. Did either Battery Cable have a voltage drop greater than 0.2 of a volt? Yes → Repair the Battery circuit for high resistance. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 4	All

*NO CRANK CONDITION — Continued

TEST	ACTION	APPLICABILITY
4	Disconnect the Clutch Interlock Switch. If this vehicle is not equipped with a manual transmission answer NO to this test and continue. **WARNING: Place shifter in Neutral and set the Parking Brake.** Connect a jumper wire between the two terminals of the Clutch Interlock Switch and attempt to start the engine. Does the engine crank? Yes → Replace the Clutch Interlock Switch. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 5 **NOTE: Remove the jumper wire and connect the Switch before continuing.**	All
5	Turn ignition off. Remove the Starter Relay from PDC. **WARNING: The Parking Brake must be on and the Transmission must be in park for a vehicle equipped with an automatic transmission or Neutral on a Manual transmission.** **Warning: The engine may be cranked in the next step. Keep away from moving engine parts.** Briefly connect a jumper wire between Starter Relay B+ circuit and the (T40) Starter Relay Output circuits. Did the Starter Motor crank the engine? Yes → Go To 6 No → Go To 8 **NOTE: Remove the jumper wire before continuing.**	All
6	Ignition on, engine not running. For vehicles equipped with a Manual Transmission, use a 12-volt test light connected to ground, probe the (T141) Clutch Interlock Relay Output circuit at the Relay connection. While observing 12-volt test light, hold ignition key in the start position. For vehicles equipped with an Automatic Transmission, use a 12-volt test light connected to ground and probe the (F45) Fused Ignition Switch Output circuit at the Relay connection. Does the test light illuminate brightly? Yes → Go To 7 No → Repair the open or short to ground in the (A41) Ignition Switch Output circuit. Inspect related fuses and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
7	Disconnect the PCM harness connectors. Measure the resistance of the TRS T41 Sense (P/N Sense) circuit from the Relay terminal to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Replace the Starter Motor Relay. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the open in the TRS T41 Sense (P/N Sense) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO CRANK CONDITION — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Remove the Starter Relay. Disconnect the Starter Relay Output connector from the Starter Solenoid. Measure the resistance of the (T40) Starter Relay Output circuit between the Relay and the Solenoid harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the (T40) Starter Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
9	Turn the ignition off. Using a 12-volt test light connected to ground, probe the (A2) Fused B+ circuit at the Starter Relay terminal. Does the test light illuminate brightly? Yes → Go To 10 No → Repair the open or high resistance in the Fused B+ circuit. Inspect related fuses and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
10	If there are no other possible causes remaining, review repair. Repair Replace the Starter. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM PCM WITH A NO START CONDITION

POSSIBLE CAUSES
PCM FUSED B+ CIRCUITS
PCM NO RESPONCE
PCM FUSED IGNITION SWITCH OUTPUT CIRCUITS
(Z107) PCM GROUND CIRCUITS
THROTTLE POSISITON SENSOR
5 VOLT SENSOR OPEN OR SHORTED
(K7) 5-VOLT SUPPLY CKT SHORT TO GROUND
(K6) 5-VOLT CIRCUIT SUPPLY SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: The DRBIII® and cable must be operating properly for the results of this test to be valid.** **NOTE: Ensure the ignition switch was on while trying to communicate with the PCM.** Turn the ignition off. Disconnect the PCM harness connectors. Using a 12-volt test light connected to ground, probe the PCM Fused B+ circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 2 No → Repair the open or short to ground in the Fused B+ circuit. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Ignition Switch Output circuits. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Turn the ignition off. Using a 12-volt test light connected to battery voltage, probe the (Z107) PCM ground circuits in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the (Z107) PCM ground circuits. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

TEST	ACTION	APPLICABILITY
4	Connect the PCM harness connectors. Disconnect the TP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit. Is the voltage between 4.5 and 5.2 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector. **NOTE: Connect the TP Sensor harness connector.** Ignition on, engine not running. Measure the voltage on the MAP Sensor 5 Volt Supply circuit. Is the voltage between 4.5 and 5.2 volts? Yes → If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
6	Turn the ignition off. Disconnect the TP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit. Disconnect all the sensors that use (K7) 5-volt Supply circuit. Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors. Yes → Replace the sensor that is pulling down the 5-volt supply. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect PCM harness connectors. Measure the resistance between ground and the (K7) 5-volt Supply circuit with all the Sensor harness connectors disconnected. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 8	All
8	Disconnect all sensors that use the (K6) 5-volt Supply. Measure the resistance between ground and the (K6) 5-volt Supply circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K6) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 9	All

*NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there is no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*START AND STALL CONDITION

POSSIBLE CAUSES
CHECKING DTCS
CHECKING SKIM DTCS
TP SENSOR SWEEP
TP SENSOR VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
ECT SENSOR OPERATION
OTHER POSSIBLE CAUSES FOR START & STALL
FUEL CONTAMINATION

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read engine DTCs. Are any DTCs present? Yes → Refer to the Driveability Category and perform the appropriate diagnostics. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 2	All
2	**NOTE: If you are unable to communicate with the SKIM, refer to the Communication Category and perform the appropriate symptom.** With the DRBIII®, read the SKIM codes. Are there any SKIM DTCs? Yes → Refer to the Vehicle Theft category and perform the appropriate diagnostics. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 3	All
3	With the DRBIII®, read TP Sensor voltage. While monitoring the DRBIII®, slowly open and close the Throttle. Is the voltage change smooth? Yes → Go To 4 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
4	With the DRBIII®, read TP Sensor voltage. Throttle must be against stop. Is the voltage 0.92 or less with the Throttle closed? Yes → Go To 5 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*START AND STALL CONDITION — Continued

TEST	ACTION	APPLICABILITY
5	**Note: For this test to be valid, the thermostat must be operating correctly.** **Note: This test works best if performed on a cold engine (cold soaked).** **NOTE: If the vehicle was allowed to sit over night with no engine start, coolant temperature should be near ambient temperatures.** With the DRBIII®, read the ECT value. **Note: If engine coolant temperature is above 82° C (180° F), allow the engine to cool until 65° C (150° F) is reached.** Start the engine. During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temp 82° C (180° F). The value should reach at least 82° C (180° F). Did the Engine Temperature value increase smoothly and did it reach at least 82° C (180° F)? Yes → Go To 6 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
6	The following additional items should be checked as a possible cause for a start and stall condition. Refer to any Technical Service Bulletins (TSB's) that may apply to the symptom. The exhaust system must be free of any restrictions. The engine compression must be within specifications. The engine valve timing must be within specifications. The engine must be free from vacuum leaks. The throttle body must be free of carbon buildup and dirt. Do any of the above conditions exist? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Verify that the Fuel tank is not empty before continuing. Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual. Was the No Start condition solved after following the above diagnostic test? Yes → Test Complete. No → Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*STARTS IN ALL GEARS WITH CLUTCH PEDAL RELEASED

POSSIBLE CAUSES
CLUTCH SWITCH OVERRIDE RELAY
CLUTCH OVERRIDE RELAY CONTROL CIRCUIT SHORT TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Raise the vehicle so that the drive wheels are off the ground. Install a substitute relay in place of the Clutch Switch Override Relay. Turn the ignition on. With the vehicle in a gear other than first, the Transfer Case in 2WD and the Clutch Pedal released, Crank the Engine. Does the engine crank? Yes → Go To 2 No → Replace the Clutch Switch Override Relay per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Measure the resistance of the (K90) Relay Control circuit from the Relay connection and the PCM. Is the resistance above 5.0 ohms? Yes → Repair the short to ground in the (K90) Clutch Override Relay Control. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All
3	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0836-4WD MUX SWITCH STUCK

When Monitored and Set Condition:

P0836-4WD MUX SWITCH STUCK

When Monitored: When Transfer Case in 4WD Low.

Set Condition: Four wheel drive (4WD) muxed switch input detected below minimum or above maximum acceptable voltage.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO GROUND
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO SENSOR RETURN CIRCUIT
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transfer Case Position Sensor Input circuit. Is the resistance above 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for an open. No → Go To 3	All

P0836-4WD MUX SWITCH STUCK — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transfer Case Position Sensor Input circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for a short to ground. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Turn the ignition on. Measure the voltage of the Transfer Case Position Sensor Input circuit. Is there any voltage present? Yes → Repair the Transfer Case Position Sensor input circuit for a short to voltage. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance above 1000.0 ohms? Yes → Go To 6 No → Repair the Transfer Case Position Sensor Input circuit for a short to the Sensor Return circuit.	All

P0836-4WD MUX SWITCH STUCK — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 7 No → Replace the Transfer Case Position Sensor.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
8	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Symptom:
P0837-4WD MUX SWITCH PERFORMANCE

When Monitored and Set Condition:

P0837-4WD MUX SWITCH PERFORMANCE

When Monitored: Continuously with the ignition on.

Set Condition: The 4WD muxed switch input detected in an invalid range or irrational switch state.

POSSIBLE CAUSES
RELATED DTCS PRESENT
TRANSFER CASE SHIFTER OUT OF ADJUSTMENT
TRANSFER CASE POSITION SENSOR OUT OF TOLERANCE
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are any other Transfer Case DTCs present? Yes → Repair all other Transfer Case DTCs before proceeding. No → Go To 2	All
2	Verify proper Transfer Case Shifter adjustment per the Service Information. Is the Transfer Case Shifter adjusted correctly? Yes → Go To 3 No → Adjust the Transfer Case shifter linkage per the Service Information.	All
3	Turn the ignition off to the lock position. Disconnect the PCM harness connector(s). **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Measure the resistance across the Transfer Case Position Sensor signal circuit and Sensor Ground circuit at the PCM harness connector. Place the transfer case in each of the following positions: 2H - resistance should be between 1124 and 1243 ohms. 4H - resistance should be between 650 and 719 ohms. N - resistance should be between 389 and 431 ohms. 4L - resistance should be between 199 and 221 ohms. Were all resistance values in each transfer case position within the specified range? Yes → Go To 4 No → Replace the Transfer Case Position Sensor.	All

P0837-4WD MUX SWITCH PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All

Symptom:
P0838-4WD MODE SENSOR LOW

When Monitored and Set Condition:

P0838-4WD MODE SENSOR LOW

When Monitored: Continuously with the ignition key on.

Set Condition: When the 4WD Mode Sensor input circuit voltage falls below 0.3 volts for 5.72 seconds.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO GROUND
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO SENSOR RETURN CIRCUIT
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transfer Case Position Sensor Input circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for a short to ground. No → Go To 3	All

P0838-4WD MODE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance above 1000.0 ohms? Yes → Go To 4 No → Repair the Transfer Case Position Sensor Input circuit for a short to the Sensor Return circuit.	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 5 No → Replace the Transfer Case Position Sensor.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
6	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Symptom:
P0839-4WD MODE SENSOR HIGH

When Monitored and Set Condition:

P0839-4WD MODE SENSOR HIGH

When Monitored: Continuously with the ignition key on.

Set Condition: When the 4WD Mode Sensor input circuit voltage raises above 4.78 volts for 5.72 seconds.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transfer Case Position Sensor Input circuit. Is the resistance above 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for an open. No → Go To 3	All

P0839-4WD MODE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Turn the ignition on. Measure the voltage of the Transfer Case Position Sensor Input circuit. Is there any voltage present? Yes → Repair the Transfer Case Position Sensor input circuit for a short to voltage. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 5 No → Replace the Transfer Case Position Sensor.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
6	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Verification Tests

BODY VERIFICATION TEST - VER 1	APPLICABILITY
1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors. **2. NOTE: If the SKIM or PCM/ECM was replaced, refer to the service information for proper programming procedures.** 3. If the Instrument Cluster was replaced, use the DRBIII® to insure the proper warning indicators are configured. 4. If the Body Control Module was replaced, turn the ignition on for 15 seconds (to learn VIN). If the vehicle is equipped with VTSS, use the DRBIII® and enable VTSS. 5. Program tire size, country code, radio EQ setting and all RKE transmitters (if RKE Module was replaced) and other options as necessary. 6. (Export only) If the Intrusion Transceiver Module ITM was replaced, use the DRBIII® to enable ITM and Program Interior Type. 7. (Export only) If the Siren was replaced perform the DRBIII® Siren Replacement procedure. 8. Ensure all accessories are turned off and the battery is fully charged. 9. With the DRBIII®, record and erase all DTC's from ALL modules. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern. 10. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTC's from ALL modules. Are any DTC's present or is the original condition still present? Yes → Repair is not complete, refer to the appropriate symptom. No → Repair is complete.	All

POWERTRAIN VERIFICATION TEST VER - 1	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. Inspect the engine oil for contamination. If oil contamination is suspected, change the oil and filter. 3. If the PCM was not replaced skip steps 4 through 6 and continue the verification. 4. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. Attempt to start the engine. 8. If the conditions cannot be duplicated, erase all DTCs with the DRBIII® Is the vehicle still unable to start and/or are there any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptoms list (Diagnostic Procedure). No → Repair is complete.	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a NO TROUBLE CODE repair, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes or the symptom no longer exists, the repair was successful and testing is complete. 4. If the initial or another symptom exists, the repair is not complete. Check all technical service bulletins or flash updates and return to Symptoms if necessary. 5. If this verification procedure is being performed after a DTC repair, perform steps 6 through 13. 6. Connect the DRBIII® to the data link connector. Using the DRBIII® erase any diagnostic trouble codes and reset all values. 7. If the PCM was not replaced, skip steps 8 through 10 and continue with the verification. 8. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer System (SKIS), Secret Key data must be updated to enable start. 9. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 10. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 11. Road test the vehicle. If the test is for an A/C DTC, ensure it is operating during the following test. 12. Drive the vehicle for at least 5 minutes at or around 64 Kmh (40 mph). Ensure the transmission shifts through all gears. At some point stop the vehicle and turn off the engine for at least 10 seconds. 13. With the DRBIII®, read DTCs. Are there any DTC(s) present? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). No → Repair is complete.	All

POWERTRAIN VERIFICATION TEST VER - 3	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. Connect the DRBIII® to the Data Link Connector and erase the DTCs. 3. If the PCM was not replaced, skip steps 4 through 6 then continue the verification. 4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. Perform the generator output test per service manual information. 8. Raise the engine speed to 2000 rpm for at least 30 seconds. 9. Allow the engine to idle. 10. Cycle the ignition key off then on. 11. With the DRBIII®, read DTCs. Are any DTC(s) or symptoms present? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). No → Repair is complete.	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 4	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. With the DRBIII®, erase DTCs. 3. If the PCM was not replaced, skip steps 4 through 6, then continue with the verification. 4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. Turn the speed control ON (if equipped, cruise light will be on). 8. Depress and release the SET Switch when the vehicle speed is greater than 35MPH. The speed control should engage and hold the selected speed. 9. Depress and hold the RESUME/ACCEL Switch. The vehicle speed should increase by at least 2 mph. 10. Press and hold the COAST switch. The vehicle speed should decrease. 11. Using caution, depress and release the brake pedal. The speed control should disengage. 12. Bring the vehicle speed back up to 35 MPH. 13. Depress the RESUME/ACCEL switch. The speed control should resume the previously set speed. 14. Hold down the SET switch. The vehicle should decelerate. 15. Ensure vehicle speed is greater than 35 mph and release the SET Switch. The vehicle should adjust and set a new vehicle speed. 16. Depress and release the CANCEL switch. The speed control should disengage. 17. Bring the vehicle speed back up above 35 mph and engage speed control. 18. Depress the OFF switch to turn OFF, (Cruise light will be off). The speed control should disengage. 19. NOTE: OVERSHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET. 20. If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as ″lift foot set″), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h). 21. It may also decelerate to less than the desired set speed, before finally achieving the desired set speed. 22. The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. 23. When the speed control is set with the vehicles operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly. 24. If the ″lift foot sets″ are continually used, a speed control overshoot/undershoot condition will develop. 25. To ″unlearn″ the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating). 26. Then turning the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. 27. This procedure must be performed approximately 10-15 times to completely unlearn the overshoot/undershoot condition. Did the Speed Control pass the above test? Yes → Repair is complete. No → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure).	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 5	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If any existing diagnostic trouble codes have not been repaired, go to the appropriate Symptom List and follow path specified. 3. Connect the DRBIII® to the data link connector. 4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories. 5. If the PCM was not replaced skip steps 6 through 8 and continue the verification. 6. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 7. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 8. For SKIM theft alarm: Connect DRBIII® to data link connector, Theft Alarm, SKIM, Misc. and place SKIM in secured access mode by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM. 9. If the Catalyst was replaced, with the DRBIII® go to the Miscellaneous Menu Option ″Catalyst Replaced″ and press enter. 10. If a Comprehensive Component DTC was repaired, perform steps 11 and 13. If a Major OBDII Monitor DTC was repaired skip step 11 and continue the verification. 11. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes. 12. With the DRBIII®, monitor the appropriate pre-test enabling conditions until all conditions have been met. Once the conditions have been met, switch screen to the appropriate OBDII monitor, (Audible beeps when the monitor is running). 13. If the conditions cannot be duplicated, erase all DTCs with the DRBIII®. Did the OBD II Monitor test run successfully and has the Good Trip Counter changed to one or more? Yes → Repair is complete. No → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptoms list (Diagnostic Procedure).	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 6	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If any existing diagnostic trouble codes are not repaired, go to symptom list and follow path specified. After all diagnostic trouble codes have been repaired, return to TEST VER-6A and run LDP Dealer Test Mode under Systems Test in DRBIII. 3. If the PCM was not replaced, skip steps 4 through 6 then continue with the verification. 4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Airbag Systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Airbag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. The LDP Monitor Test Mode has been added to the DRBIII® to verify repairs to the LDP System. A DRBIII® software program was written which causes the PCM to run the LDP Monitor as part of this test. Test failures will be indicated through a stored DTC. 8. LDP Monitor Test Mode is a useful way to run a total system performance test. Use this test to verify any type of LDP system repair. 9. Software program makes temporary changes to operating mode of PCM. For this reason, it is critical that test not be interrupted. PCM's left in this mode as result of interrupted test will illuminate the MIL for 8-10 mi of driving with no DTC's stored. 10. Erasing DTCs will not change this condition. 11. If a vehicle is found to be stuck in the mode described above, the LDP Dealer Test should be re-run in its entirety so that the software program in the DRBIII® can restore the PCM operating mode. 12. Note similarity to LDP Monitor screen found under OBDII Monitors. Failure modes are fewer in this System Test than OBDII LDP Monitor. System Test only stores Small Leak DTC to indicate problem with system. No other type of failure mode indication given. 13. System Test failure may have been, for example, due to a large leak, but the PCM will set the Small Leak DTC to indicate failures that occurred as part of the system test. 14. Connect the DRBIII® to the data link connector. Engine running, turn off all accessories. 15. Note: While test is being performed, PCM must see RPM, minimum MAP, No Vehicle speed and minimum Throttle Position sensor (At idle, in park.) With DRBIII® in System Tests, perform the LDP Monitor Test and follow the instructions on the screen. Are any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the apopropriate Symptom list (Diagnostic Procedure) No → Repair is complete.	All

Verification Tests — Continued

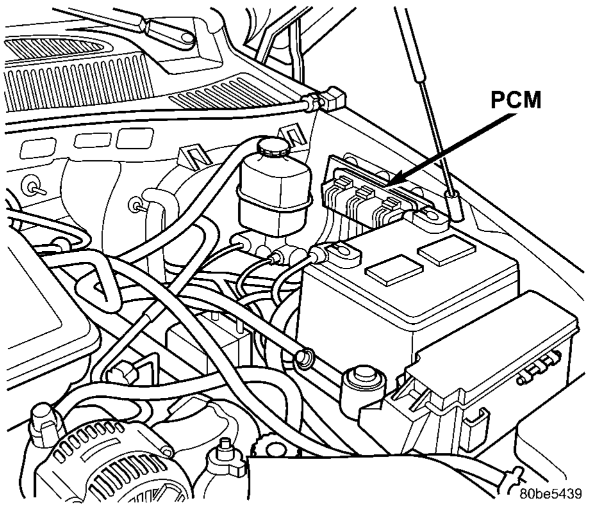
SKIS VERIFICATION	APPLICABILITY
1. Reconnect all previously disconnected components and connectors. 2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKIM. This number can be obtained from the vehicle's invoice or Chrysler's Customer Center (1-800-992-1997). **3. NOTE: When entering the PIN, care should be taken because the SKIM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PINs are entered, the SKIM will Lock Out the DRB for 1 hour.** 4. To exit Lock Out mode, the ignition key must remain in the Run position continually for 1 hour. Turn off all accessories and connect a battery charger if necessary. 5. With the DRB, select Theft Alarm, SKIM and Miscellaneous. Then, select the desired procedure and follow the steps that will be displayed. 6. If the SKIM has been replaced, ensure all of the vehicle ignition keys are programmed to the new SKIM. **7. NOTE: Prior to returning vehicle to the customer, perform a module scan to be sure that all DTCs are erased. Erase any DTCs that are found.** 8. With the DRB, erase all DTCs. Perform 5 ignition key cycles leaving the key on for at least 90 seconds per cycle. 9. With the DRB, read the SKIM DTCs. Are there any SKIM DTCs? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

NOTES

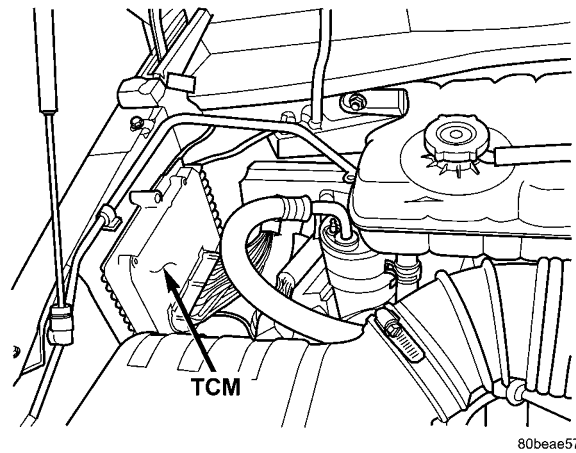
8.0 COMPONENT LOCATIONS

8.1 CONTROL MODULES AND PDC

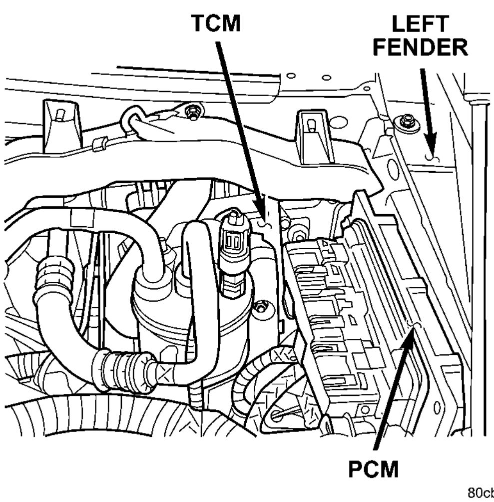
LHD



LHD



RHD



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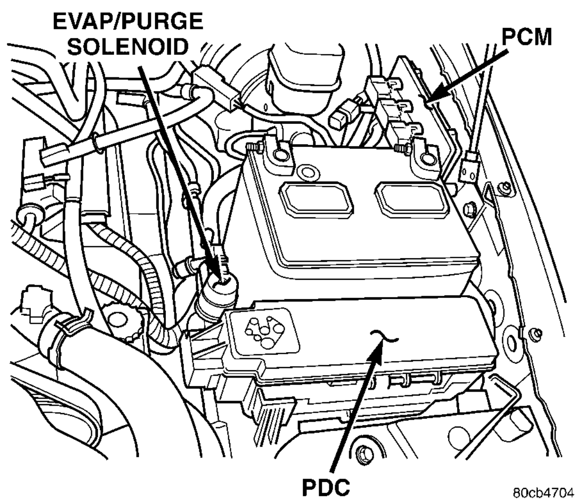
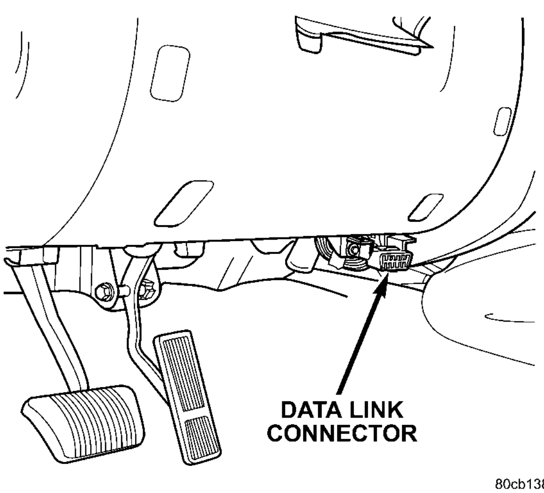
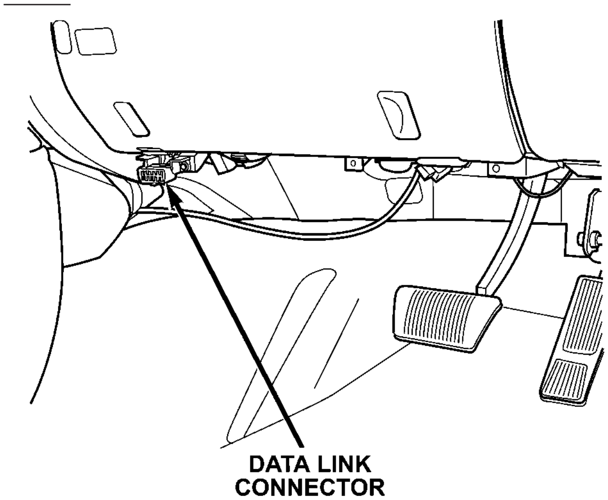


8.2 DATALINK CONNECTOR

LHD

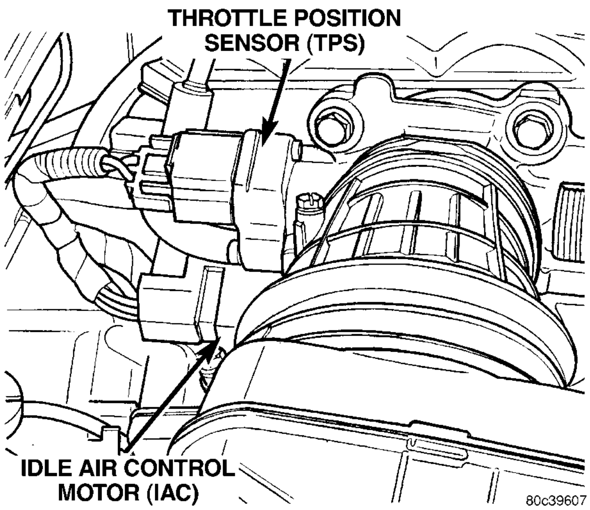


RHD



8.3 SENSORS AND SOLENOIDS

2.4L



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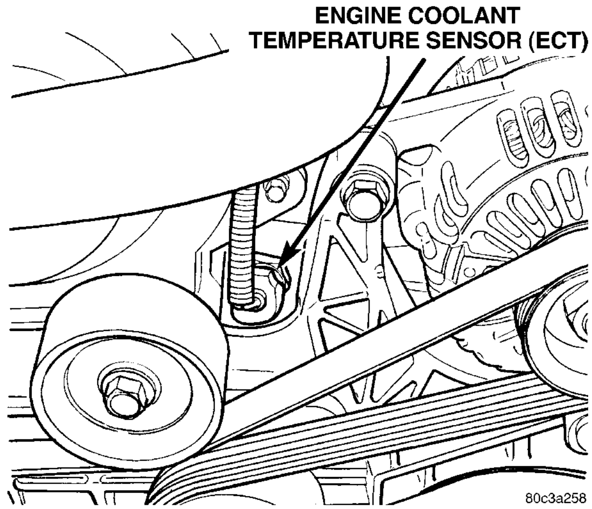

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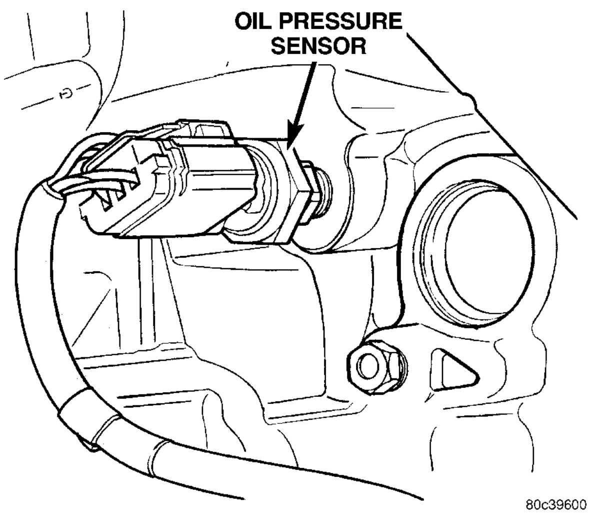

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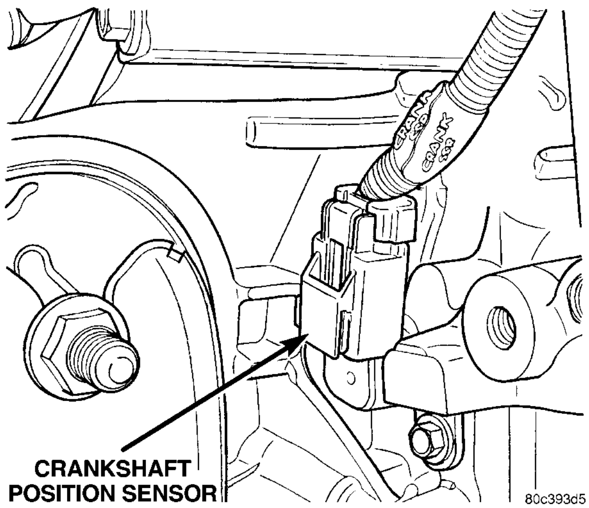

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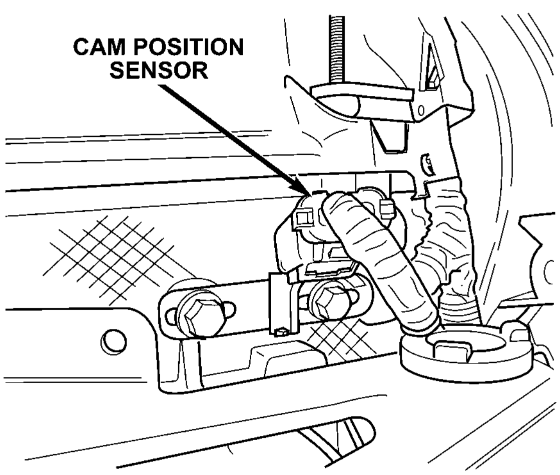

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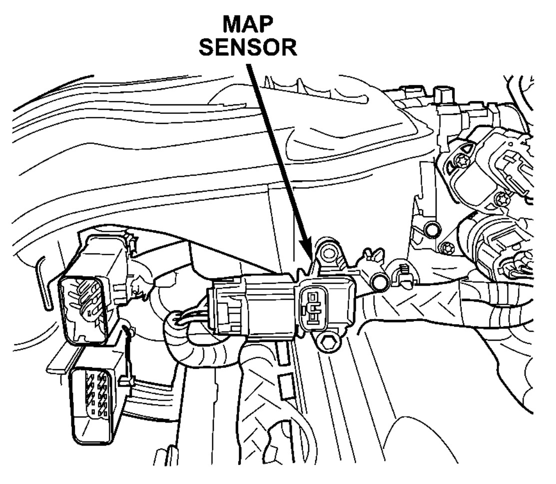

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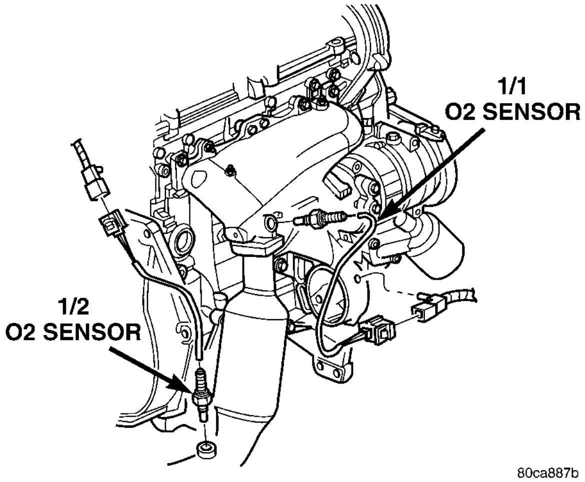

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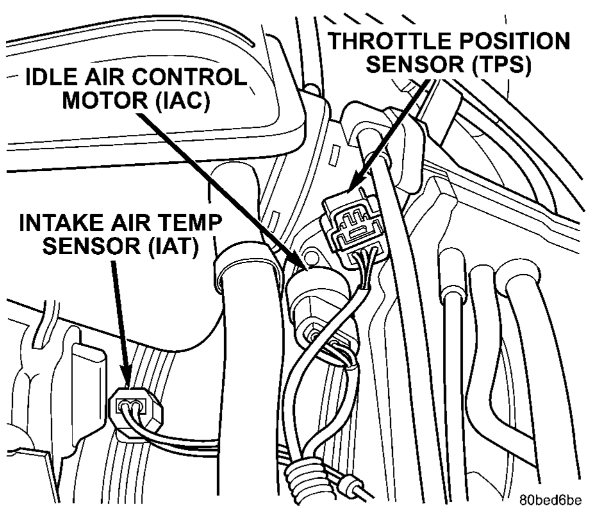

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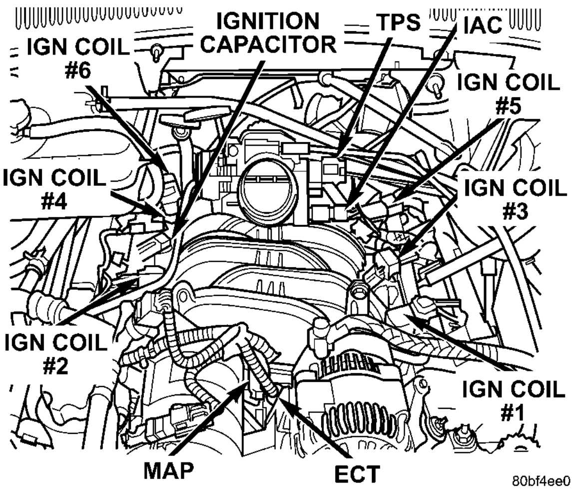

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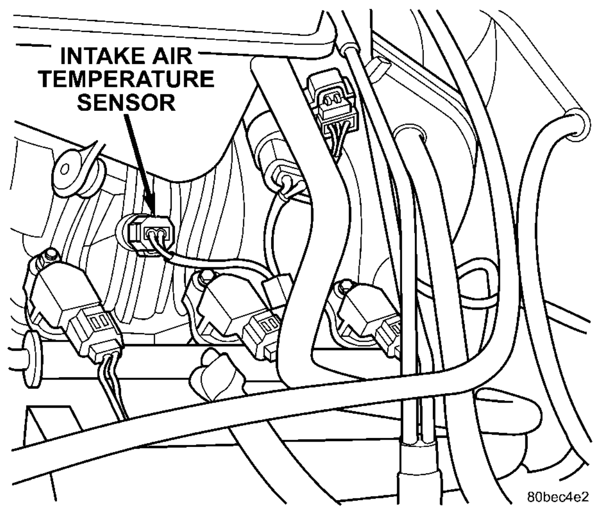

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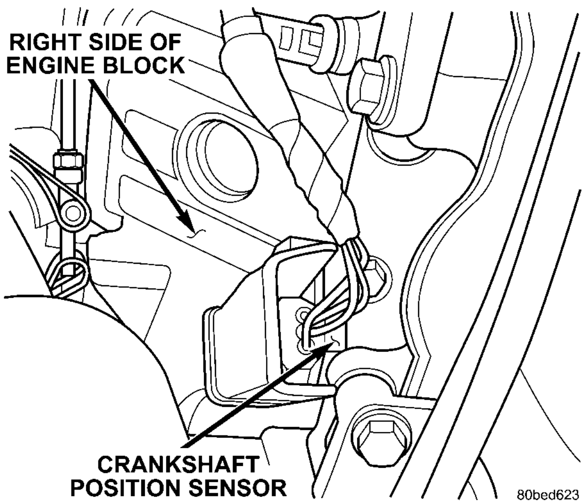

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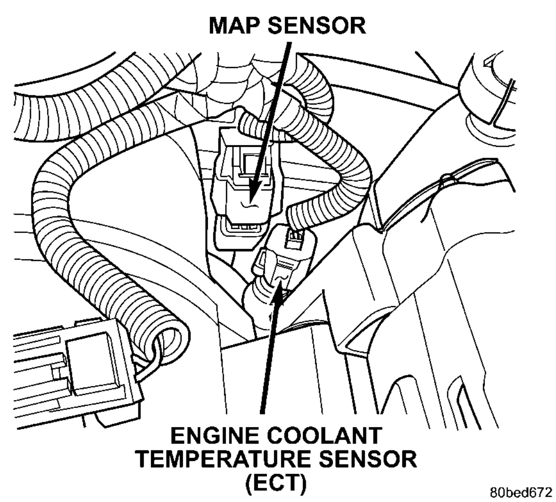
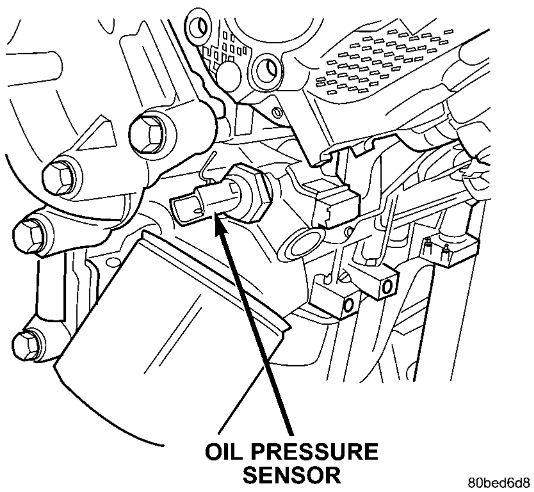


C O M P O N E N T   L O C A T I O N S

8.3 SENSORS AND SOLENOIDS (Continued)

3.7L



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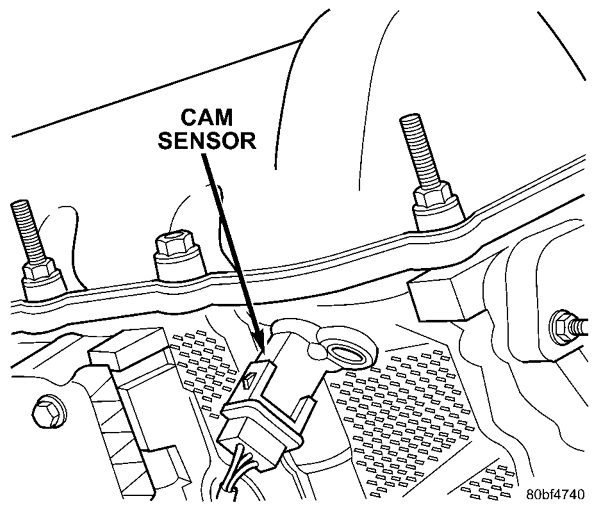

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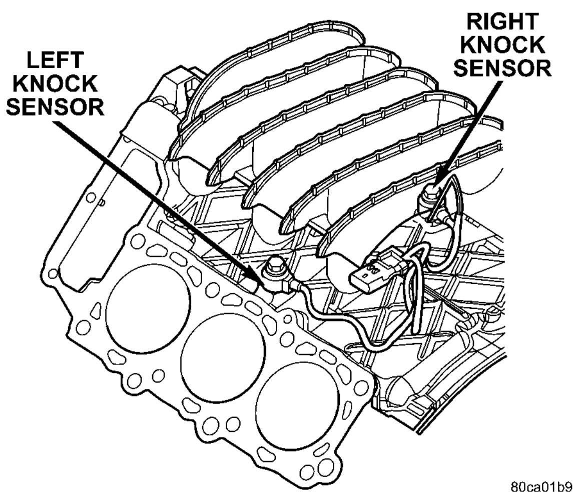

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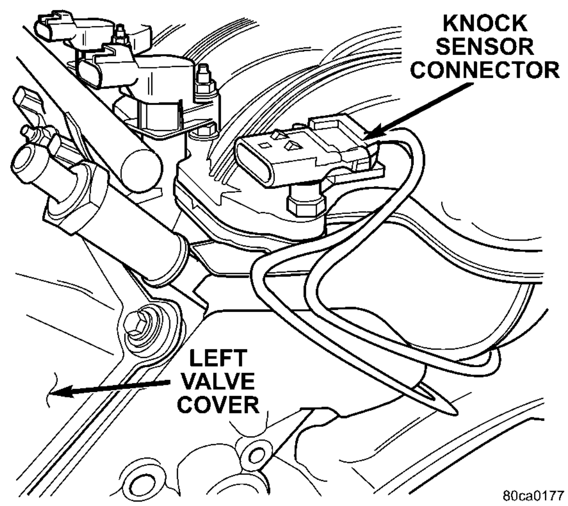

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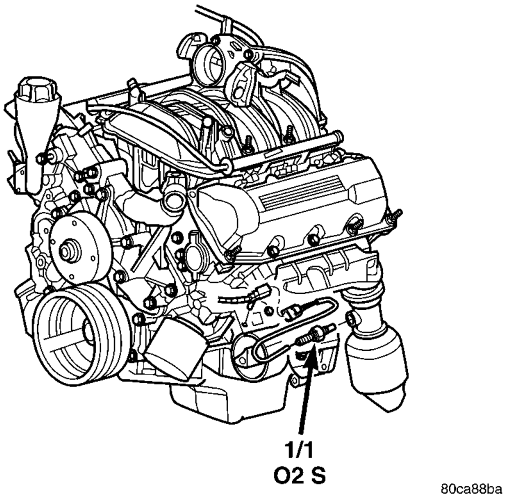

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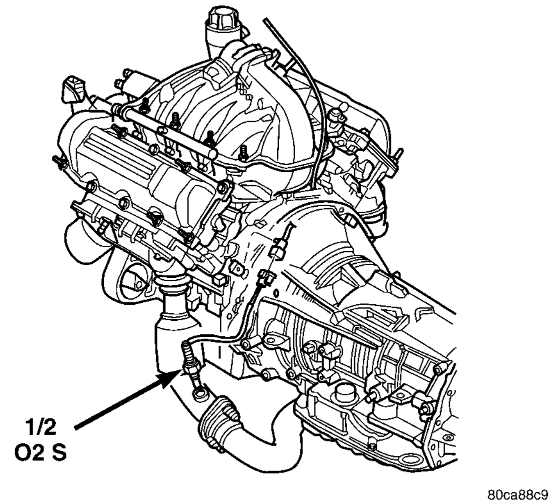

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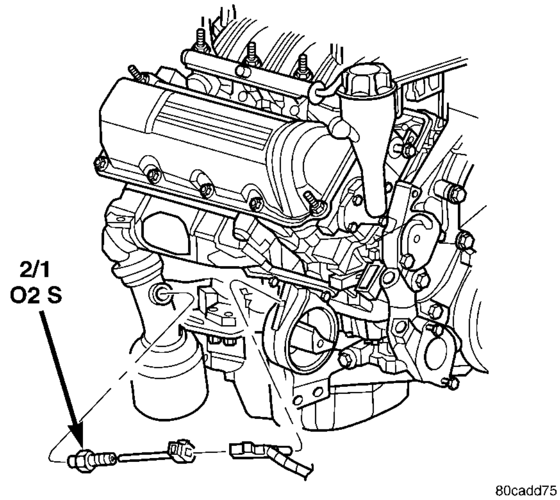
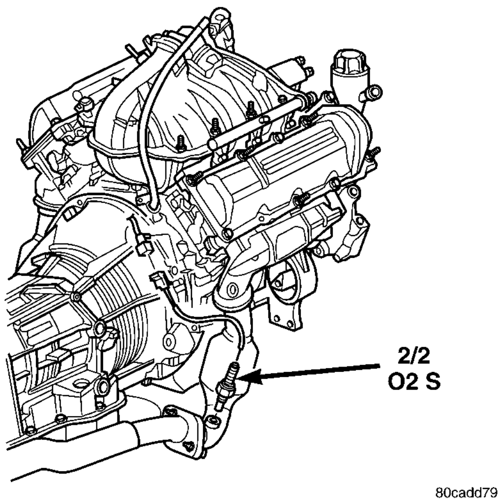

2/1
O2 S
80cadd75

3.7L


2/2
O2 S
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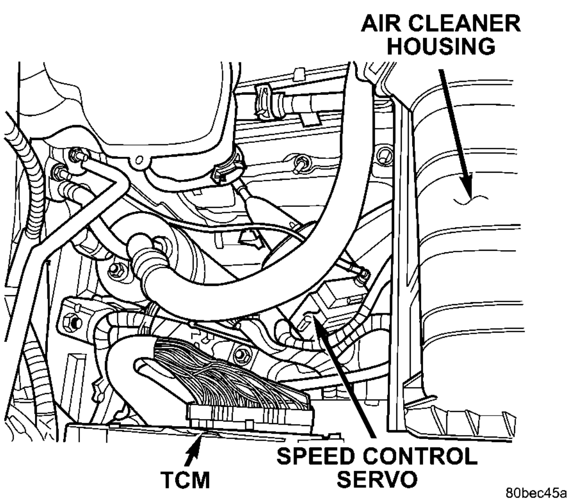
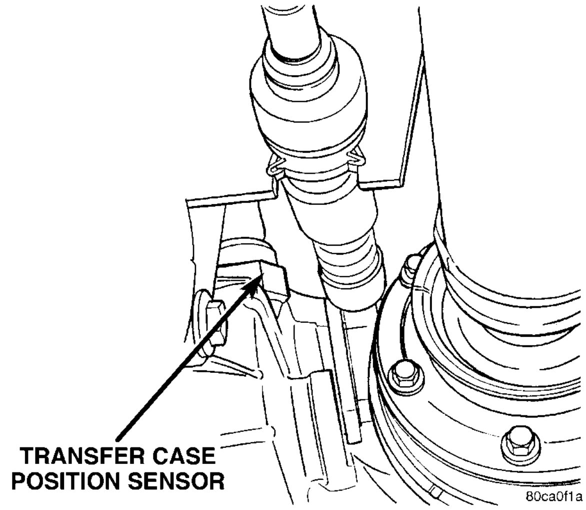
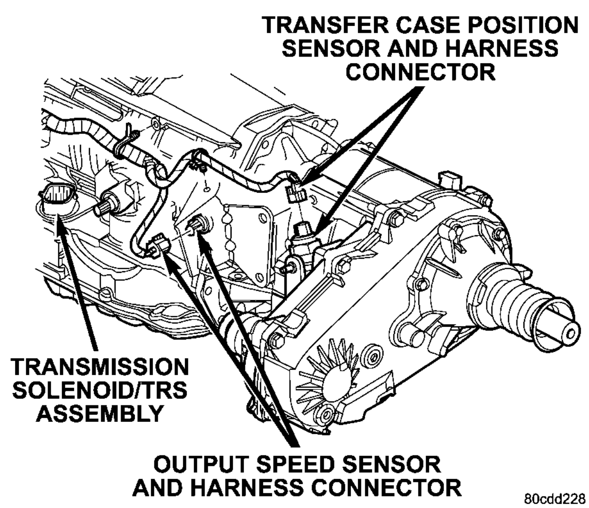
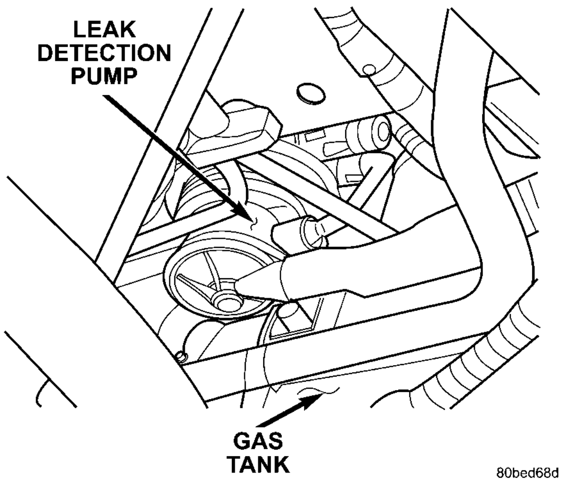
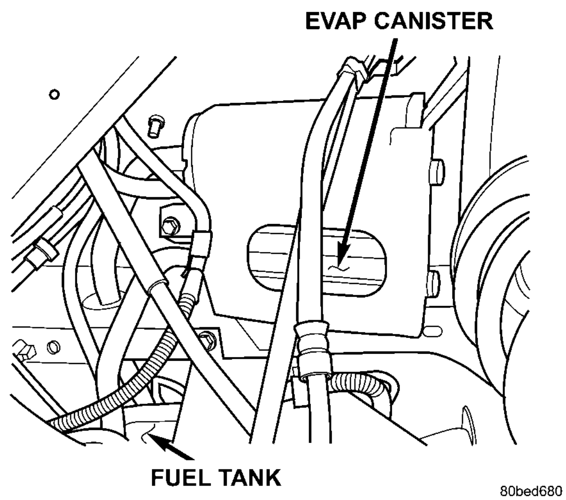

AIR CLEANER
HOUSING
TCM
SPEED CONTROL
SERVO
80bec45a

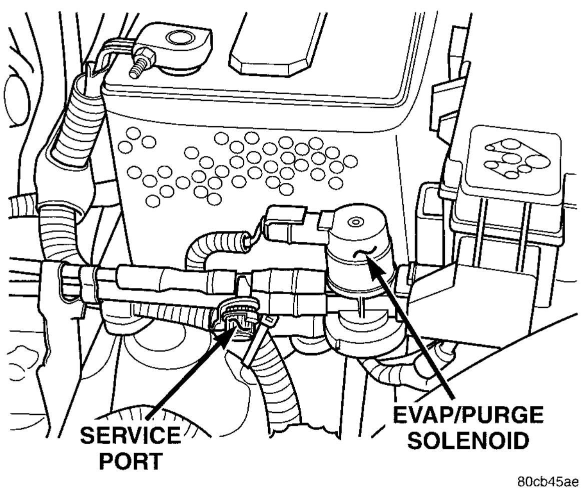

TRANSFER CASE
POSITION SENSOR
80ca0f1a

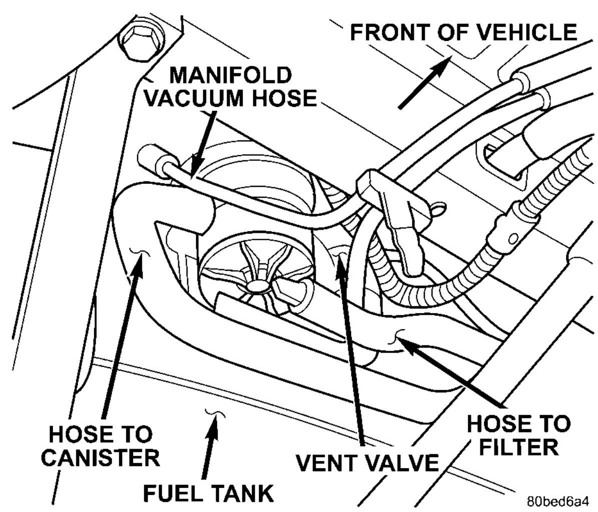

TRANSFER CASE POSITION
SENSOR AND HARNESS
CONNECTOR
TRANSMISSION
SOLENOID/TRS
ASSEMBLY
OUTPUT SPEED SENSOR
AND HARNESS CONNECTOR
80cdd228

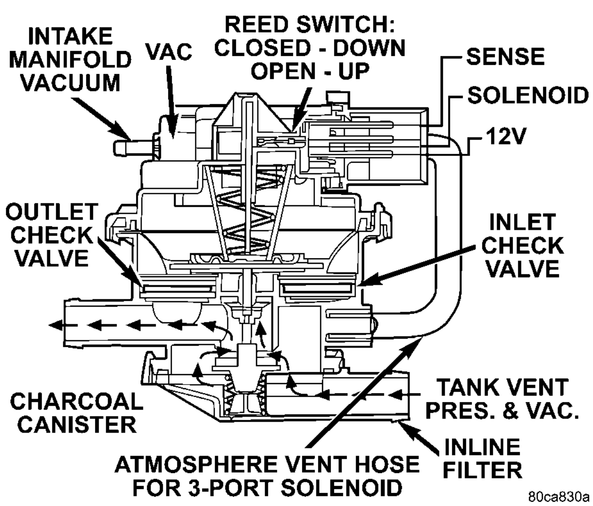
8.4 FUEL SYSTEM



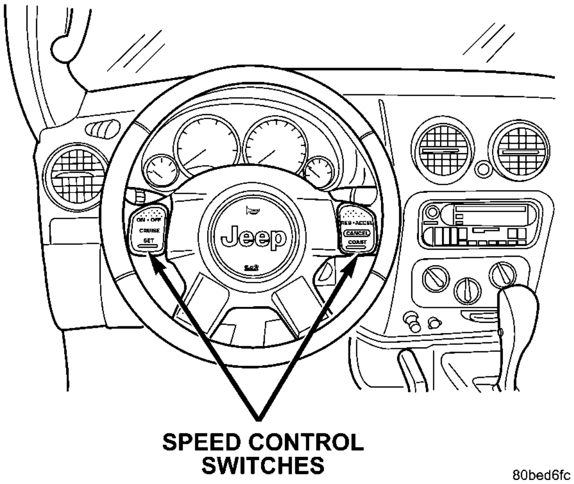






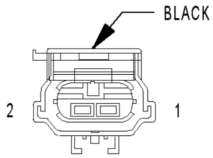


8.5 SWITCHES



NOTES

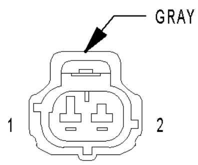
9.0 CONNECTOR PINOUTS



A/C COMPRESSOR CLUTCH

A/C COMPRESSOR CLUTCH

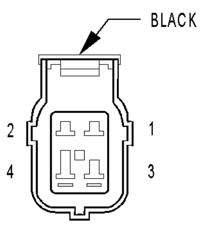
CAV	CIRCUIT	FUNCTION
1	C3 18DB/BK	A/C CLUTCH RELAY OUTPUT
2	Z246 18BK/GY	GROUND



A/C LOW PRESSURE SWITCH

A/C LOW PRESSURE SWITCH

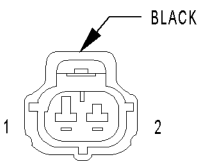
CAV	CIRCUIT	FUNCTION
1	C21 18DB/OR (GAS)	A/C SWITCH SENSE
1	C21 18DB/OR (DIESEL)	A/C LOW PRESSURE SWITCH SIGNAL
2	Z142 18BK/WT (RHD)	GROUND
2	Z212 18BK/OR (LHD)	GROUND



A/C PRESSURE TRANSDUCER (GAS)

A/C PRESSURE TRANSDUCER (GAS)

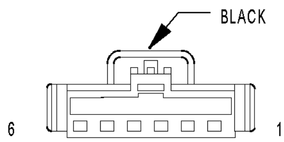
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K6 18VT/WT	5 VOLT SUPPLY
3	C18 18DB	A/C PRESSURE SIGNAL
4	-	-



BATTERY TEMPERATURE SENSOR

BATTERY TEMPERATURE SENSOR

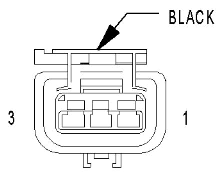
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH

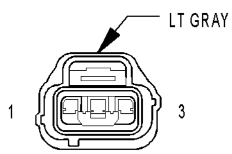
CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN (DIESEL)	PRIMARY BRAKE SWITCH SIGNAL
2	L50 18WT/TN (GAS)	BRAKE LAMP SWITCH OUTPUT
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	V32 18YL/RD	SPEED CONTROL SUPPLY
5	Z3 18BK/OR	GROUND
6	K29 18WT/PK (DIESEL)	SECONDARY BRAKE SWITCH SIGNAL
6	K29 18WT/PK (GAS)	BRAKE SWITCH SENSE



CAMSHAFT POSITION SENSOR (2.4L)

CAMSHAFT POSITION SENSOR (2.4L)

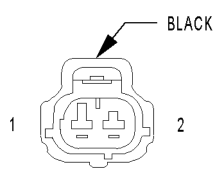
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL



CAMSHAFT POSITION SENSOR (3.7L)

CAMSHAFT POSITION SENSOR (3.7L)

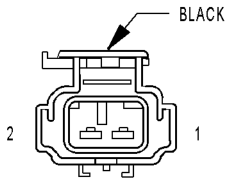
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CAPACITOR (2.4L)

CAPACITOR (2.4L)

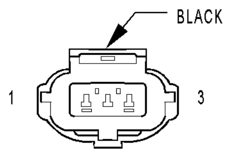
CAV	CIRCUIT	FUNCTION
1	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
2	Z55 14BK/WT	GROUND



CLUTCH INTERLOCK SWITCH (M/T)

CLUTCH INTERLOCK SWITCH (M/T)

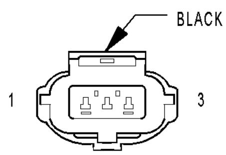
CAV	CIRCUIT	FUNCTION
1	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT
2	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)



COIL ON PLUG NO. 1 (3.7L)

COIL ON PLUG NO. 1 (3.7L)

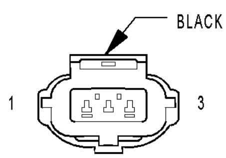
CAV	CIRCUIT	FUNCTION
1	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON PLUG NO. 2 (3.7L)

COIL ON PLUG NO. 2 (3.7L)

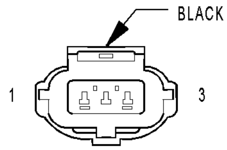
CAV	CIRCUIT	FUNCTION
1	K92 14TN/PK	COIL ON PLUG DRIVER NO. 2
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON PLUG NO. 3 (3.7L)

COIL ON PLUG NO. 3 (3.7L)

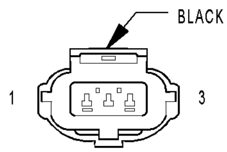
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG
NO. 4
(3.7L)

COIL ON PLUG NO. 4 (3.7L)

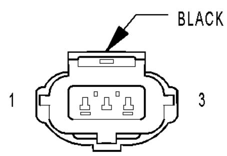
CAV	CIRCUIT	FUNCTION
1	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG
NO. 5
(3.7L)

COIL ON PLUG NO. 5 (3.7L)

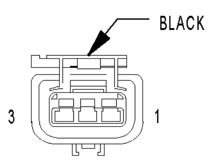
CAV	CIRCUIT	FUNCTION
1	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG
NO. 6
(3.7L)

COIL ON PLUG NO. 6 (3.7L)

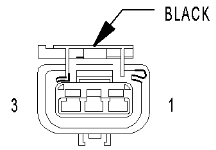
CAV	CIRCUIT	FUNCTION
1	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL RAIL
(2.4L)

COIL RAIL (2.4L)

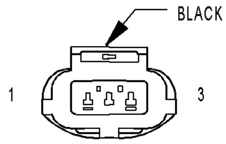
CAV	CIRCUIT	FUNCTION
1	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER



CRANKSHAFT POSITION SENSOR (2.4L)

CRANKSHAFT POSITION SENSOR (2.4L)

CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



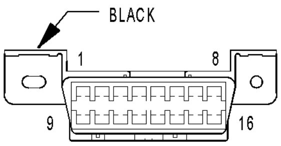
CRANKSHAFT POSITION SENSOR (3.7L)

CRANKSHAFT POSITION SENSOR (3.7L)

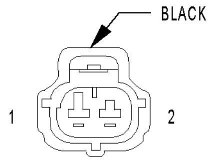
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY

DATA LINK CONNECTOR

CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



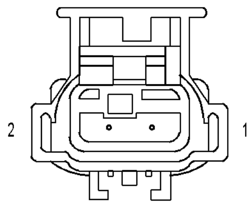
DATA LINK CONNECTOR



ENGINE COOLANT TEMPERATURE SENSOR (GAS)

ENGINE COOLANT TEMPERATURE SENSOR (GAS)

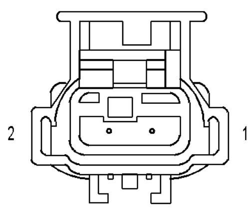
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE OIL PRESSURE SWITCH

ENGINE OIL PRESSURE SWITCH (GAS)

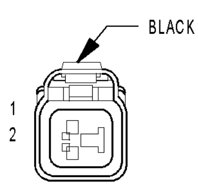
CAV	CIRCUIT	FUNCTION
1	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
2	-	-



ENGINE OIL PRESSURE SWITCH (GAS)

EVAP/PURGE SOLENOID

CAV	CIRCUIT	FUNCTION
1	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)

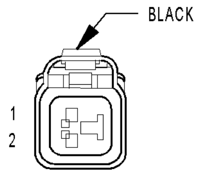


FUEL INJECTOR NO. 1 (GAS)

FUEL INJECTOR NO. 1 (GAS)

CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER

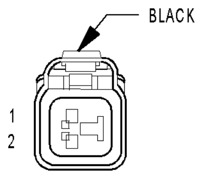
CONNECTOR PINOUTS



FUEL INJECTOR NO. 2 (GAS)

FUEL INJECTOR NO. 2 (GAS)

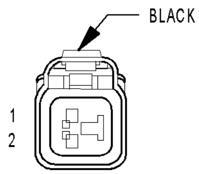
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER



FUEL INJECTOR NO. 3 (GAS)

FUEL INJECTOR NO. 3 (GAS)

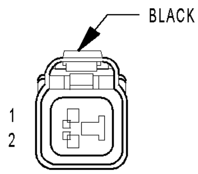
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER



FUEL INJECTOR NO. 4 (GAS)

FUEL INJECTOR NO. 4 (GAS)

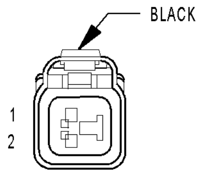
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER



FUEL INJECTOR NO. 5 (3.7L)

FUEL INJECTOR NO. 5 (3.7L)

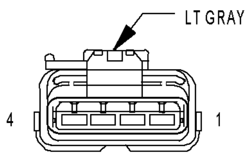
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K38 18GY	FUEL INJECTOR NO. 5 DRIVER



FUEL INJECTOR NO. 6 (3.7L)

FUEL INJECTOR NO. 6 (3.7L)

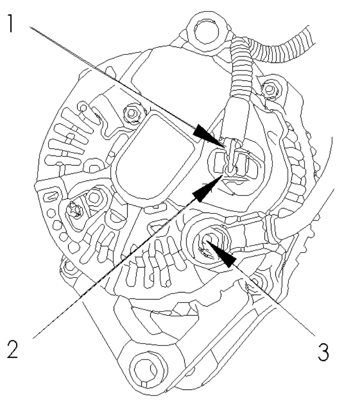
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K58 18BR/DB	FUEL INJECTOR NO. 6 DRIVER



FUEL PUMP MODULE

FUEL PUMP MODULE

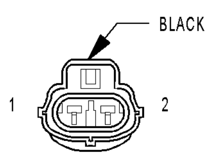
CAV	CIRCUIT	FUNCTION
1	Z211 16BK (GAS)	GROUND
2	K4 18BK/LB	SENSOR GROUND
3	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
4	A141 16DG/WT (GAS)	FUEL PUMP RELAY OUTPUT



GENERATOR

GENERATOR

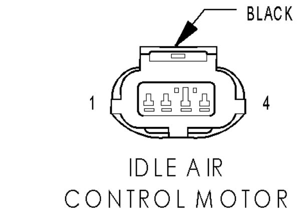
CAV	CIRCUIT	FUNCTION
1	-	FIELD WIRES
2	-	FIELD WIRE CONNECTOR
3	-	B(+) (OUTPUT TERMINALS)



GENERATOR

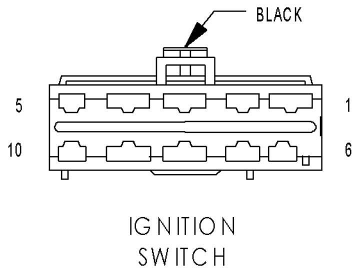
GENERATOR

CAV	CIRCUIT	FUNCTION
1	K20 18DG (GAS)	GENERATOR FIELD DRIVER
1	A71 18DG/RD (DIESEL)	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K20 18DG (DIESEL)	GENERATOR FIELD CONTROL
2	K125 18WT/DB (GAS)	GENERATOR SOURCE



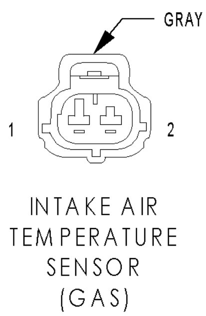
IDLE AIR CONTROL MOTOR

CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
4	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER



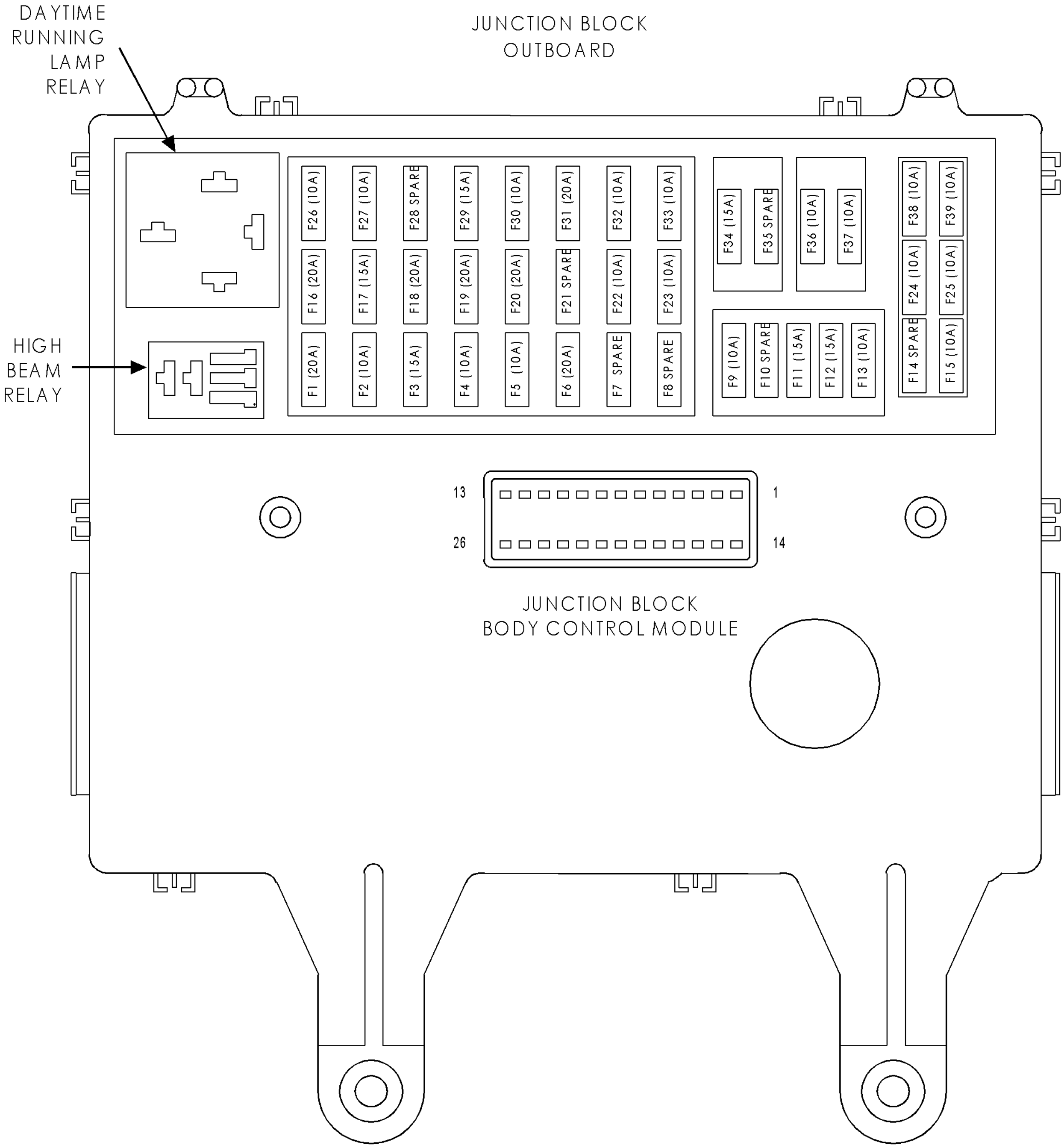
IGNITION SWITCH

CAV	CIRCUIT	FUNCTION
1	A1 12RD	FUSED B(+)
2	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
3	F81 12TN	IGNITION SWITCH OUTPUT (RUN-ACC)
4	A25 12DB	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	A41 12YL	IGNITION SWITCH OUTPUT (START)
7	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
8	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
9	A2 12PK/BK	FUSED B(+)
10	Z232 16BK/LB	GROUND



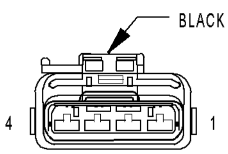
INTAKE AIR TEMPERATURE SENSOR (GAS)

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL


DAYTIME RUNNING LAMP RELAY
JUNCTION BLOCK OUTBOARD
HIGH BEAM RELAY
F26 (10A)
F27 (10A)
F28 SPARE
F29 (15A)
F30 (10A)
F31 (20A)
F32 (10A)
F33 (10A)
F16 (20A)
F17 (15A)
F18 (20A)
F19 (20A)
F20 (20A)
F21 SPARE
F22 (10A)
F23 (10A)
F1 (20A)
F2 (10A)
F3 (15A)
F4 (10A)
F5 (10A)
F6 (20A)
F7 SPARE
F8 SPARE
F34 (15A)
F35 SPARE
F36 (10A)
F37 (10A)
F38 (10A)
F39 (10A)
F24 (10A)
F25 (10A)
F9 (10A)
F10 SPARE
F11 (15A)
F12 (15A)
F13 (10A)
F14 SPARE
F15 (10A)
13
1
26
14
JUNCTION BLOCK BODY CONTROL MODULE

FUSES (JB)

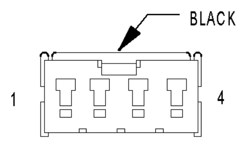
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F38 16RD/WT	FUSED B(+)
2	10A	INTERNAL	FUSED B(+)
3	15A	INTERNAL	FUSED B(+)
4	10A	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
5	10A	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
6	20A	INTERNAL	FUSED B(+)
7	-	SPARE	-
8	-	SPARE	-
9	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
10	-	SPARE	-
11	15A	A15 18PK/OR	FUSED B(+)
12	15A	F32 18PK/DB	FUSED B(+)
13	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	-	SPARE	-
15	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	20A	F41 16PK/VT	FUSED B(+)
17	15A	F70 18PK/BK	FUSED B(+)
18	20A	F60 16DG/RD	FUSED B(+)
19	15A	INTERNAL	FUSED B(+)
20	20A	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
21	-	SPARE	-
22	10A	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
23	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
24	10A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
25	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
26	10A	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
27	10A	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
28	-	SPARE	-
29	30A	A3 16RD/WT (HIGHLINE)	FUSED B(+)
30	10A	INTERNAL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
31	20A	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
32	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
33	10A	INTERNAL	FUSED B(+)
34	15A	INTERNAL	FUSED B(+)
35	-	SPARE	-
36	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
37	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
38	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
39	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)



LEAK DETECTION PUMP

LEAK DETECTION PUMP

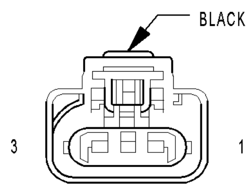
CAV	CIRCUIT	FUNCTION
1	-	-
2	K125 18WT/DB	GENERATOR SOURCE
3	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE



LEFT
SPEED CONTROL
SWITCH
(EXCEPT BASE)

LEFT SPEED CONTROL SWITCH (EXCEPT BASE)

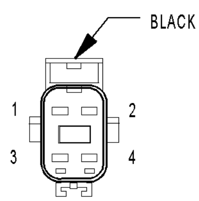
CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



MANIFOLD ABSOLUTE
PRESSURE
SENSOR

MANIFOLD ABSOLUTE PRESSURE SENSOR

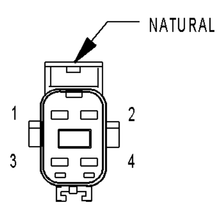
CAV	CIRCUIT	FUNCTION
1	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



OXYGEN
SENSOR 1/1
UPSTREAM

OXYGEN SENSOR 1/1 UPSTREAM

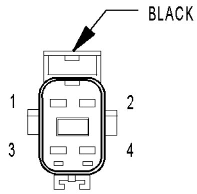
CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL



OXYGEN
SENSOR 1/2
DOWNSTREAM

OXYGEN SENSOR 1/2 DOWNSTREAM

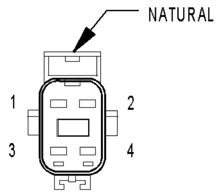
CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD (2.4L)	FUSED AUTO SHUT DOWN RELAY OUTPUT
1	F18 18LG/BK (3.7L)	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	Z186 18BK/OR (3.7L)	GROUND
2	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL



OXYGEN
SENSOR 2/1
UPSTREAM
(3.7L)

OXYGEN SENSOR 2/1 UPSTREAM (3.7L)

CAV	CIRCUIT	FUNCTION
1	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K299 18BR/WT	OXYGEN SENSOR 2/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL

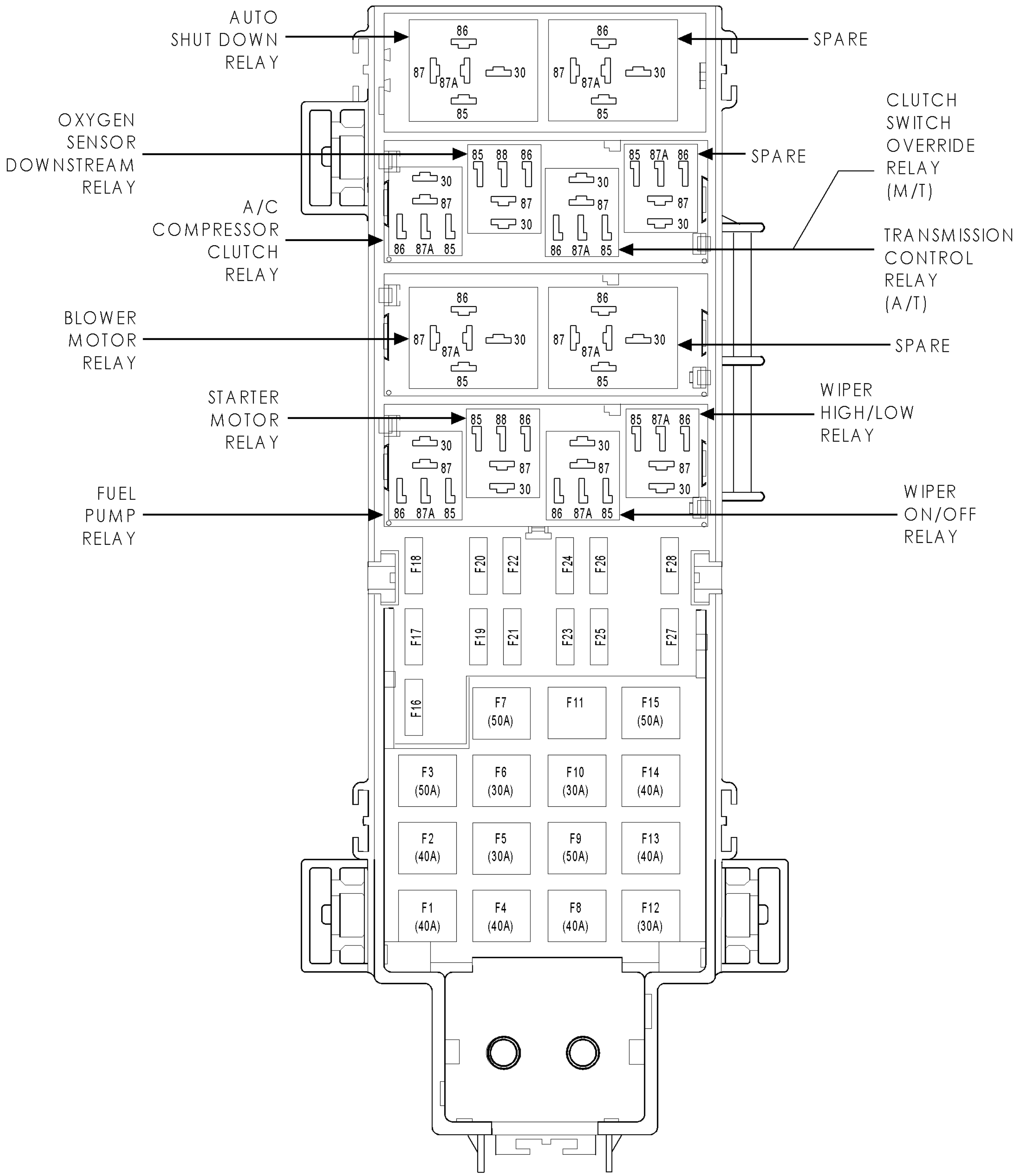


OXYGEN
SENSOR 2/2
DOWNSTREAM
(3.7L)

OXYGEN SENSOR 2/2 DOWNSTREAM (3.7L)

CAV	CIRCUIT	FUNCTION
1	F18 18LG/BK	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	Z186 18BK/OR	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL

POWER DISTRIBUTION CENTER
GAS



FUSES (GAS)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	40A	C24 12DB/PK	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG (ABS)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	30A	A99 14RD/VT	FUSED B(+)
11	-	-	-
12	30A	A32 14RD/DB (SECURITY A/T)	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	20A	A14 16RD/WT	FUSED B(+)
24	20A	A14 16RD/WT	FUSED B(+)
25	20A	A20 12RD/DB (ABS)	FUSED B(+)
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

AUTO SHUT DOWN RELAY

CAV	CIRCUIT	FUNCTION
30	A9 14RD/YL	FUSED B(+)
30	A9 14RD/YL (DIESEL)	FUSED B(+)
85	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
86	F1 18DB (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
86	A9 14RD/YL (DIESEL)	FUSED B(+)
86	F1 18DB (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	A142 14DG/OR (DIESEL)	AUTO SHUT DOWN RELAY OUTPUT
87A	-	-
87	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT

CLUTCH SWITCH OVERRIDE RELAY (M/T)

CAV	CIRCUIT	FUNCTION
30	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
30	F45 18YL/BR (GAS)	FUSED IGNITION SWITCH OUTPUT (START)
85	K90 18TN	CLUTCH SWITCH OVERRIDE RELAY CONTROL
86	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
87	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT
87A	-	-
87	T141 18YL/RD	CLUTCH SWITCH OVERRIDE RELAY OUTPUT

FUEL PUMP RELAY (GAS)

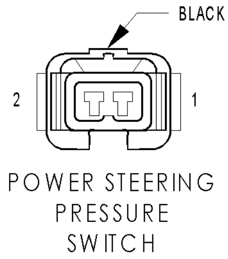
CAV	CIRCUIT	FUNCTION
30	A14 16RD/WT	FUSED B(+)
85	K31 18BR	FUEL PUMP RELAY CONTROL
86	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
86	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87A	-	-
87	A141 16DG/WT	FUEL PUMP RELAY OUTPUT

OXYGEN SENSOR DOWNSTREAM RELAY (GAS)

CAV	CIRCUIT	FUNCTION
30	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
30	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
85	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
86	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	F18 18LG/BK	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
87A	-	-

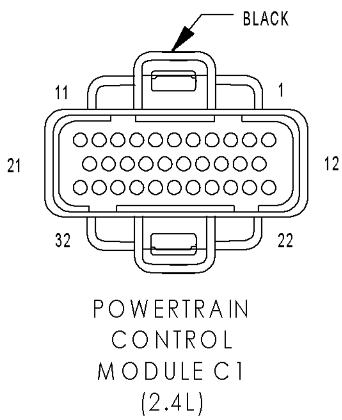
STARTER MOTOR RELAY

CAV	CIRCUIT	FUNCTION
30	A2 12PK/BK	FUSED B(+)
85	T41 18BK/WT (A/T)	PARK/NEUTRAL POSITION SWITCH SENSE
85	Z142 18BK/WT (M/T)	GROUND
86	F45 18YL/BR (A/T)	FUSED IGNITION SWITCH OUTPUT (START)
86	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
86	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
87A	-	-
87	T40 12BR	STARTER MOTOR RELAY OUTPUT



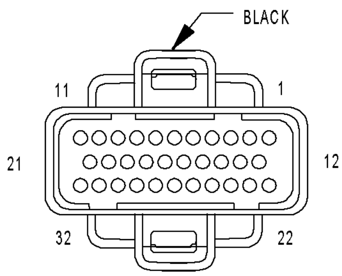
POWER STEERING PRESSURE SWITCH

CAV	CIRCUIT	FUNCTION
1	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
2	Z246 18BK/GY	GROUND



POWERTRAIN CONTROL MODULE C1 (2.4L)

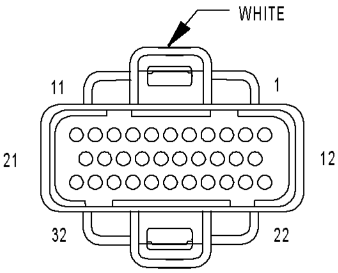
CAV	CIRCUIT	FUNCTION
1	-	-
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	K4 18BK/LB	SENSOR GROUND
5	-	-
6	-	-
7	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	T141 18YL/RD	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	-	-
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	-	-
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	-	-
30	-	-
31	Z107 14BK/DB	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C1 (3.7L)

POWERTRAIN CONTROL MODULE C1 (3.7L)

CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
4	K4 18BK/LB	SENSOR GROUND
5	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
6	T41 18BK/WT (A/T)	PARK/NEUTRAL POSITION SWITCH SENSE
7	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	F45 18YL/BR (A/T)	FUSED IGNITION SWITCH OUTPUT (START)
13	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z107 14BK/DB	GROUND
31	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DB	GROUND



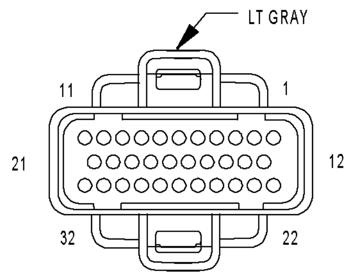
POWERTRAIN CONTROL MODULE C2 (GAS)

POWERTRAIN CONTROL MODULE C2 (GAS)

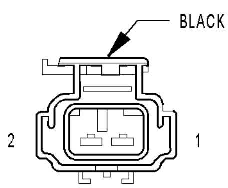
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K38 18GY (3.7L)	FUEL INJECTOR NO. 5 DRIVER
7	-	-
8	-	-
9	K17 18DB/TN (2.4L)	IGNITION COIL NO. 2 DRIVER
9	K92 14TN/PK (3.7L)	COIL ON PLUG DRIVER NO. 2
10	K20 18DG	GENERATOR FIELD
11	-	-
12	K58 18BR/DB (3.7L)	FUEL INJECTOR NO. 6 DRIVER
13	-	-
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	K173 18LG	RADIATOR FAN RELAY CONTROL
18	-	-
19	C18 18DB	A/C PRESSURE SIGNAL
20	-	-
21	-	-
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	K6 18VT/WT	5 VOLT SUPPLY
32	-	-

POWERTRAIN CONTROL MODULE C3 (GAS)

CAV	CIRCUIT	FUNCTION
1	C13 18DG	A/C CLUTCH RELAY CONTROL
2	-	-
3	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	K90 18TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
7	K42 18DB/LB (3.7L)	KNOCK SENSOR NO. 1 SIGNAL
7	K42 18DB/LB (2.4L)	NOT USED
8	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
9	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18YL/RD	SPEED CONTROL SUPPLY
12	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY SENSE INPUT
13	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
14	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE
15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
16	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
16	K299 18BR/WT (3.7L)	OXYGEN SENSOR 2/1 HEATER CONTROL
17	B22 18DG/YL	VEHICLE SPEED OUTPUT
18	K142 18GY/BK (3.7L)	KNOCK SENSOR NO. 2 SIGNAL
18	K142 18GY/BK (2.4L)	NOT USED
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
21	-	-
22	C21 18DB/OR	A/C SWITCH SENSE
23	-	-
24	K29 18WT/PK	BRAKE SWITCH SENSE
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG	SCI RECEIVE (PCM)
30	D25 18YL/VT	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL



POWERTRAIN CONTROL MODULE C3 (GAS)

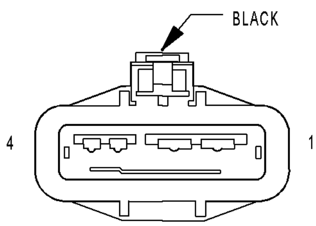


RADIATOR FAN MOTOR

RADIATOR FAN MOTOR

CAV	CIRCUIT	FUNCTION
1	C25 12YL	RADIATOR FAN RELAY OUTPUT
2	Z212 12BK/OR	GROUND

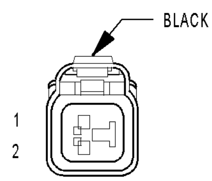
CONNECTOR PINOUTS



RADIATOR
FAN RELAY

RADIATOR FAN RELAY

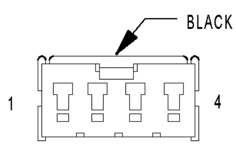
CAV	CIRCUIT	FUNCTION
1	C24 12DB/PK	FUSED B(+)
2	C25 12YL	RADIATOR FAN RELAY OUTPUT
3	Z212 18BK/OR	GROUND
4	K173 18LG	RADIATOR FAN RELAY CONTROL



REAR
WHEEL SPEED
SENSOR

REAR WHEEL SPEED SENSOR

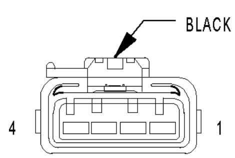
CAV	CIRCUIT	FUNCTION
1	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL



RIGHT
SPEED CONTROL
SWITCH
(EXCEPT BASE)

RIGHT SPEED CONTROL SWITCH (EXCEPT BASE)

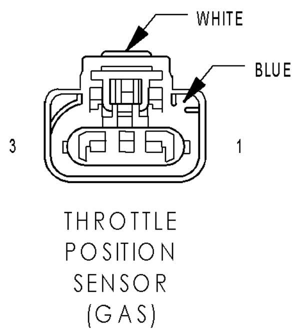
CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



SPEED
CONTROL
SERVO

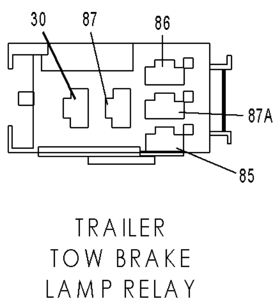
SPEED CONTROL SERVO

CAV	CIRCUIT	FUNCTION
1	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	Z212 18BK/OR	GROUND



THROTTLE POSITION SENSOR (GAS)

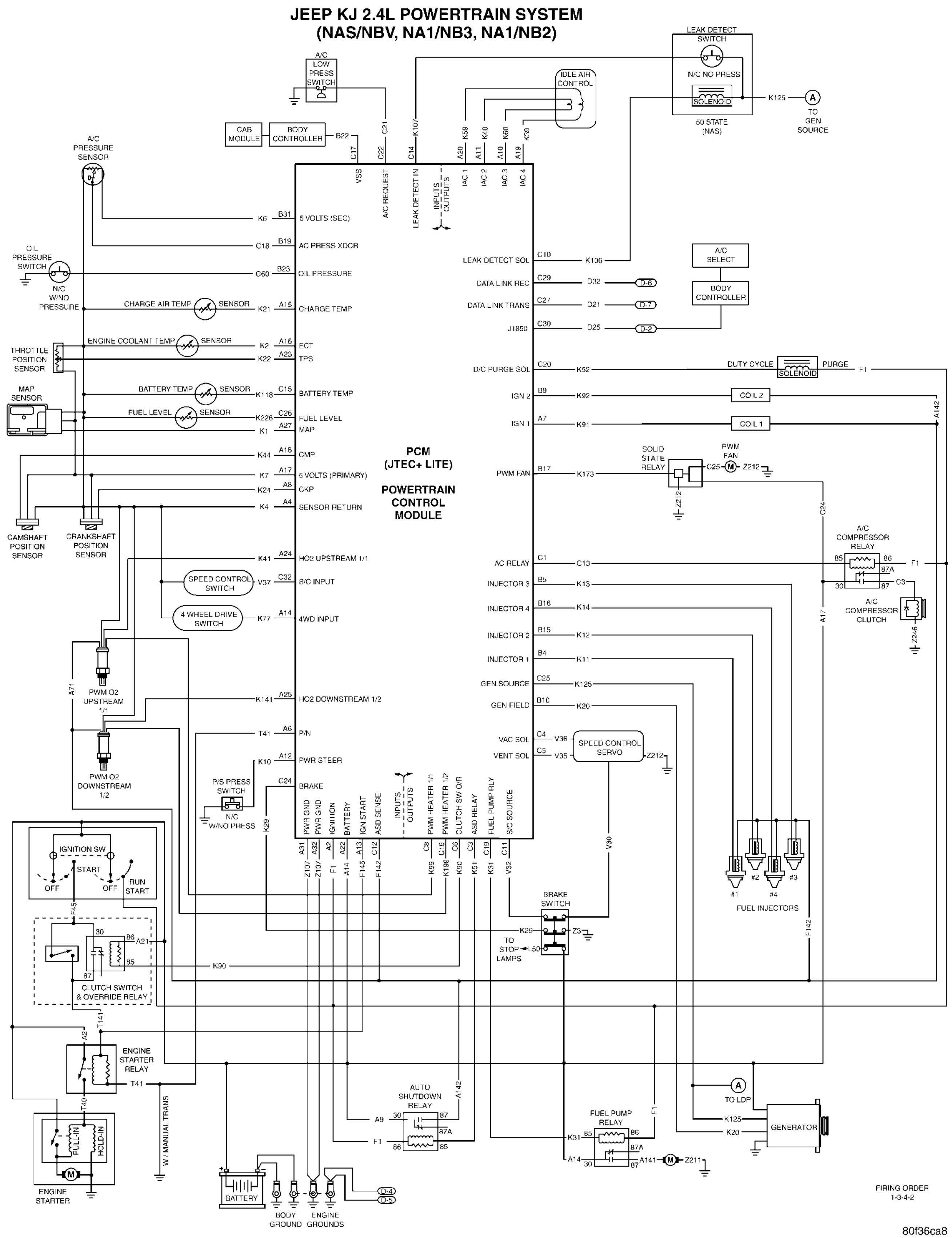
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL



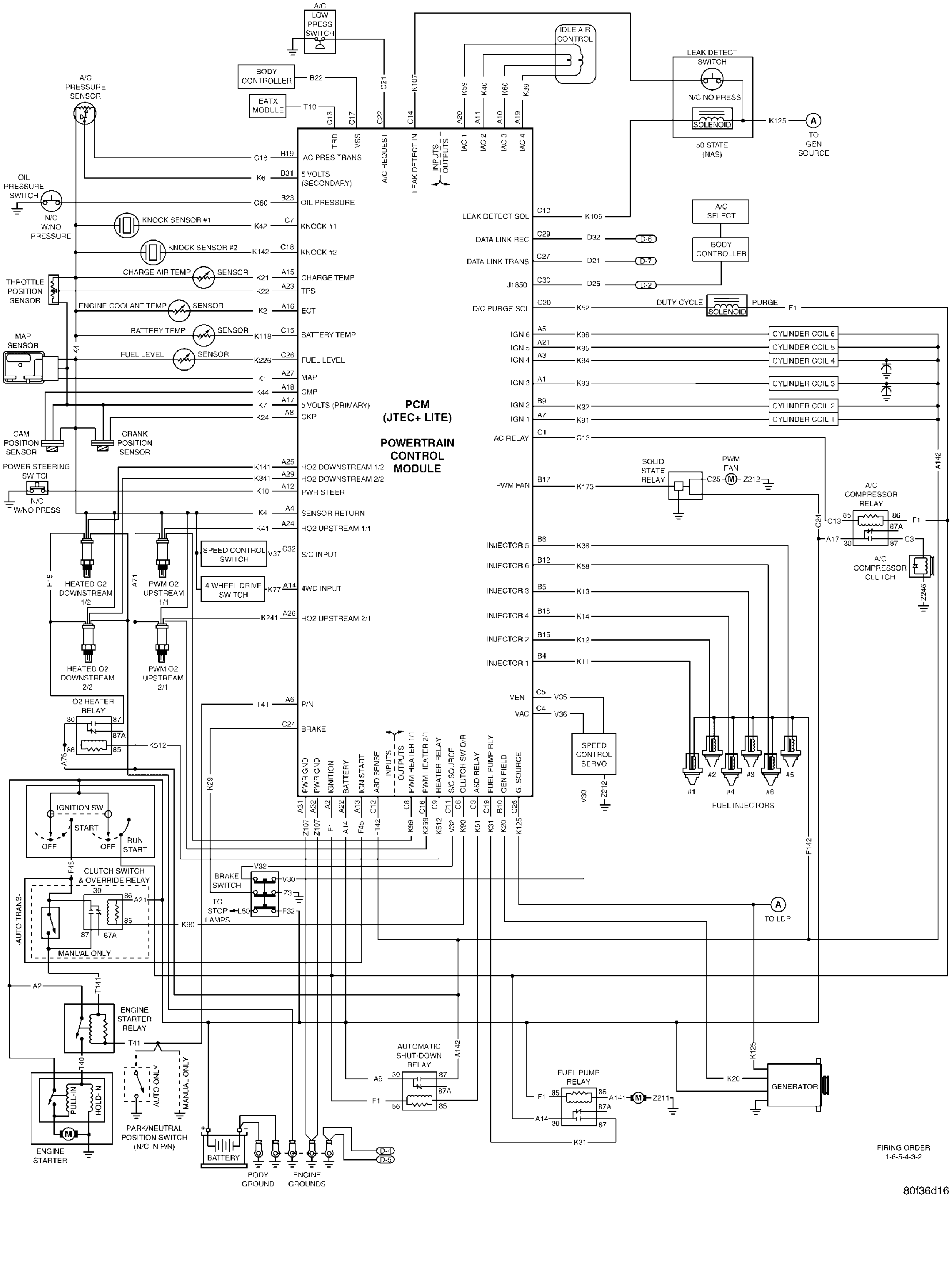
TRAILER TOW BRAKE LAMP RELAY

CAV	CIRCUIT	FUNCTION
30	A6 16RD/BK	FUSED B(+)
85	Z149 18BK/LB	GROUND
86	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
87	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	L76 16BK/OR	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87	L95 16DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT

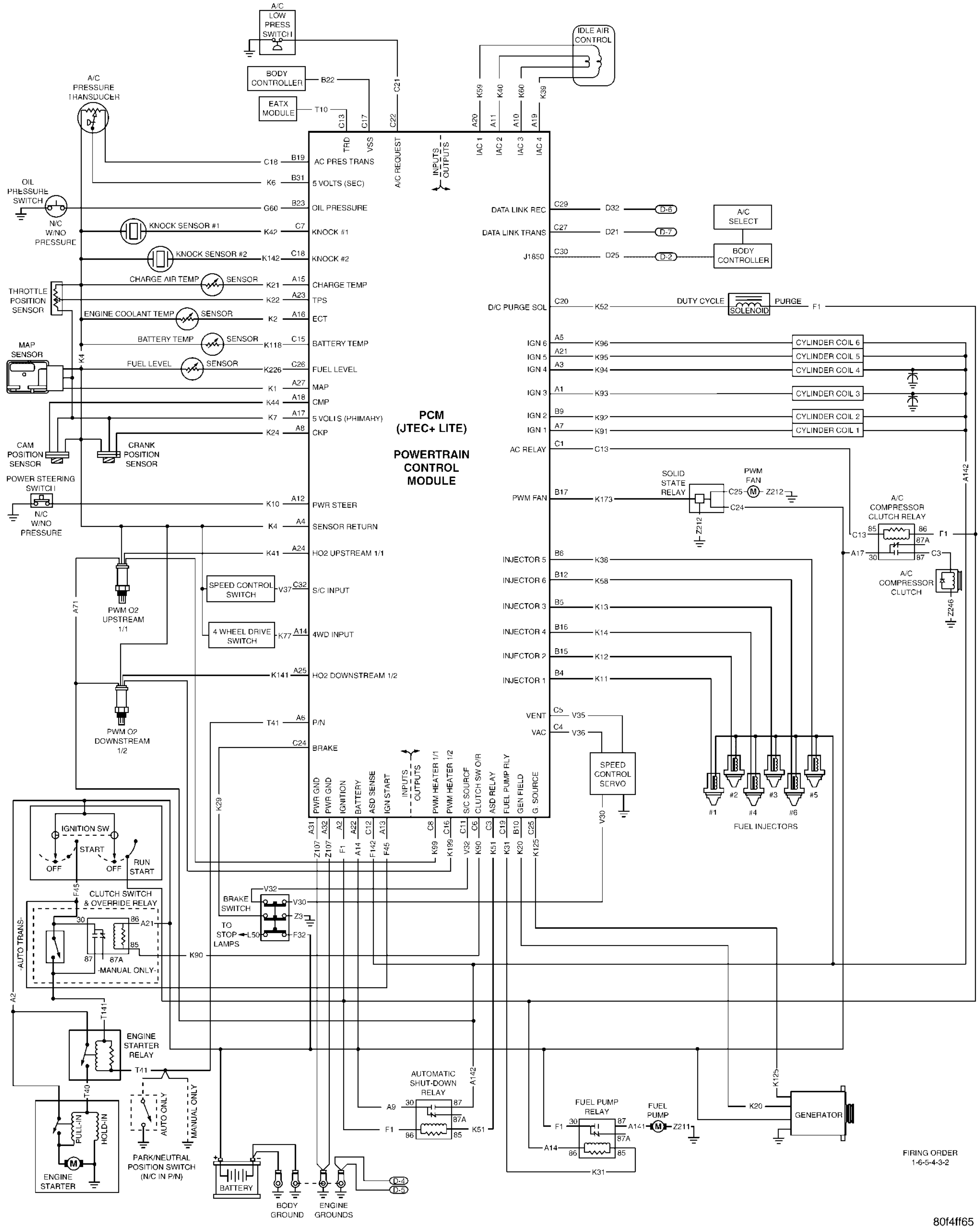
10.0 SCHEMATIC DIAGRAMS



JEEP KJ 3.7L POWERTRAIN SYSTEM (NAS/NBV, NA1/NB2, NA1/NB3,NA1/NBJ)



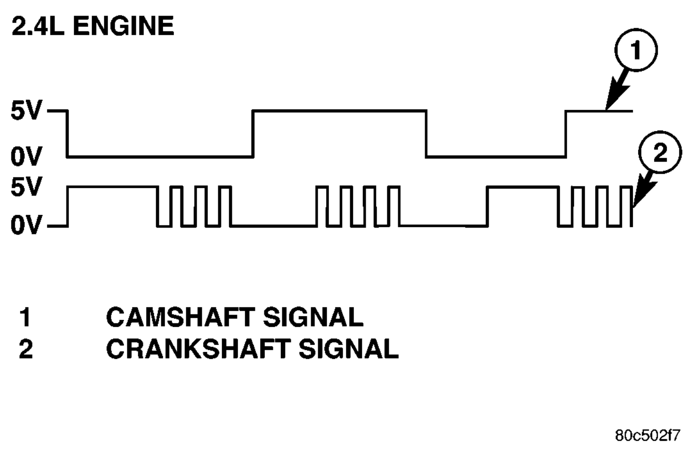
JEEP 3.7L POWERTRAIN SYSTEM (NA1/NB2)

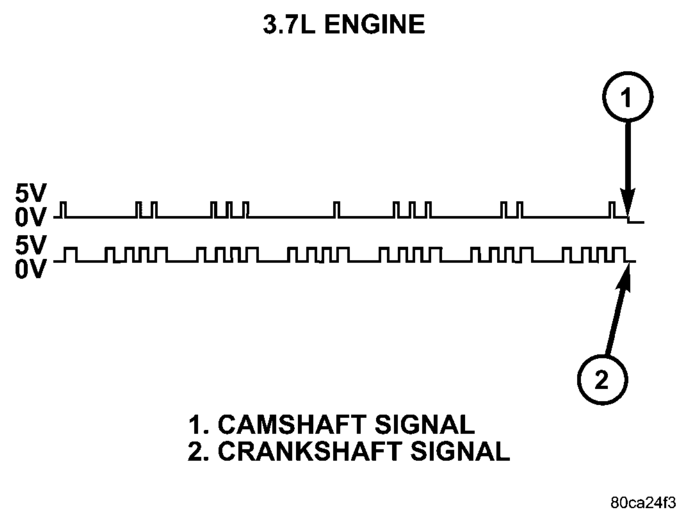


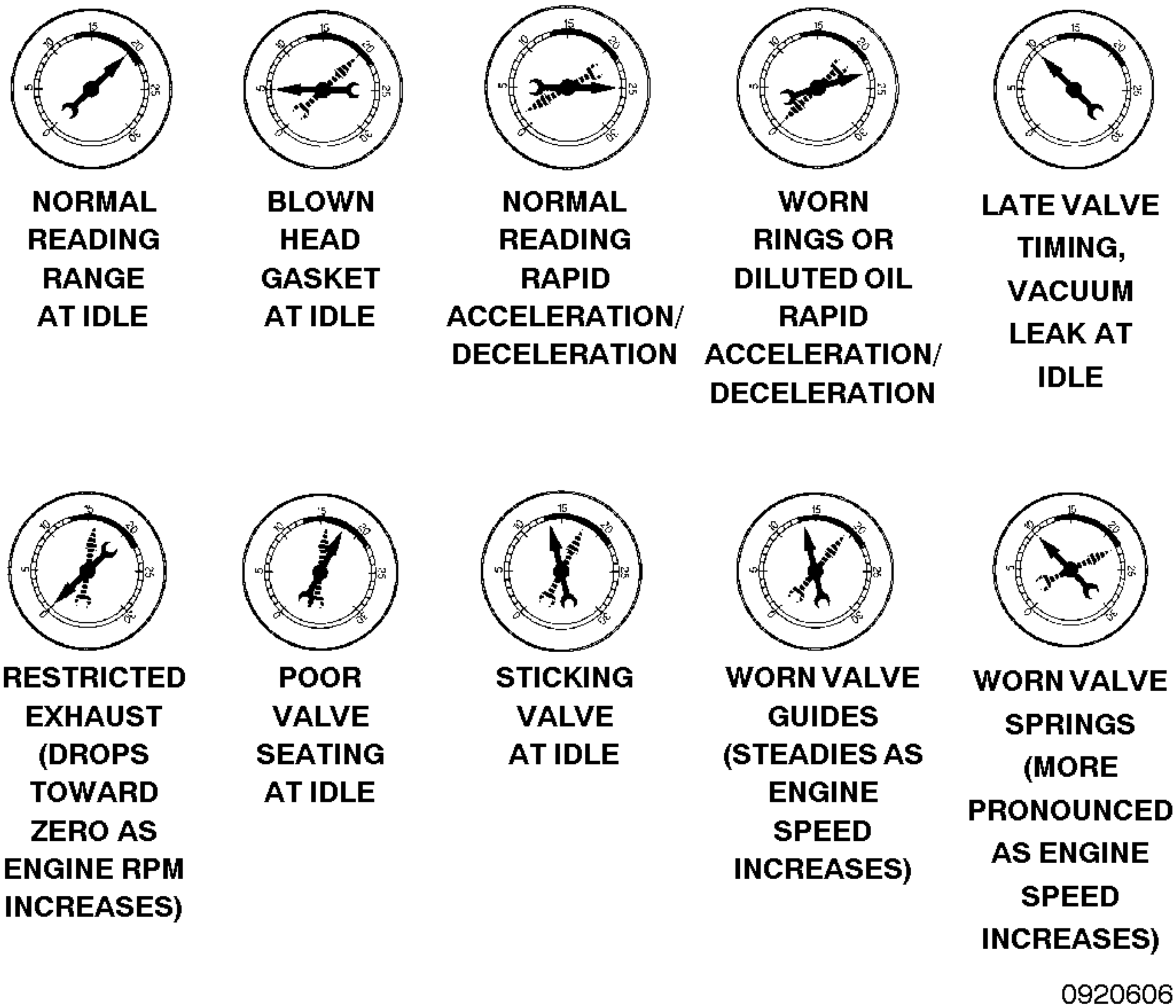
S C H E M A T I C D I A G R A M S

NOTES

11.0 CHARTS AND GRAPHS



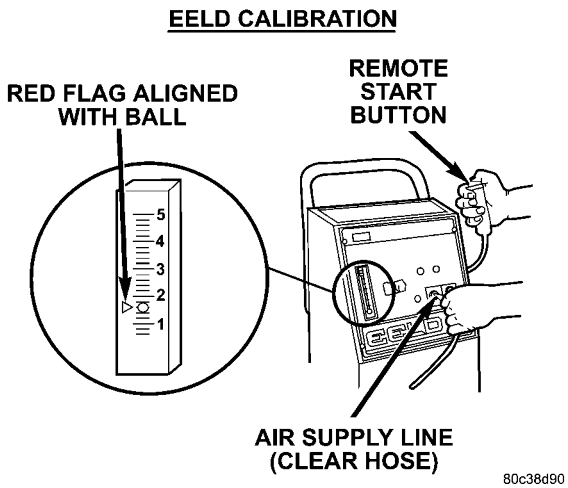


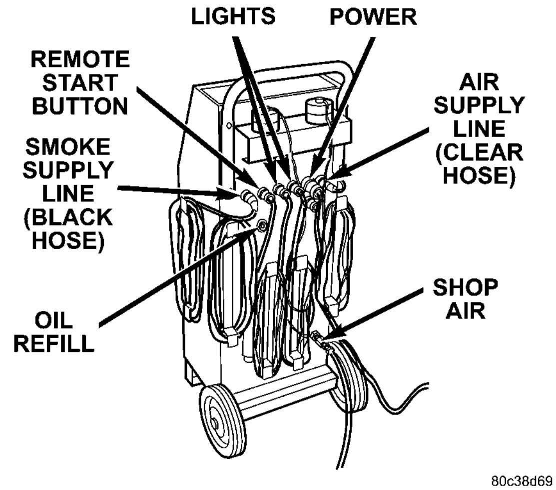

NORMAL READING RANGE AT IDLE
BLOWN HEAD GASKET AT IDLE
NORMAL READING RAPID ACCELERATION/ DECELERATION
WORN RINGS OR DILUTED OIL RAPID ACCELERATION/ DECELERATION
LATE VALVE TIMING, VACUUM LEAK AT IDLE
RESTRICTED EXHAUST (DROPS TOWARD ZERO AS ENGINE RPM INCREASES)
POOR VALVE SEATING AT IDLE
STICKING VALVE AT IDLE
WORN VALVE GUIDES (STEADIES AS ENGINE SPEED INCREASES)
WORN VALVE SPRINGS (MORE PRONOUNCED AS ENGINE SPEED INCREASES)
0920606

O2 SENSOR CONFIGURATION

AB 3.9L	1/1	UPSTREAM
AB 3.9L	1/2	DOWNSTREAM
AB 5.2L	1/1	LEFT BANK UPSTREAM
AB 5.2L	1/2	LEFT BANK DOWNSTREAM
AB 5.2L	2/1	RIGHT BANK UPSTREAM
AB 5.2L	2/2	RIGHT BANK DOWNSTREAM
AB 5.9L	1/1	UPSTREAM
AB 5.9L	1/2	DOWNSTREAM
AN 2.5L	1/1	UPSTREAM
AN 2.5L	1/2	DOWNSTREAM
AN 3.9L	1/1	UPSTREAM
AN 3.9L	1/2	DOWNSTREAM
AN 4.7L	1/1	LEFT BANK UPSTREAM
AN 4.7L	1/2	LEFT BANK DOWNSTREAM
AN 4.7L	2/1	RIGHT BANK UPSTREAM
AN 4.7L	2/2	RIGHT BANK DOWNSTREAM
AN 5.9L 2WD	1/1	LEFT BANK UPSTREAM
AN 5.9L 2WD	1/2	PRE CATALYST
AN 5.9L 2WD	1/3	POST CATALYST
AN 5.9L 2WD	2/1	RIGHT BANK UPSTREAM
AN 5.9L 4WD	1/1	UPSTREAM
AN 5.9L 4WD	1/2	DOWNSTREAM
DN 3.9L	1/1	UPSTREAM
DN 3.9L	1/2	DOWNSTREAM
DN 4.7L	1/1	LEFT BANK UPSTREAM
DN 4.7L	1/2	LEFT BANK DOWNSTREAM
DN 4.7L	2/1	RIGHT BANK UPSTREAM
DN 4.7L	2/2	RIGHT BANK DOWNSTREAM
DN 5.9L	1/1	UPSTREAM
DN 5.9L	1/2	DOWNSTREAM
DR 3.7L	1/1	UPSTREAM
DR 3.7L	1/2	DOWNSTREAM
DR 4.7L	1/1	LEFT BANK UPSTREAM
DR 4.7L	1/2	LEFT BANK DOWNSTREAM
DR 4.7L	2/1	RIGHT BANK UPSTREAM
DR 4.7L	2/2	RIGHT BANK DOWNSTREAM
DR 5.7L	1/1	LEFT BANK UPSTREAM
DR 5.7L	1/2	LEFT BANK DOWNSTREAM
DR 5.7L	2/1	RIGHT BANK UPSTREAM
DR 5.7L	2/2	RIGHT BANK DOWNSTREAM
DR 5.9L	1/1	UPSTREAM
DR 5.9L	1/2	DOWNSTREAM
DR 8.0L	1/1	LEFT BANK UPSTREAM
DR 8.0L	1/2	PRE CATALYST
DR 8.0L	1/3	POST CATALYST
DR 8.0L	2/1	RIGHT BANK UPSTREAM
KJ 2.4L	1/1	UPSTREAM
KJ 2.4L	1/2	DOWNSTREAM
KJ 3.7L	1/1	LEFT BANK UPSTREAM
KJ 3.7L	1/2	LEFT BANK DOWNSTREAM
KJ 3.7L	2/1	RIGHT BANK UPSTREAM
KJ 3.7L	2/2	RIGHT BANK DOWNSTREAM
TJ 2.4L	1/1	UPSTREAM
TJ 2.4L	1/2	DOWNSTREAM
TJ 4.0L	1/1	FRONT UPSTREAM
TJ 4.0L	1/2	FRONT DOWNSTREAM
TJ 4.0L	2/1	REAR UPSTREAM
TJ 4.0L	2/2	REAR DOWNSTREAM
WJ 4.0L	1/1	FRONT UPSTREAM
WJ 4.0L	1/2	FRONT DOWNSTREAM
WJ 4.0L	2/1	REAR UPSTREAM
WJ 4.0L	2/2	REAR DOWNSTREAM
WJ 4.7L	1/1	LEFT BANK UPSTREAM
WJ 4.7L	1/2	LEFT BANK DOWNSTREAM
WJ 4.7L	2/1	RIGHT BANK UPSTREAM
WJ 4.7L	2/2	RIGHT BANK DOWNSTREAM
WJ 5.9L	1/1	UPSTREAM
WJ 5.9L	1/2	DOWNSTREAM
ZB 8.3L	1/1	LEFT BANK UPSTREAM
ZB 8.3L	1/2	LEFT BANK DOWNSTREAM
ZB 8.3L	2/1	RIGHT BANK UPSTREAM
ZB 8.3L	2/2	RIGHT BANK DOWNSTREAM

80f4482e


EELD CALIBRATION
RED FLAG ALIGNED WITH BALL
REMOTE START BUTTON
5
4
3
2
1
AIR SUPPLY LINE (CLEAR HOSE)
80c38d90


LIGHTS
POWER
REMOTE START BUTTON
SMOKE SUPPLY LINE (BLACK HOSE)
AIR SUPPLY LINE (CLEAR HOSE)
OIL REFILL
SHOP AIR
80c38d69

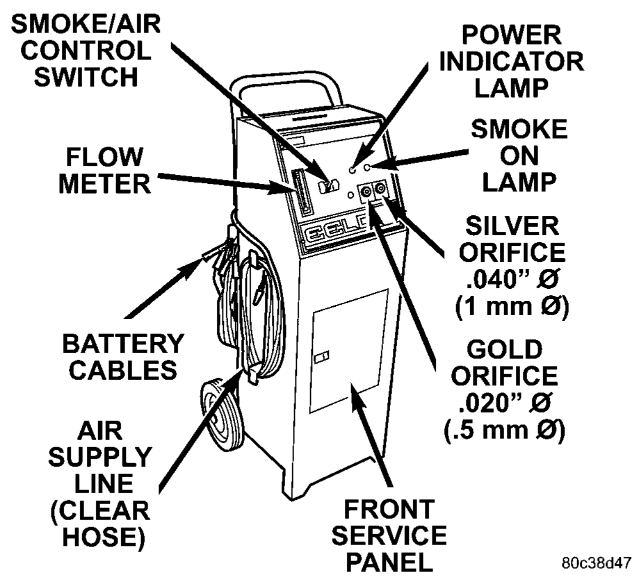

SMOKE/AIR CONTROL SWITCH
POWER INDICATOR LAMP
FLOW METER
SMOKE ON LAMP
SILVER ORIFICE .040” Ø (1 mm Ø)
BATTERY CABLES
GOLD ORIFICE .020” Ø (.5 mm Ø)
AIR SUPPLY LINE (CLEAR HOSE)
FRONT SERVICE PANEL
80c38d47

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TABLE OF CONTENTS - Continued

1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, instructions, and graphics needed to diagnose 2003 body system problems. The diagnostics in this manual are based on the failure condition or symptom being present at the time of diagnosis.

Please follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the appropriate modules; i.e., if the DRBIII® displays a "No Response" condition, you must diagnose that first.
2. Read DTC's (diagnostic trouble codes) with the DRBIII®.
3. If no DTC's are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

All component location views are in Section 8.0. All connector pinouts are in Section 9.0. All schematics are in Section 10.0.

An * placed before the symptom description indicated a customer complaint.

When repairs are required, refer to the appropriate service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added: carryover systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE DIAGNOSTIC TROUBLE CODE. It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

This book reflects many suggested changes from readers of past issues. After using this book, if you have any comments or suggestions, please fill out the back of the book and mail it back to us.

1.1 SYSTEM COVERAGE

This diagnostic manual covers 2003 Jeep Liberty (KJ) vehicles.

1.2 SIX STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the body system is done in six basic steps:

- Verification of complaint
- Verification of any related symptoms
- Symptom analysis
- Problem isolation
- Repair of isolated problem
- Verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

The vehicle systems that are part of the "body" system are:

- Electrically Heated System
- Audio
- Airbag System (ORC) and (SIACM)
- Chime
- Overhead Console (CMTC)
- Exterior Lighting
- Mechanical Instrument Cluster (MIC)
- Interior Lighting
- Door Ajar
- Vehicle Communication
- Power Door Locks/RKE
- Vehicle Theft Security System
- Wiper System

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

The body system on the 2003 KJ consists of a combination of modules that communicate over the PCI bus (Programmable Communication Interface multiplex system). Through the PCI bus, information about the operation of vehicle components and circuits is relayed quickly to the appropriate module(s). All modules receive all the information transmitted on the bus even though a module may not require all information to perform its function. It will only respond to messages "addressed" to it through binary coding process. This method of data transmission significantly reduces the complexity of the wiring in the vehicle and the size of wiring harnesses. All of the information about the functioning of all the systems is organized, controlled, and communicated by the PCI bus, which is described in the Communication Section of this general information.

3.1 AIRBAG SYSTEM/OCCUPANT RESTRAINT CONTROLLER SYSTEM

The 2003 Liberty Airbag System contain the following components: Occupant Restraint Controller (ORC), Airbag Warning Indicator, Clockspring, Driver and Passenger Airbags, Driver Seat belt Tensioner (SBT), Driver and Passenger Hall-effect Seat Belt buckle Switches (SBS), Left and Right

Side Airbag Control Module (SIACM), curtain Airbags, and front impact sensors.

The Occupant Restraint Controller (ORC) is a new type of Airbag Control Module (ACM). The new ACM supports staged airbag deployment and remote impact sensing. Staged deployment is the ability to trigger airbag system squib inflators individually as needed to provide the appropriate restraint for the severity of the impact. The ACM has four major functions: PCI Bus communications, onboard diagnostics, impact sensing, and component deployment. The ACM also contains an energy-storage capacitor. This capacitor stores enough electrical energy to deploy the front airbag components for two seconds following a battery disconnect or failure during an impact. The ACM is secured to the floor panel transmission tunnel below the instrument panel inside the vehicle. The ACM cannot be repaired or adjusted.

The ACM sends and/or receives PCI Bus messages with the Instrument Cluster (MIC), Body Control Module (BCM), and Side Impact Airbag Control Module (SIACM) Diagnostic trouble codes will be set if the communication with these modules is lost or contains invalid information.

The microprocessor in the ACM monitors the front impact sensor signals and the airbag system electrical circuits to determine the system readiness. The ACM also monitors bus messages from both SIACM's. If the ACM detects a monitored system fault or SIACM fault, it sends a message to the instrument cluster via PCI bus to turn on the airbag warning indicator. The ACM can set both active and stored diagnostic trouble codes to aid in the diagnosing system problems. See DIAGNOSTIC TROUBLE CODES in this section.

The ACM uses two front impact sensors, Internal Accelerometer, and Safing Sensor to sense the rate of vehicle deceleration, provide verification of the direction and severity of an impact. A preprogrammed decision algorithm in the ACM microprocessor determines when the deceleration rate is severe enough to require airbag system protection. The ACM also uses the driver and front passenger seat belt switch status (buckled or unbuckled) and crash severity to determine the level of driver and front passenger airbag deployment, low medium or high. When the programmed conditions are met, the ACM sends an electrical signal to deploy the appropriate airbag system components.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE OR SERVICE ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO DO THIS COULD RESULT IS ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY. NEVER STRIKE OR KICK THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT.

The airbag warning indicator is the only point at which the customer can observe symptoms of a system malfunction. Whenever the ignition key is turned to the run or start position, the ACM performs a lamp check by turning the airbag warning indicator on for 6-8 seconds. After the lamp check, if the indicator turns off, it means that the ACM has checked the system and found it to be free of discernible malfunctions. If the lamp remains on, there could be an active fault in the system or the MIC lamp circuit may be internally shorted. If the lamp comes on and stays on for a period longer than 6-8 seconds then goes off, there is usually an intermittent problem in the system.

3.1.1 DRIVER AIRBAG

The airbag protective trim cover is the most visible part of the driver side airbag system. The protective trim cover is fitted to the front of the airbag module and forms a decorative cover in the center of the steering wheel. The module is mounted directly to the steering wheel. Located under the trim cover are the horn switch, the airbag cushion, and the airbag cushion supporting components. The airbag module includes a housing to which the cushion and hybrid inflator are attached and sealed. The 2003 Liberty is equipped with driver airbag with dual stage inflators. When supplied with the proper electrical signal, the inflator or inflators discharge the gas directly into the cushion. The airbag module cannot be repaired, and must be replaced if deployed or in any way damaged.

WARNING: THE DRIVER AIRBAG MODULE CONTAINS ARGON GAS PRESSURIZED TO OVER 17236.89 Kpa (2500 PSI). DO NOT ATTEMPT TO DISMANTLE AN AIRBAG MODULE OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURE EXCEEDING 93°C (200°F). REPLACE AIRBAG SYSTEM COMPONENTS ONLY BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION. THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE AIRBAG SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE MOPAR PARTS CATALOG.

CAUTION: Deployed Front Air Bags may or may not have live pyrotechnic material within the air bag inflator. Do not dispose of 2003 Model Year Driver and Passenger Airbags unless you are sure of complete deployment. Please refer to the Hazardous Substance Control System for Proper Disposal. Dispose of deployed air bags in a manner consistent with state, provincial, local, and federal regulations. Use the following table to identify the status of the Airbag Squib.

AIRBAG SQUIB STATUS

(1) Using a DRBIII® read Airbag DTC's **If** the following active codes are present:

ACTIVE DTC	CONDITIONS	SQUIB STATUS
Driver Squib 1 open Driver Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for both are within 15 minutes of each other.	Both Driver Squib 1 and 2 were used.
Driver Squib 1 open Driver Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for Driver Squib 2 open is GREATER than the stored minutes for Driver Squib 1 by 15 minutes or more.	Driver Squib 1 was used; Driver Squib 2 is live.
Driver Squib 1 open Driver Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for Driver Squib 1 open is GREATER than the stored minutes for Driver Squib 2 by 15 minutes or more.	Driver Squib 1 is live; Driver Squib 2 was used.
If Driver Squib 1 open	**AND IF** Driver Squib 2 opens is NOT an active code.	Driver Squib 1 was used; Driver Squib 2 is live.
If Driver Squib 2 open	**AND IF** Driver Squib 1 open is NOT an active code.	Driver Squib 1 is live; Driver Squib 2 was used.

If neither of the following codes is an active code:

ACTIVE DTC	SQUIB STATUS
Driver squib 1 open	Status of Airbag is Unknown.
Driver Squib 2 open	

3.1.2 CLOCKSPRING

The clockspring is mounted on the steering column behind the steering wheel. This assembly consist of a plastic housing which contains a flat, ribbon-like, electrically conductive tape that winds and unwinds with the steering wheel rotation. The clockspring is used to maintain a continuous electrical circuit between the instrument panel wiring and the driver airbag, the horn, and the vehicle speed control switches if equipped. The clockspring must be properly centered when it is reinstalled on the steering column following any service procedure, or it could be damaged. The clockspring cannot be repaired and it must be replaced.

3.1.3 PASSENGER AIRBAG

The 2003 Liberty is equipped with front passenger airbag with dual stage squib inflators. When supplied with the proper electrical signal the inflator or inflators discharge the gas directly into the cushion. The airbag module cannot be repaired, and must be replaced if deployed or in any way damaged.

WARNING: THE PASSENGER AIRBAG MODULE CONTAINS INERT GAS PRESSURIZED TO 17236.89 Kpa (2500 PSI). DO NOT ATTEMPT TO DISMANTLE AN AIRBAG MODULE OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURE EXCEEDING 93°C (200°F). REPLACE AIRBAG SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE MOPAR PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION. THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE AIRBAG SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE MOPAR PARTS CATALOG.

CAUTION: Deployed Front Air Bags may or may not have live pyrotechnic material within the air bag inflator. Do not dispose of 2003 Mopar Year Driver and Passenger Airbags unless you are sure of complete deployment. Please refer to the Hazardous Substance Control System for Proper Disposal. Dispose of deployed air bags in a manner consistent with state, provincial, local, and federal regulations. Use the following table to identify the status of the Airbag Squib.

AIRBAG SQUIB STATUS

(1) Using a DRBIII® read Airbag DTC's **If** the following active codes are present:

ACTIVE DTC	CONDITIONS	SQUIB STATUS
Passenger Squib 1 open Passenger Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for both are within 15 minutes of each other.	Both Passenger Squib 1 and 2 were used.
Passenger Squib 1 open Passenger Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for Passenger Squib 2 open is GREATER than the stored minutes for Passenger Squib 1 by 15 minutes or more.	Passenger Squib 1 was used; Passenger Squib 2 is live.
Passenger Squib 1 open Passenger Squib 2 open	Check the stored DTC's **AND IF** the stored minutes for Passenger Squib 1 open is GREATER than the stored minutes for Driver Squib 2 by 15 minutes or more.	Passenger Squib 1 is live; Driver Squib 2 was used.
If Passenger Squib 1 open	**AND IF** Passenger Squib 2 open is NOT an active code.	Passenger Squib 1 was used; Passenger Squib 2 is live.
If Passenger Squib 2 open	**AND IF** Passenger Squib 1 open is NOT an active code.	Passenger Squib 1 is live; Passenger Squib 2 was used.

If neither of the following codes is an active code:

ACTIVE DTC	SQUIB STATUS
Passenger squib 1 open	Status of Airbag is
Passenger squib 2 open	Unknown.

3.1.4 SEAT BELT TENSIONER (SBT)

The 2003 Liberty driver front seat belt (retractor) tensioner supplements the driver airbag system. The seat belt tensioner is integral to the driver side front seat belt and retractor unit, which is secured to the B-pillar on the left side of the vehicle. The retractor is concealed beneath the molded plastic B-pillar trim. At the onset of an impact event the ACM uses the seat belt tensioner to rapidly retract the seat belt. With the slack removed, the occupant's forward motion in an impact will be reduced as will the likelihood of contacting interior components. The seat belt tensioner cannot be repaired, if damaged or defective it must be replaced. The ACM continuously monitors the resistance of the seat belt tensioner circuits and reports DTCs for open or shorted conditions.

3.1.5 SEAT BELT SWITCH (SBS)

The hall-effect driver seat belt switch provide the seat belt status, buckled or unbuckled, via hardwired inputs to the ACM. The ACM uses seat belt switch input to determine the appropriate level of airbag deployment. The ACM also controls the seat belt warning indicator via a PCI Bus message to the instrument cluster. The indicator will be turned on if the driver seat belt status is unbuckled. If the seat belt switch is damaged or defective the seat belt buckle assembly must be replaced. The ACM continuously monitors the seat belt switch circuits for an open or shorted conditions.

3.1.6 SIDE IMPACT AIRBAG CONTROL MODULE (SIACM)

Supplemental driver and front passenger curtain airbags provide side impact protection for the front and rear seat occupants. Each curtain airbag has it own side impact airbag control module (SIACM) to provide independent impact sensing and deployment. SIACM are located on the left and right B post just below the seat belt retractor. The SIACM performs self diagnostics and circuit tests to determine if the system is functioning properly. If the test finds a problem the SIACM will set both active and stored diagnostic trouble codes. The results of the system test are transmitted on the PCI Bus to the ACM once each second. If the warning lamp status message from either SIACM contains a lamp on request, the ACM will set an active DTC. At the same time as the DTC is set the ACM sends a PCI Bus message to the mechanical instrument cluster (MIC) requesting the airbag warning lamp be turned on. Observe all ACM warning and caution statements when servicing or handling the SIACM. SIACM are not repairable and must be replaced if they are dropped.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTROMECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE OR SERVICE ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY. NEVER STRIKE OR KICK THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT.

3.1.7 CURTAIN AIRBAGS

The Left and Right curtain airbags are located in the outboard edge of the roof under the headliner, just above the door openings. When supplied with the proper electrical signal the inflator can discharge the compress gas directly into the curtain airbag. Upon deployment, the curtain will tear open the headliner allowing the curtain airbag to fully deploy between the headliner and seat. The curtain airbag cannot re repaired and must be replaced if deployed or in any way damaged.

WARNING: THE CURTAIN AIRBAG CONTAINS AN INERT GAS PRESSURIZED TO 17236.89 Kpa (2500 PSI). DO NOT ATTEMPT TO DISMANTLE AN AIRBAG MODULE OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURE EXCEEDING 93°C (200°F). REPLACE AIRBAG SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE CHRYSLER MOPAR PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION. THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE AIRBAG SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE MOPAR PARTS CATALOG.

3.1.8 FRONT IMPACT SENSOR

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, and combined with the ACM Accelerometer and Safing Sensor provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Airbag Control Module. The ACM microprocessor continuously monitors all of the front passive restraint system electrical circuits to determine the system readiness. If the ACM detects a system fault, it sets a Diagnostic Trouble Code and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through dedicated left and right sensor signal and ground circuits from the ACM. The impact sensors and the ACM communicate by modulating the voltage in the sensor signal circuit. If the sensor is dropped it must be replaced.

CAUTION: Do not remove or install the impact sensors while the sensor is connected to the vehicle wiring.

3.1.9 SPECIAL TOOLS

Some airbag diagnostic test use special tools, airbag load tools, 8310 and 8443 for testing squib circuits. The load tools contain fixed resistive loads, jumpers and adapters. The fixed loads are connected to cables and mounted in a storage case. The cables can be directly connected to some airbag system connectors. Jumpers are used to convert the load tool cable connectors to the other airbag system connectors. The adapters are connected to the module harness connector to open shorting clips and protect the connector terminal during testing. When using the load tool follow all of the safety procedures in the service information for disconnecting airbag system components. Inspect the wiring, connector and terminals for damage or misalignment. Substitute the airbag load tool in place of an Driver or Passenger Airbag, curtain airbag, clockspring, or seat belt tensioner (use a jumper if needed). Then follow all of the safety procedures in the service information for connecting airbag system components. Read the module active DTC's. If the module reports NO ACTIVE DTC's the defective component has been removed from the system and should be replaced. If the DTC is still active, continue this process until all component in the circuit have been tested. Then disconnect the module connector and connect the matching adapter to the module connector. With all airbags disconnected and the adapter installed the squib wiring can be tested for open and shorted conditions.

3.1.11 DIAGNOSTIC TROUBLE CODES

Airbag diagnostic trouble codes consist of active and stored codes. If more than one code exists, diagnostic priority should be given to the active codes. Each diagnostic trouble code is diagnosed by following a specific testing procedure. The diagnostic test procedures contain step-by-step instructions for determining the cause of the trouble codes. It is not necessary to perform all of the tests in this book to diagnose an individual code. Always begin by reading the diagnostic trouble codes with the DRB. This will direct you to the specific test(s) that must be performed. In certain test procedures within this manual, diagnostic trouble codes are used as a diagnostic tool.

3.1.11.1 ACTIVE CODES

The code becomes active as soon as the malfunction is detected or key-on, whichever occurs first. An active trouble code indicates an on-going malfunction. This means that the defect is currently there every time the airbag control module checks that circuit or component. It is impossible to erase an active code. Active diagnostic trouble codes for the airbag system are not permanent and will change the moment the reason for the code is corrected. With the exception of the warning lamp trouble codes or malfunctions, when a malfunction is detected, the airbag lamp remains lit for a minimum of 12 seconds or as long as the malfunction is present.

3.1.11.2 STORED CODES

Airbag codes are automatically stored in the ACM's memory as soon as the malfunction is detected. A stored code indicates there was an active code present at some time. When a trouble code occurs, the airbag warning indicator illuminates for 12 seconds minimum (even if the problem existed for less than 12 seconds). Once the code is no longer active, the time in minutes it was active, and the number of times the ignition has been cycled since the problem was last detected will be displayed. The minimum time shown for any code will be one minute, even if the code was actually present for less than one minute. Thus, the time shown for a code that was present for two minutes 13 seconds, for example, would be three minutes. If a malfunction is detected a diagnostic trouble code is stored and will remain stored. When and if the malfunction ceases to exist, an ignition cycle count will be initiated for that code. If the ignition cycle count reaches 100 without a reoccurrence of the same malfunction, the diagnostic trouble code is erased and that ignition cycle counter is reset to zero. If the malfunction reoccurs before the count reaches 100, then the ignition cycle counter will be reset and diagnostic trouble code will continue to be a stored code. If a malfunction is not active while performing a diagnostic test procedure, the active code diagnostic test will not locate the source of the problem. In this case, the stored code can indicate an area to inspect. Maintain a safe distance from all airbags while performing the following inspection. If no obvious problems are found, erase stored codes, and with the ignition on wiggle the wire harness and connectors, rotate the steering wheel from stop to stop. Recheck for codes periodically as you work through the system. This procedure may uncover a malfunction that is difficult to locate.

3.2 AUDIO SYSTEM

The PCI Bus inputs into the radio are used for VF dimming and remote steering wheel controls. All the radios are capable of displaying faults and allowing certain actuation tests through the use of the DRBIII®. When attempting to perform PCI Bus diagnostics, the first step is to identify the radio in use in the vehicle.

When trouble shooting output shorts or "output" error messages, the following applies:

On radios without an external amplifier, the term output refers to the path between the radio and the speaker. This type of circuit can be monitored all the way through the speaker connections by the radio assembly. When the radio displays a shorted output DTC with this type of system, the speaker, radio, or wiring could be at fault.

On radios with an external amplifier, the term "output" refers to the circuit between the radio connector and the amplifier. The radio is capable of monitoring only this portion and can tell nothing about the circuit between the amplifier and the speakers. Consequently, a shorted output DTC on this type of system would only refer to this circuit. A faulty speaker could not cause this DTC.

3.2.1 REMOTE RADIO CONTROLS

These radios can be controlled via remote radio switches (optional). These switches are located on the back side of the steering wheel. They control mode, preset, seek up, seek down, volume up and volume down functions.

These functions are inputs to the Body Control Module and can be read with the DRBIII®. The switches are a multiplexed signal to the BCM. The radio control MUX circuit is a 5 volt line that is pulled to ground through different value resistors built into the switches. This causes a voltage drop to be seen by the BCM and it sends a specific message to the radio on the PCI Bus circuit. The radio then responses to the message.

This circuit is fairly simple to troubleshoot. The circuit must be complete from the switches in the steering wheel to the BCM. The ground must be complete so that the switches can cause the voltage drop for the BCM to see. The circuit passes through the clockspring so continuity through this devise must be verified.

3.2.2 CD CHANGER

The CD Changer is mounted in the cargo area of the passenger compartment on the right rear quarter panel. The CD Changer features a removable 10-CD magazine. The CD Changer receives both ground and radio switch power through the radio. The controls on the radio operate the CD Changer through messages sent over the PCI Bus. The two-channel audio outputs of the CD Changer are hard-wired back to the radio, which then outputs the signal through the channels to the speakers or amplifiers.

3.3 BODY CONTROL MODULE

The KJ Body Control Module (BCM) is attached to the Junction Block (JB), which is the interface for the Body Harness, Instrument Panel (IP) Harness, and the Headlamp & Dash Harness. The JB also contains the fuses and relays used for the interior electrical system of the vehicle. The combination of the BCM and the JB is called the Junction Block Module (JBM).

There are two versions of JBM's: highline and lowline. The lowline is a subset of the components in the highline. Basically the lowline JBM will not support the following: Front or Rear Fogs, Remote Keyless Entry (RKE), and Vehicle Theft Alarm (VTA). In order to reduce service inventory, only the highline will be stocked. If there is a need to replace a lowline module in the field, a highline module may be used to replace it without any noticeable difference to the customer. The relay content of the JB varies based on vehicle options (power vs. manual seats, with or without Front Fogs, etc.). On right hand drive vehicles there is a separate ground wire connected to the BCM to identify it as a right hand drive.

The BCM controls the following subsystems:

- Compass/Mini-Trip Computer
- Door Ajar System
- Exterior Lighting
- Interior Lighting
- Power Door Locks / Remote Keyless Entry
- Rear Window Defogger
- Vehicle Theft Security System
- Windshield Wipers System

The BCM also is involved in the following functions:

- Vehicle Speed Sensing (Program Tire Size)
- Detection / Analysis of Miscellaneous Body Switches
- Driver Information Warnings (Chime)

The BCM is powered via the Ignition Off Draw (IOD) fuse. This allows the BCM to be active whenever the vehicle battery is connected whether the ignition is on or not. This is necessary because the BCM controls functions which are active when the ignition is not on (power locks, VTSS, etc.). If the IOD fuse is removed (i.e. for shipping or storage), the BCM will not be powered when the ignition is off, so any ignition-off functions will not be available. To optimize battery life in a stationary vehicle with the IOD fuse in place, the BCM goes to a low power mode ("sleeps"), when it detects that there is no relevant input or output active when the ignition is off. This transition from full power mode to low power mode, and vice versa, is extremely quick and is transparent to the vehicle owner.

3.3.1 DOOR AJAR SYSTEM

The door ajar, tailgate and flip-up glass ajar states are used as inputs for the Body Control Module (BCM). The BCM uses these inputs to determine exactly what position the doors, tailgate and flip-up glass are in. The DRBIII® will display the state of the door ajar, tailgate ajar and flip-up glass ajar switches in Input/Outputs. It's important to note, that when any door, the tailgate or flip-up glass is closed the switch state on the DRBIII® will show OPEN. When any door, the tailgate or flip-up glass is open the switch state on the DRBIII® will show CLOSED. During diagnosis, if a door, the tailgate or flip-up glass is closed and the DRBIII® displays the switch state as CLOSED, it indicates a shorted ajar circuit. If a door, the tailgate or flip-up glass is open and the DRBIII® displays the switch state as OPEN, it indicates an open ajar circuit.

The door ajar switch is part of the door latch assembly. Each of the door ajar switches are individually connected to the Body Control Module. On right hand drive vehicles there is a separate ground wire connected to the BCM to identify it as a right hand drive. Therefore, when using the DRBIII and reading Input/Output on a RHD vehicle, the driver door ajar switch will read the Right Front Door Ajar Switch status.

3.3.2 EXTERIOR LIGHTING

The BCM controls the Exterior Lights via the appropriate relays, based on input from the Exterior Light Mode Switch. The BCM reads the position of the Exterior Light Mode Switch, and turns on the corresponding Exterior Lamps. The Exterior Lights are:

- Park Lamps
- Low Beams
- High Beams
- Front Fogs (optional)
- Rear Fogs (export markets)

If the Exterior Lamp Mode Switch is in the Lowbeam position, and then the ignition is turned off, followed by the customer turning off the Exterior Lamp Mode Switch, the BCM enters the Headlamp Delay mode. In this mode, the Lowbeam Lamps are left on for either 30, 60, or 90 seconds. The time period can be changed via the DRBIII®. This mode is exited if the ignition switch or the Exterior Lamp Mode Switch is cycled.

In certain conditions, the BCM will also control certain Exterior Lamps to signal special conditions (VTSS alarm, etc).

In the Canadian market, the BCM enables the Daylight Running Lamp (DRL) mode. The Highbeam Relay is replaced in the JB with a solid-state relay. The BCM will duty cycle this relay when the engine is running and the Lowbeam Lamps are not on.

If either the Exterior Lamps are left on with the ignition in the OFF position for greater than 8 minutes, the BCM will turn off ("Loadshed") the lamps until another cycle occurs (i.e. ignition is turned on, Exterior Lamp Mode Switch position is changed, etc.). This feature exists to attempt to save the vehicle battery in the event that a customer forgets to turn off the headlamps, etc. On export vehicles, the park lamps do not "Loadshed".

3.3.3 INTERIOR LIGHTING

The BCM controls the Courtesy Lamps directly based on input from the Dimmer Switch, Door Ajar switches, Glass Ajar switch, and Rear Courtesy Disable switch.

The Courtesy Lamps are switched on in the event of a door or glass ajar, RKE unlock reception, or optional cylinder lock switch in the unlock position event. Upon the above inputs returning to off (door closed, etc.) the Courtesy Lamps will stay on for 27 seconds, and then fade to off ("Theater Dimming") over a period of 3 seconds.

If the Dimmer Switch is turned to the off position, the Courtesy Lamps are disabled and will not be turned on when any of the above inputs occur.

If the Rear Courtesy Disable Switch is in the disable position, the Courtesy Lamps will still be turned on when any of the above inputs occur except the flip-up glass ajar or tailgate ajar. This allows the interior lights to be off if the customer leaves the tailgate open for an extended period of time ("Tailgate Mode").

If the ignition is turned to Run, or a RKE door lock input is received while the Courtesy Lamps are on, the remainder of the 27 second timer is skipped and the Courtesy Lamps proceed immediately to the 3 second fade to off mode.

There are also two Map Lamps in the vehicle headliner between the driver and the passenger. The Map Lamps may be individually controlled independently of the Courtesy Lamp function. The Map Lamps are turned off and on by pressing directly on the lens cover. If the Map Lamp is in the OFF position, the Map Lamps will mimic the Courtesy Lamp state (i.e. if the Courtesy Lamps are on, the Map Lamps will also be on). If the Map Lamp is in the ON position, the Map Lamp will remain on until it is pressed again by the driver (independent of the Dimmer switch, door ajars, etc.).

If either the Courtesy Lamps or the Map Lamps are left on with the ignition in the OFF position for greater than 8 minutes, the BCM will turn off (“Loadshed”) the lamps until another cycle occurs (i.e. ignition is turned on, a different door is opened, etc.). This feature exists to attempt to save the vehicle battery in the event that a door is accidentally left open, etc.

3.3.4 OVERHEAD CONSOLE

3.3.4.1 ELECTRONIC VEHICLE INFORMATION CENTER (EVIC)

When equipped, the Electronic Vehicle Information Center (EVIC) is located in the overhead console. The EVIC supplements the standard vehicle instrumentation. The EVIC also provides additional driver information, warnings; an interface to enable and disable vehicle programmable features and displays memory system messages. Most of the EVIC display information is received over the PCI bus. The EVIC sends and receives data over the PCI bus, communicating with the BCM, PCM, and the Instrument Cluster.

The EVIC uses a vacuum fluorescent (VF) display to supply the vehicle operator with a compass heading, outdoor temperature, average fuel economy, distance to empty, trip odometer, and elapsed ignition on time.

The EVIC function buttons are labeled C/T, RESET, STEP, and MENU. The three UGDO buttons are labeled with dots to indicate the channel number.

The optional Universal Garage Door Opener (UGDO) known as HomeLink® is integrated with the EVIC.

VEHICLE INFORMATION DISPLAY

The EVIC provides the following functions:

- Compass direction
- Outside temperature
- Elapsed ignition on time
- Distance to empty
- Average fuel economy
- Trip Odometer
- Service Interval
- Customer Programmable Features
- Vehicle Information Warning Message Displays

The EVIC will not display information for any of the screens for which it did not receive the proper PCI bus data. Refer to the symptom list in the Compass Mini-Trip Computer section for problems related to the EVIC.

The EVIC receives the following messages from the Instrument Cluster:

- Low Washer Fluid
- Turn Signal On
- Vehicle Odometer

The EVIC receives the following message from the BCM:

- Filtered Outside Temperature
- Door(s) Ajar
- Reargate Ajar
- Liftgate Ajar
- Remote Key Battery Low
- VF display dimming brightness and exterior lamp status
- Elapsed Ignition On Time data
- Distance to Empty
- Average Fuel Economy
- Trip Odometer data
- Verification of US/Metric status

The EVIC receives the following message from the PCM:

- Vehicle Speed
- Engine RPM
- Charging System Voltage

WARNING MESSAGES: When the appropriate conditions exist, the EVIC displays the following warning messages and symbols. Each message is accompanied by a series of beeps.

- – TURN SIGNAL ON (with graphic)
- – PERFORM SERVICE
- – DRIVER DOOR OPEN (with graphic)
- – PASSENGER DOOR OPEN (with graphic)
- – REAR DOOR(S) OPEN (One or more, with graphic)
- – REARGATE OPEN
- – LIFTGLASS OPEN
- – HOOD OPEN (BUX Only)
- – WASHER FLUID LOW
- – REMOTE KEY BATTERY LOW
- – NO J1850 MSGS RECEIVED

CUSTOMER PROGRAMMABLE FEATURES: Press the MENU button to select one of the following displays:

- – LANGUAGE (Press STEP button to select one of 5 languages)

– US or METRIC (Press STEP button to toggle between US or Metric units)
– AUTO DOOR LOCKS (Press STEP button to select ″Yes″ or ″No.″) (EXCEPT BUX)
– AUTO UNLOCK ON EXIT (Press STEP button to select ″Yes″ or ″No.″) (EXCEPT BUX)
– REMOTE UNLOCK DRIVER'S DOOR 1st (Press STEP button to select)
– SOUND HORN ON LOCK (Press STEP button to select)
– FLASH LIGHTS ON LOCK/UNLOCK? (Press STEP button to select ″Yes″ or ″No.″)
– HEADLAMP DELAY (Press STEP button to select desired delay)
– SERVICE INTERVAL (Press STEP button to select distance intervals)
– TRAIN REMOTE (Press STEP button to select ″Yes″ or ″No.″)
– RESET SERVICE DISTANCE (Press STEP button to select ″Yes″ or ″No.″)
– LOW FUEL CHIME (Press STEP button to select ″Yes″ or ″No.″)

MENU BUTTON

Pressing the MENU button while displaying Compass/Temp or traveler screens will initiate the personalization menu. Pressing the MENU button while in the personalization menu will step the EVIC through the personalization screens.

STEP BUTTON

The EVIC will enter a traveler screen by pressing the STEP button while the Compass/Temp screen is displayed or by stepping through all the personalization screens with the MENU button. The STEP Button can be used in one of the following ways:

1) To sequentially select one of 4 displays or blank display in the following order:

- Average Fuel Economy
- Distance to Empty
- Trip Odometer
- Time Elapsed
- Service Mileage
- Off (Blank)

2) To set the magnetic variance zone when VARIANCE = X (X = 1 - 15) is indicated in the VF display.

3) Pressing the STEP button while displaying a personalization screen will toggle the options for that feature.

RESET BUTTON

The RESET Button has two different functions:

1) To clear the trip functions that may be reset

2) To enter and exit the diagnostic mode

Pressing the RESET button once will clear the trip function that is currently being displayed and the EVIC will send a PCI bus beep request to the BCM. If the RESET button is pressed again within 3 seconds, the EVIC will reset ALL of the trip functions and an additional beep request is sent to the BCM. The trip functions that may be reset are:

- Average Fuel Economy
- Trip Odometer
- Elapsed Time
- Service Mileage

A reset will only occur if one of the trip functions that may be reset is currently being displayed. The EVIC module will send a beep request to the BCM.

Simultaneously pressing the RESET button and the C/T button while turning the ignition from Off to On will enter the EVIC into the self-diagnostic mode. The EVIC self-diagnostic mode may also be initiated using the DRBIII®.

COMPASS/TEMPERATURE (C/T) BUTTON

Actuating the Compass/Temperature Button (C/T) will cause the EVIC to display the compass and temperature information. This function will operate from another traveler display. The EVIC simultaneously displays the compass reading and the outside temperature. Outside temperature information is received via the PCI bus from the BCM.

The EVIC module internally senses and calculates the compass direction.

TRAVELER DISPLAY FUNCTIONS

Using the STEP button will change the EVIC between modes of operation and display the appropriate information according to data received from the PCI Bus.

COMPASS OPERATION

Upon ignition on, if the calibration information stored in the EVIC memory is within the normal range, the EVIC will perform in slow Auto-Cal mode. In slow Auto-Cal mode, the EVIC continuously compensates for the slowly changing magnetic field of the vehicle. The compass module detects changes in the vehicle magnetism and makes appropriate internal corrections to ensure proper displayed direction.

However, if the calibration information stored in the EVIC memory is not within the normal range at ignition on, the EVIC will enter fast Auto-Cal. CAL is displayed along with the temperature.

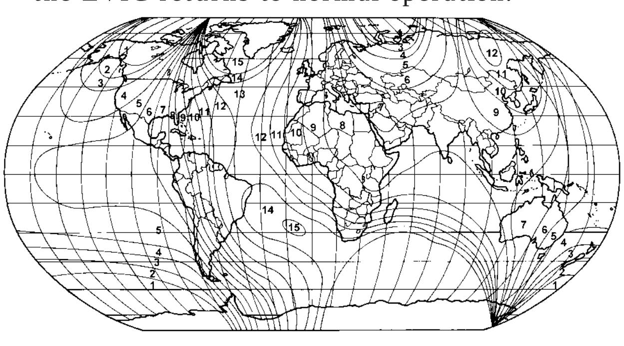
Auto activation of the fast Auto-Cal mode will also occur when the EVIC is subjected to high magnetic field strength levels, which cause all compass readings to be erroneous for a continuous period of five (5) minutes. During fast Auto-Cal, CAL will be displayed along with the temperature.

Fast Auto-Cal can also be performed manually, by pressing and holding the RESET button for 10 seconds during the Compass/Temperature display mode.

SETTING MAGNETIC ZONE VARIANCE

Variance is the difference between magnetic North and geographic North. For proper compass function, the correct variance zone must be set. Refer to the Zone Variance map for the correct zone. Follow these steps to check or change the variance zone:

- The ignition switch must be in the On position and the EVIC display must not be blank.
- If the compass/temperature data is not currently being displayed, momentarily press and release the C/T button to display compass/temp information.
- Press and hold the RESET button until VARIANCE = XX is displayed. The EVIC will display the variance zone stored in memory and the word VARIANCE.
- Use the STEP button to select the proper variance zone number, 1 through 15.
- After selecting the proper zone number, momentarily press and release the RESET button. The variance zone is then stored in the memory and the EVIC returns to normal operation.



COMPASS CALIBRATION

The compass module has 2 types of auto-calibration; slow-cal and fast-cal. Slow-cal ensures that during normal vehicle operation the compass performs auto-calibration functions to keep the compass sensors in their proper operating range. Whenever the ignition is On and the EVIC receives PCI bus data indicating that engine RPM is greater than zero, auto-calibration is performed continuously.

If the calibration information stored in the compass module memory is not within the normal range after a power-up cycle, the compass will display CAL. The EVIC will enter into the fast-cal mode until calibration is complete.

To enter the compass into Manual Calibration mode, perform the following steps:

- Drive the vehicle to an area away from any large metal objects or overhead power lines.
- Ensure that the proper variance zone is selected. See “Setting Magnetic Zone Variance.”
- The ignition switch must be in the On position and the EVIC display must not be blank.
- Press the C/T button to view the Compass/Temperature display.
- Press and hold the RESET button until CAL is displayed, then release the button.
- Drive slowly, less than 5 MPH (8KPH) in at least 1 complete 360 degree circle.
- CAL will remain illuminated to alert the driver that the compass is in the calibration mode.
- After calibration is complete, CAL will turn off.

If the compass appears blank, unable to be calibrated, or the compass displays false indications, the vehicle must be demagnetized. Refer to Compass Demagnetizing Procedure in the Service Manual.

SELF-CHECK DIAGNOSTICS

The EVIC is capable of performing a diagnostic self check on its internal functions. EVIC diagnostics may be performed using a DRBIII® or by using the following procedure:

(1) With the ignition switch in the OFF position, depress and hold the RESET and the C/T buttons.

(2) Turn the ignition switch to the ON position.

(3) Continue to hold both buttons until the software versions are displayed, then release the buttons.

(4) All of the VFD segments will illuminate for 2-4 seconds. Check for segments that do not illuminate or illuminate all the time.

(5) When the self-check is complete the EVIC will display one of the following messages:

- PASSED SELF TEST
- FAILED SELF TEST
- FAILED J1850 COMMUNICATION

(6) To exit the self-check mode, depress the RESET button or cycle the ignition switch and the EVIC will return to normal operation.

If a Communication fault is displayed, refer to the symptom list. If a FAILED SELF TEST is displayed, the EVIC must be replaced.

AMBIENT TEMPERATURE SENSOR

The ambient air temperature is monitored by the BCM and displayed by the EVIC. The BCM receives a hardwire input from the ambient temperature sensor (ATS).

The ATS is a variable resistor that operates on a 5-volt reference signal circuit hardwired from the

BCM. The resistance in the ATS changes as the outside temperature rises or falls. The BCM senses the change in reference voltage through the ATS resistor. Based on the resistance of the ATS, the BCM is programmed to correspond to a specific temperature. The BCM stores and filters the ambient temperature data and transmits this data to the EVIC via the PCI Bus. The ATS cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

AMBIENT TEMPERATURE SENSOR FAULT CODES

The outside temperature function is supported by the ambient temperature sensor (ATS), a signal and ground circuit hardwired to the BCM, and the EVIC display.

If the EVIC display indicates 54°C (130°F) or the ATS sense circuit is shorted to ground, the temp display will be 54°C (130°F) to indicate a SHORT circuit condition.

If the EVIC display indicates -40°C (-40°F) or the ATS sense circuit is open, the temp display will be -40°C (-40°F) to indicate an OPEN circuit condition.

If there is an OPEN or SHORT circuit condition, it must be repaired before the CMTC/EVIC VFD can be tested.

The ATS is supported by the FCM. Ambient Temperature Sensor DTCs will be recorded in the FCM. The ATS can be diagnosed using the following Sensor Test. Test the ATS circuits using the diagnostics in the Body Diagnostic Procedures Manual. If the EVIC passes the self test, and the ATS, the circuits, and PCI bus communications are confirmed to be OK, but the EVIC temperature display is inoperative or incorrect, replace the FCM.

AMBIENT TEMPERATURE SENSOR TEST

(1) Turn the ignition OFF.

(2) Disconnect the ATS harness connector.

(3) Measure the resistance of the ATS using the following min/max values:

- 0° C (32° F) Sensor Resistance = 29.33 - 35.99 Kilohms
- 10° C (50° F) Sensor Resistance = 17.99 - 21.81 Kilohms
- 20° C (68° F) Sensor Resistance = 11.37 - 13.61 Kilohms
- 25° C (77° F) Sensor Resistance = 9.12 - 10.86 Kilohms
- 30° C (86° F) Sensor Resistance = 7.37 - 8.75 Kilohms
- 40° C (104° F) Sensor Resistance = 4.90 - 5.75 Kilohms

The sensor resistance should read between these min/max values. If the resistance values are not OK, replace the Sensor.

HOMELINK® UNIVERSAL TRANSMITTER

If equipped, the HomeLink® Universal Transmitter is integrated into the overhead console. For added security it will operate home security systems that use coded signals known generically as Rolling Codes. The overhead console display provides visual feedback to the operator, indicating which HomeLink® transmitter channel button is being pressed. The HomeLink® can learn and store up to 3 separate transmitter radio frequency codes to operate garage door openers, security gates, and security lighting. The HomeLink® buttons are marked with one, two, or three dots. For complete information, refer to Universal Transmitter in the Service Manual or Owner Manual.

3.3.5 POWER DOOR LOCKS/REMOTE KEYLESS ENTRY (RKE)

The BCM controls the Power Door Locks via the relays in the JB. There are three individual relays for this system: Driver Unlock Relay, which only unlocks the drivers door, the Unlock Relay which unlocks the other 3 doors, and the Lock Relay, which locks all of the doors.

There are two Power Door Lock Switches (on the driver and passenger doors) which are read by the BCM to control the locks.

The optional RKE module plugs directly into the side of a highline BCM. A lowline BCM does not have a connector for the RKE. The RKE receiver communicates with the RKE transmitters (key fobs), and gives the BCM commands, via a direct serial communications line. The RKE can tell the BCM to unlock the doors, lock the doors, open the flip-up glass, or initiate the panic alarm. The RKE also can be used to change the Customer Programmable Features (such as Enable / Disable Optical Chirp).

The BCM will actuate the Lock Relay for 250 ms if either power lock switch is in the lock position, unless the driver's door is ajar and the key is in the ignition. The BCM will also lock the doors if the RKE lock button is pressed.

The BCM will actuate the Driver's Door Unlock Relay and the Unlock All Relay for 250 ms if either power lock switch is in the unlock position. If the Customer Programmable Features are set to Unlock Driver's Door First, the BCM will only actuate the Driver's Door Unlock Relay when the RKE Unlock button is pressed the first time. If the button is pressed a second time, both the unlock relays will be actuated (2 unlock presses within 5 seconds). However, if the Customer Programmable Features are set to Unlock All Doors, then the BCM actuates both unlock relays every time an RKE unlock button is pressed.

The BCM does not allow rapid cycling of the lock / unlock relays. Once the BCM starts to actuate a lock or unlock relay, it will hold it for 250 ms regardless of someone cycling the switch rapidly.

The BCM will lock the doors if the Customer Programmable Feature for Rolling Locks is enabled, and the PCI bus message from the Powertrain Control Module (PCM) is received.

The BCM also directly drives the Tailgate Lock motor and the Flip-up Glass Release motor. The BCM can reverse the current through the Tailgate Lock motor to lock or unlock the door as required. If the BCM actuates the Flip-up Glass Release motor, the latch on the glass is released, and the window will raise itself under the power of two gas cylinders (struts).

The Tailgate motor will be controlled to the lock or unlock positions exactly the same as the conditions above for the Door Lock Relay. In addition, the Tailgate Motor will be locked for the following conditions:

1. Tailgate Cylinder Lock Switch in the lock position (if equipped).
2. Battery disconnect / reconnect (including pulling and replacing the IOD fuse)
3. Rear Wiper Switch turned on

The Tailgate Motor can also be unlocked with the Tailgate Cylinder Lock Switch (if equipped).

The Flip-Up Glass Release Motor will release the latch if the Tailgate Cylinder Lock Switch is turned to the unlock position (if equipped) or the RKE Flip-Up Glass button is pressed or the BCM “knows” the doors are unlocked and the rear door handle is pulled to the Flip-Up Glass Release position.

This vehicle is not equipped with central locking. The key cylinder lock switches, if equipped, are to disarm the VTSS only.

3.3.6 REAR WINDOW DEFOGGER

The Body Control Module reads the Rear Window Defogger Switch and turns on the rear window defogger relay to defrost the rear glass. The first time in an ignition cycle that the driver presses the defogger button, the BCM will turn on the relay for 10 minutes. The second and subsequent times, the BCM will turn on the relay for 5 minutes. If the ignition is turned off, the BCM will turn the rear window defogger relay off.

3.3.7.1 VEHICLE THEFT SECURITY SYSTEM (VTSS)

The BCM controls the VTSS if equipped. To arm the VTSS the BCM will begin the VTSS Pre-arming process, which last for sixteen seconds after the following criteria is met. The key is removed from the ignition switch and the operator locks the vehicle using a key fob or power door lock switch with the doors closed or if the doors are open it will then begin when all doors are closed. During Pre-arm, the VTSS indicator located in the Instrument Cluster flashes two times per second. Pre-arm is exited if any door/tailgate is opened, flip-up glass is opened, a cylinder lock switch is turned to unlock, or the ignition is turned on.

After the Pre-arm timer expires, the BCM goes to the armed mode and flashes the VTSS indicator at a slower rate. The BCM monitors the door ajar, flip-up glass ajar, tailgate ajar and ignition status and trips to alarming if any of these change states.

Disarming the VTSS feature is done with the left key cylinder lock switch, a Remote Keyless Entry system “unlock” or the ignition turned to the “on” position with a valid SKIM key.

If the BCM is triggered to the Alarm state, it flashes the headlamps, hazard lamps and actuates the Horn on and off for 3 minutes, then will flash the headlamps and hazard lamps without the horn for an additional 15 minutes until it times out. After the timeout, the alarm will return to the armed state. If the alarm was triggered while the operator was away from the vehicle, the BCM will chirp the horn 3 times (“Tamper Alert”) when the driver disarms the alarm.

3.3.7.2 VEHICLE THEFT SECURITY SYSTEM (VTSS) (EXPORT ONLY)

The Vehicle Theft Security System (VTSS) is available in either a base or a premium version for this model. The base system is controlled by the Body Control Module (BCM) while the premium system is controlled by the BCM along with an Intrusion Transceiver Module (ITM) which monitors the interior of the vehicle for movement. The base VTSS uses the vehicle horn for the audible alert while the premium version is equipped with a battery backed siren. Both systems will flash the hazard lamps when tripped. The VTSS does not prevent engine operation, this is done with the Sentry Key Immobilizer System SKIS. For information regarding SKIS, refer to the appropriate Powertrain Diagnostic Procedures manual.

To arm the VTSS the BCM must complete a sixteen-second Pre-arming process, which will begin after the following criteria are met. The key is removed from the ignition switch and the operator locks the vehicle using a key fob or power door lock switch with the doors, tailgate and flip-up glass closed or if any of these are open, pre-arm will begin after they are closed. If the hood is left open during pre-arming it will be ignored as input until it is closed. During Pre-arming, the VTSS indicator located in the Instrument Cluster flashes two times per second. Pre-arm is exited if any doors, tailgate, flip-up glass or the hood is opened, or if the ignition switch is turned to the on position.

After the Pre-arming timer expires, the BCM goes to the armed mode and flashes the VTSS indicator at a slower rate. The BCM will then monitor the ignition switch status along with the hood/door/flip-up glass/tailgate ajar switches. For vehicles equipped with the Intrusion Transceiver Module the vehicle's interior will continuously be monitored for movement. This feature can be disabled during the pre-arm sequence with three additional lock commands from the RKE which will cause a single audible chirp confirming this request. While armed the Siren will continuously monitor it's battery feed and the siren signal control circuits and will trigger if either of these are disconnected. The Siren also sends a status message back to the ITM.

Disarming the VTSS is done with either a Remote Keyless Entry system "unlock" or the ignition turned to the "on" position with a valid SKIM key.

When the VTSS is triggered on a base system, the alarming state will be twenty-five seconds. Vehicles with the premium system will actuate the hazard lamps for twenty-five seconds and the siren twenty-eight seconds. After that period if the disturbance is still present only the siren will be activated again for twenty-eight seconds with five seconds intervals between warning cycles. This will continue up to ten times unless the disturbance goes away. If the alarm was triggered while the operator was away from the vehicle, there will be three audible chirp messages when the system is disarmed.

3.3.8 WINDSHIELD WIPER SYSTEM (FRONT)

The BCM controls the Front Windshield Wipers via the On/Off and Hi/Low relays located in the Power Distribution Center (PDC), based on input from the Front Wiper Mode Switch. Note: The BCM does not control the rear wiper system, however, the BCM does monitor the Rear Wiper Mode Switch to control the flip-up glass release. This function is discussed under Power Door Locks.

If the Front Wiper Mode Switch is in any of the Intermittent Delay positions, the BCM will turn on the On/ Off relay until the wiper motor is off of the Park Switch. The internal wiring between the motor and the relays, allows the wipers to complete a single cycle and return to the parked position. The BCM monitors the Park Switch to make sure that the Wiper is able to return to the parked position within 8 seconds. If this does not occur, the BCM sets a Wiper Park Switch DTC and turns the wiper on/off relay to on until the wipers are switched off.

If the Front Wiper Mode Switch is in the Low position, the BCM will turn on the On/Off relay. The wiper motor will run at low speed.

If the Front Wiper Mode Switch is in the High position, the BCM will turn on the On/Off relay and the Hi/Low relay. The wiper motor will run at high speed.

If the Front Wiper Mode Switch is turned to the Wash position, the BCM will turn on the On/Off relay until it sees 3 cycles of the park switch. The wiper motor will run at low speed for 3 cycles and then resume whatever the current mode of the switch is.

3.3.9 THE BCM IS ALSO INVOLVED IN THE FOLLOWING FUNCTIONS:

3.3.9.1 VEHICLE SPEED SENSING

The speed sensor on the rear axle generates approximately 80,000 pulses per mile. This signal is sent to the ABS module (if equipped) and then to the BCM. The BCM has been programmed in the Assembly Plant with the proper tire size. If a BCM is replaced, it must be programmed with the proper tire size using the DRBIII®. Based on this tire size, the BCM converts the 80,000 pulses per mile into 8,000 pulses per mile, and outputs this signal to the PCM.

If the vehicle is equipped with ABS, the ABS module supplies the required 12VDC to the wheel speed sensor. If the vehicle is not equipped with ABS, the BCM supplies this voltage on the Vehicle Speed Sensor Supply pin. This output is on for non-ABS vehicles when the ignition switch is in the Run or Crank positions.

3.3.9.2 DETECTION / ANALYSIS OF MISCELLANEOUS BODY SWITCHES

The BCM detects the position of the A/C Switch from the control head and reports this over the PCI bus to the PCM.

The BCM detects the position of the Renegade Lighting Input and reports this over the PCI bus to the Cluster.

3.3.9.3 DRIVER INFORMATION WARNINGS (CHIME)

The Chime is located in the cluster. However, the cluster goes to sleep with the ignition off, so the BCM turns on the Cluster Wakeup Output when it detects that the Headlamps-On Warning or the Key-In-Ignition Warning conditions exist. The BCM sends these warnings to the Cluster over the PCI bus.

3.4 COMMUNICATION

The Programmable Communication Interface or PCI Bus is a single wire multiplexed network capable of supporting binary encoded messages shared between multiple modules. The PCI bus circuit is identified as D25. Additional tracer colors may be added in order to distinguish between different module connections. The modules are wired in parallel. Connections are made in the harness using splices.

The following modules are used on this vehicle:

- Body Control Module
- Airbag Control Module
- Left Side Impact Airbag Control Module
- Right Side Impact Airbag Control Module
- Controller Antilock Brake
- Powertrain Control Module (Gas only)
- Engine Control Module (Diesel only)
- Radio
- CD Changer
- Transmission Control Module
- Sentry Key Immobilizer Module
- Overhead Console
- Intrusion Transceiver Module (Export only)
- Instrument Cluster

Each module provides its own bias and termination in order to transmit and receive messages. The bus voltage is at zero volts when no modules are transmitting and is pulled up to about seven and a half volts when modules are transmitting.

The bus messages are transmitted at a rate averaging 10800 bits per second. Since there is only voltage present when the modules transmit and the message length is only about 500 milliseconds, it is ineffective to try and measure the bus activity with a conventional voltmeter. The preferred method is to use the DRBIII® lab scope. The 12v square wave selection on the 20-volt scale provides a good view of the bus activity. Voltage on the bus should pulse between zero and about seven and a half volts. Refer to the following figure for some typical displays.

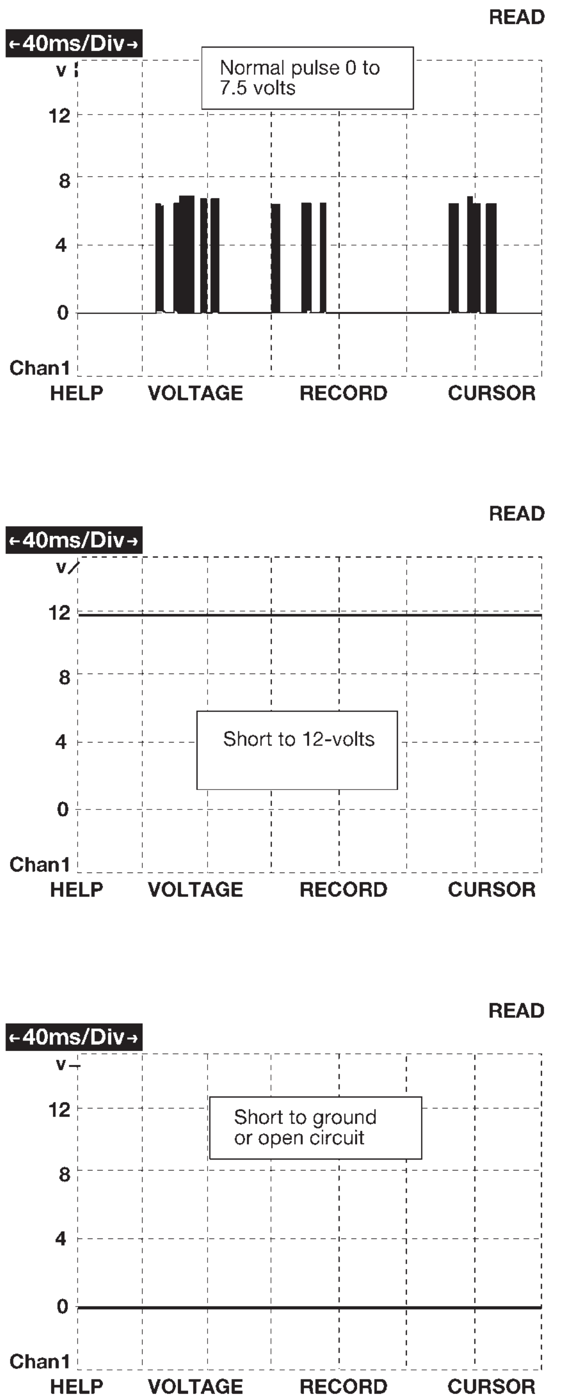
The PCI bus failure modes are broken down into two categories. Complete PCI Bus Communication Failure and individual module no response. Causes of a complete PCI Bus Communication Failure include a short to ground or battery on the PCI circuit. Individual module no response can be caused by an open PCI circuit at the module, or an open battery or ground circuit to the affected module.

Symptoms of a complete PCI Bus Communication Failure would include but are not limited to:

- All gauges on the EMIC stay at zero
- All telltales on EMIC illuminate
- EMIC backlighting at full intensity
- Dashed lines in the overhead console ambient temperature display
- No response received from any module on the PCI bus (except the PCM/ECM)
- No start (if equipped with Sentry Key Immobilizer)

Symptoms of Individual module failure could include any one or more of the above. The difference would be that at least one or more modules would respond to the DRBIII®.

Diagnosis starts with symptom identification. If a complete PCI Bus Communication Failure is suspected, begin by identifying which modules the vehicle is equipped with and then attempt to get a response from the modules with the DRBIII®. If any modules are responding, the failure is not related to the total bus, but can be caused by one or more modules PCI circuit or power supply and ground circuits. The DRBIII® may display “BUS ± SIGNAL OPEN” or “NO RESPONSE” to indicate a communication problem. These same messages will be displayed if the vehicle is not equipped with that particular module. The CCD error message is a default message used by the DRBIII® and in no way indicates whether or not the PCI bus is operational. The message is only an indication that a module is either not responding or the vehicle is not equipped.



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3.5 INSTRUMENT CLUSTER

The Instrument Cluster houses the Speedometer, Tachometer, Fuel, and Engine Coolant Temperature analog gauges. The cluster positions all of the gauges using PCI Bus messages received from the PCM. The cluster contains certain warning indicators, depending on engine type and options. Some of the indicators are hardwire inputs to the cluster and some indicators are controlled by messages received via the PCI Bus. The warning chime tone generator is contained internally within the cluster. The cluster contains a vacuum fluorescent (VF) display for the Odometer/Trip/Warning function. The VF will also display warning messages such as door / gate / glass ajar; low washer fluid level, and no bus communications. The cluster has the ability to store DTCs, communicate on the PCI Bus, display engine information, and display certain inputs using the DRBIII®.

For complete Description and Operation of the Instrument Cluster, refer to the KJ Service Manual Instrument Cluster section.

3.5.1 DIAGNOSTIC SELF TEST

The Instrument Cluster is capable of performing a Diagnostic Self Test. This self test can be initiated manually by depressing and holding the odometer trip reset button while cycling the ignition from the Off to the On position. This self test can also be initiated using the DRBIII®. During the self test, all of the PCI Bus controlled light-emitting diode (LED) indicators will illuminate. (NOTE: The VTSS indicator can be turned on and off through the BCM using the DRBIII®; the Airbag indicator is illuminated by the ORC module in response to a PCI Bus message from the cluster). The Speedometer, Tachometer, Fuel gauge, and the Engine Coolant Temperature gauge will position the pointers at the respective calibration points. The vacuum flourescent (VF) display will illuminate all segments beginning with 111111 through 999999, and then display the cluster software version. The chime will sound 5 (five) times. The cluster will then return to normal operation. Turning the ignition switch to the Off position or the cluster detecting engine RPM greater than 0 (zero) will stop the self test.

3.6 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading trouble codes, erasing trouble codes, and other DRBIII® functions.

3.7 DRBIII® ERROR MESSAGES AND BLANK SCREEN

Under normal operation, the DRBIII® will display one of only two error messages:

– User-Requested WARM Boot or User-Requested COLD Boot

If the DRBIII® should display any other error message, record the entire display and call the STAR Center. This is a sample of such an error message display.

– User-Requested WARM Boot by pressing MORE and NO at the same time.

```
ver: 2.29
date: 1 Oct 93
file: key_itf.cc
date: Jan 12 1994
line: 544
err: 0x1
User-Requested WARM Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

or User-Requested COLD Boot by pressing MORE and YES at the same time.

```
ver: 2.29
date: 1 Oct 99
file: keyhndi.cc
date: Mar 8 2000
line: 1297
err: 0x1
User-Requested COLD Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

3.7.1 DRBIII® DOES NOT POWER UP

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage (data link 16-way connector cavity 16). A minimum of 11 volts is required to adequately power the DRBIII®. Check for proper grounds at DLC cavities 4 and 5.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of a faulty cable or vehicle wiring.

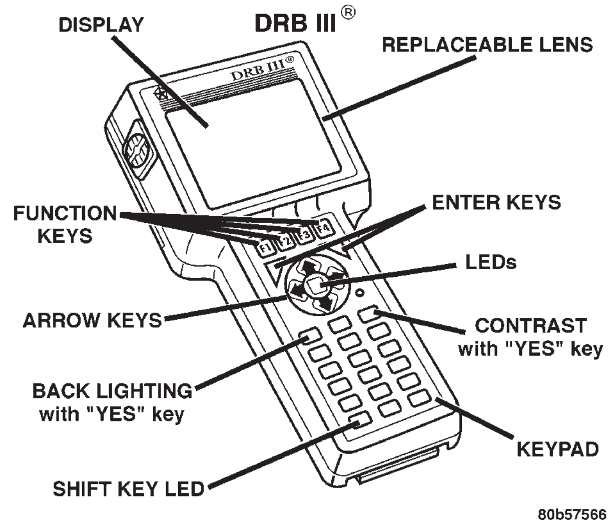
3.7.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.

4.0 DISCLAIMERS, SAFETY, WARNINGS

4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.



4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the parking brake does not hold drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing a body system problem, it is important to follow approved procedures where applicable. These procedures can be found in the service manual. Following these procedures is very important to the safety of individuals performing diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic error messages may occur.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the body system are intended to be serviced as an assembly only. Attempting to remove or repair certain system subcomponents may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS OR POSSIBLY FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATION LIMITS.

- Follow the vehicle manufacturer's service specifications at all times.
- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and functions for the measurement. Do not try voltage or current measurement that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0 - 500 peak volts AC 0 - 500 volts DC
Ohms (resistance)*	0 -1.12 megohms
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-58 - 1100°F -50 - 600°C

* Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- The circuit being tested must be protected by a 10A fuse or circuit breaker.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

4.3 WARNINGS

4.3.1 VEHICLE DAMAGE WARNINGS

Before disconnecting any control module, make sure the ignition is “off”. Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage it and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second code could be set, making diagnosis of the original problem more difficult.

4.3.2 ROAD TESTING A COMPLAINT VEHICLE

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

WARNING: BEFORE ROAD TESTING A VEHICLE, BE SURE THAT ALL COMPONENTS ARE REASSEMBLED. DURING THE TEST DRIVE, DO NOT TRY TO READ THE DRBIII® SCREEN WHILE IN MOTION. DO NOT HANG THE DRBIII® FROM THE REAR VIEW MIRROR OR OPERATE IT YOURSELF. HAVE AN ASSISTANT AVAILABLE TO OPERATE THE DRBIII®.

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box)
Jumper wires
ohmmeter
voltmeter
Test Light
8310 Airbag Load Tool
8443 SRS Airbag System Load Tool

6.0 GLOSSARY OF TERMS

ABS antilock brake system

ACM airbag control module

AECM airbag electronic control module (ACM)

ASDM airbag system diagnostic module (ACM)

BCM body control module

CAB controller antilock brakes

DAB driver airbag

DLC data link connector

DTC diagnostic trouble code

EBL electric back lite (rear window defogger)

ECM engine control module

EVIC electronic vehicle information center

ITM instrusion transceiver module

JB junction block

LHD left hand drive

MIC mechanical instrument cluster

ODO odometer

ORC occupant restraint controller

PAB passenger airbag

PCI programmable communication interface

PCM powertrain control module

PDC power distribution center

PWM pulse width modulated

RHD right hand drive

RKE remote keyless entry

SBS seat belt switch

SBT seat belt tensioner

SIACM side impact airbag control module

SKIM Sentry Key Immobilizer Module

SKIS Sentry Key Immobilizer System

SRS supplemental restraint system

SUV sport utility vehicle

TCM transmission control module

UGDO universal garage door opener

VFD vacuum fluorescent display

VTSS vehicle theft security system

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom List:

ACCELEROMETER 1
ACCELEROMETER 2
INTERNAL 1
OUTPUT DRIVER 1
SAFING SENSOR
STORED ENERGY FIRING 1

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be INTERNAL MODULE TEST.

When Monitored and Set Condition:

ACCELEROMETER 1

When Monitored: With the ignition on, the module on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the module identifies an out of range internal circuit.

ACCELEROMETER 2

When Monitored: With the ignition on, the module on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the module identifies an out of range internal circuit.

INTERNAL 1

When Monitored: With the ignition on, the module on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the module identifies an out of range internal circuit.

OUTPUT DRIVER 1

When Monitored: With the ignition on the module on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the module identifies an out of range internal circuit.

SAFING SENSOR

When Monitored: When the ignition on, the module on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the module identifies an out of range safing sensor.

STORED ENERGY FIRING 1

When Monitored: With the ignition on the ACM on board diagnostics continuously performs internal circuit tests.

Set Condition: This DTC will set if the ACM identifies an out of range internal circuit.

INTERNAL MODULE TEST — Continued

POSSIBLE CAUSES
AIRBAG CONTROL MODULE - ACM
LEFT SIDE IMPACT AIRBAG CONTROL MODULE - LSIACM
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE - RSIACM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **WARNING: IF THE MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** From the list below, select the appropriate module reporting this diagnostic trouble code. SELECT ONE: ACM - ACTIVE or STORED DTC WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1. LEFT SIACM - ACTIVE or STORED DTC WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Left Side Impact Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1. RIGHT SIACM - ACTIVE or STORED DTC WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Right Side Impact Airbag Control Module in accordance with Service information. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

Symptom List:

AIRBAG WARNING INDICATOR OPEN
AIRBAG WARNING INDICATOR SHORT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be AIRBAG WARNING INDICATOR TEST.

When Monitored and Set Condition:

AIRBAG WARNING INDICATOR OPEN

When Monitored: With ignition on the ACM monitors the PCI Bus for a message from the MIC containing the airbag warning indicator status. The MIC transmits the message one time at ignition on, upon lamp state change, or in response to the ACM lamp message.

Set Condition: This DTC will set if the indicator status is OPEN for 2 or 3 consecutive messages or 2 or 3 seconds.

AIRBAG WARNING INDICATOR SHORT

When Monitored: With ignition on the ACM monitors the PCI Bus for a message from the MIC containing the airbag warning indicator status. The MIC transmits the message one time at ignition on, upon lamp state change, or in response to the ACM lamp message.

Set Condition: This DTC will set if the indicator status is SHORT for 2 or 3 consecutive messages or 2 or 3 seconds.

POSSIBLE CAUSES
MIC, COMMUNICATION FAILURE
WARNING INDICATOR
ACM, WARNING INDICATOR
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

AIRBAG WARNING INDICATOR TEST — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, ensure PCI Bus communications with the Instrument Cluster. Is the Instrument Cluster communicating on the PCI Bus? Yes → Go To 3 No → Refer to category COMMUNICATION CATEGORY and select the related symptom INSTRUMENT CLUSTER BUS +/- SIGNAL OPEN. Perform BODY VERIFICATION TEST - VER 1.	All
3	With the DRBIII® select PASSIVE RESTRAINTS, AIRBAG and MONITOR DISPLAY. Using the DRBIII®, read the WARNING LAMP MONITOR screen. Select the LAMP STATUS displayed on the DRB monitors screen. Does the DRBIII® show the LAMP STATUS: OK? YES Go To 4 NO Replace Instrument Cluster. Perform BODY VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CLUSTER MESSAGE MISMATCH

When Monitored and Set Condition:

CLUSTER MESSAGE MISMATCH

When Monitored: After the MIC bulb test is completed, the ACM compares the Lamp Request by ACM, On or Off, and the Lamp on by MIC, On or Off, PCI Bus messages. Each message is transmitted one time per second or when a change in the lamp state occur.

Set Condition: If the Lamp Request by ACM, On or Off, and the Lamp on by MIC, On or Off, messages do not match, the code will set.

POSSIBLE CAUSES
MIC DIAGNOSTIC CODES
CLUSTER MESSAGE MISMATCH
STORED CODE OR INTERMITTENT CONDITION
ACM, CLUSTER MESSAGE MISMATCH
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition on. With the DRBIII®, read the MIC DTCs. Does the DRBIII® display any active Diagnostic Codes? Yes → Refer to symptom list for problems related to Instrument Cluster. No → Go To 3	All

CLUSTER MESSAGE MISMATCH — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII® select PASSIVE RESTRAINTS, AIRBAG, MONITOR DISPLAY and WARNING LAMP STATUS. Cycle the ignition key and observe the LAMP ON BY MIC and LAMP REQ BY ACM monitors after the 6 to 8 second indicator test. Does the LAMP ON BY MIC and LAMP REQ BY ACM monitors match? YES Go To 4 NO Replace Mechanical Instrument Cluster. Perform BODY VERIFICATION TEST - VER 1.	All
4	**WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CONFIGURATION ERROR

When Monitored and Set Condition:

CONFIGURATION ERROR

When Monitored: With ignition on the Side Impact Airbag Control Module monitors the unused squib terminals for the a valid squib circuit resistance.

Set Condition: When the SIACM detects a valid squib circuit resistance across the unused terminals.

POSSIBLE CAUSES
SELECT MODULE REPORTING DTC
MISS WIRED LEFT SIACM CONNECTOR
MISS WIRED RIGHT SIACM CONNECTOR
LEFT SIDE IMPACT AIRBAG CONTROL MODULE - LSIACM
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE - LSIACM
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ONE: LEFT SIACM - ACTIVE DTC Go To 2 LEFT SIACM - STORED DTC Go To 4 RIGHT SIACM - ACTIVE DTC Go To 3 RIGHT SIACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

CONFIGURATION ERROR — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Left SIACM connector. **NOTE: Check connectors - Clean and repair as necessary.** Using the wiring diagram/schematic as a guide, inspect the Left SIACM connector wiring. Is the connector correctly wired? Yes → Replace the Left Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Rewire the Left Side Impact Airbag Control Module connector. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Right SIACM connector. **NOTE: Check connectors - Clean and repair as necessary.** Using the wiring diagram/schematic as a guide, inspect the Right SIACM connector wiring. Is the connector correctly wired? Yes → Replace the Right Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Rewire the Right Side Impact Airbag Control Module connector. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CURTAIN SQUIB CIRCUIT OPEN

When Monitored and Set Condition:

CURTAIN SQUIB CIRCUIT OPEN

When Monitored: With the ignition is On, the SIACM monitors the resistance of the Curtain Squib circuits.

Set Condition: When the SIACM detects an open circuit or high resistance on the Curtain Squib circuits.

POSSIBLE CAUSES
CURTAIN AIRBAG OPEN
CURTAIN SQUIB LINE 1 OR LINE 2 CIRCUIT OPEN
SIACM, CURTAIN SQUIB CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Ensure the battery is fully charged. Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ONE: LEFT SIACM - ACTIVE DTC Go To 2 LEFT SIACM - STORED DTC Go To 4 RIGHT SIACM - ACTIVE DTC Go To 2 RIGHT SIACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

CURTAIN SQUIB CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Curtain Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Curtain Airbag connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the SIACM active DTC's. Does the DRBIII® show CURTAIN SQUIB CIRCUIT OPEN? Yes → Go To 3 No → Replace Curtain Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Airbag Load Tool Jumper. Disconnect the Side Impact Airbag Control Module Connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Side Impact Airbag Control Module connector. Measure the resistance of the Curtain Squib 1 Line 1 and Line 2 circuits between the Load Tool SIACM adaptor and the Curtain Airbag connector. Is the resistance below 1.0 ohms on both circuits? Yes → Replace the Side Impact Airbag Control Module in accordance with the Service information. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open or high resistance in the Curtain Squib 1 Line 1 or Line 2 circuits. Perform AIRBAG VERIFICATION TEST - VER 1.	All

CURTAIN SQUIB CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CURTAIN SQUIB CIRCUIT SHORT

When Monitored and Set Condition:

CURTAIN SQUIB CIRCUIT SHORT

When Monitored: When the ignition is on, the SIACM monitors the resistance between the Curtain Squib circuits.

Set Condition: When the SIACM detects a low resistance between the Curtain Squib circuits.

POSSIBLE CAUSES
CURTAIN AIRBAG SHORT
CURTAIN SQUIB 1 LINE 1 SHORT TO LINE 2
SIACM, CURTAIN SQUIB CIRCUIT SHORT
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Ensure the battery is fully charged. Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ONE: LEFT SIACM - ACTIVE DTC Go To 2 LEFT SIACM - STORED DTC Go To 4 RIGHT SIACM - ACTIVE DTC Go To 2 RIGHT SIACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

CURTAIN SQUIB CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Curtain Airbag connector. **NOTE: Check connectors - Clean repair as necessary.** Connect the appropriate Load Tool to the Curtain Airbag connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the SIACM active DTC's. Does the DRBIII® show CURTAIN SQUIB CIRCUIT SHORT? Yes → Go To 3 No → Replace Curtain Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the SIACM connector. Disconnect the Side Impact Airbag Control Module connector Measure the resistance between the Curtain Squib 1 Line 1 and Line 2 circuits at the Curtain Airbag connector. Is the resistance below 10K ohms? Yes → Repair Curtain Squib 1 Line 1 shorted to Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

CURTAIN SQUIB CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CURTAIN SQUIB SHORT TO BATTERY

When Monitored and Set Condition:

CURTAIN SQUIB SHORT TO BATTERY

When Monitored: When the ignition is on, the SIACM monitors the voltage of the Curtain Squib circuits.

Set Condition: When the SIACM detects high voltage on the Curtain Squib circuits.

POSSIBLE CAUSES
CURTAIN AIRBAG SHORT TO BATTERY
CURTAIN SQUIB 1 LINE 1 OR LINE 2 SHORTED TO BATTERY
SIACM, CURTAIN SQUIB SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ONE: LEFT SIACM - ACTIVE DTC Go To 2 LEFT SIACM - STORED DTC Go To 4 RIGHT SIACM - ACTIVE DTC Go To 2 RIGHT SIACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

CURTAIN SQUIB SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Curtain Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Curtain Airbag connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read SIACM active DTC's. Does the DRBIII® display CURTAIN SQUIB SHORT TO BATTERY? Yes → Go To 3 No → Replace Curtain Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Airbag Load Tool Jumper. Disconnect the Side Impact Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool SIACM adaptor to the SIACM connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage of the Curtain Squib 1 Line 1 and Line 2 circuits between the Curtain Airbag connector and ground. Is any voltage present on either circuit? Yes → Repair Curtain Squib 1 Line 1 or Line 2 shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

CURTAIN SQUIB SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
CURTAIN SQUIB SHORT TO GROUND

When Monitored and Set Condition:

CURTAIN SQUIB SHORT TO GROUND

When Monitored: When the ignition is on, the SIACM monitors the resistance of the Curtain Squib circuits.

Set Condition: When the SIACM detects a short to ground on the Curtain Squib circuits.

POSSIBLE CAUSES
CURTAIN AIRBAG SHORT TO GROUND
CURTAIN SQUIB 1 LINE 1 OR LINE 2 SHORTED TO GROUND
SIACM, CURTAIN SQUIB SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Ensure the battery is fully charged. Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ONE: LEFT SIACM - ACTIVE DTC Go To 2 LEFT SIACM - STORED DTC Go To 4 RIGHT SIACM - ACTIVE DTC Go To 2 RIGHT SI ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

CURTAIN SQUIB SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Curtain Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Curtain Airbag connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read SIACM active DTC's. Does the DRBIII® display CURTAIN SQUIB SHORT TO GROUND? Yes → Go To 3 No → Replace the Curtain Airbag in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED CURTAIN AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Airbag Load Tool Jumper. Disconnect the Side Impact Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool SIACM adaptor to the SIACM connector. Measure the resistance of the Curtain Squib 1 Line 1 and Line 2 circuits between the Curtain Squib connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Curtain Squib 1 Line 1 or Line 2 shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE SIDE IMPACT AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

CURTAIN SQUIB SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT SWITCH CIRCUIT OPEN

When Monitored and Set Condition:

DRIVER SEAT BELT SWITCH CIRCUIT OPEN

When Monitored: With the ignition on the ACM monitors the Seat Belt Switch circuit for an open condition.

Set Condition: The code will set if the ACM does not detect the correct circuit voltage.

POSSIBLE CAUSES
DRIVER SEAT BELT SWITCH OPEN
DRIVER SEAT BELT SWITCH CIRCUITS OPEN
ACM, DRIVER SEAT BELT SWITCH CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition off. Disconnect the Driver Seat Belt Switch. **NOTE: Check connectors - Clean and repair as necessary.** Turn the ignition on. Measure the voltage between Driver Seat Belt Switch Line 1 and Line 2 circuits at the SBS connector. Is there any voltage present? Yes → Replace the Driver Seat Belt Switch Buckle Assembly. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

DRIVER SEAT BELT SWITCH CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Measure the resistance of the Driver SBS Line 1 and line 2 circuits between the Driver SBS harness connector and Airbag Load Tool adaptor. Is the resistance of both circuits below 10K ohms? Yes → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair the open Driver Seat Belt Switch Line 1 or Line 2. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT SWITCH SHORT TO BATTERY

When Monitored and Set Condition:

DRIVER SEAT BELT SWITCH SHORT TO BATTERY

When Monitored: With the ignition on the ACM monitors the Seat Belt Buckle Switch circuit for an short to battery.

Set Condition: The code will set if the ACM detects high circuit voltage.

POSSIBLE CAUSES
DRIVER SEAT BELT SWITCH SHORT TO BATTERY
DRIVER SEAT BELT SWITCH CIRCUITS SHORT TO BATTERY
ACM, DRIVER SEAT BELT SWITCH SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4	All
2	Turn the ignition off. Disconnect the Driver Seat Belt Switch. **NOTE: Check connectors - Clean and repair as necessary.** Turn the ignition on. With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SEAT BELT SWITCH CIRCUIT OPEN? Yes → Replace the Driver Seat Belt Switch Buckle Assembly. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

DRIVER SEAT BELT SWITCH SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage on the Driver SBS Line 1 and line 2 circuits at the Driver SBS connector. Is there any voltage present? Yes → Repair the Driver Seat Belt Switch line 1 or line 2 shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT SWITCH SHORT TO GROUND

When Monitored and Set Condition:

DRIVER SEAT BELT SWITCH SHORT TO GROUND

When Monitored: With the ignition on the ACM monitors the Seat Belt Buckle Switch circuit for a shorted together or shorted to ground condition.

Set Condition: The code will set if the ACM detects low circuit voltage.

POSSIBLE CAUSES
DRIVER SEAT BELT SWITCH CIRCUITS SHORT TOGETHER
DRIVER SEAT BELT SWITCH CIRCUITS SHORT TO GROUND
ACM, DRIVER SEAT BELT SWITCH SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4	All
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** Measure the resistance between the Driver SBS Line 1 and line 2 circuits at the Driver SBS connector. Is the resistance below 10K ohms? Yes → Repair the Driver Seat Belt Switch Line 1 and Line 2 shorted together. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

DRIVER SEAT BELT SWITCH SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Measure the resistance of the Driver SBS Line 1 and Line 2 circuits between the Driver SBS connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair the Driver Seat Belt Switch line 1 or line 2 shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT TENSIONER CIRCUIT OPEN

When Monitored and Set Condition:

DRIVER SEAT BELT TENSIONER CIRCUIT OPEN

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Seat Belt Tensioner circuits.

Set Condition: The ACM has detected an open circuit or high resistance on the Driver Seat Belt Tensioner circuits.

POSSIBLE CAUSES
DRIVER SBT CIRCUITS OPEN
DRIVER SEAT BELT TENSIONER LINE 1 OR LINE 2 CIRCUITS OPEN
ACM, DRIVER SEAT BELT TENSIONER CIRCUITS OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Ensure the battery is fully charged. Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**NOTE: Ensure the battery is fully charged.** **WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Driver SBT. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver SBT connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active DTC's. Does the DRBIII® display DRIVER SBT CIRCUIT OPEN? Yes → Go To 3 No → Replace Driver Seat Belt Tensioner in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SEAT BELT TENSIONER CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module Connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool Driver SBT connector. Measure the resistance of the Driver SBT Line 1 and Line 2 circuits between the Load Tool Adaptor and the Diver SBT connector. Is the resistance below 1.0 ohms on both circuit? Yes → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open or high resistance in Driver Seat Belt Tensioner Line 1 Line 2 circuits. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT TENSIONER CIRCUIT SHORT

When Monitored and Set Condition:

DRIVER SEAT BELT TENSIONER CIRCUIT SHORT

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Seat Belt Tensioner circuits

Set Condition: The ACM has detected low resistance in the Driver Seat Belt Tensioner circuits.

POSSIBLE CAUSES
DRIVER SEAT BELT TENSIONER SHORT
DRIVER SEAT BELT TENSIONER LINE 1 SHORT TO LINE 2
ACM, DRIVER SEAT BELT TENSIONER CIRCUIT SHORT
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Driver SBT connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver SBT connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active DTC's. Does the DRBIII® display DRIVER SEAT BELT TENSIONER CIRCUIT SHORT? Yes → Go To 3 No → Replace Driver Seat Belt Tensioner in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SEAT BELT TENSIONER CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Driver SBT connector. Measure the resistance between the Driver SBT Line 1 and Line 2 circuit at the Driver SBT connector. Is the resistance below 10K Ohms? Yes → Repair Driver Seat Belt Tensioner Line 1 circuit shorted to Driver Seat Belt Tensioner Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT TENSIONER SHORT TO BATTERY

When Monitored and Set Condition:

DRIVER SEAT BELT TENSIONER SHORT TO BATTERY

When Monitored: With the ignition on the ACM monitors the voltage of the Driver Seat Belt Tensioner circuits.

Set Condition: The ACM has detected high voltage on the Driver Seat Belt Tensioner circuits.

POSSIBLE CAUSES
DRIVER SEAT BELT TENSIONER SHORT TO BATTERY
DRIVER SBT LINE 1 OR LINE 2 SHORT TO BATTERY
ACM, DRIVER SEAT BELT TENSIONER CIRCUITS SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Driver Seat Belt Tensioner connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver SBT connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active DTC's. Does the DRBIII® display DRIVER SEAT BELT TENSIONER SHORT TO BATTERY? Yes → Go To 3 No → Replace Driver Seat Belt Tensioner in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SEAT BELT TENSIONER SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module Connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** Disconnect the Load Tool from the Driver SBT connector. Measure the voltage of the Driver SBT Line 1 and Line 2 circuits between the Driver SBT connector and ground. Is there any voltage present? Yes → Repair Driver Seat Belt Tensioner Line 1 or Line 2 circuit shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SEAT BELT TENSIONER SHORT TO GROUND

When Monitored and Set Condition:

DRIVER SEAT BELT TENSIONER SHORT TO GROUND

When Monitored: With the ignition on the ACM monitors the voltage of the Driver Seat Belt Tensioner circuits.

Set Condition: The ACM has detected a short to ground in the Driver Seat Belt Tensioner circuits.

POSSIBLE CAUSES
DRIVER SEAT BELT TENSIONER SHORT TO GROUND
DRIVER SEAT BELT LINE 1 OR LINE 2 SHORT TO GROUND
ACM, DRIVER SEAT BELT TENSIONER CIRCUITS SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
2	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Driver SBT connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver SBT connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active DTC's. Does the DRBIII® display DRIVER SEAT BELT TENSIONER SHORT TO GROUND? Yes → Go To 3 No → Replace the Driver Seat Belt Tensioner in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SEAT BELT TENSIONER SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module Connector **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Driver SBT connector. Measure the resistance of the Driver SBT Line 1 and Line 2 circuits between the Driver SBT connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Driver Seat Belt Tensioner Line 1 or Line 2 circuits shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 1 CIRCUIT OPEN

When Monitored and Set Condition:

DRIVER SQUIB 1 CIRCUIT OPEN

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 1 circuits.

Set Condition: The ACM detects an open circuit or high resistance in the Driver Squib 1 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG OPEN
CLOCKSPRING SQUIB CIRCUITS OPEN
DRIVER SQUIB 1 LINE 1 OR LINE 2 CIRCUIT OPEN
ACM, DRIVER SQUIB 1 CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 1 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 CIRCUIT OPEN? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 CIRCUIT OPEN? Yes → Go To 4 No → Replace the Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance of the Driver Squib 1 Line 1 and Line 2 circuit between the ACM adaptor and the Clockspring connector. Is the resistance below 1.0 ohms on both circuits? Yes → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open or high resistance in the Driver Squib 1 Line 1 or Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 1 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 1 CIRCUIT SHORT

When Monitored and Set Condition:

DRIVER SQUIB 1 CIRCUIT SHORT

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 1 circuits.

Set Condition: The ACM has detected low resistance on the Driver Squib 1 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT SHORT
CLOCKSPRING, DRIVER SQUIB 1 CIRCUIT SHORT
DRIVER SQUIB 1 LINE 1 SHORT TO LINE 2
ACM, DRIVER SQUIB 1 CIRCUIT SHORT
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Driver Airbag. **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 CIRCUIT SHORT? Yes → Go To 3 No → Replace Driver Airbag. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 1 CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 CIRCUIT SHORT? Yes → Go To 4 No → Replace Clockspring. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance between the Driver Squib 1 Line 1 and Line 2 at the Clockspring connector. Is the resistance below 10K ohms? Yes → Repair the Driver Squib 1 Line 1 circuit shorted to Driver Squib 1 Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 1 SHORT TO BATTERY

When Monitored and Set Condition:

DRIVER SQUIB 1 SHORT TO BATTERY

When Monitored: With the ignition on the ACM monitors the voltage of the Driver Squib 1 circuits.

Set Condition: The ACM has detected high voltage on the Driver Squib 1 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT SHORT TO BATTERY
CLOCKSPRING, DRIVER SQUIB 1 CIRCUIT SHORT TO BATTERY
DRIVER SQUIB 1 LINE 1 OR LINE 2 SHORT TO BATTERY
ACM, DRIVER SQUIB 1 CIRCUITS SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED ACM DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 1 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCS. Does the DRBIII® show DRIVER SQUIB 1 SHORT TO BATTERY? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 SHORT TO BATTERY ? Yes → Go To 4 No → Replace the Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Disconnect the Load Tool from the Clockspring connector. Measure the voltage on the Driver Squib 1 Line 1 and Line 2 circuits between the Clockspring connector and ground. Is there any voltage present? Yes → Repair the Driver Squib 1 Line 1 or Line 2 circuits shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 1 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 1 SHORT TO GROUND

When Monitored and Set Condition:

DRIVER SQUIB 1 SHORT TO GROUND

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 1 circuits.

Set Condition: The ACM has detected a short to ground in the Driver Squib 1 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT SHORT TO GROUND
CLOCKSPRING, DRIVER SQUIB 1 CIRCUIT SHORT TO GROUND
DRIVER SQUIB 1 LINE 1 OR LINE 2 SHORTED TO GROUND
ACM, DRIVER SQUIB 1 CIRCUITS SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 1 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag Module. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 SHORT TO GROUND? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 1 SHORT TO GROUND? Yes → Go To 4 No → Replace the Clockspring. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance of the Driver Squib 1 Line 1 and Line 2 circuits between Clockspring connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Driver Squib 1 Line 1 or Line 2 circuits shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 1 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 2 CIRCUIT OPEN

When Monitored and Set Condition:

DRIVER SQUIB 2 CIRCUIT OPEN

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 2 circuits.

Set Condition: The ACM has detected an open circuit or high resistance in the Driver Squib 2 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT OPEN
CLOCKSPRING, DRIVER SQUIB 2 CIRCUIT OPEN
DRIVER SQUIB 2 LINE 1 OR LINE 2 CIRCUIT OPEN
ACM, DRIVER SQUIB 2 CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All

DRIVER SQUIB 2 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show DRIVER SQUIB 2 CIRCUIT OPEN? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRB, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 CIRCUIT OPEN? Yes → Go To 4 No → Replace the Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance of the Driver Squib 2 Line 1 and Line 2 circuits between the ACM adaptor and the Clockspring connector. Is the resistance below 1.0 ohms on both circuits? Yes → Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair the open or high resistance in the Driver Squib 2 Line 1 or Line 2 circuits. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 2 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 2 CIRCUIT SHORT

When Monitored and Set Condition:

DRIVER SQUIB 2 CIRCUIT SHORT

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 2 circuits.

Set Condition: The ACM has detected low resistance on the Driver Squib 2 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT SHORT
CLOCKSPRING, DRIVER SQUIB 2 CIRCUIT SHORT
DRIVER SQUIB 2 LINE 1 SHORT TO LINE 2
ACM, DRIVER SQUIB 2 CIRCUIT SHORT
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 2 CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 CIRCUIT SHORT? Yes → Go To 3 No → Replace Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 CIRCUIT SHORT? Yes → Go To 4 No → Replace Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance between the Driver Squib 2 Line 1 and Line 2 at the Clockspring connector. Is the resistance below 10K ohms? Yes → Repair the Driver Squib 2 Line 1 circuit shorted to Driver Squib 2 Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 2 CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 2 SHORT TO BATTERY

When Monitored and Set Condition:

DRIVER SQUIB 2 SHORT TO BATTERY

When Monitored: With the ignition on the ACM monitors the voltage of the Driver Squib 2 circuits.

Set Condition: The ACM has detected high voltage on the Driver Squib 2 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG CIRCUIT SHORT TO BATTERY
CLOCKSPRING, DRIVER SQUIB 2 CIRCUIT SHORT TO BATTERY
DRIVER SQUIB 2 LINE 1 OR LINE 2 SHORT TO BATTERY
ACM, DRIVER SQUIB 2 CIRCUIT SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 2 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTC's. Does the DRB show DRIVER SQUIB 2 SHORT TO BATTERY? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 SHORT TO BATTERY ? Yes → Go To 4 No → Replace the Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Disconnect the Load Tool from the Clockspring connector. Measure the voltage on the Driver Squib 2 Line 1 and Line 2 from the Clockspring connector to ground. Is there any voltage present? Yes → Repair the Driver Squib 2 Line 1 or Line 2 circuits shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 2 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
DRIVER SQUIB 2 SHORT TO GROUND

When Monitored and Set Condition:

DRIVER SQUIB 2 SHORT TO GROUND

When Monitored: With the ignition on the ACM monitors the resistance of the Driver Squib 2 circuits.

Set Condition: The ACM has detected a short to ground in the Driver Squib 2 circuits.

POSSIBLE CAUSES
DRIVER AIRBAG, CIRCUIT SHORT TO GROUND
CLOCKSPRING, DRIVER SQUIB 2 CIRCUIT SHORT TO GROUND
DRIVER SQUIB 2 LINE 1 OR LINE 2 SHORT TO GROUND
ACM, DRIVER SQUIB 2 CIRCUIT SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

DRIVER SQUIB 2 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Driver Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Driver Airbag connectors. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 SHORT TO GROUND? Yes → Go To 3 No → Replace the Driver Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Clockspring connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Clockspring connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show DRIVER SQUIB 2 SHORT TO GROUND? Yes → Go To 4 No → Replace the Clockspring in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Clockspring connector. Measure the resistance of the Driver Squib 2 Line 1 and Line 2 circuits between Clockspring connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Driver Squib 2 Line 1 or Line 2 circuits shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

DRIVER SQUIB 2 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
5	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
INTERROGATE LEFT SIACM

When Monitored and Set Condition:

INTERROGATE LEFT SIACM

When Monitored: With ignition on, the ACM monitors the PCI Bus for a Left SIACM status message containing the airbag warning lamp ″On or OFF″ request. The status message is sent to the ACM once each second or upon any change in the active DTCs.

Set Condition: The Code will set, if the ACM receives an Lamp On status message from the Left SIACM. NOTE: This indicates that there was an active diagnostic trouble code in the Left SIACM.

POSSIBLE CAUSES
INTERROGATE LEFT SIACM
ACM, NO ACTIVE LEFT SIACM DTCS
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition on. With the DRBIII® read the Left SIACM active DTCs. Did the DRBIII® show any active DTCs? Yes → Refer to symptom list for problems related to Left SIACM. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

INTERROGATE LEFT SIACM — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
INTERROGATE RIGHT SIACM

When Monitored and Set Condition:

INTERROGATE RIGHT SIACM

When Monitored: With ignition on, the ACM monitors the PCI Bus for a Right SIACM status message containing the airbag warning indicator On - OFF request. The status message is sent to the ACM once each second or upon any change in the active DTCs.

Set Condition: The Code will set, if the ACM receives an Lamp On status message from the Right SIACM. NOTE: This indicates that there is an active diagnostic trouble code in the Right SIACM.

POSSIBLE CAUSES
INTERROGATE RIGHT SIACM
NO ACTIVE RIGHT SIACM DTCS
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition on. With the DRBIII® read the Right SIACM active DTCs. Did the DRBIII® show any active DTCs? Yes → Refer to symptom list for problems related to Right SIACM. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

INTERROGATE RIGHT SIACM — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom List:

LEFT FRONT IMPACT SENSOR INTERNAL 1
NO LEFT FRONT IMPACT SENSOR COMMUNICATION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be LEFT FRONT IMPACT SENSOR TEST.

When Monitored and Set Condition:

LEFT FRONT IMPACT SENSOR INTERNAL 1

When Monitored: The Left Front Impact sensors is equipped with onboard diagnostics to monitor the sensors internal circuits. If a problem is identified the sensor sends the Left Front Impact sensor internal 1 message to the ACM.

Set Condition: The code will set if the ACM receives an internal 1 message from the Left Front Impact Sensor.

NO LEFT FRONT IMPACT SENSOR COMMUNICATION

When Monitored: The ACM continuously communicates with the Left Front Impact Sensor over the sensor signal circuit. The sensor communication and onboard diagnostics are powered by the ACM signal.

Set Condition: The code will set, if the ACM and Left Front Sensor do not establish and maintain valid data communications.

POSSIBLE CAUSES
SIGNAL CIRCUIT SHORTED TO BATTERY
SIGNAL CIRCUIT SHORT TO GROUND
LEFT SENSOR CIRCUITS SHORTED TOGETHER
GROUND CIRCUIT OPEN
SIGNAL CIRCUIT OPEN
ACM, LEFT FRONT IMPACT SENSOR
REPAIR IS COMPLETE
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

LEFT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 9 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Left Front Impact Sensor connector. Disconnect the Airbag Control Module connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage of the Left Front Impact Sensor Signal circuit between the Left Sensor connector and ground. Is there any voltage present? Yes → Repair the Left Front Impact Sensor Signal circuit shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Measure the resistance of the Left Impact Sensor Signal circuit between the Left Impact Sensor connector and ground. Is the resistance below 100K ohms? Yes → Repair the Left Impact Sense signal circuit shorted for a short to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 4	All
4	Measure the resistance between the Left Front Impact Sensor Signal and Sensor Ground circuits at the Left Impact Sensor connector. Is the resistance below 100K ohms? Yes → Repair the Left Front Impact Sensor circuits shorted together. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 5	All
5	Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Measure the resistance of the Left Front Impact Sensor Ground circuit between the Left Impact Sensor connector and the Load Tool adaptor. Is the resistance below 1 ohm? Yes → Go To 6 No → Repair the Left Front Impact Sensor Ground circuit open or high resistance. Perform AIRBAG VERIFICATION TEST - VER 1.	All

LEFT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
6	Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Measure the resistance of the Left Front Impact Sensor Signal circuit between the Left Impact Sensor connector and the Load Tool adaptor. Is the resistance below 1 ohm? Yes → Go To 7 No → Repair the Left Front Impact Sensor Signal circuit open or high resistance. Perform AIRBAG VERIFICATION TEST - VER 1.	All
7	Replace the Left Front Impact Sensor. Reconnect the vehicle body harness to the impact sensor. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Connect the DRB to the Data Link Connector - use the most current software available. Use the DRB III and erase the stored codes in all airbag system modules. Turn the Ignition Off, and wait 15 seconds before turning the Ignition On. Wait one minute, and read active codes and if there are none present read the stored codes. DID the active Left Impact Sensor DTC return? Yes → Go To 8 No → Repair is complete.	All
8	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1.	All

LEFT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
LOSS OF IGNITION RUN - START

When Monitored and Set Condition:

LOSS OF IGNITION RUN - START

When Monitored: With the ignition in the Run or Start position the module monitors the Run - Start circuit for proper system voltage.

Set Condition: The code will set, if the voltage on the Run - Start circuit drops below approximately 4.5 volts for the ACM or 6.7 volts for the SIACM.

POSSIBLE CAUSES
AIRBAG SYSTEM COMPONENT SHORTED TO GROUND
IGNITION SWITCH RUN-START CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT RUN-START CIRCUIT OPEN
ACM, FUSED IGNITION OUTPUT RUN-START CIRCUIT OPEN
MODULE RUN - START SHORTED TO GROUND
RSIACM, LOW IGNITION RUN - START VOLTAGE
LSIACM - LOW IGNITION RUN - START VOLTAGE
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** From the list below, select the appropriate module and DTC type for the this diagnostic trouble code. SELECT ONE: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 6 LEFT SIACM - ACTIVE DTC Go To 7 RIGHT SIACM - ACTIVE DTC Go To 8 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

LOSS OF IGNITION RUN - START — Continued

TEST	ACTION	APPLICABILITY
2	Turn ignition off. Remove and inspect the Airbag Run-Start Fuse. **NOTE: Check connectors - Clean and repair as necessary.** Is the Fuse open? Yes → Go To 3 No → Go To 4	All
3	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Measure the resistance of the Fused Ignition Switch Output Run-Start circuit between the Airbag Run-Start Fuse and ground. While monitoring the ohmmeter, disconnect each airbag system component on the Run - Start circuit one at a time. **NOTE: Refer to the service information and system schematics to identify component(s) on the run - start circuit.** Is the resistance above 10K ohms: Yes - after removing a component? Replace the shorted airbag system component in accordance with Service Instructions and replace the airbag Run - Start fuse. WARNING: IF THE MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No - after all components are removed? Repair the Fused Ignition Run - Start circuit shorted to ground and replace Airbag Run-Start Fuse. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	Turn the ignition on. Measure the voltage of the Ignition Switch Output circuit between the Airbag Run-Start Fuse and ground. Is the voltage above approximately 4.5 volts? Yes → Go To 5 No → Repair the open Ignition Switch Output Run-Start circuit. Perform AIRBAG VERIFICATION TEST - VER 1.	All
5	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Reinstall the previously removed Airbag Run-Start Fuse. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage of the Fused Ignition Switch Output Run-Start Circuit between the Airbag Control Module connector ground. Is the voltage above approximately 4.5 volts? Yes → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open Fused Ignition Switch Output Run-Start circuit. Perform AIRBAG VERIFICATION TEST - VER 1.	All

LOSS OF IGNITION RUN - START — Continued

TEST	ACTION	APPLICABILITY
6	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All
7	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Left Side Impact Airbag Control Module in accordance with Service Instructions. WARNING: IF THE MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
8	**WARNING: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Right Side Impact Airbag Control Module in accordance with Service information. WARNING: IF THE MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

Symptom:
LOSS OF IGNITION RUN ONLY

When Monitored and Set Condition:

LOSS OF IGNITION RUN ONLY

When Monitored: With the ignition in the run position the module monitors the Run Only circuit for proper system voltage.

Set Condition: If the voltage on the Run Only circuit drops below 4.5 volts, the code will set.

POSSIBLE CAUSES
IGNITION SWITCH OUTPUT RUN CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT RUN CIRCUIT OPEN
ACM, FUSED IGNITION OUTPUT RUN CIRCUIT OPEN
CHECKING FOR A SHORTED RUN CIRCUIT
FUSED IGNITION SWITCH OUTPUT RUN CIRCUIT SHORT TO GROUND
ACM, FUSED IGNITION RUN CIRCUIT SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 8 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition off. Remove and inspect the Airbag Run circuit fuse. Is the Fuse open? Yes → Go To 3 No → Go To 5	All

LOSS OF IGNITION RUN ONLY — Continued

TEST	ACTION	APPLICABILITY
3	Remove the Airbag Run fuse. **NOTE: Check connectors - Clean and repair as necessary.** Measure the resistance of the Fused Ignition Switch Output Run circuit between the Run Fuse and ground. Is the resistance below 10.0 ohms ? Yes → Go To 4 No → Replace the defective fuse. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Measure the resistance of the Fused Ignition Switch Output Run circuit between the ACM connector and ground. Is the resistance below 10K ohms ? Yes → Repair the Fused Ignition Switch Output Run circuit for a short to ground and replace Airbag Run Fuse. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions and replace the Run Only Fuse. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
5	Turn the ignition on. Measure the voltage of the Ignition Switch Output Run circuit between the Airbag Run circuit fuse and ground. Is the voltage above approximately 4.5 volts? Yes → Go To 6 No → Repair the open Ignition Switch Output Run circuit. Perform AIRBAG VERIFICATION TEST - VER 1.	All
6	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Reinstall the airbag Run fuse. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage of the Fused Ignition Switch Output Run circuit at the Airbag Control Module connector. Is the voltage above approximately 4.5 volts? Yes → Go To 7 No → Repair the an open or high resistance in the Fused Ignition Switch Output Run circuit. Perform AIRBAG VERIFICATION TEST - VER 1.	All

LOSS OF IGNITION RUN ONLY — Continued

TEST	ACTION	APPLICABILITY
7	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
8	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
MODULE NOT CONFIGURED FOR SAB

When Monitored and Set Condition:

MODULE NOT CONFIGURED FOR SAB

When Monitored: With ignition on, the ACM monitors the PCI Bus for messages from the Left and Right Side Impact Airbag Control Modules.

Set Condition: The code will set, if the ACM detects a Side Impact Airbag Control Module active on the PCI Bus and the ACM is not configured for side airbags.

POSSIBLE CAUSES
MODULE NOT CONFIGURED
ACM, NOT CONFIGURED FOR SIDE AIRBAGS
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure the battery is fully charged. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Using the DRB select MISCELLANEOUS and then CONFIGURE FOR SIDE AIRBAGS. Then press the continue button to display the current side airbag status. Does the DRBIII® show current status as ACM WITHOUT SIDE AIRBAG? Yes → Using the DRB select ACM WITH SIDE AIRBAGS to configure the ACM for Side Airbags. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

MODULE NOT CONFIGURED FOR SAB — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
NO CLUSTER MESSAGE

When Monitored and Set Condition:

NO CLUSTER MESSAGE

When Monitored: With ignition on, the ACM monitors the PCI Bus for a message from the MIC containing the airbag warning indicator status. The MIC transmits the message one time at ignition on, lamp state change, or in response to the ACM message.

Set Condition: If the MIC message is not received for 10 consecutive seconds, the code will set.

POSSIBLE CAUSES
MIC, COMMUNICATION FAILURE
ACM, NO CLUSTER MESSAGES
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** Turn the ignition on. SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Turn the ignition on. With the DRBIII®, ensure PCI Bus communications with the Instrument Cluster. Is the Instrument Cluster communicating on the PCI Bus? Yes → Go To 3 No → Refer to category COMMUNICATION CATEGORY and select the related symptom INSTRUMENT CLUSTER BUS +/- SIGNAL OPEN.	All

NO CLUSTER MESSAGE — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
NO LEFT SIACM MESSAGE

When Monitored and Set Condition:

NO LEFT SIACM MESSAGE

When Monitored: With ignition on, the ACM monitors the PCI Bus for the Left Side Impact Airbag Control Module status message. The Left SIACM transmits the status message to the ACM at 1 - second intervals.

Set Condition: If the ACM fails to see the Left SIACM status message on the PCI Bus for 10 seconds the code will set.

POSSIBLE CAUSES
NO LEFT SIACM MESSAGE
ACM, NO LEFT SIACM MESSAGE
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4	All
2	With the DRBIII® select PASSIVE RESTRAINTS, SIDE AIRBAG then LEFT SIDE from the DRB menu. Does the DRBIII® show NO RESPONSE or BUS +/- SIGNAL OPEN? Yes → Refer to the Communication category for the related symptom. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All

NO LEFT SIACM MESSAGE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
NO PCI TRANSMISSION

When Monitored and Set Condition:

NO PCI TRANSMISSION

When Monitored: With the ignition on and the module transmitting information on the PCI BUS.

Set Condition: The code will set if the onboard diagnostic cannot detect the module transmitting information on the PCI BUS for 4 consecutive seconds. NOTE: Any PCI Bus Failure will may cause a stored code to set.

POSSIBLE CAUSES
AIRBAG CONTROL MODULE - ACM
LEFT SIDE IMPACT AIRBAG CONTROL MODULE - LSIACM
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE - RSIACM
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

NO PCI TRANSMISSION — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** IF THE MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Turn the ignition on. From the list below, select the appropriate module and DTC type for the this diagnostic trouble code. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** Select the appropriate module and type of DTC ACM - ACTIVE WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1. ACM - STORED Go To 2 LEFT SIACM - ACTIVE WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Left Side Impact Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1. LEFT SIACM - STORED Go To 2 RIGHT SIACM - ACTIVE WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING. Replace the Right Side Impact Airbag Control Module in accordance with Service information. Perform AIRBAG VERIFICATION TEST - VER 1. RIGHT SIACM - STORED Go To 2	All

NO PCI TRANSMISSION — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom List:

NO RIGHT FRONT IMPACT SENSOR COMMUNICATION
RIGHT FRONT IMPACT SENSOR INTERNAL 1

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be RIGHT FRONT IMPACT SENSOR TEST.

When Monitored and Set Condition:

NO RIGHT FRONT IMPACT SENSOR COMMUNICATION

When Monitored: The ACM continuously communicates with the Right Front Impact Sensor over the sensor signal circuit. The sensor communication and onboard diagnostics are powered by the ACM signal.

Set Condition: The code will set, if the ACM and Right Front Sensor do not establish and maintain valid data communications.

RIGHT FRONT IMPACT SENSOR INTERNAL 1

When Monitored: The Right Front Impact sensors is equipped with onboard diagnostics to monitor the sensors internal circuits. If a problem is identified the sensor sends the Right Front Impact sensor internal 1 message to the ACM.

Set Condition: The code will set if the ACM receives an internal 1 message from the Right Front Impact Sensor.

POSSIBLE CAUSES
SIGNAL CIRCUIT SHORTED TO BATTERY
SIGNAL CIRCUIT SHORT TO GROUND
RIGHT SENSOR CIRCUITS SHORTED TOGETHER
GROUND CIRCUIT OPEN
SIGNAL CIRCUIT OPEN
ACM, RIGHT FRONT IMPACT SENSOR
REPAIR IS COMPLETE
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

RIGHT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 9 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Right Front Impact Sensor connector. Disconnect the Airbag Control Module connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Measure the voltage of the Right Front Impact Sensor Signal circuit between the Right Sensor connector and ground. Is there any voltage present? Yes → Repair the Right Front Impact Sensor Signal circuit shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Measure the resistance of the Right Impact Sensor Signal circuit between the Right Impact Sensor connector and ground. Is the resistance below 100K ohms? Yes → Repair the Right Impact Sense signal circuit shorted for a short to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 4	All
4	Measure the resistance between the Right Front Impact Sensor Signal and Sensor Ground circuits at the Right Impact Sensor connector. Is the resistance below 100K ohms? Yes → Repair the Right Front Impact Sensor circuits shorted together. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 5	All
5	Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Measure the resistance of the Right Front Impact Sensor Ground circuit between the Right Impact Sensor connector and the Load Tool adaptor. Is the resistance below 1 ohm? Yes → Go To 6 No → Repair the Right Front Impact Sensor Ground circuit open or high resistance. Perform AIRBAG VERIFICATION TEST - VER 1.	All

RIGHT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
6	Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Measure the resistance of the Right Front Impact Sensor Signal circuit between the Right Impact Sensor connector and the Load Tool adaptor. Is the resistance below 1 ohm? Yes → Go To 7 No → Repair the Right Front Impact Sensor Signal circuit open or high resistance. Perform AIRBAG VERIFICATION TEST - VER 1.	All
7	Replace the Right Front Impact Sensor. Reconnect the vehicle body harness to the impact sensor. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Connect the DRB to the Data Link Connector - use the most current software available. Use the DRB III and erase the stored codes in all airbag system modules. Turn the Ignition Off, and wait 15 seconds before turning the Ignition On. Wait one minute, and read active codes and if there are none present read the stored codes. DID the active Right Impact Sensor DTC return? Yes → Go To 8 No → Repair is complete.	All
8	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. Perform AIRBAG VERIFICATION TEST - VER 1.	All

RIGHT FRONT IMPACT SENSOR TEST — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
NO RIGHT SIACM MESSAGE

When Monitored and Set Condition:

NO RIGHT SIACM MESSAGE

When Monitored: With ignition on, the ACM monitors the PCI Bus for the Right Side Impact Airbag Control Module status message. The Right SIACM transmits the status message to the ACM at 1 - second intervals.

Set Condition: If the ACM fails to see the Right SIACM status message on the PCI Bus for 10 seconds the code will set.

POSSIBLE CAUSES
NO RIGHT SIACM MESSAGE
ACM, NO RIGHT SIACM MESSAGE
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	With the DRBIII® select SIDE AIRBAG and the RIGHT SIDE AIRBAG from the DRBIII® menu. Does the DRBIII® show NO RESPONSE or BUS +/- SIGNAL OPEN? Yes → Refer to the COMMUNICATION category for the related symptom. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 3	All

NO RIGHT SIACM MESSAGE — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** If there are no possible causes remaining, view repair. Repair Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom List:

PASSENGER SEAT BELT SWITCH CIRCUIT OPEN
PASSENGER SEAT BELT SWITCH SHORT TO BATTERY
PASSENGER SEAT BELT SWITCH SHORT TO GROUND

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be PASSENGER SEAT BELT SWITCH CIRCUIT TEST.

When Monitored and Set Condition:

PASSENGER SEAT BELT SWITCH CIRCUIT OPEN

When Monitored: The ACM monitors the Passenger Seat Belt Buckle Switch circuit for an open condition.

Set Condition: The code will set if the ACM does not detect the correct circuit voltage.

PASSENGER SEAT BELT SWITCH SHORT TO BATTERY

When Monitored: The ACM monitors the Seat Belt Buckle Switch circuit for an short to battery.

Set Condition: The code will set if the ACM detects high circuit voltage.

PASSENGER SEAT BELT SWITCH SHORT TO GROUND

When Monitored: The ACM monitors the Seat Belt Buckle Switch circuit for a shorted together or shorted to ground condition.

Set Condition: The code will set if the ACM detects low circuit voltage.

POSSIBLE CAUSES
ACM, PASSENGER SEAT BELT SWITCH DTC

PASSENGER SEAT BELT SWITCH CIRCUIT TEST — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. ACM - STORED DTC Replace the Airbag Control Module in accordance with the Service information. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

Symptom:
PASSENGER SQUIB 1 CIRCUIT OPEN

When Monitored and Set Condition:

PASSENGER SQUIB 1 CIRCUIT OPEN

When Monitored: When the ignition is On, the ACM monitors the resistance of the Passenger Squib 1 circuits.

Set Condition: The ACM has detected an open circuit or high resistance on the Passenger Squib 1 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG OPEN
PASSENGER SQUIB 1 LINE 1 OR LINE 2 CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACM, PASSENGER SQUIB 1 CIRCUIT OPEN
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

PASSENGER SQUIB 1 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show PASSENGER SQUIB 1 CIRCUIT OPEN? Yes → Go To 3 No → Replace the Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Passenger Airbag connector. Measure the resistance of the Passenger Squib 1 Line 1 and Line 2 circuit between the ACM Adaptor and the Passenger Airbag connector. Is the resistance below 1.0 ohms on both circuits? Yes → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open or high resistance in Passenger Squib 1 Line 1 or Line 2 circuits. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All

PASSENGER SQUIB 1 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 1 CIRCUIT SHORT

When Monitored and Set Condition:

PASSENGER SQUIB 1 CIRCUIT SHORT

When Monitored: When the ignition is on, the ACM monitors the resistance of the Passenger Squib 1 circuits.

Set Condition: The ACM has detected low resistance in the Passenger Squib 1 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORT
PASSENGER SQUIB 1 LINE 1 SHORT TO LINE 2
ACM, PASSENGER SQUIB 1 CIRCUIT SHORT
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active airbag DTCs. Does the DRBIII® show PASSENGER SQUIB 1 CIRCUIT SHORT? Yes → Go To 3 No → Replace Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 1 CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adapter to the Airbag Control Module connector. Disconnect the Load Tool from the Passenger airbag connector. Measure the resistance between Passenger Squib 1 Line 1 and Squib 1 Line 2 circuit at the Passenger Airbag connector. Is the resistance below 10K ohms? Yes → Repair Passenger Squib 1 Line 1 circuit short to Passenger Squib 1 Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.**	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 1 SHORT TO BATTERY

When Monitored and Set Condition:

PASSENGER SQUIB 1 SHORT TO BATTERY

When Monitored: When the ignition is on, the ACM monitors the voltage of the Passenger Squib 1 circuits.

Set Condition: The ACM has detected high voltage on the Passenger Squib 1 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORT TO BATTERY
PASSENGER SQUIB 1 LINE 1 OR LINE 2 SHORT TO BATTERY
ACM, PASSENGER SQUIB 1 CIRCUIT SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show PASSENGER SQUIB 1 CIRCUIT SHORT TO BATTERY? Yes → Go To 3 No → Replace Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 1 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. **WARNING: TURN IGNITION ON, THEN RECONNECT THE BATTERY.** Disconnect the Load Tool from the Passenger Airbag connector. Measure the voltage on the Passenger Squib 1 Line 1 and Line 2 circuits between the Passenger Airbag connector and ground. Is there any voltage present? Yes → Repair Passenger Squib 1 Line 1 or Line 2 circuit short to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 1 SHORT TO GROUND

When Monitored and Set Condition:

PASSENGER SQUIB 1 SHORT TO GROUND

When Monitored: When the ignition is on, the ACM monitors the resistance of the Passenger Squib 1 circuits for low resistance.

Set Condition: The ACM has detected a short to ground in the Passenger Squib 1 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORT TO GROUND
PASSENGER SQUIB 1 LINE 1 AND LINE 2 SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACM, PASSENGER SQUIB 1 CIRCUIT SHORT TO GROUND
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: Connect the appropriate Load Tool to the Passenger Airbag connector.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRBIII® show PASSENGER SQUIB 1 CIRCUIT SHORT TO GROUND? Yes → Go To 3 No → Replace the Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 1 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Passenger Airbag connector. Measure the resistance of the Passenger Squib 1 Line 1 or Line 2 circuit between the Passenger Airbag Module Connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Passenger Squib 1 Line 1 and Line 2 circuits for a short to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 2 CIRCUIT OPEN

When Monitored and Set Condition:

PASSENGER SQUIB 2 CIRCUIT OPEN

When Monitored: When the ignition is On, the ACM monitors the resistance of the Passenger Squib 2 circuits.

Set Condition: The ACM has detected an open circuit or high resistance on the Passenger Squib 2 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG OPEN
PASSENGER SQUIB 2 LINE 1 OR LINE 2 CIRCUIT OPEN
ACM, PASSENGER SQUIB 2 CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

PASSENGER SQUIB 2 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show PASSENGER SQUIB 2 CIRCUIT OPEN? Yes → Go To 3 No → Replace Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Passenger Airbag connector. Measure the resistance of the Passenger Squib 2 Line 1 and Line 2 circuits between the ACM adaptor and the Passenger Airbag connector. Is the resistance below 1.0 ohms on both circuits? Yes → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair open or high resistance in Passenger Squib 2 Line 1 or Line 2 circuits. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 2 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 2 CIRCUIT SHORT

When Monitored and Set Condition:

PASSENGER SQUIB 2 CIRCUIT SHORT

When Monitored: When the ignition is on, the ACM monitors the resistance of the Passenger Squib 2 circuits.

Set Condition: The ACM has detected low resistance in the Passenger Squib 2 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORT
PASSENGER SQUIB 1 LINE 1 SHORT TO LINE 2
STORED CODE OR INTERMITTENT CONDITION
ACM, PASSENGER SQUIB 2 CIRCUIT SHORT
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active DTCs. Does the DRB show PASSENGER SQUIB 2 CIRCUIT SHORT? Yes → Go To 3 No → Replace Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 2 CIRCUIT SHORT — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connectors. Disconnect the Load Tool from the Passenger Airbag connector. Measure the resistance between the Passenger Squib 2 Line 1 and line 2 circuits at the Passenger Airbag connector. Is the resistance below 10K ohms? Yes → Repair Passenger Squib 2 Line 1 circuit short to Passenger Squib 2 Line 2 circuit. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 2 SHORT TO BATTERY

When Monitored and Set Condition:

PASSENGER SQUIB 2 SHORT TO BATTERY

When Monitored: When the ignition is on, the ACM monitors the voltage of the Passenger Squib 2 circuits.

Set Condition: The ACM has detected high voltage on the Passenger Squib 2 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORT TO BATTERY
PASSENGER SQUIB 2 LINE 1 OR LINE 2 SHORTED TO BATTERY
ACM, PASSENGER SQUIB 2 CIRCUIT SHORT TO BATTERY
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show PASSENGER SQUIB 2 CIRCUIT SHORT TO BATTERY? Yes → Go To 3 No → Replace Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 2 SHORT TO BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Airbag Control Module connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** Disconnect the Load Tool from the Passenger Airbag connector. Measure the voltage on the Passenger Squib 2 Line 1 and Line 2 circuits between the Passenger Airbag connector and ground. Is there any voltage present? Yes → Repair Passenger Squib 2 Line 1 or Line 2 circuit shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER SQUIB 2 SHORT TO GROUND

When Monitored and Set Condition:

PASSENGER SQUIB 2 SHORT TO GROUND

When Monitored: When the ignition is on, the ACM monitors the resistance of the Passenger Squib 2 circuits for low resistance.

Set Condition: The ACM has detected a short to ground in the Passenger Squib 2 circuits.

POSSIBLE CAUSES
PASSENGER AIRBAG CIRCUIT SHORTED TO GROUND
PASSENGER SQUIB 2 LINE 1 OR LINE 2 SHORT TO GROUND
ACM, PASSENGER SQUIB 2 CIRCUIT SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the battery is fully charged.** Turn the ignition on. **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 4 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Passenger Airbag connector. **NOTE: Check connectors - Clean and repair as necessary.** Connect the appropriate Load Tool to the Passenger Airbag connector. **WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII®, read the active Airbag DTCs. Does the DRB show PASSENGER SQUIB 2 CIRCUIT SHORT TO GROUND? Yes → Go To 3 No → Replace the Passenger Airbag in accordance with the Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All

PASSENGER SQUIB 2 SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED, AND COULD RESULT IN SERIOUS OR FATAL INJURY.** Disconnect the Airbag Control Module connector **NOTE: Check connectors - Clean repair as necessary.** Connect the appropriate Load Tool adaptor to the Airbag Control Module connector. Disconnect the Load Tool from the Passenger Airbag connector. Measure the resistance of the Passenger Squib 2 Line 1 and Line 2 circuits between the Passenger Airbag Module connector and ground. Is the resistance below 10K ohms on either circuit? Yes → Repair Passenger Squib 2 Line 1 or Line 2 circuit for a shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1. No → Replace the Airbag Control Module in accordance with Service Instructions. WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. Perform AIRBAG VERIFICATION TEST - VER 1.	All
4	**NOTE: Ensure the battery is fully charged.** With the DRBIII®, record and erase all DTCs from all modules. All active codes must be resolved before diagnosing any stored codes. Maintain a safe distance from all airbags while performing the following steps. With the DRBIII® monitor active codes as you work through the system. **NOTE: If equipped with Passenger Airbag On-Off switch, read the DTC's in all switch positions.** Wiggle the wiring harness and connectors of the appropriate airbag system and rotate the steering wheel from stop to stop. **NOTE: Check connectors - Clean and repair as necessary.** You have just attempted to simulate the condition that initially set the trouble code message. The following additional checks may assist you in identifying a possible intermittent problem: - Visually inspect related wire harness connectors. Look for broken, bent, pushed out, spread, corroded, or contaminated terminals. - Visually inspect the related harnesses. Look for chafed, pierced, pinched or partially broken wire. - Refer to Wiring Diagrams and Technical Service Bulletins that may apply. Did the DTC become active ? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
ALL OUTPUTS SHORT - BASE AUDIO SYSTEM

When Monitored and Set Condition:

ALL OUTPUTS SHORT - BASE AUDIO SYSTEM

When Monitored: Ignition in RUN and IOD fuse installed.

Set Condition: The radio has sensed a short on the output for more than 10 seconds.

POSSIBLE CAUSES
DETERMINE FAULT
LEFT I/P SPEAKER
LEFT FRONT DOOR SPEAKER
RIGHT I/P SPEAKER
RIGHT FRONT DOOR SPEAKER
LEFT REAR SPEAKER
RIGHT REAR SPEAKER
(+) CIRCUIT SHORTED TO GROUND
SPEAKER SECTION OF RADIO
(-) CIRCUIT SHORTED TO GROUND
SPEAKER (+) & (-) CIRCUITS SHORTED TOGETHER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Turn the Radio on. With the DRBIII®, erase the audio DTC's. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read the audio DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 2 No → Refer to the wiring diagrams located in the service information to help isolate a possible intermittent short. Perform BODY VERIFICATION TEST - VER 1.	All

ALL OUTPUTS SHORT - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Left I/P Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 3 No → Replace the Left I/P Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 4 No → Replace the Left Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the Right I/P Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 5 No → Replace the Right I/P Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Disconnect the Right Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 6 No → Replace the Right Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All

ALL OUTPUTS SHORT - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Left Rear Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 7 No → Replace the Left Rear Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
7	Turn the ignition off. Disconnect the Right Rear Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 8 No → Replace the Right Rear Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
8	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (+) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (+) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (-) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 10	All

ALL OUTPUTS SHORT - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between each speaker (+) circuit and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms for any of the measurements? Yes → Repair the shorted together speaker circuits. Perform BODY VERIFICATION TEST - VER 1. No → Go To 11	All
11	If there are no possible causes remaining, view repair. Repair Replace the Radio. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
ALL OUTPUTS SHORT - PREMIUM AUDIO SYSTEM

When Monitored and Set Condition:

ALL OUTPUTS SHORT - PREMIUM AUDIO SYSTEM

When Monitored: Ignition in RUN and IOD fuse installed.

Set Condition: The radio has sensed a short on the output for more than 10 seconds.

POSSIBLE CAUSES
DETERMINE FAULT
LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
(+) CIRCUIT SHORTED TO GROUND
(-) CIRCUIT SHORTED TO GROUND
SPEAKER (+) & (-) CIRCUITS SHORTED TOGETHER
SPEAKER SECTION OF RADIO

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Turn the Radio on. With the DRBIII®, erase the audio DTC's. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read the audio DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 2 No → Refer to the wiring diagrams located in the service information to help isolate a possible intermittent short. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 3 No → Replace the Left Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All

ALL OUTPUTS SHORT - PREMIUM AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Right Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display ALL OUTPUTS SHORT? Yes → Go To 4 No → Replace the Right Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (+) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (+) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (-) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between each speaker (+) circuit and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms for any of the measurements? Yes → Repair the shorted together speaker circuits. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace the Radio. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

CASSETTE PLAYER INOP
CD MECHANICAL FAILURE
***AM/FM SWITCH INOPERATIVE**
***ANY STATION PRESET SWITCH INOPERATIVE**
***BALANCE INOPERATIVE**
***CD EJECT SWITCH INOPERATIVE**
***EQUALIZER INOPERATIVE**
***FADER INOPERATIVE**
***FF/RW SWITCH INOPERATIVE**
***HOUR/MINUTE SWITCHES INOPERATIVE**
***PAUSE/PLAY SWITCH INOPERATIVE**
***PWR SWITCH INOPERATIVE**
***SCAN SWITCH INOPERATIVE**
***SEEK SWITCH INOPERATIVE**
***SET SWITCH INOPERATIVE**
***TAPE EJECT SWITCH INOPERATIVE**
***TIME SWITCH INOPERATIVE**
***TUNE SWITCH INOPERATIVE**

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be CASSETTE PLAYER INOP.

When Monitored and Set Condition:

CASSETTE PLAYER INOP

When Monitored: Continuously with the ignition and radio turned on.

Set Condition: The code will set if the radio detects a internal cassette failure.

CD MECHANICAL FAILURE

When Monitored: Continuously with the ignition and CD player turned on.

Set Condition: The code will set if the radio detects a CD mechanical failure.

POSSIBLE CAUSES
INTERNAL FAILURE

CASSETTE PLAYER INOP — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If a DTC is set, erase the DTC and attempt to reset the DTC. If DTC resets, follow this test.** This is an internal radio failure. View repair Repair Replace the Radio. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
CD CHANGER MECHANICAL FAILURE

When Monitored and Set Condition:

CD CHANGER MECHANICAL FAILURE

When Monitored: Continuously with the ignition and CD Changer turned on.

Set Condition: The code will set if the CD Changer detects a mechanical failure.

POSSIBLE CAUSES
INTERNAL FAILURE

TEST	ACTION	APPLICABILITY
1	**NOTE: Erase DTC and attempt to reset. If DTC resets, follow this test.** This is an internal CD Changer failure. View repair Repair Replace the CD Changer. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
CD CHANGER READ FAILURE

When Monitored and Set Condition:

CD CHANGER READ FAILURE

When Monitored: Continuously with the ignition and CD Changer turned on.

Set Condition: The code will set if a CD that is not formatted as a music CD is installed in the CD Changer.

POSSIBLE CAUSES
CD CHANGER READ FAILURE

TEST	ACTION	APPLICABILITY
1	Replace the problem CD with a good, clean, unscratched, music CD. Turn the radio on and select the good CD. With the DRBIII®, read DTC's. Does the DRBIII® display CD CHANGER READ FAILURE? Yes → Replace the CD Changer. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CD CHANGER TEMPERATURE HIGH

When Monitored and Set Condition:

CD CHANGER TEMPERATURE HIGH

When Monitored: Continuously with the ignition and CD Changer turned on.

Set Condition: The code will set if the temperature inside the CD Changer is above +65° C (+145° F).

POSSIBLE CAUSES
HIGH TEMPERATURE FAILURE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the audio DTC's. Start the engine and allow the engine to reach normal operating temperature. If the vehicle has been in the hot sunlight or extreme cold move the vehicle indoors and open the doors to allow the inside temperature to stabilize. The CD Changer will operate between -23° C and 65° C (-10° F and +145° F). With the DRBIII®, read DTC's. Does the DRBIII® display CD CHANGER TEMPERATURE HIGH? Yes → Replace the CD Changer. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CD PLAY FAILURE

When Monitored and Set Condition:

CD PLAY FAILURE

When Monitored: Continuously with the ignition and the radio CD player turned on.

Set Condition: The code will set if a CD that is not formatted as a music CD or is scratched, dirty so the radio can not play the CD is installed in the radio CD player.

POSSIBLE CAUSES
CD PLAY FAILURE

TEST	ACTION	APPLICABILITY
1	Replace the problem CD with a good, clean, unscratched, music CD. Turn the radio CD player on. With the DRBIII®, read DTC's. Does the DRBIII® display CD PLAY FAILURE? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CD READ FAILURE

When Monitored and Set Condition:

CD READ FAILURE

When Monitored: Continuously with the ignition and the radio CD player turned on.

Set Condition: The code will set if a CD that is not formatted as a music CD is installed in the radio CD player.

POSSIBLE CAUSES
CD READ FAILURE

TEST	ACTION	APPLICABILITY
1	Replace the problem CD with a good, clean, unscratched, music CD. Turn the radio CD player on. With the DRBIII®, read DTC's. Does the DRBIII® display CD READ FAILURE? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CD TEMPERATURE HIGH

When Monitored and Set Condition:

CD TEMPERATURE HIGH

When Monitored: Continuously with the ignition and the radio CD player turned on.

Set Condition: The code will set if the temperature inside the radio CD player is above +70° C (+156° F).

POSSIBLE CAUSES
HIGH TEMPERATURE FAILURE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the audio DTC's. Start the engine and allow the engine to reach normal operating temperature. If the vehicle has been in the hot sunlight or extreme cold move the vehicle indoors and open the doors to allow the inside temperature to stabilize. The radio CD player will operate between -23° C and 70° C (-10° F and +156° F). With the DRBIII®, read DTC's. Does the DRBIII® display CD TEMPERATURE HIGH? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
LOW VOLTAGE LEVEL

When Monitored and Set Condition:

LOW VOLTAGE LEVEL

When Monitored:

Set Condition: The radio detects lower than normal voltage.

POSSIBLE CAUSES
CHECK CHARGING SYSTEM
CHECK VOLTAGE LEVEL AT RADIO
RADIO

TEST	ACTION	APPLICABILITY
1	Check the charging system in accordance with the service information. Is the charging system operating properly? Yes → Go To 2 No → Refer to the appropriate service information and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Radio harness connector. Start the engine. Measure the voltage of each Fused B+ circuit and the Fused Ignition Switch Output circuit. Is the voltage above or approximately 14 volts for each measurement? Yes → Go To 3 No → Repair the circuit for high resistance. Perform BODY VERIFICATION TEST - VER 1.	All
3	**Note: Reconnect all previously disconnected components.** Turn the ignition and Radio on. With the DRBIII®, erase the audio DTC's. Start the engine. With the DRBIII®, read the audio DTC's. Did this DTC reset? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
NO ANTENNA CONNECTION

When Monitored and Set Condition:

NO ANTENNA CONNECTION

When Monitored: With the ignition on and the radio in seek up/down mode.

Set Condition: With the radio in seek or scan mode for two minutes and the radio does not detect an antenna connection or does not receive a radio station signal.

POSSIBLE CAUSES
BAD ANTENNA CONNECTION
TEST ANTENNA
RADIO

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the Radio Antenna connector. Inspect the Radio Antenna connection. Was the Antenna connection clean and tight? Yes → Go To 2 No → Repair Antenna connection as needed. Perform BODY VERIFICATION TEST - VER 1.	All
2	Refer to the Audio System in the service information and test the Antenna in accordance with the service procedure. Is the Antenna ok? Yes → Go To 3 No → Repair or replace the Antenna assembly as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
3	**Note: Reconnect all previously disconnected components.** Turn the ignition and Radio on. With the DRBIII®, erase the audio DTC's, put the radio in seek up and seek down mode for approximately 2 minutes before proceeding. With the DRBIII®, read the audio DTC's. Did this DTC reset? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
POWER AMP SHUTDOWN - BASE AUDIO SYSTEM

When Monitored and Set Condition:

POWER AMP SHUTDOWN - BASE AUDIO SYSTEM

When Monitored: Ignition in RUN and IOD fuse installed.

Set Condition: The radio has sensed a short on the output for more than 10 seconds.

POSSIBLE CAUSES
DETERMINE FAULT
LEFT I/P SPEAKER
LEFT FRONT DOOR SPEAKER
RIGHT I/P SPEAKER
RIGHT FRONT DOOR SPEAKER
LEFT REAR SPEAKER
RIGHT REAR SPEAKER
(+) CIRCUIT SHORTED TO GROUND
SPEAKER SECTION OF RADIO
(-) CIRCUIT SHORTED TO GROUND
SPEAKER (+) & (-) CIRCUITS SHORTED TOGETHER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Turn the Radio on. With the DRBIII®, erase the audio DTC's. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read the audio DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 2 No → Refer to the wiring diagrams located in the service information to help isolate a possible intermittent short. Perform BODY VERIFICATION TEST - VER 1.	All

POWER AMP SHUTDOWN - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Left I/P Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 3 No → Replace the Left I/P Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 4 No → Replace the Left Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the Right I/P Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 5 No → Replace the Right I/P Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Disconnect the Right Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 6 No → Replace the Right Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All

POWER AMP SHUTDOWN - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Left Rear Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 7 No → Replace the Left Rear Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
7	Turn the ignition off. Disconnect the Right Rear Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 8 No → Replace the Right Rear Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
8	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (+) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (+) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (-) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 10	All

POWER AMP SHUTDOWN - BASE AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Left I/P Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Right I/P Speaker harness connector. Disconnect the Left Rear Speaker harness connector. Disconnect the Right Rear Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between each speaker (+) circuit and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms for any of the measurements? Yes → Repair the shorted together speaker circuits. Perform BODY VERIFICATION TEST - VER 1. No → Go To 11	All
11	If there are no possible causes remaining, view repair. Repair Replace the Radio. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
POWER AMP SHUTDOWN - PREMIUM AUDIO SYSTEM

When Monitored and Set Condition:

POWER AMP SHUTDOWN - PREMIUM AUDIO SYSTEM

When Monitored: Ignition in RUN and IOD fuse installed.

Set Condition: The radio has sensed a short on the output for more than 10 seconds.

POSSIBLE CAUSES
DETERMINE FAULT
LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
(+) CIRCUIT SHORTED TO GROUND
(-) CIRCUIT SHORTED TO GROUND
SPEAKER (+) & (-) CIRCUITS SHORTED TOGETHER
SPEAKER SECTION OF RADIO

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Turn the Radio on. With the DRBIII®, erase the audio DTC's. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read the audio DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 2 No → Refer to the wiring diagrams located in the service information to help isolate a possible intermittent short. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 3 No → Replace the Left Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All

POWER AMP SHUTDOWN - PREMIUM AUDIO SYSTEM — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Right Front Door Speaker harness connector. Turn the ignition on. Turn the radio on. With the DRBIII®, erase the audio DTCs. Cycle the ignition switch from off to on and wait 10 seconds. With the DRBIII®, read DTC's. Does the DRBIII® display POWER AMP SHUTDOWN? Yes → Go To 4 No → Replace the Right Front Door Speaker. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (+) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (+) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between ground and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms? Yes → Repair the speaker (-) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the Left Front Door Speaker harness connector. Disconnect the Right Front Door Speaker harness connector. Disconnect the Radio C1 harness connector. Measure the resistance between each speaker (+) circuit and each speaker (-) circuit. Is the resistance below 1000.0 (1K) ohms for any of the measurements? Yes → Repair the shorted together speaker circuits. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace the Radio. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*REMOTE RADIO SWITCHES INOPERATIVE (IF EQUIPPED)

POSSIBLE CAUSES
ATTEMPT TO COMMUNICATE WITH THE RADIO
CHECK OPERATION OF SWITCHES
LEFT REMOTE RADIO SWITCH SHORTED TO GROUND
RIGHT REMOTE RADIO SWITCH SHORTED TO GROUND
RADIO CONTROL MUX CIRCUIT SHORTED TO GROUND AT THE SWITCH
RADIO CONTROL MUX CKT SHORTED TO THE RADIO CONTROL MUX RETURN CKT AT THE SWITCH
CLOCKSPRING SHORTED TO GROUND
RADIO CONTROL MUX CIRCUIT SHORTED TO GROUND
RADIO CONTROL MUX CKT SHORTED TO THE RADIO CONTROL MUX RETURN CKT
BODY CONTROL MODULE - INTERNAL SHORT
CLOCKSPRING OPEN
OPEN RADIO CONTROL MUX RETURN CIRCUIT
OPEN RADIO CONTROL MUX CIRCUIT
BODY CONTROL MODULE - OPEN INTERNALLY

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, attempt to communicate with the Radio. Was the DRB able to communicate with the Radio? Yes → Go To 2 No → Refer to the communication category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition on. Turn the Radio on. Operate all the remote radio switch functions. Is only one function or one switch not operating properly? Yes → Repair the Radio Control MUX circuit or the Radio Control MUX Return circuit for an open between the inoperative switch and the clockspring. If OK, replace the remote radio switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

*REMOTE RADIO SWITCHES INOPERATIVE (IF EQUIPPED) — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition on. With the DRB, enter Body Computer then Sensors and monitor the Radio Control SW voltage. Is the voltage above 3.8 volts? Yes → Go To 4 No → Go To 8	All
4	Turn the ignition on. Turn the Radio on. Disconnect the Clockspring C1 harness connector. Connect a jumper wire between the Radio Control MUX circuit and the Radio Control MUX Return circuit. Did the radio change stations? Yes → Repair the Radio Control MUX circuit or the Radio Control MUX Return circuit for an open between the clockspring and the splice to the switches. If OK, replace the Clockspring. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Clockspring C1 harness connector. Disconnect the BCM C2 harness connector. Measure the resistance of the Radio Control MUX Return circuit between the BCM C2 connector and the Clockspring C1 connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Radio Control MUX Return circuit for an open between the clockspring and the BCM. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the Clockspring C1 harness connector. Disconnect the BCM C2 harness connector. Measure the resistance of the Radio Control MUX circuit between the BCM C2 connector and the Clockspring C1 connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Radio Control MUX circuit for an open between the clockspring and the BCM. Perform BODY VERIFICATION TEST - VER 1.	All
7	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1.	All

*REMOTE RADIO SWITCHES INOPERATIVE (IF EQUIPPED) — Continued

TEST	ACTION	APPLICABILITY
8	**WARNING: Turn the ignition off, disconnect the battery and wait 2 minutes before proceeding.** **CAUTION: Do not place an intact undeployed airbag module face down on a hard surface, the airbag module will propel into the air if accidently deployed.** Remove the Driver Airbag Module. Disconnect the Left Remote Radio Switch harness connector. Turn the ignition on, reconnect the battery. With the DRB, enter Body Computer then Sensors and monitor the Radio Control SW voltage. Is the voltage above 3.8 volts? Yes → Replace the Left Remote Radio Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 9	All
9	**WARNING: Turn the ignition off, disconnect the battery and wait 2 minutes before proceeding.** **CAUTION: Do not place an intact undeployed airbag module face down on a hard surface, the airbag module will propel into the air if accidently deployed.** Remove the Driver Airbag Module. Disconnect the Right Remote Radio Switch harness connector. Turn the ignition on, reconnect the battery. With the DRB, enter Body Computer then Sensors and monitor the Radio Control SW voltage. Is the voltage above 3.8 volts? Yes → Replace the Right Remote Radio Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off. Disconnect the Clockspring C3 harness connector. Turn the ignition on. With the DRB, enter Body Computer then Sensors and monitor the Radio Control SW voltage. Is the voltage above 3.8 volts? Yes → Go To 11 No → Go To 12	All
11	Turn the ignition off. Disconnect the Clockspring C3 harness connector. **NOTE: Ensure both remote radio switches are disconnected.** Measure the resistance between ground and the Radio Control MUX circuit at the clockspring C3 harness connector. Is the resistance below 5.0 ohms? Yes → Repair the Radio Control MUX circuit for a short to ground between the clockspring and the remote radio switches. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Radio Control MUX circuit for a short to the Radio Control MUX Return circuit between the clockspring and the remote radio switches. Perform BODY VERIFICATION TEST - VER 1.	All

*REMOTE RADIO SWITCHES INOPERATIVE (IF EQUIPPED) — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the Clockspring C1 harness connector. Turn the ignition on. With the DRB, enter Body Computer then Sensors and monitor the Radio Control SW voltage. Is the voltage above 3.8 volts? Yes → Replace the Clockspring in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 13	All
13	Turn the ignition off. Disconnect the Clockspring C1 harness connector. Disconnect the BCM C2 harness connector. Measure the resistance between ground and the Radio Control MUX circuit. Is the resistance below 5.0 ohms? Yes → Repair the Radio Control MUX circuit for a short to ground between the clockspring and the BCM. Perform BODY VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off. Disconnect the Clockspring C1 harness connector. Disconnect the BCM C2 harness connector. Measure the resistance between the Radio Control MUX circuit and the Radio Control MUX Return circuit. Is the resistance below 5.0 ohms? Yes → Repair the Radio Control MUX circuit for a short to the Radio Control MUX Return circuit between the clockspring and the BCM. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*CHIME INOPERATIVE

POSSIBLE CAUSES
RELATED CHIME SYMPTOMS
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, actuate the Chime. Does the Chime operate? Yes → Refer to Chime category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1. No → Replace the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*CHIME SOUNDS WITH DRIVER DOOR OPEN KEY REMOVED

POSSIBLE CAUSES
KEY-IN IGN SW STATUS
KEY-IN IGNITION SWITCH SHORTED
KEY-IN IGNITION SW SENSE SHORT TO GROUND
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the exterior lamps turn on and off properly and are off before continuing this test.** With the DRB III select: Body, Body Computer, Input Output. Remove the key from the ignition switch. Read the Key-In Ignition status. Does the DRB III show Key-In Ign OPEN? Yes → Refer to the service information for other possible causes. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Ignition Switch connector. Did the chime turn off? Yes → Check the Ignition Lock Cylinder for damage. If OK replace the Ignition Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn ignition off. Disconnect the Ignition Switch connector. Disconnect the Body Control Module C1 connector. Measure the resistance of the Key-in Ignition Switch Sense circuit to ground at the Ignition Switch connector. Is the resistance below 100.0 ohms? Yes → Repair the Key-In Ignition Switch Sense wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	If there are no possible causes remaining, view repair. Repair Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*KEY IN IGNITION AND DRIVER'S DOOR OPEN CHIME INOPERATIVE

POSSIBLE CAUSES
BODY CONTROL MODULE DIAGNOSTIC TROUBLE CODE
OBSERVE THE KEY-IN IGNITION SWITCH STATUS
KEY-IN IGNITION SWITCH OPEN
KEY-IN IGNITION SWITCH GROUND CIRCUIT OPEN
KEY-IN IGNITION SWITCH SENSE CIRCUIT OPEN
BCM - INCORRECT KEY-IN IGNITION SWITCH STATUS

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, read BCM DTC's. Does the DRBIII® display any Cluster Wake Up Output or Communication DTC's? Yes → Refer to symptom list for the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	The driver's door ajar switch must be operational for the result of this test to be valid. **NOTE: Ensure that the Key is still in the Ignition Switch.** With the DRBIII® enter Body Computer then Input Output and read the Key-In Ignition Switch status. Does the DRB display: KEY-IN IGN: CLOSED? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition on. Back jumper the Key-In Ignition Switch Sense circuit to ground at the ignition switch connector. With the DRBIII®, enter Body Computer then Input/Output and observe the Key-In Ignition Switch status. Does the DRBIII display Key-In Ign SW: Closed? Yes → Replace the Ignition Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Ignition Switch harness connector. Turn all lights off. Measure the resistance between ground and the ground circuit in the ignition switch connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*KEY IN IGNITION AND DRIVER'S DOOR OPEN CHIME INOPERATIVE

— Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Ignition Switch harness connector. Disconnect the Body Control Module C1 harness connector. Measure the resistance of the Key-In Ignition Switch Sense circuit between the ignition switch connector and the BCM harness C1 connector . Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Key-In Ignition Switch Sense circuit for an open Perform BODY VERIFICATION TEST - VER 1.	All
6	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*VEHICLE SPEED WARNING CHIME PROBLEM

POSSIBLE CAUSES
INCORRECT COUNTRY CODE PROGRAMMED IN BCM
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The high speed warning chime is for Gulf Coast Countries only. With the DRBIII® in Miscellaneous check the Body Control Module country code setting. Is the country code incorrect? Yes → Program the correct country code setting. Perform BODY VERIFICATION TEST - VER 1. No → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
BATTERY IOD DISCONNECT AT BCM

When Monitored and Set Condition:

BATTERY IOD DISCONNECT AT BCM

When Monitored: Each time the DRB request DTC's from the BCM, the BCM checks for battery voltage on the IOD circuit.

Set Condition: The DTC will set if the BCM detects a low or no voltage condition on the IOD circuit.

POSSIBLE CAUSES
VERIFYING ACTIVE DTC
JUNCTION BLOCK FUSE #34
CHECK FUSED B+ FEED TO FUSE
JUNCTION BLOCK IOD FAILURE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Connect the DRB to the Data Link Connector. Turn the ignition on. With the DRB, erase BCM DTC's. Turn the ignition off then turn the ignition on. With the DRB, read BCM DTC's. Does the DRB display: Battery IOD Disconnect at BCM? Yes → Go To 2 No → No problem found at this time. Use the wiring diagrams located in the service information to help isolate a possible intermittent wiring problem. Perform BODY VERIFICATION TEST - VER 1.	All
2	Inspect fuse #34 in the Junction Block. Is the fuse open? Yes → Re-install or replace Junction Block fuse #34. Use the wiring diagrams located in the service information to help isolate a possible intermittent wiring problem. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Remove Fuse #34 from the Junction Block. Using a 12-volt test light connected to ground, probe the Fused B+ side of the fuse. Is the test light illuminated? Yes → Go To 4 No → Check PDC Fuse #7 for an open. If OK, repair the Fused B+ circuit for an open between the PDC and the Fuse. Perform BODY VERIFICATION TEST - VER 1.	All

BATTERY IOD DISCONNECT AT BCM — Continued

TEST	ACTION	APPLICABILITY
4	Install Fuse #34 in the Junction Block. Remove the BCM from the Junction Block. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Junction Block Body Control Module connector cavity 15. **NOTE: Make sure all the Junction Block connectors are connected at this time** Is the test light illuminated? Yes → Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Junction Block in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
EEPROM CHECKSUM FAILURE

When Monitored and Set Condition:

EEPROM CHECKSUM FAILURE

When Monitored: Each time the DRB request DTC's from the BCM, the BCM runs an EEPROM checksum test.

Set Condition: The DTC will set if the BCM detects an EEPROM checksum failure.

POSSIBLE CAUSES
BCM INTERNAL EEPROM FAILURE

TEST	ACTION	APPLICABILITY
1	Connect the DRB to the Data Link Connector. Turn the ignition on. With the DRB, erase BCM DTC's. Turn the ignition off then turn the ignition on. With the DRB, read BCM DTC's. Did this DTC reset? Yes → Reflash or Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
FLASH CHECKSUM FAILURE

When Monitored and Set Condition:

FLASH CHECKSUM FAILURE

When Monitored: Each time the DRB performs the flash process, the BCM runs a flash checksum test.

Set Condition: The DTC will set if the BCM detects a flash checksum failure.

POSSIBLE CAUSES
BCM INTERNAL FLASH CHECKSUM FAILURE

TEST	ACTION	APPLICABILITY
1	Connect the DRB to the Data Link Connector. Turn the ignition on. With the DRB, erase BCM DTC's. Turn the ignition off then turn the ignition on. With the DRB, read BCM DTC's. Did this DTC reset? Yes → Reflash or Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
ITM MESSAGES NOT RECEIVED

When Monitored and Set Condition:

ITM MESSAGES NOT RECEIVED

When Monitored: With the ignition in run, and the IOD fuse installed.

Set Condition: The BCM does not receive any messages from the Intrusion Transceiver Module (ITM) for at least 30 seconds.

POSSIBLE CAUSES
ATTEMPT TO COMMUNICATE WITH THE INTRUSION TRANSCEIVER MODULE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, enter Theft Alarm then Intrusion Module. Was the DRB able to I/D or communicate with the Intrusion Module? Yes → Go To 2 No → Refer to the Communication category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All
2	With the DRB, erase DTC's. Turn the ignition on and wait approximately 1 minute. With the DRB, read DTC's. Did this DTC reset? Yes → Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
PCM MESSAGE NOT RECEIVED

When Monitored and Set Condition:

PCM MESSAGE NOT RECEIVED

When Monitored: With the ignition in run, and the IOD fuse installed.

Set Condition: The BCM does not receive any messages from the PCM for at least 30 seconds.

POSSIBLE CAUSES
PCM MESSAGE NOT RECEIVED
ATTEMPT TO COMMUNICATE WITH THE PCM
PCI BUS CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, enter Body Computer, System Tests then PCM Monitor. Does the DRB display: PCM is active on BUS? Yes → With the DRB, erase DTCs. Cycle the ignition switch and check for BCM DTCs. If DTC resets, replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition on. With the DRB, attempt to communicate with the PCM. Was the DRB able to communicate with the PCM? Yes → Go To 3 No → Refer to the communication category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All

PCM MESSAGE NOT RECEIVED — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connector. **CAUTION: IF NGC, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the DRBIII® from the DLC. Measure the resistance of the PCI Bus circuit between the DLC and the PCM connector. Is the resistance below 5.0 ohms? Yes → Replace the Powertrain Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM ACM

POSSIBLE CAUSES
CHECKING FOR VOLTAGE AT ACM
GROUND CIRCUIT OPEN
PCI BUS CIRCUIT OPEN
AIRBAG CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ensure that the battery is fully charged. **WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the ACM C1 harness connector. Connect the appropriate Load Tool ACM Adapter to the ACM connector. Turn the ignition on and then reconnect the Battery. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output (Run) Circuit and the Fused Ignition Switch Output (Run/Start) Circuit at the ACM connector. NOTE: One open circuit will not cause a NO RESPONSE condition. Is the test light illuminated on both circuits? Yes → Go To 2 No → Repair the Fused Ignition Switch Output (Run) and Fused Ignition Switch Output (Run/Start) circuits for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	**Ensure that the battery is fully charged.** **WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the ACM C1 harness connector. Connect the appropriate Load Tool ACM Adapter to the ACM connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. **NOTE: Make sure test light is connected to the Battery positive terminal.** Is the test light illuminated? Yes → Go To 3 No → Repair the Ground circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

*NO RESPONSE FROM ACM — Continued

TEST	ACTION	APPLICABILITY
3	**Note: Ensure there is PCI bus communication with other modules. If not, refer to the PCI Bus Communication Failure symptom and repair as necessary.** **WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the ACM C1 harness connector. Connect the appropriate Load Tool ACM Adapter to the ACM connector. Turn the ignition on and then reconnect the Battery. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the ACM connector. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace the Airbag Control Module in accordance with the Service lnformation. WARNING: Make sure the battery is disconnected and wait 2 minutes before proceeding. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM BODY CONTROL MODULE

POSSIBLE CAUSES
ATTEMPT TO COMMUNICATE WITH ANOTHER MODULE
OPEN GROUND CIRCUIT
OPEN PCI BUS CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, attempt to communicate with the Airbag Control Module. With the DRB, attempt to communicate with the Instrument Cluster. Was the DRB able to I/D or communicate with the ACM and the CAB? Yes → Go To 2 No → Refer to symptom list for problems related to the PCI Bus Communication Failure. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the BCM C1 and C2 harness connectors. Using a 12-volt test light connected to 12-volts, probe the each ground circuit. Is the test light illuminated for each circuit? Yes → Go To 3 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the BCM C1 harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the BCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 4 No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM BODY CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
4	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM COMPASS MINI-TRIP COMPUTER

POSSIBLE CAUSES
GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
OPEN PCI BUS CIRCUIT
COMPASS MINI-TRIP COMPUTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Turn the ignition off. Disconnect the Compass Mini-Trip Computer harness connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. Is the test light illuminated? Yes → Go To 2 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	**NOTE: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Turn the ignition off. Disconnect the Compass Mini-Trip Computer harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 3 No → Repair the Fused Ignition Switch Output circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	**NOTE: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Turn the ignition off. Disconnect the Compass Mini-Trip Computer harness connector. Using a 12-volt test light connected to ground, probe the Fused B+ circuit. Is the test light illuminated? Yes → Go To 4 No → Repair the Fused B+ circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM COMPASS MINI-TRIP COMPUTER — Continued

TEST	ACTION	APPLICABILITY
4	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the Compass Mini-Trip Computer harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Compass Mini-Trip Computer connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace the Compass Mini-Trip Computer in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE

POSSIBLE CAUSES
NO RESPONSE FROM CAB
GROUND CIRCUIT OPEN
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
OPEN PCI BUS CIRCUIT
CONTROLLER ANTILOCK BRAKE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **Note: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, attempt to communicate with the Airbag Control Module. With the DRB, attempt to communicate with the Body Control Module (BCM). Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Communications category and perform the symptom PCI Bus Communication Failure. Perform ABS VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe both ground circuits. Is the test light illuminated for both circuits? Yes → Go To 3 No → Repair the ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the CAB harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 4 No → Repair the Fused Ignition Switch Output circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE — Continued

TEST	ACTION	APPLICABILITY
4	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the CAB harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the CAB connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 5 No → Repair the PCI Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM ECM (PCI BUS) - DIESEL ONLY

POSSIBLE CAUSES
ECM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, enter Body then Body Computer. With the DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, enter Passive Restraints then Airbag. Were you able to establish communications with any of the modules? Yes → Go To 2 No → Refer to symptom PCI Bus Communication Failure in the Communications category. Perform ROAD TEST VERIFICATION - VER-2.	All
2	With the DRB read ECM Diagnostic Trouble Codes. This is to ensure power and grounds to the ECM are operational. **NOTE: If the DRB will not read ECM DTCs, follow the NO RESPONSE TO ECM (SCI only) symptom path.** Turn the ignition off. Disconnect the ECM harness connectors. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to ground. Connect the Red lead to the PCI Bus circuit in the ECM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the PCI Bus circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
*NO RESPONSE FROM ECM (SCI ONLY) - DIESEL ONLY

POSSIBLE CAUSES
CHECK ECM POWERS AND GROUNDS
SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE
TRANSMISSION CONTROL MODULE
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
SCI TRANSMIT CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Perform the symptom Checking ECM Power and Ground Circuits in the Driveability category. Did the vehicle pass this test? Yes → Go To 2 No → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the TCM harness connector (if equipped). **NOTE: If vehicle is not equipped with a TCM, answer yes to the question.** Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Transmit circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Transmission Control Module in accordance with the service information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the ECM harness connectors. Disconnect the TCM harness connector (if equipped). Turn the ignition on. Measure the voltage of the SCI Transmit circuit at the DLC connector (cav 7). Is the voltage above 1.0 volt? Yes → Repair the SCI Transmit circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All

*NO RESPONSE FROM ECM (SCI ONLY) - DIESEL ONLY — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Transmit circuit between the ECM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the SCI Transmit circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*NO RESPONSE FROM INSTRUMENT CLUSTER

POSSIBLE CAUSES
OPEN GROUND CIRCUIT
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
OPEN FUSED B+ CIRCUIT
OPEN PCI BUS CIRCUIT
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Turn all lights off. Disconnect the Instrument Cluster harness connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. Is the test light illuminated? Yes → Go To 2 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 3 No → Repair the Fused Ignition Switch Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Using a 12-volt test light connected to ground, probe the Fused B+ circuit. Is the test light illuminated? Yes → Go To 4 No → Repair the Fused B+ circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM INSTRUMENT CLUSTER — Continued

TEST	ACTION	APPLICABILITY
4	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the Instrument Cluster harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. Install DRBIII® SuperCard 2 CH8361 into DRBIII®. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Instrument Cluster connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 5 No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Instrument Cluster in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM INTRUSION TRANSCEIVER MODULE

POSSIBLE CAUSES
GROUND CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
OPEN PCI BUS CIRCUIT
INTRUSION TRANSCEIVER MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Turn the ignition off. Disconnect the Intrusion Transceiver Module harness connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. Is the test light illuminated? Yes → Go To 2 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	**NOTE: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Turn the ignition off. Disconnect the Intrusion Transceiver Module harness connector. Using a 12-volt test light connected to ground, probe the Fused B+ circuit. Is the test light illuminated? Yes → Go To 3 No → Repair the Fused B+ circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM INTRUSION TRANSCEIVER MODULE — Continued

TEST	ACTION	APPLICABILITY
3	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the Intrusion Transceiver Module harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Intrusion Transceiver Module connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace the Intrusion Transceiver Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM LEFT SIACM

POSSIBLE CAUSES
INTERROGATE ACM
GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT (RUN/START) OPEN
PCI BUS CIRCUIT OPEN
LEFT SIDE IMPACT AIRBAG CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® select Passive Restraints. With the DRBIII® select Airbag and read the active DTC's. Is the Loss Of Ignition Run/Start DTC set? Yes → Refer to the symptom list and perform the Loss Of Ignition Run/Start symptom. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 2	All
2	**Ensure that the battery is fully charged.** **Warning: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Left Side Impact Airbag Control Module harness connector. Connect the appropriate Load Tool SIACM Adapter to the SIACM connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. **NOTE: Make sure test light is connected to the Battery positive terminal.** Is the test light illuminated? Yes → Go To 3 No → Repair the Ground circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **Note: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
3	**Warning: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Left Side Impact Airbag Control Module harness connector. Connect the appropriate Load Tool SIACM Adapter to the SIACM connector. Turn the ignition on and then reconnect the Battery. Measure the voltage of the Fused Ignition Switch Output (Run/Start) circuit. Is the voltage above 6.0 volts? Yes → Go To 4 No → Repair the Fused Ignition Switch Output (Run/Start) circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **Note: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

*NO RESPONSE FROM LEFT SIACM — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure there is PCI bus communication with other modules. If not, refer to the PCI Bus Communication Failure symptom and repair as necessary.** **WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Left Side Impact Airbag Control Module harness connector. Connect the appropriate Load Tool SIACM Adapter to the SIACM connector. Turn the ignition on and then reconnect the Battery. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Left Side Impact Airbag Control Module connector. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace the Left Side Impact Airbag Control Module (LSIACM) in accordance with the Service Information. WARNING: Make sure the battery is disconnected and wait 2 minutes before proceeding. Perform AIRBAG VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM PCM (PCI BUS)

POSSIBLE CAUSES
PCM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, enter Body then Body Computer. With the DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, enter Passive Restraints then Airbag. Were you able to establish communications with any of the modules? Yes → Go To 2 No → Refer to symptom PCI Bus Communication Failure in the Communications category. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (PCI BUS) — Continued

TEST	ACTION	APPLICABILITY
2	With the DRB read PCM Diagnostic Trouble Codes. This is to ensure power and grounds to the PCM are operational. **NOTE: If the DRB will not read PCM DTC's, follow the NO RESPONSE TO PCM (SCI only) symptom path.** **NOTE: If the vehicle will not start and the DRBIII® displays a no response message, refer to the appropriate symptom in the powertrain diagnostic procedures.** Turn the ignition off. Disconnect the PCM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. Install DRBIII® SuperCard 2 CH8361 into DRBIII®. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the PCM ground. Connect the Red lead to the PCI Bus circuit in the PCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the PCI Bus circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM PCM (SCI ONLY)

POSSIBLE CAUSES
CHECK PCM POWERS AND GROUNDS
SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE
TRANSMISSION CONTROL MODULE
SCI RECEIVE CIRCUIT SHORTED TO VOLTAGE
SCI CIRCUITS SHORTED TOGETHER
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
SCI RECEIVE CIRCUIT SHORTED TO GROUND
SCI RECEIVE CIRCUIT OPEN
SCI TRANSMIT CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Perform the symptom Checking PCM Power and Ground Circuits in the Driveability category. **NOTE: With the DRBIII® in the generic scan tool mode, attempt to communicate with the PCM.** **NOTE: If the DRBIII® can communicate with the PCM in the generic scan tool mode, it may not be necessary to perform this step.** Did the vehicle pass this test? Yes → Go To 2 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the TCM harness connector (if equipped). **NOTE: If vehicle is not equipped with a TCM, answer yes to the question.** Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Transmit circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Transmission Control Module in accordance with the service information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (SCI ONLY) — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Disconnect the TCM harness connector (if equipped). Turn the ignition on. Measure the voltage of the SCI Transmit circuit at the DLC connector (cav 7). Is the voltage above 1.0 volt? Yes → Repair the SCI Transmit circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Turn the ignition on. Measure the voltage of the SCI Receive circuit at the DLC connector (cav 6). Is the voltage above 1.0 volt? Yes → Repair the SCI Receive circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the PCM harness connectors. Measure the resistance between the SCI Transmit circuit and the SCI Receive circuit at the PCM connector. Is the resistance below 5.0 ohms? Yes → Repair the short between the SCI Transmit and the SCI Receive circuits. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Receive circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Receive circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 8	All
8	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Receive circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the SCI Receive circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (SCI ONLY) — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Transmit circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the SCI Transmit circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM RADIO

POSSIBLE CAUSES
NO RESPONSE FROM RADIO
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
OPEN FUSED B+ CIRCUIT
RADIO GROUND CIRCUIT OPEN
OPEN PCI BUS CIRCUIT
RADIO

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **Note: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, attempt to communicate with the Airbag Control Module. With the DRB, attempt to communicate with the Body Control Module (BCM). Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Communications category and perform the symptom PCI Bus Communication Failure. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Radio C1 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 3 No → Repair the Fused Ignition Switch Output circuit for an open or short. Refer to the wiring diagrams located in the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Radio C1 harness connector. Using a 12-volt test light connected to ground, probe both Fused B+ circuits. Is the test light illuminated for both circuits? Yes → Go To 4 No → Repair the Fused B+ circuit for an open or short. Refer to the wiring diagrams located in the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM RADIO — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Radio C1 harness connector. Using a 12-volt test light connected to 12-volts, probe both ground circuits. Is the test light illuminated for both circuits? Yes → Go To 5 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
5	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the Radio C1 harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. Install DRBIII® SuperCard 2 CH8361 into DRBIII®. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Radio connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace the Radio. Perform BODY VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM RIGHT SIACM

POSSIBLE CAUSES
INTERROGATE ACM
GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT (RUN/START) OPEN
PCI BUS CIRCUIT OPEN
RIGHT SIDE IMPACT AIRBAG CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® select Passive Restraints. With the DRBIII® select Airbag and read the active DTC's. Is the Loss Of Ignition Run/Start DTC set? Yes → Refer to the symptom list and perform the Loss Of Ignition Run/Start symptom. Perform AIRBAG VERIFICATION TEST - VER 1. No → Go To 2	All
2	**Ensure that the battery is fully charged.** **Warning: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Right Side Impact Airbag Control Module harness connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit. **NOTE: Make sure test light is connected to the Battery positive terminal.** Is the test light illuminated? Yes → Go To 3 No → Repair the Ground circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **Note: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
3	**Warning: TURN IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Disconnect the Right Side Impact Airbag Control Module harness connector. Turn the ignition on and then reconnect the Battery. Measure the voltage of the Fused Ignition Switch Output (Run/Start) circuit. Is the voltage above 6.0 volts? Yes → Go To 4 No → Repair the Fused Ignition Switch Output (Run/Start) circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1. **Note: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

*NO RESPONSE FROM RIGHT SIACM — Continued

<table>
<tr><th>TEST</th><th>ACTION</th><th>APPLICABILITY</th></tr>
<tr><td>4</td><td>NOTE: Ensure there is PCI bus communication with other modules. If not, refer to the PCI Bus Communication Failure symptom and repair as necessary.
WARNING: TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.
Disconnect the Right Side Impact Airbag Control Module harness connector.
Turn the ignition on and then reconnect the Battery.
Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.
Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable.
With the DRBIII® select Pep Module Tools.
Select lab scope.
Select Live Data.
Select 12 volt square wave.
Press F2 for Scope, then enter to select channel.
Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete.
Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the Right Side Impact Airbag Control Module connector.
Observe the voltage display on the DRB Lab Scope.
Does the voltage pulse from 0 to approximately 7.5 volts?

Yes → Replace the Right Side Impact Airbag Control Module (RSIACM) in accordance with the Service Information. WARNING: Make sure the battery is disconnected and wait 2 minutes before proceeding.
Perform AIRBAG VERIFICATION TEST - VER 1.

No → Repair the PCI Bus circuit for an open.
Perform AIRBAG VERIFICATION TEST - VER 1.</td><td>All</td></tr>
</table>

Symptom:
*NO RESPONSE FROM SENTRY KEY IMMOBILIZER MODULE

POSSIBLE CAUSES
ATTEMPT TO COMMUNICATE WITH THE BCM
GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
FUSED B(+) CIRCUIT OPEN
OPEN PCI BUS CIRCUIT
SENTRY KEY IMMOBILIZER MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, enter Body then Body Computer. Was the DRB able to I/D or communicate with the BCM? Yes → Go To 2 No → Refer to the symptom list for problems related to no communication with the BCM. Perform SKIS VERIFICATION.	All
2	Turn the ignition off. Disconnect the SKIM harness connector. Using a 12-volt test light connected to 12-volts, probe each ground circuit. Does the test light illuminate brightly for each circuit? Yes → Go To 3 No → Repair the ground circuit for an open. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Disconnect the SKIM harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused Ignition Switch Output circuit for an open. Perform SKIS VERIFICATION.	All
4	Turn the ignition off. Disconnect the SKIM harness connector. Using a 12-volt test light connected to ground, probe the Fused B(+) circuit. Does the test light illuminate brightly? Yes → Go To 5 No → Repair the Fused B+ circuit for an open. Perform SKIS VERIFICATION.	All

*NO RESPONSE FROM SENTRY KEY IMMOBILIZER MODULE — Continued

TEST	ACTION	APPLICABILITY
5	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the SKIM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the SKIM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 6 No → Repair the PCI Bus circuit for an open. Perform SKIS VERIFICATION.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All

Symptom:
*NO RESPONSE FROM TRANSMISSION CONTROL MODULE

POSSIBLE CAUSES
NO RESPONSE FROM TRANSMISSION CONTROL MODULE
FUSED IGNITION SWITCH OUTPUT (RUN/ST) CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT SHORT
FUSED B(+) CIRCUIT OPEN
GROUND CIRCUIT(S) OPEN
OPEN PCI BUS CIRCUIT
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **Note: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, attempt to communicate with the Airbag Control Module (ACM). With the DRB, attempt to communicate with the Instrument Cluster. Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Body Communication category and perform the symptom PCI Bus Communication Failure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
2	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output (Run/St) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Fused Ignition Switch Output (Run/St) circuit for an open. Refer to the wiring diagrams location in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM TRANSMISSION CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the starter relay from the PDC. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output (Start) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Observe the test light while momentarily turning the ignition switch to the Start position. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused Ignition Switch Output (Start) circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. With a voltmeter in the millivolt scale, measure the voltage of the Fused Ignition Switch Output (Start) circuit. **NOTE: A no response condition can exist if voltage is present on this circuit with the ignition switch in any position except for the Start position.** **NOTE: Voltage up to .080 millivolts can cause this condition.** **NOTE: Check for after market components that could cause this condition.** Perform this step with the Ignition Switch in every position except for the Start position. Is any voltage present? Yes → Repair the Fused Ignition Switch Output (Start) circuit for a short to voltage. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5 **Note: Reinstall the original Starter Relay.**	All
5	Turn the ignition off. Disconnect the TCM harness connector. Using a 12-volt test light connected to ground, check the Fused B(+) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B(+) circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM TRANSMISSION CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Using a 12-volt test light connected to 12-volts, check each ground circuit in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly at all the ground circuits? Yes → Go To 7 No → Repair the Ground circuit(s) for an open. Check the main ground connection to engine block and/or chassis. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the TCM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the TCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 8 No → Repair the PCI Bus circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module in accordance with the service information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
*PCI BUS COMMUNICATION FAILURE

POSSIBLE CAUSES
WIRING HARNESS INTERMITTENT
OPEN PCI BUS CIRCUIT AT THE DATA LINK CONNECTOR (DLC)
PCI BUS CIRCUIT SHORTED TO VOLTAGE
MODULE SHORT TO VOLTAGE
PCI BUS CIRCUIT SHORTED TO GROUND
MODULE SHORT TO GROUND

TEST	ACTION	APPLICABILITY
1	**Note: Determine which modules this vehicle is equipped with before beginning.** **Note: When attempting to communicate with any of the modules on this vehicle, the DRB will display 1 of 2 different communication errors: a NO RESPONSE message or a BUS +/- SIGNALS OPEN message.** Turn the ignition on. Using the DRB, attempt to communicate with the following control modules: Airbag Control Module Body Control Module MIC (INSTRUMENT CLUSTER) Was the DRBIII® able to communicate with one or more Module(s)? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: If the DRB can not communicate with a single module, refer to the category list for the related symptom.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All
3	Turn the ignition off. Disconnect the PCM/ECM harness connector. Disconnect the DRB from the Data Link Connector (DLC). Disconnect the negative battery cable. Measure the resistance of the PCI Bus circuit between the Data Link Connector (DLC) and the PCM/ECM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Reconnect the PCM/ECM harness connector and the negative battery cable.** Turn the ignition on. Measure the voltage of the PCI Bus circuit at the Data Link Connector (DLC). Is the voltage above 7.0 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Using a voltmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. **Note: When performing the next step turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.** Turn the ignition on. While monitoring the voltmeter, disconnect each module the vehicle is equipped with one at a time. Is the voltage steadily above 7.0 volts with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to voltage was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the negative battery cable. Using a ohmmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. While monitoring the ohmmeter, disconnect each module the vehicle is equipped with one at a time. **NOTE: Total bus resistance to ground thru all of the modules is typically between 350 to 1000 ohms. The more modules on the bus, the lower the total bus resistance will be.** Is the resistance below 150.0 ohms with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to ground was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

BUS MESSAGES MISSING

POSSIBLE CAUSES
NO RESPONSE FROM EVIC
INTERMITTENT CONDITION
NO RESPONSE - PCI BUS - PCM
NO RESPONSE - PCI BUS - BCM
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	**NOTE: The EVIC self test can performed manually or by using the DRBIII®.** Turn the ignition off. Perform the EVIC self test. Depress and hold the RESET and C/T EVIC buttons while turning the ignition on. Does the EVIC display ″PASS″? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, select Body Computer, System Tests, then PCM Monitor. Does the DRBIII® display ″PCM Active on the Bus″? Yes → Go To 3 No → Refer to COMMUNICATION for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition on. With the DRBIII®, attempt to I/D or communicate with the BCM. Was the DRBIII® able to I/D or communicate with the BCM? Yes → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to COMMUNICATION for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Perform the EVIC self test. Press and hold the RESET and C/T buttons. Turn the ignition on. Does the EVIC display ″BUS″? Yes → Refer to symptom *NO RESPONSE FROM COMPASS in the Communication category. Perform BODY VERIFICATION TEST - VER 1. No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:
COMPASS TEST FAILURE
EVIC INTERNAL FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be COMPASS TEST FAILURE.

POSSIBLE CAUSES
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Depress and hold the RESET and C/T buttons while turning the ignition on. **NOTE: This test may also be performed using the DRBIII®.** Does the EVIC or DRBIII® display ″FAIL″? Yes → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
NO BCM MESSAGES RECEIVED

When Monitored and Set Condition:

NO BCM MESSAGES RECEIVED

When Monitored: When the ignition is turned on.

Set Condition: No PCI Bus message received for 5 seconds after the ignition is turned on. No PCI Bus message is indicated by dashes in the VF display. When valid data is received, the data will replace the dashes.

POSSIBLE CAUSES
DTC PRESENT
NO RESPONSE - PCI BUS - BCM
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 1 minute. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition on. With the DRBIII®, attempt to I/D or communicate with the BCM. Was the DRBIII® able to communicate with the BCM? Yes → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO PCM MESSAGES RECEIVED

When Monitored and Set Condition:

NO PCM MESSAGES RECEIVED

When Monitored: When the ignition is turned on.

Set Condition: No PCI Bus message received for 5 seconds after the ignition is turned on. No PCI Bus message is indicated by dashes in the VF display. When valid data is received, the data will replace the dashes.

POSSIBLE CAUSES
DTC PRESENT
NO RESPONSE - PCI BUS - PCM
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 1 minute. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition on. With the DRBIII®, enter Body Computer, System Tests, then PCM Monitor. Does the DRBIII® display PCM Active on the Bus? Yes → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

***ANY SWITCH ON EVIC INOPERATIVE**
***AVERAGE FUEL INOPERATIVE OR WRONG**
***CMTC FAILS TO RESPOND TO INSTRUMENT PANEL DIMMING**
***DISTANCE TO EMPTY INOPERATIVE OR WRONG**
***ELAPSED TIME INOPERATIVE OR WRONG**
***TRIP ODOMETER INOPERATIVE OR WRONG**
***UNIVERSAL GARAGE DOOR OPENER (UGDO) INOPERATIVE**

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be *ANY SWITCH ON EVIC INOPERATIVE.

POSSIBLE CAUSES
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Diagnose and repair any BCM, MIC, PCM, or COMMUNICATION DTCs before proceeding** If all the possible causes above are operating correctly, view repair. Repair Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*EVIC INOPERATIVE

POSSIBLE CAUSES
FUSED B+ CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
GROUND CIRCUIT OPEN
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Diagnose and repair any BCM, MIC, PCM, or COMMUNICATION DTCs before proceeding.** Turn the ignition off. Disconnect the Overhead Console harness connector. Measure the voltage between the Fused B+ circuit and ground. Is the voltage above 10.5 volts? Yes → Go To 2 No → Repair the Fused B(+) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Overhead Console harness connector. Turn the ignition on. Measure the voltage between the Fused Ignition Switch Output circuit and ground. Is the voltage below 10.5 volts? Yes → Repair the Fused Ignition Switch Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Overhead Console harness connector. Measure the resistance between ground and the CMTC ground circuit. Is the resistance above 5.0 ohms? Yes → Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*TEMP DISPLAY INOPERATIVE OR WRONG

POSSIBLE CAUSES
AMBIENT TEMPERATURE SENSOR
AMBIENT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
AMBIENT TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
AMBIENT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
AMBIENT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND CIRCUIT
AMBIENT TEMPERATURE SENSOR GROUND CIRCUIT OPEN
BODY CONTROL MODULE
ELECTRONIC VEHICLE INFORMATION CENTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the EVIC is communicating on the PCI Bus before proceeding with this test.** **NOTE: The Ambient Temperature Sensor is hardwired to the BCM. Ambient temperature information is transmitted to the EVIC via the PCI Bus.** Turn the ignition off. Disconnect the Ambient Temperature Sensor harness connector. Measure the resistance of the Ambient Temperature Sensor using the following temperature/resistance values: 10°C (50°F) Sensor Resistance = 17.99 - 21.81 Kilohms 20°C (68°F) Sensor Resistance = 11.37 - 13.61 Kilohms 25°C (77°F) Sensor Resistance = 9.12 - 10.88 Kilohms 30°C (86°F) Sensor Resistance = 7.37 - 8.75 Kilohms 40°C (104°F) Sensor Resistance = 4.90 - 5.75 Kilohms 50°C (122°F) Sensor Resistance = 3.33 - 3.88 Kilohms Is the Ambient Temperature Sensor resistance measurement between the min/max specifications? Yes → Go To 2 No → Replace the Ambient Temperature Sensor. NOTE: After any repair for an Ambient Temperature Sensor problem, the vehicle must be driven over 5 kilometers (3 miles) above 40 km/h (25 MPH) to update the EVIC display. Perform BODY VERIFICATION TEST - VER 1.	All

*TEMP DISPLAY INOPERATIVE OR WRONG — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Ensure that the Interior lights are off. Ensure that the Exterior lights are off. Disconnect the DRBIII®. Ensure that all doors are closed. Disconnect the Ambient Temperature Sensor harness connector. Measure the voltage between the Ambient Temperature Sensor Signal circuit and ground. Is there any voltage present? Yes → Repair the Ambient Temperature Sensor Signal circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Ambient Temperature Sensor harness connector. Turn the ignition on. Measure the voltage between the Ambient Temperature Sensor Signal circuit and the Sensor ground circuit. Is the voltage above 4.5 volts? Yes → Replace the EVIC in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Ambient Temperature Sensor harness connector. Disconnect the BCM C2 harness connector. Measure the resistance between ground and the Ambient Temperature Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the Ambient Temperature Sensor Signal circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Ambient Temperature Sensor harness connector. Disconnect the BCM C2 harness connector. Measure the resistance of the Sensor Signal circuit to the Sensor Ground circuit in the Sensor connector. Is the resistance below 5.0 ohms? Yes → Repair the Ambient Temperature Sensor Signal circuit for a short to the Ambient Temperature Sensor Ground circuit. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All

*TEMP DISPLAY INOPERATIVE OR WRONG — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Ambient Temperature Sensor harness connector. Disconnect the BCM C2 harness connector. Measure the resistance of the Ambient Temperature Sensor Signal circuit between the Sensor connector and the BCM C2 connector. Is the resistance above 5.0 ohms? Yes → Repair the Ambient Temperature Sensor Signal circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off. Disconnect the Ambient Temperature Sensor harness connector. Disconnect the BCM C2 harness connector. Measure the resistance of the Sensor Ground circuit between the Sensor connector and the BCM C2 connector. Is the resistance above 5.0 ohms? Yes → Repair the Ambient Temperature Sensor Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*FLIP-UP GLASS AJAR CIRCUIT OPEN

POSSIBLE CAUSES
FLIP-UP GLASS AJAR SWITCH GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
FLIP-UP GLASS AJAR SWITCH
FLIP-UP GLASS AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Open the Flip-up Glass. With the DRBIII® in Inputs/Outputs, read the FLIP-UP AJAR SW state. Does the DRBIII® display CLOSED? Yes → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. No → Go To 2	All
2	Disconnect the Tailgate Flip-up Glass Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, test the Ground circuit for continuity. Does the light illuminate? Yes → Go To 3 No → Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Disconnect the Tailgate Flip-up Glass Ajar Switch connector. With the DRBIII® in Inputs/Outputs, read the FLIP-UP AJAR SW state. Connect a jumper wire between Sense circuit and the Ground circuit. Does the DRBIII® display FLIP-UP AJAR SW: CLOSED? Yes → Replace the Flip-up Glass Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Disconnect the Body Control Module C1 harness connector. Disconnect the Flip-up Glass Ajar Switch harness connector. Measure the resistance of the Sense circuit. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Flip-up Glass Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*FLIP-UP GLASS AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
FLIP-UP GLASS AJAR SWITCH SHORTED TO GROUND
FLIP-UP GLASS AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the FLIP-UP AJAR SW state. Disconnect the Tailgate Flip-up Glass Ajar Switch harness connector. With the DRBIII® in Inputs/Outputs, read the FLIP-UP AJAR SW state. Does the Switch State change from CLOSED to OPEN? Yes → Replace the Flip-up Glass Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Body Control Module C1 harness connector. Disconnect the Tailgate Flip-up Glass Ajar Switch harness connector. Using a 12-volt Test Light connected to 12-volts, test the Sense circuit for a short to ground. Does the Test Light illuminate? Yes → Repair the Flip-up Glass Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*HOOD AJAR CIRCUIT OPEN

POSSIBLE CAUSES
HOOD AJAR SWITCH GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
HOOD AJAR SWITCH
HOOD AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Open the Hood. With the DRBIII® in Inputs/Outputs, read the HOOD AJAR SW state. Does the DRBIII® display CLOSED? Yes → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. No → Go To 2	All
2	Disconnect the Hood Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, test the Ground circuit for continuity. Does the light illuminate? Yes → Go To 3 No → Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Disconnect the Hood Ajar Switch connector. With the DRBIII® in Inputs/Outputs, read the HOOD AJAR SW state. Connect a jumper wire between Sense circuit and the Ground circuit. Does the DRBIII® display HOOD AJAR SW: CLOSED? Yes → Replace the Hood Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Disconnect the Body Control Module C1 harness connector. Disconnect the Hood Ajar Switch harness connector. Measure the resistance of the Sense circuit. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Hood Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*HOOD AJAR CIRCUIT SHORTED TO GROUND- EXPORT ONLY

POSSIBLE CAUSES
HOOD AJAR SWITCH SHORTED TO GROUND
HOOD AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the HOOD AJAR SW state. Disconnect the Hood Ajar Switch harness connector. With the DRBIII® in Inputs/Outputs, read the HOOD AJAR SW state. Does the Switch State change from CLOSED to OPEN? Yes → Replace the Hood Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Body Control Module C1 harness connector. Disconnect the Hood Ajar Switch harness connector. Using a 12-volt Test Light connected to 12-volts, test the Sense circuit for a short to ground. Does the Test Light illuminate? Yes → Repair the Hood Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LEFT FRONT DOOR AJAR CIRCUIT OPEN

POSSIBLE CAUSES
LEFT FRONT DOOR AJAR SWITCH GROUND CIRCUIT OPEN
LEFT FRONT DOOR AJAR SWITCH
LEFT FRONT DOOR AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Disconnect the Left Front Door Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, test the Ground circuit for continuity. Does the light illuminate? Yes → Go To 2 No → Repair the Left Front Door Ajar Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Left Front Door Ajar Switch connector. Connect a jumper wire between the Sense circuit and the Ground circuit. **NOTE: For the Left Front Door Ajar state the DRBIII will read "PASS" for RHD.** With the DRBIII® in Inputs/Outputs, read the DR DOOR AJAR SW state. Does the DRBIII® display CLOSED? Yes → Replace the Left Front Door Lock Motor/Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Left Front Door Ajar Switch connector. Disconnect the BCM C1 harness connector. Measure the resistance of the Sense circuit between the BCM connector and the Door Ajar Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Left Front Door Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LEFT FRONT DOOR AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
LEFT FRONT DOOR AJAR SWITCH SHORTED TO GROUND
LEFT FRONT DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	**NOTE: For the Left Front Door Ajar state the DRBIII will read ″PASS″ for RHD.** With the DRBIII® in Inputs/Outputs, read the DR or PASS DOOR AJAR SW state. While monitoring the DRBIII®, disconnect the Left Front Door Ajar Switch harness connector. Did the Switch State change from CLOSED to OPEN? Yes → Replace the Left Front Door Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Left Front Door Ajar Switch harness connector. Disconnect the BCM C1 harness connector. Using a 12-volt test light connected to 12-volts, probe the Sense circuit and test for a short to ground. Does the test light illuminate? Yes → Repair the Left Front Door Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LEFT REAR DOOR AJAR CIRCUIT OPEN

POSSIBLE CAUSES
LEFT REAR DOOR AJAR SWITCH GROUND CIRCUIT OPEN
LEFT REAR DOOR AJAR SWITCH
LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Disconnect the Left Rear Door Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, probe the Ground circuit and test for continuity. Does the light illuminate? Yes → Go To 2 No → Repair the Left Rear Door Ajar Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Left Rear Door Ajar Switch connector. Connect a jumper wire between the Sense circuit and the Ground circuit. With the DRBIII® in Inputs/Outputs, read the LR DOOR AJAR SW state. Does the DRBIII® display CLOSED? Yes → Replace the Left Rear Door Lock Motor/Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Left Rear Door Ajar Switch connector. Disconnect the BCM C2 connector. Measure the resistance of the Sense circuit between the BCM C2 connector and the Door Ajar Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Left Rear Door Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LEFT REAR DOOR AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
LEFT REAR DOOR AJAR SWITCH SHORTED TO GROUND
LEFT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the LR DOOR AJAR SW state. While monitoring the DRBIII®, disconnect the Left Rear Door Ajar Switch harness connector. Did the Switch State change from CLOSED to OPEN? Yes → Replace the Left Rear Door Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Left Rear Door Ajar Switch harness connector. Disconnect the BCM C2 harness connector. Using a 12-volt test light connected to 12-volts, probe the Sense circuit and test for a short to ground. Does the test light illuminate? Yes → Repair the Left Rear Door Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RIGHT FRONT DOOR AJAR CIRCUIT OPEN

POSSIBLE CAUSES
RIGHT FRONT DOOR AJAR SWITCH GROUND CIRCUIT OPEN
RIGHT FRONT DOOR AJAR SWITCH
RIGHT FRONT DOOR AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Disconnect the Right Front Door Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, probe the Ground circuit and test for continuity. Does the light illuminate? Yes → Go To 2 No → Repair the Right Front Door Ajar Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Right Front Door Ajar Switch connector. Connect a jumper wire between the Sense circuit and the Ground circuit. **NOTE: For the Right Front Door Ajar state the DRBIII will read ″DR″ for RHD.** With the DRBIII® in Inputs/Outputs, read the PASS or DR DOOR AJAR SW state. Does the DRBIII® display CLOSED? Yes → Replace the Right Front Door Lock Motor/Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Right Front Door Ajar Switch harness connector. Disconnect the BCM C1 harness connector. Measure the resistance of the Sense circuit between the BCM C1 connector and the Door Ajar Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Right Front Door Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RIGHT FRONT DOOR AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
RIGHT FRONT DOOR AJAR SWITCH SHORTED TO GROUND
RIGHT FRONT DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	**NOTE: For the Right Front Door Ajar state the DRBIII will read ″DR″ for RHD.** With the DRBIII® in Inputs/Outputs, read the PASS or DR DOOR AJAR SW state. While monitoring the DRBIII®, disconnect the Right Front Door Ajar Switch harness connector. Did the Switch State change from CLOSED to OPEN? Yes → Replace the Right Front Door Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Right Front Door Ajar Switch connectors. Disconnect the BCM C1 harness connector. Using a 12-volt test light connected to 12-volts, probe the Sense circuit and test for a short to ground. Does the test light illuminate? Yes → Repair the Right Front Door Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RIGHT REAR DOOR AJAR CIRCUIT OPEN

POSSIBLE CAUSES
RIGHT REAR DOOR AJAR SWITCH GROUND CIRCUIT OPEN
RIGHT REAR DOOR AJAR SWITCH
RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT OPEN
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Disconnect the Right Rear Door Ajar switch connector. Using a 12-volt Test Light connected to 12-volts, probe the Ground circuit and test for continuity. Does the light illuminate? Yes → Go To 2 No → Repair the Right Rear Door Ajar Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Right Rear Door Ajar Switch connector. Connect a jumper wire between the Sense circuit and the Ground circuit. With the DRBIII® in Inputs/Outputs, read the RR DOOR AJAR SW state. Does the DRBIII® display CLOSED? Yes → Replace the Right Rear Door Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Right Rear Door Ajar Switch harness connector. Disconnect the BCM C1 harness connector. Measure the resistance of the Sense circuit between the BCM connector and the Door Ajar Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Right Rear Door Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RIGHT REAR DOOR AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
RIGHT REAR DOOR AJAR SWITCH SHORTED TO GROUND
RIGHT REAR DOOR AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the RR DOOR AJAR SW state. While monitoring the DRBIII®, disconnect the Right Rear Door Ajar Switch connector. Did the Switch State change from CLOSED to OPEN? Yes → Replace the Right Rear Door Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Right Rear Door Ajar Switch connectors. Disconnect the BCM C1 harness connector. Using a 12-volt test light connected to 12-volts, probe the Sense circuit and test for a short to ground. Does the test light illuminate? Yes → Repair the Right Rear Door Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*TAILGATE AJAR CIRCUIT OPEN

POSSIBLE CAUSES
BODY CONTROL MODULE - INTERNAL MALFUNCTION
TAILGATE AJAR SWITCH
TAILGATE AJAR SWITCH SENSE CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Disconnect the Tailgate Lock Motor/Ajar Switch connector. Connect a jumper wire between the Sense circuit and the Ground circuit. With the DRBIII® in Inputs/Outputs, read the TAILGATE AJAR SW state. Does the DRBIII® display CLOSED? Yes → Replace the Tailgate Ajar Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Tailgate Lock Motor/Ajar Switch connector. Disconnect the BCM C1 harness connector. Measure the resistance of the Sense circuit between the BCM connector and the Tailgate Ajar Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Tailgate Ajar Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*TAILGATE AJAR CIRCUIT SHORTED TO GROUND

POSSIBLE CAUSES
TAILGATE AJAR SWITCH SHORTED TO GROUND
TAILGATE AJAR SWITCH SENSE CIRCUIT SHORTED TO GROUND
BODY CONTROL MODULE - INTERNAL MALFUNCTION

TEST	ACTION	APPLICABILITY
1	Disconnect the Tailgate Lock Motor/Ajar Switch harness connector. With the DRBIII® in Inputs/Outputs, read the TAILGATE AJAR SW state. Does the DRBIII® display CLOSED? Yes → Go To 2 No → Replace the Tailgate Ajar Switch. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Tailgate Lock Motor/Ajar Switch harness connector. Disconnect the BCM C1 harness connector. Using a 12-volt test light connected to 12-volts, probe the Sense circuit and test for a short to ground. Does the test light illuminate? Yes → Repair the Tailgate Ajar Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
REAR DEFOGGER RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND

When Monitored and Set Condition:

REAR DEFOGGER RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND

When Monitored: With the ignition on.

Set Condition: When the BCM detects no voltage on the Rear Window Defogger Control circuit due to an open or short to ground.

POSSIBLE CAUSES
JUNCTION BLOCK FUSE 39
CODE ACTIVE
RELAY OPEN OR SHORTED
JUNCTION BLOCK - REAR WINDOW DEFOGGER RELAY CONTROL SHORT TO GROUND
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
JUNCTION BLOCK - REAR WINDOW DEFOGGER RELAY CONTROL OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Attempt to operate the Rear Window Defogger. With the DRBIII®, read DTCs. Does the DRBIII® display REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Ensure the relay is completely plugged in. Perform BODY VERIFICATION TEST - VER 1.	All
2	Check Junction Block fuse 39. Is the fuse open. Yes → Check for a short to ground and replace the Junction Block fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

REAR DEFOGGER RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit at Fuse 39. The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the open Fused Ignition Switch Output circuit as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
4	Remove the Rear Window Defogger Relay from the Junction Block. Install fuse if previously removed. Install a substitute relay in place of the Rear Window Defogger Relay. With the DRBIII®, erase DTCs. Attempt to operate the Rear Window Defogger. With the DRBIII®, read DTCs. Does the DRBIII® display REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND? Yes → Go To 5 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Remove the Rear Window Defogger Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Measure the resistance between ground and the Rear Window Defogger Relay Control circuit in the relay connector of the Junction Block. Is the resistance below 100.0 ohms? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off. Remove the Rear Window Defogger Relay from the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Rear Window Defogger Relay Control circuit between the Relay connector and the Junction Block - BCM connector. Is the resistance below 2.0 ohms? Yes → Go To 7 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
7	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
REAR DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored and Set Condition:

REAR DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored: With the ignition on.

Set Condition: When the BCM detects unwanted voltage on the rear window defogger control circuit.

POSSIBLE CAUSES
CODE ACTIVE
REAR DEFOGGER RELAY SHORTED
JUNCTION BLOCK - REAR DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Attempt to operate the Rear Window Defogger. With the DRBIII®, read DTCs. Does the DRBIII® display REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Rear Window Defogger Relay from the Junction Block. Install a substitute relay in place of the Rear Window Defogger Relay. With the DRBIII®, erase DTCs. Attempt to operate the Rear Window Defogger. With the DRBIII®, read DTCs. Does the DRBIII® display REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

REAR DEFOGGER RELAY CONTROL CIRCUIT SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Rear Window Defogger Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Turn the ignition on. Measure the voltage of the Rear Window Defogger Relay Control circuit in the relay connector of the Junction Block. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*REAR WINDOW DEFOGGER INOPERATIVE

POSSIBLE CAUSES
JUNCTION BLOCK FUSE 30
PDC FUSE 19
REAR DEFOGGER RELAY DTC'S
REAR WINDOW DEFOGGER RELAY OUTPUT CIRCUIT OPEN
REAR WINDOW DEFOGGER RELAY
REAR WINDOW DEFOGGER GRID OPEN
FUSED B(+) CKT OPEN AT RELAY
A/C-HEATER CONTROL
OPEN GROUND CIRCUIT
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT CIRCUIT OPEN
REAR WINDOW DEFOGGER CONTROL OPEN
BODY CONTROL MODULE
A/C-HEATER CONTROL LED

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read the Body Control Module DTC's. Are there any Rear Defogger Relay DTC's present? Yes → Refer to the symptom list for problems related to Rear Defogger Relay DTC's. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Toggle the Rear Defogger switch and observe the indicator. Does the indicator toggle on and off when the switch is pressed? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition on. Turn the Rear Window Defogger on. Measure the voltage between the Rear Window Defogger Relay Output circuit at the defogger grid on the rear window to ground. Is the voltage above 12.0 volts? Yes → Repair the open in the Rear Window Defogger Grid or the Grid Ground circuit. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Rear Window Defogger Relay Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*REAR WINDOW DEFOGGER INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	With the DRBIII® in Inputs/Outputs, read the R Defogger SW state. Cycle the Rear Defogger On/Off button and observe the DRBIII. Did the DRBIII® display change from Open to Closed? Yes → Go To 5 No → Go To 10	All
5	Check the Power Distribution Center fuse 19. Is the fuse open. Yes → Check for a short to ground and replace the PDC fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Check Junction Block fuse 30. Is the fuse open. Yes → Check for a short to ground and replace the Junction Block fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	Remove the Rear Window Defogger Relay from the Junction Block. Measure the voltage of the Fused B(+) circuit in the Rear Window Defogger Relay connector. Is the voltage above 10.0 volts? Yes → Go To 8 No → Repair the open Fused B(+) circuit from PDC fuse #19. Perform BODY VERIFICATION TEST - VER 1.	All
8	Remove the Rear Window Defogger Relay from the Junction Block. Install a known good relay in the Rear Window Defogger Relay connector. Turn the ignition on. Toggle the Rear Window Defogger switch and observe the indicator. Does the Rear Window Defogger indicator illuminate? Yes → Replace the original Rear Window Defogger Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 9	All
9	Gain access to the A/C Heater Control C2 connector. Toggle the Rear Window Defogger switch in the next step. While back probing, measure the voltage of the Fused Rear Window Defogger Relay Output circuit. Is there any voltage present? Yes → Replace the A/C-Heater Control. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fused Rear Window Defogger Relay Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*REAR WINDOW DEFOGGER INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the A/C-Heater Control C2 connector. Turn of all interior lights. Measure the resistance of the Ground circuit in the C2 connector. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
11	Turn the ignition off. Disconnect the A/C-Heater Control C2 connector. With the DRBIII® in Inputs/Outputs, read the R Defogger SW state. Connect a jumper wire between Rear Window Defogger Control and ground. Did the DRBIII® display change from Open to Closed? Yes → Replace the A/C-Heater Control. Perform BODY VERIFICATION TEST - VER 1. No → Go To 12	All
12	Turn the ignition off. Disconnect the A/C-Heater Control C2 connector. Disconnect the Body Control Module C1 connector. Measure the resistance of the Rear Window Defogger Control circuit between the A/C- Heater Control C2 connector and the Body Control Module C1 connector. Is the resistance below 5.0 ohms? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Rear Window Defogger Control circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
FRONT FOG RELAY CIRCUIT HIGH

When Monitored and Set Condition:

FRONT FOG RELAY CIRCUIT HIGH

When Monitored: With ignition on(if equipped)

Set Condition: BCM detects battery on the Front Fog Relay when it is attempting to turn on the Front Fog Lamps for more than 5 seconds. The BCM learns that the Front Fog Options exists on a vehicle when it detects a ground on the Front Fog Switch Input circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN FUSE
FOG LAMP RELAY
BODY CONTROL MODULE
FOG LAMP RELAY CONTROL CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Fog Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: FRONT FOG RELAY CKT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the Junction Block to make certain the Fog Lamp Relay is present. Is the Fog Lamp Relay present? Yes → Go To 3 No → Replace the missing Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check Junction Block fuse #19. Is the fuse open? Yes → Replace the open fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

FRONT FOG RELAY CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the fog lamp relay. Turn the Fog Lamps On. Do the Fog Lamps operate normally? Yes → Replace the Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Fog Lamp Relay. Measure the voltage of the Fused B+ circuit of the fog lamp relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fog Lamp Relay Control Circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
FRONT FOG RELAY CIRCUIT LOW

When Monitored and Set Condition:

FRONT FOG RELAY CIRCUIT LOW

When Monitored: With the ignition on.

Set Condition: BCM detects a low (ground) on the Front Fog Relay even though it is not attempting to turn on the Front Fog Lamps for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FRONT FOG RELAY SHORT TO GROUND
FRONT FOG RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Fog Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: FRONT FOG RELAY CKT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Front Fog Relay. Measure the resistance between ground and the Front Fog Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Front Fog Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Front Fog Relay harness connector. Measure the voltage of the Front Fog Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
HEADLAMP SWITCH INPUT CIRCUIT HIGH

When Monitored and Set Condition:

HEADLAMP SWITCH INPUT CIRCUIT HIGH

When Monitored: Ignition ON

Set Condition: The BCM detects a voltage greater than 4.75 V on the Headlamp Switch Input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HEADLAMP SWITCH OPEN
HEADLAMP SWITCH MUX CIRCUIT OPEN
HEADLAMP SWITCH RETURN CIRCUIT OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase all BCM DTC's. Turn the headlamps to the ON position. With the DRBIII®, read DTCs. Does the DRBIII® display: HEADLAMP SWITCH INPUT CKT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Headlamp Switch harness connector. Connect a jumper wire between the Headlamp Switch MUX circuit and the Headlamp Switch Return circuit in the Headlamp Switch harness connector. Turn the ignition on. With the DRBIII®, select Body, Body Controller and read: Headlamp Switch volts. Does the DRBIII® display Headlamp Switch voltage below 0.5volts? Yes → Replace the Headlamp Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

HEADLAMP SWITCH INPUT CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Headlamp Switch harness connector. Measure resistance of the Headlamp Switch MUX circuit from the Body Control Module connector to the Headlamp Switch harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Headlamp Switch MUX circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Headlamp Switch harness connector. Measure resistance of the Headlamp Switch Return circuit from the Body Control Module connector to the Headlamp Switch harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Headlamp Switch Return circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
HEADLAMP SWITCH INPUT CIRCUIT LOW

When Monitored and Set Condition:

HEADLAMP SWITCH INPUT CIRCUIT LOW

When Monitored: Ignition On

Set Condition: BCM detects a voltage less than 0.25 volts on the Headlamp Switch Input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HEADLAMP SWITCH SHORTED
HEADLAMP SWITCH MUX CIRCUIT SHORT TO RETURN CIRCUIT
HEADLAMP SWITCH MUX CIRCUIT SHORT TO GROUND
HEADLAMP SWITCH RETURN CIRCUIT SHORT TO GROUND
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the headlamps to the ON position. With the DRBIII®, read DTCs. Does the DRBIII® display: HEADLAMP SWITCH INPUT CKT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Headlamp Switch harness connector. Turn the ignition on. With the DRBIII®, select Body, Body Control Module and read: Headlamp Switch voltage.. Does the DRBIII® display Headlamp Switch voltage above 4.8 volts? Yes → Replace the Headlamp Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

HEADLAMP SWITCH INPUT CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Headlamp Switch harness connector. Measure resistance between the Headlamp Switch Return circuit and the Headlamp Switch MUX circuit. Is the resistance below 5.0 ohms? Yes → Repair the Headlamp Switch MUX circuit for a short to the Headlamp Switch Return circuit. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Headlamp Switch harness connector. Measure resistance between ground and the Headlamp Switch MUX circuit. Is the resistance above 5.0 ohms? Yes → Repair the Headlamp Switch MUX Circuit for a short to ground condition. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Headlamp Switch harness connector. Measure resistance between ground and the Headlamp Switch Return circuit. Is the resistance below 5.0 ohms? Yes → Repair the Headlamp Switch Return Circuit for a short to ground condition. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
HIGH BEAM RELAY CIRCUIT HIGH

When Monitored and Set Condition:

HIGH BEAM RELAY CIRCUIT HIGH

When Monitored: With ignition on

Set Condition: BCM detects battery on the High Beam Relay when it is attempting to turn on the High Beams for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN FUSE
HIGH BEAM RELAY
MULTIFUNCTION SWITCH
HIGH BEAM SWITCH SENSE CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the High Beams on. With the DRBIII®, read the DTC information. Does the DRBIII® read: HIGH BEAM RELAY CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the Junction Block to make certain the High Beam Relay is present. Is the High Beam Relay present? Yes → Go To 3 No → Replace the missing High Beam Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check the Junction Block High Beam fuses #26 and #27. Are any of the fuses open? Yes → Replace the open fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

HIGH BEAM RELAY CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the High Beam Relay. Turn the High Beams On. Do the High Beams operate normally? Yes → Replace the High Beam Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Disconnect the Multifunction Switch harness connector C1. Disconnect the BCM C2 connector. Measure the resistance of the High Beam Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Repair the High Beam Switch Sense circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
LOW BEAM RELAY CIRCUIT HIGH

When Monitored and Set Condition:

LOW BEAM RELAY CIRCUIT HIGH

When Monitored: With ignition on

Set Condition: BCM detects battery on the Low Beam Relay when it is attempting to turn on the Low Beams for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN FUSE
LOW BEAM RELAY
BODY CONTROL MODULE
FUSED LOW BEAM RELAY OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Low Beams on. With the DRBIII®, read the DTC information. Does the DRBIII® read: LOW BEAM RELAY CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the Junction Block to make certain the Low Beam Relay is present. Is the Low Beam Relay present? Yes → Go To 3 No → Replace the missing Low Beam Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check the Junction Block Low Beam fuses #4 and #5. Are any of the fuses open? Yes → Replace the open fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

LOW BEAM RELAY CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the Low Beam Relay. Turn the Low Beams On. Do the Low Beams operate normally? Yes → Replace the Low Beam Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Low Beam Relay. Measure the voltage of the Fused B+ circuit of the Low Beam Relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fused Low Beam Relay Output circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
LOW BEAM RELAY CIRCUIT LOW

When Monitored and Set Condition:

LOW BEAM RELAY CIRCUIT LOW

When Monitored: With ignition on

Set Condition: BCM detects a low (ground) on the Low Beam Relay even though it is not attempting to turn on the Low Beams for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
LOW BEAM RELAY SHORT TO GROUND
LOW BEAM RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Low Beams on. With the DRBIII®, read the DTC information. Does the DRBIII® read: LOW BEAM RELAY CKT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Low Beam Relay. Measure the resistance between ground and the Low Beam Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Low Beam Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Low Beam Relay harness connector. Measure the voltage of the Low Beam Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Low Beam Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
PARK LAMP RELAY CIRCUIT HIGH

When Monitored and Set Condition:

PARK LAMP RELAY CIRCUIT HIGH

When Monitored: With the ignition on

Set Condition: BCM detects battery on the Park Lamp Relay when it is attempting to turn on the Park Lamps for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN FUSE
PARK LAMP RELAY
BODY CONTROL MODULE
FUSED PARK LAMP RELAY OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Park Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: PARK LAMP RELAY CKT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the Junction Block to make certain the Park Lamp Relay is present. Is the Park Lamp Relay present? Yes → Go To 3 No → Replace the missing Park Lamp Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check the Junction Block Park Lamp fuses #23 and #9. Are any of the fuses open? Yes → Replace the open fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

PARK LAMP RELAY CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the Park Lamp Relay. Turn the Park Lamps On. Do the Park Lamps operate normally? Yes → Replace the Park Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Park Lamp Relay. Measure the voltage of the Fused B+ circuit of the Park Lamp Relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fused Park Lamp Relay Output circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
PARK LAMP RELAY CIRCUIT LOW

When Monitored and Set Condition:

PARK LAMP RELAY CIRCUIT LOW

When Monitored: With ignition on.

Set Condition: BCM detects a low (ground) on the Park Lamp Relay even though it is not attempting to turn on the Park Lamps for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
PARK LAMP RELAY SHORT TO GROUND
PARK LAMP RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Park Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: PARK LAMP RELAY CKT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Park Lamp Relay. Measure the resistance between ground and the Park Lamp Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Park lamp Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Park Lamp Relay harness connector. Measure the voltage of the Park Lamp Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Park Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
REAR FOG RELAY CIRCUIT HIGH

When Monitored and Set Condition:

REAR FOG RELAY CIRCUIT HIGH

When Monitored: With the ignition on.

Set Condition: BCM detects battery on the Rear Fog Relay when it is attempting to turn on the Front Fog Lamps for more than 5 seconds. The BCM is programmed per Country Code whether or not a vehicle is equipped with a Rear Fog Relay.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN FUSE
FOG LAMP RELAY
BODY CONTROL MODULE
FOG LAMP RELAY CONTROL CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Fog Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: REAR FOG RELAY CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the Junction Block to make certain the Rear Fog Lamp Relay is present. Is the Rear Fog Lamp Relay present? Yes → Go To 3 No → Replace the missing Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check Junction Block fuse 2. Is the fuse open? Yes → Replace the open fuse. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

REAR FOG RELAY CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the Rear Fog Lamp Relay. Turn the Fog Lamps On. Do the Rear Fog Lamps operate normally? Yes → Replace the Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Fog Lamp Relay. Measure the voltage of the Fused B+ circuit of the Fog Lamp Relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fog Lamp Relay Control Circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
REAR FOG RELAY CIRCUIT LOW

When Monitored and Set Condition:

REAR FOG RELAY CIRCUIT LOW

When Monitored: With the ignition on.

Set Condition: BCM detects a low (ground) on the Fog Relay even though it is not attempting to turn on the Rear Fog Lamps for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
REAR FOG RELAY SHORT TO GROUND
REAR FOG RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Fog Lamps on. With the DRBIII®, read the DTC information. Does the DRBIII® read: Rear Fog Relay Circuit Low? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Rear Fog Relay. Measure the resistance between ground and the Rear Fog Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Rear Fog Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Rear Fog Relay harness connector from the Junction Block. Measure the voltage of the Rear Fog Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Rear Fog Lamp Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LOW BEAM HEADLAMPS INOPERATIVE

POSSIBLE CAUSES
INTERMITTENT CONDITION
LOW BEAM RELAY
OPEN FUSED B+ CIRCUIT
LOW BEAM RELAY CONTROL CIRCUIT
LOW BEAM RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the Low Beams on. Do the Low Beam Headlamps operate properly? Yes → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Remove the Low Beam Relay from the Junction Block. Install a known good relay in place of the Low Beam Relay. With the DRBIII®, actuate the Low Beam Relay. Do the Headlamps flash while actuating the Low Beam Relay? Yes → Replace the Low Beam Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Remove the Low Beam Relay from the Junction Block. Measure the voltage of the Fused B(+) circuit at the Low Beam Relay connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open fused B+ circuit. Perform BODY VERIFICATION TEST - VER 1.	All
4	Remove the BCM from the junction block. Connect a jumper wire between the Fused B(+) circuit and the Low Beam Relay Control circuit at the Low Beam Relay connector. Measure the voltage of the Low Beam Relay Control circuit to the BCM Junction Block connector. Is the voltage above 10.0 volts? Yes → Go To 5 No → Repair the Low Beam Relay Control circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

*LOW BEAM HEADLAMPS INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
5	Disconnect the jumper wire. Reinstall the Low Beam Relay in the Junction Block. Remove the BCM from the junction block. Measure the voltage of the Low Beam Relay Control circuit to the BCM internal connector. Is the voltage above 10.0 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Low Beam Relay. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

ABS LAMP CIRCUIT SHORT
ABS LAMP OPEN
AIRBAG LAMP CIRCUIT SHORT
AIRBAG LAMP OPEN
BRAKE LAMP CIRCUIT OPEN
BRAKE LAMP CIRCUIT SHORT
MIL LAMP CIRCUIT OPEN
MIL LAMP CIRCUIT SHORT
SEATBELT LAMP CIRCUIT OPEN
SEATBELT LAMP CIRCUIT SHORT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ABS LAMP CIRCUIT SHORT.

When Monitored and Set Condition:

ABS LAMP CIRCUIT SHORT

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

ABS LAMP OPEN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

AIRBAG LAMP CIRCUIT SHORT

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

AIRBAG LAMP OPEN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

BRAKE LAMP CIRCUIT OPEN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

ABS LAMP CIRCUIT SHORT — Continued

BRAKE LAMP CIRCUIT SHORT

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

MIL LAMP CIRCUIT OPEN

When Monitored: With the ignition in the Ru/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open during internal self test.

MIL LAMP CIRCUIT SHORT

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

SEATBELT LAMP CIRCUIT OPEN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

SEATBELT LAMP CIRCUIT SHORT

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects Indicator short/open fault during internal self test.

POSSIBLE CAUSES
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: The Instrument Cluster performs internal tests on the MIL, Seatbelt, Brake, ABS, and Airbag indicators during each ignition cycle. Instrument Cluster LEDs are not serviceable.** With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 1 minute. With the DRBIII®, read DTCs. Did the Indicator lamp circuit Open or Short DTC reset? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
BRAKE FLUID SWITCH CIRCUIT OPEN

When Monitored and Set Condition:

BRAKE FLUID SWITCH CIRCUIT OPEN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The cluster performs open circuit detection on the Brake Fluid Level (Red Brake Warning Indicator Driver) switch and the sense circuit. Fault sets if an open circuit is detected. When this fault is detected the cluster will illuminate the Brake warning indicator.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BRAKE FLUID LEVEL SWITCH
BRAKE FLUID LEVEL SWITCH GROUND CIRCUIT
RED BRAKE WARNING INDICATOR DRIVER CIRCUIT
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the Brake Fluid Level Switch harness connector is properly connected.** With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 15 seconds. With the DRBIII®, read DTCs. Does the DRBIII® display BRAKE FLUID SWITCH CIRCUIT OPEN? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connectors. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Brake Fluid Level Switch harness connector. Check connectors - Clean/repair as necessary. Measure the internal resistance of the Brake Fluid Level (Red Brake Warning Indicator Driver) Switch. Is the resistance above 1.1k (1,100) ohms? Yes → Replace the Brake Fluid Level (Red Brake Warning Indicator Driver) Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

BRAKE FLUID SWITCH CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Brake Fluid Level Switch harness connector. Check connectors - Clean/repair as necessary. Measure the resistance between ground and the Brake Fluid Level Switch Ground circuit. Is the resistance above 5.0 ohms? Yes → Repair the Brake Fluid Level (Red Brake Warning Indicator Driver) Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Brake Fluid Level Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance of the Red Brake Warning Indicator Driver circuit. Is the resistance above 5.0 ohms? Yes → Repair the Red Brake Warning Indicator Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
CLUSTER BUS TRANSMIT SHUTDOWN

When Monitored and Set Condition:

CLUSTER BUS TRANSMIT SHUTDOWN

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects loss of internal bus transmission for 4 seconds.

POSSIBLE CAUSES
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 1 minute. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Replace the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CLUSTER WAKE UP OUTPUT HIGH

When Monitored and Set Condition:

CLUSTER WAKE UP OUTPUT HIGH

When Monitored: With the ignition in the OFF position.

Set Condition: When the BCM receives an input from the driver door switch or an input from exterior lamp control switch. Symptoms will include: No fast chime with key in ignition or Park Lamps on and driver door open. No VF odometer display when door open. No cluster, high beam indicator, front or rear fog lamp indicator illumination.

POSSIBLE CAUSES
INSTRUMENT CLUSTER WAKE UP SIGNAL CIRCUIT SHORT TO VOLTAGE
INTERMITTENT CONDITION
BODY CONTROL MODULE
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the BCM C1 harness connector. Disconnect the Instrument Cluster harness connector. Measure the voltage between the Instrument Cluster Wake Up Signal circuit and ground. Is there any voltage present? Yes → Repair the Instrument Cluster Wake Up Signal circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Ensure that the BCM C1 harness connector is connected. Measure the voltage between the Cluster Wake Up circuit and ground. Is there any voltage present? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

CLUSTER WAKE UP OUTPUT HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Ensure that the Instrument Cluster and BCM C1 harness connectors are connected. Turn the ignition on. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → The condition is not present at this time. Monitor DRBIII® DTCs while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.	All

Symptom:
CLUSTER WAKE UP OUTPUT LOW

When Monitored and Set Condition:

CLUSTER WAKE UP OUTPUT LOW

When Monitored: With the ignition in the OFF position.

Set Condition: When the BCM receives an input from the driver door switch or an input from exterior lamp control switch. Symptoms will include: No fast chime with key in ignition or Park Lamps on and driver door open. No VF odometer display when door open. No cluster, high beam indicator, front or rear fog lamp indicator illumination.

POSSIBLE CAUSES
FUSED B(+) CIRCUIT OPEN
INSTRUMENT CLUSTER WAKE UP SIGNAL CIRCUIT OPEN
INTERMITTENT CONDITION
INSTRUMENT CLUSTER WAKE UP SIGNAL CIRCUIT SHORT TO GROUND
BODY CONTROL MODULE
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Measure the voltage between the Fused B(+) circuit and ground. Is the voltage above 10.5 volts? Yes → Go To 2 No → Repair the Fused B(+) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Disconnect the BCM C1 harness connector. Measure the resistance of the Instrument Cluster Wake Up Signal circuit. Is the resistance above 5.0 ohms? Yes → Repair the Instrument Cluster Wake Up Signal circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

CLUSTER WAKE UP OUTPUT LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Disconnect the BCM C1 harness connector. Measure the resistance between ground and the Cluster Wake Up circuit. Is the resistance below 5.0 ohms? Yes → Repair the Instrument Cluster Wake Up Signal circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Ensure that the BCM C1 harness connector is connected. Install a DVOM between the Cluster Wake Up circuit of the Instrument Cluster harness connector and ground. Set the DVOM to read resistance. Turn the ignition on. With the DRBIII®, select Body Control Module, then Actuators. Observe the DVOM while using the DRBIII® to actuate the Cluster Wake Up "on." Did the DVOM indicate a brief (2 second) continuity to ground? Yes → Go To 5 No → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Ensure that the Instrument Cluster and BCM C1 harness connectors are connected. Open the driver door or actuate the High Beam Headlamps with the key off. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → The condition is not present at this time. Monitor DRBIII® DTCs while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.	All

Symptom:
NO ABS BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO ABS BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no ABS bus messages for 6 continuous seconds. The cluster will illuminate the ABS warning indicator.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS - CAB MODULE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, attempt to communicate with the CAB module. Was the DRBIII® able to I/D or communicate with the CAB module? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO BCM BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO BCM BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no BCM bus message for 6 seconds.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS - BCM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, attempt to communicate with the BCM. Was the DRBIII® able to I/D or communicate with the BCM? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO ORC BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO ORC BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no ORC bus message for 6 seconds. The cluster will illuminate the Airbag warning indicator.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS - ORC
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, attempt to communicate with the ACM. Was the DRBIII® able to I/D or communicate with the ACM? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO PCI BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO PCI BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no PCI Bus messages for 4 continuous seconds. The VF will display ″no bus.″ The cluster will illuminate the ABS, Fuel, SKIM, Airbag, and MIL warning indicators. All guage needles will default to the lowest indication.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS
INTERMITTENT CONDITION
NO RESPONSE - PCI BUS - INSTRUMENT CLUSTER
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: When the Instrument Cluster detects no PCI Bus, the VF will display ″no bus″.** With the DRBIII®, attempt to communicate with other modules on the PCI Bus. Was the DRBIII® able to communicate with other modules? Yes → Go To 2 No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition on. With the DRBIII®, select System Monitors, then J1850 Module Scan. Does the DRBIII® display MIC PRESENT on the BUS? Yes → Go To 3 No → Refer to symptom ″No Response from Instrument Cluster in the Communication″ category. Perform BODY VERIFICATION TEST - VER 1.	All

NO PCI BUS MESSAGES RECEIVED — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 1 minute. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Replace the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO PCM BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO PCM BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no PCM bus message for 20 seconds. The cluster will illuminate the MIL indicator.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS - PCM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, attempt to communicate with the PCM. Was the DRBIII® able to I/D or communicate with the PCM? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
NO SKIM BUS MESSAGES RECEIVED

When Monitored and Set Condition:

NO SKIM BUS MESSAGES RECEIVED

When Monitored: With the ignition in the Run/Start position.

Set Condition: The Instrument Cluster detects no SKIM bus message for 20 seconds. The cluster will illuminate the SKIM warning indicator.

POSSIBLE CAUSES
NO RESPONSE - PCI BUS - SKIM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the vehicle is equipped with the SKIM feature before proceeding with this test.** With the DRBIII®, attempt to communicate with the SKIM module. Was the DRBIII® able to I/D or communicate with the SKIM module? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1. No → Refer to the COMMUNICATION category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
TIRE SIZE NOT PROGRAMMED

When Monitored and Set Condition:

TIRE SIZE NOT PROGRAMMED

When Monitored: When the battery is connected.

Set Condition: Tire size is not programmed to a valid size. The default condition for a new BCM is un-programmed. The BCM must be programmed with a valid tire size or the speedometer will default to Zero and this code will set.

POSSIBLE CAUSES
PROGRAM TIRE SIZE

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Body Computer, select Miscellaneous, then select Program Tire Size. Program the appropriate tire size. With the DRBIII®, erase DTCs. Turn the ignition off, wait 15 seconds, then turn the ignition on. With the DRBIII®, read DTCs. Did this DTC reset? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
VEHICLE SPEED SENSOR FAILURE

When Monitored and Set Condition:

VEHICLE SPEED SENSOR FAILURE

When Monitored: With ignition on.

Set Condition: If the BCM detects the current on the Vehicle Speed Sensor (rear wheel speed sensor) input is out of range for more than 5 seconds, this code will set. The sensor supplies a square wave signal to the BCM whose period varies with the vehicle speed.

POSSIBLE CAUSES
ABS DTC'S PRESENT
VEHICLE SPEED SENSOR FAILURE DTC PRESENT - ABS
VEHICLE SPEED SENSOR FAILURE DTC PRESENT- NON/ABS
VEHICLE SPEED SENSOR SUPPLY CIRCUIT SHORT TO GROUND
VEHICLE SPEED SIGNAL CIRCUIT SHORT TO GROUND
VEHICLE SPEED SIGNAL SHORT TO GROUND - NON/ABS
VEHICLE SPEED SENSOR SUPPLY CIRCUIT OPEN
VEHICLE SPEED SIGNAL CIRCUIT SHORT TO VOLTAGE
VEHICLE SPEED SIGNAL SHORT TO VOLTAGE - NON/ABS
VEHICLE SPEED SIGNAL CIRCUIT OPEN
VEHICLE SPEED SIGNAL OPEN - NON/ABS
VEHICLE SPEED SENSOR
BODY CONTROL MODULE - VEHICLE SPEED SENSOR SUPPLY OPEN
BODY CONTROL MODULE - VEHICLE SPEED SIGNAL OPEN
BODY CONTROL MODULE - VEHICLE SPEED SIGNAL OPEN - NON/ABS

TEST	ACTION	APPLICABILITY
1	Is this vehicle equipped with the Antilock Brake System? Yes → Go To 2 No → Go To 8	All
2	With the DRBIII®, read DTCs in Antilock Brakes. Does the DRBIII® display any Antilock Brake DTC's? Yes → Refer to the appropriate category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

VEHICLE SPEED SENSOR FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, record and erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display VEHICLE SPEED SENSOR FAILURE? Yes → Go To 4 No → The DTC is intermittent. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Perform BODY VERIFICATION TEST - VER 1.	All
4	Disconnect the Controller Antilock Brake connector. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Signal circuit. Is the resistance below 1000.0 ohms? Yes → Repair the Vehicle Speed Signal circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Disconnect the Controller Antilock Brake connector. Disconnect the Body Control Module C2 connector. Measure the voltage between the Vehicle Speed Signal circuit and ground. Is there any voltage present? Yes → Repair the Vehicle Speed Signal circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Disconnect the Controller Antilock Brake connector. Connect a jumper wire between Vehicle Speed Signal circuit in the CAB connector and ground. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Signal circuit in the BCM connector.. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Vehicle Speed Signal circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
7	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
8	With the DRBIII®, record and erase DTC's. Drive the vehicle for a short distance. With the DRBIII®, read DTCs. Does the DRBIII® display VEHICLE SPEED SENSOR FAILURE? Yes → Go To 9 No → The DTC is intermittent. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Perform BODY VERIFICATION TEST - VER 1.	All

VEHICLE SPEED SENSOR FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition on. Disconnect the Rear Wheel Speed Sensor connector. Measure the voltage between the Vehicle Speed Sensor Supply circuit and ground. Is the voltage above 10.0 volts? Yes → Go To 10 No → Go To 15	All
10	Turn the ignition on. Disconnect the Rear Wheel Speed Sensor connector. Measure the resistance between ground and the Vehicle Speed Signal circuit in the harness connector. Is the resistance between 100.0 and 300.0 ohms? Yes → Replace the Vehicle Speed Sensor in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 11	All
11	Disconnect the Rear Vehicle Speed Sensor connector. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Signal circuit in the harness connector. Is the resistance below 1000.0 ohms? Yes → Repair the Vehicle Speed Signal circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 12	All
12	Disconnect the Vehicle Speed Sensor connector. Disconnect the Body Control Module C2 connector. Measure the voltage between the Vehicle Speed Signal circuit and ground. Is there any voltage present? Yes → Repair the Vehicle Speed Signal circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 13	All
13	Disconnect the Vehicle Speed Sensor connector. Connect a jumper wire between Vehicle Speed Signal circuit in the Vehicle Speed Sensor connector and ground. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Signal circuit in the BCM connector.. Is the resistance below 5.0 ohms? Yes → Go To 14 No → Repair the Vehicle Speed Signal circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
14	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

VEHICLE SPEED SENSOR FAILURE — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the Rear Wheel Speed Sensor connector. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Sensor Supply circuit. Is the resistance below 100.0 ohms? Yes → Repair the Vehicle Speed Sensor Supply circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 16	All
16	Turn the ignition off. Disconnect the Rear Wheel Speed Sensor connector. Connect a jumper wire between Vehicle Speed Sensor Supply circuit and ground. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Vehicle Speed Sensor Supply circuit. Is the resistance below 5.0 ohms? Yes → Go To 17 No → Repair the Vehicle Speed Sensor Supply circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
17	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*4WD INDICATOR INACCURATE

POSSIBLE CAUSES
4WD MODE SENSOR DTC PRESENT
INTERMITTENT CONDITION
TRANSFER CASE POSITION SENSOR
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: With the DRBIII®, ensure that the Instrument Cluster is configured for the correct transfer case before proceeding with this test.** With the DRBIII®, read DTCs. Does the DRBIII® display any 4WD Mode Sensor DTCs? Yes → Refer to the DRIVEABILITY category and perform the appropriate symptom. No → Go To 2	All
2	Perform the Instrument Cluster Self Test. Depress and hold the Trip Odometer reset button while turning the ignition from the off to the on position. Did the 4WD indicator in question illuminate? Yes → Go To 3 No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition on. With the DRBIII® in Sensors, read the T-Case Position while moving the transfer case shift lever through all of the positions. The DRBIII® should display the following values: 4WD Lo: 0.96 - 1.35 volts Nuetral: 2.39 - 2.76 volts Full Time: 3.2 - 3.5 volts Part Time: 3.7 - 4.0 volts 2WD: 4.17 - 4.45 volts Is the Transfer Case Position voltage within the specified ranges? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. No → Replace the Transfer Case Position Sensor in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*4WD INDICATOR INACCURATE - DIESEL ONLY

POSSIBLE CAUSES
4WD MODE SENSOR DTC PRESENT
INTERMITTENT CONDITION
TRANSFER CASE POSITION SENSOR
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: With the DRBIII®, ensure that the Instrument Cluster is configured for the correct transfer case before proceeding with this test.** With the DRBIII®, read DTCs. Does the DRBIII® display any 4WD Mode Sensor DTCs? Yes → Refer to the DRIVEABILITY category and perform the appropriate symptom. No → Go To 2	All
2	Perform the Instrument Cluster Self Test. Depress and hold the Trip Odometer reset button while turning the ignition from the off to the on position. Did the 4WD indicator in question illuminate? Yes → Go To 3 No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition on. With the DRBIII® in Sensors, read the T-Case Position while moving the transfer case shift lever through all of the positions. The DRBIII® should display the following values: 4WD Lo: 0.15 - 0.40 volts Nuetral: 0.68 - 0.98 volts Full Time: 1.23 - 1.56 volts Part Time: 1.78 - 2.12 volts 2WD: 2.43 - 2.77 volts Is the Transfer Case Position voltage within the specified ranges? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals. No → Replace the Transfer Case Position Sensor in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*ALL GAUGES INOPERATIVE

POSSIBLE CAUSES
NO RESPONSE - PCI BUS
NO RESPONSE - PCI BUS - POWERTRAIN CONTROL MODULE
NO RESPONSE - PCI BUS - INSTRUMENT CLUSTER
FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER GROUND CIRCUIT OPEN
FUSED IGNITION CIRCUIT OPEN
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, select System Monitors, then J1850 Module Scan. Does the DRBIII® display MIC PRESENT on the BUS? Yes → Go To 2 No → Refer to the COMMUNICATION category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition on. With the DRBIII®, select Body, MIC, SYSTEM TESTS, PCM Monitor. Does the DRBIII® display PCM INACTIVE on the BUS? Yes → Refer to the symptom list for problems related to *NO RESPONSE FROM THE POWERTRAIN CONTROL MODULE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition on. With the DRBIII®, select Body, MIC, MODULE DISPLAY. Does the DRBIII® display NO RESPONSE from MIC? Yes → Refer to the symptom list for problems related to *NO RESPONSE FROM THE INSTRUMENT CLUSTER. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*ALL GAUGES INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Inspect the #13 Fuse in the Junction Block. If the fuse is open, replace with proper rated fuse. Turn the ignition on for one minute. Turn the ignition off. Inspect the #13 Fuse in the Junction Block. Is the fuse open? Yes → Repair the Fused Ignition Switch Output circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Turn the ignition on. Measure the voltage between the Fused Ignition Switch Output circuit and ground. Is the voltage above 10.5 volts? Yes → Go To 6 No → Repair the Fused Ignition Switch Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Measure the resistance between ground and the Instrument Cluster Ground circuit. Is the resistance below 5.0 ohms? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Instrument Cluster Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ANY PCI BUS INDICATOR INOPERATIVE

POSSIBLE CAUSES
INDICATOR MESSAGE NOT RECEIVED
NO RESPONSE - INSTRUMENT CLUSTER
NO RESPONSE - PCI BUS
NO RESPONSE - PCI BUS - POWERTRAIN CONTROL MODULE
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, select System Monitors, then J1850 Module Scan. Does the DRBIII® display MIC PRESENT on the BUS? Yes → Go To 2 No → Refer to the COMMUNICATION category and perform the appropriate symptom.	All
2	Turn the ignition on. With the DRBIII®, select MIC, then MODULE DISPLAY. Does the DRBIII® display NO RESPONSE from MIC? Yes → Refer to the symptom list for problems related to *NO RESPONSE FROM THE INSTRUMENT CLUSTER. No → Go To 3	All
3	Turn the ignition on. With the DRBIII®, select Body, MIC, MONITORS, PCI BUS MONITORS. Does the DRBIII® display PCM INACTIVE on the BUS? Yes → Refer to the symptom list for problems related to *NO RESPONSE FROM THE POWERTRAIN CONTROL MODULE. No → Go To 4	All
4	**NOTE: Diagnose and repair any PCM or BCM DTCs before proceeding with this test.** Perform the Instrument Cluster Self Test. Depress and hold the Trip Odometer button while turning the ignition from the off to the on position. Observe the indicator in question. Did the indicator illuminate? Yes → Refer to the appropriate Service Information category to diagnose the related system. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*BRAKE INDICATOR ALWAYS ON

POSSIBLE CAUSES
BRAKE FLUID LEVEL SWITCH CIRCUIT DTC PRESENT
BRAKE FLUID LEVEL SWITCH
RED BRAKE WARNING INDICATOR DRIVER CIRCUIT SHORT TO GROUND
PARK BRAKE SWITCH
PARK BRAKE SWITCH SENSE CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the Brake Fluid Level is properly filled and the Brake Fluid Level Switch harness connector is properly connected.** With the DRBIII®, erase DTCs. Cycle the ignition and wait approximately 15 seconds. With the DRBIII®, read DTCs. Does the DRBIII® display ″BRAKE FLUID LEVEL SWITCH CIRCUIT OPEN? Yes → Refer to symptom list for problems related to ″BRAKE FLUID SWITCH CIRCUIT OPEN″. No → Go To 2	All
2	Turn the ignition off. Disconnect the Brake Fluid Level Switch harness connector. Measure the resistance of the Brake Fluid Level Switch. Is the resistance below 900 ohms? Yes → Replace the Brake Fluid Level Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Brake Fluid Level Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance between ground and the Red Brake Warning Indicator Driver circuit. Is the resistance below 5.0 ohms? Yes → Repair the Red Brake Warning Indicator Driver circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*BRAKE INDICATOR ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure that the Brake Fluid Level Switch and Instrument Cluster harness connectors are properly connected.** Disconnect the Park Brake Switch harness connector. With the DRBIII® in Inputs/Outputs, read the Park Brake Switch state. Does the DRBIII® display ″Open″? Yes → Replace the Park Brake Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Park Brake Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance between ground and the Park Brake Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the Park Brake Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*BRAKE INDICATOR INOPERATIVE

POSSIBLE CAUSES
BRAKE FLUID LEVEL SWITCH
PARK BRAKE SWITCH
PARK BRAKE SWITCH SENSE CIRCUIT OPEN
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Is the BRAKE indicator only inoperative with the Park Brake engaged? Yes → Go To 2 No → Replace the Brake Fluid Level Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Park Brake Switch harness connector. Connect a jumper wire between the Park Brake Switch Sense circuit and ground. Turn the ignition on. Observe the BRAKE indicator. Did the BRAKE indicator illuminate? Yes → Replace the Park Brake Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Park Brake Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance of the Park Brake Switch Sense circuit. Is the resistance above 5.0 ohms? Yes → Repair the Park Brake Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*FUEL GAUGE INACCURATE

POSSIBLE CAUSES
FUEL LEVEL SENSOR DTC PRESENT
INTERMITTENT CONDITION
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Diagnose and repair any PCM Fuel Level DTCs before proceeding with this test.** With the DRBIII®, read DTCs. Does the DRBIII® display any Fuel Level Sensor DTCs? Yes → Refer to symptom list for problems related to Fuel Level Sensor DTCs. No → Go To 2	All
2	Perform the Instrument Cluster Self Test. Depress and hold the Trip Odometer reset button while turning the ignition on. **NOTE: The Instrument Cluster Self Test can also be performed using the DRBIII®.** Observe the Fuel Gauge calibration points during the Self Test. The Fuel Gauge indicator needle should pause at the following positions: Off: Empty Stop below ″E″ Calibration Point 1: ″1/4″ Calibration Point 2: ″1/2″ Calibration Point 3: ″F″ Calibration Point 4: ″3/4″ Calibration Point 5: ″1/2″ Calibration Point 6: ″1/4″ Calibration Point 7: ″E″ Did the Fuel Gauge needle pause at the correct calibration points? Yes → Go To 3 No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

*FUEL GAUGE INACCURATE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, select Body, MIC, then Monitors. Read the Fuel Tank Level Volts. Compare the Fuel Tank Level Volts displayed by the DRBIII® to the Fuel Gauge using the following values: 4.3 - 3.19 Volts (Approximately 270 - 200 Ohms of Fuel Sensor Resistance) = ″E″ 2.56 Volts (Approximately 160 Ohms of Fuel Sensor Resistance) = ″1/4″ 1.91 Volts (Approximately 120 Ohms of Fuel Sensor Resistance) = ″1/2″ 1.27 Volts (Approximately 80 Ohms of Fuel Sensor Resistance) = ″3/4″ 0.319 - .646 Volts (Approximately 20 - 40 Ohms of Fuel Sensor Resistance) = ″F″ **NOTE: Fuel Tank Level Voltage should be within +/- 0.2 volts.** Is the displayed Fuel Tank Level voltage correct? Yes → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector termianls. No → Replace the Fuel Level Sensor in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*INSTRUMENT CLUSTER INOPERATIVE

POSSIBLE CAUSES
FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
INSTRUMENT CLUSTER GROUND CIRCUIT OPEN
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Remove and inspect the #13 Fuse in the Junction Block. If the fuse is open, replace with proper rated fuse. Turn the ignition on for 1 minute. Turn the ignition off. Remove and inspect the #13 Fuse in the Junction Block. Is the fuse open? Yes → Repair the Fused Ignition Switch Output circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Turn the ignition on. Measure the voltage between Fused Ignition Switch Output circuit and ground. Is the voltage above 10.5 volts? Yes → Go To 3 No → Repair the Fused Ignition Switch Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Measure the resistance between ground and the Instrument Cluster Ground circuit. Is the resistance below 5.0 ohms? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Instrument Cluster Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LOW COOLANT INDICATOR ALWAYS ON - DIESEL ONLY

POSSIBLE CAUSES
LOW COOLANT SWITCH
LOW COOLANT FLUID LEVEL SENSE CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the coolant is filled to the proper level before proceeding with this test.** Disconnect the Low Coolant Level Switch harness connector. With the DRBIII® in Inputs/Outputs, read the Low Coolant Switch state. Does the DRBIII® display ″Closed″? Yes → Go To 2 No → Replace the Low Coolant Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Low Coolant Level Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance between ground and the Low Coolant Fluid Level Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the Low Coolant Fluid Level Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LOW COOLANT INDICATOR INOPERATIVE - DIESEL ONLY

POSSIBLE CAUSES
LOW COOLANT SWITCH
LOW COOLANT FLUID LEVEL SENSE CIRCUIT OPEN
LOW COOLANT SWITCH GROUND CIRCUIT OPEN
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Perform the Instrument Cluster Self Test before proceeding with this test. If the Indicator does not illuminate, replace the Cluster.** Turn the ignition off. Disconnect the Low Coolant Switch harness connector. Connect a jumper wire between cavity 1 and cavity 2. Turn the ignition on and wait approximately 1 minute. With the DRBIII® in Inputs/Outputs, read the Low Coolant Switch state. Does the DRBIII® display ″Closed″? Yes → Replace the Low Coolant Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Low Coolant Switch harness connector. Measure the resistance between ground and the Low Coolant Switch Ground circuit. Is the resistance above 5.0 ohms? Yes → Repair the Low Coolant Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Low Coolant Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance of the Low Coolant Fluid Level Sense circuit. Is the resistance above 5.0 ohms? Yes → Repair the Low Coolant Fluid Level Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LOW WASH MESSAGE NOT OPERATING PROPERLY

POSSIBLE CAUSES
WASHER FLUID LEVEL SWITCH ALWAYS CLOSED
LOW WASHER FLUID SENSE CIRCUIT OPEN
LOW WASHER FLUID SENSE CIRCUIT SHORT TO GROUND
WASHER FLUID LEVEL SWITCH ALWAYS OPEN
WASHER FLUID LEVEL SWITCH GROUND CIRCUIT OPEN
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the Washer Fluid reservoir is filled and the Fluid Level Switch connector is properly connected before proceeding with this test.** Turn the ignition on and wait approximately 1 minute. Is the ″Lowash″ message always displayed? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition off. Disconnect the Washer Fluid Level Switch harness connector. Turn the ignition on and wait approximately 1 minute. Does the VF display ″LOWASH″? Yes → Repair the Low Washer Fluid Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Washer Fluid Level Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Washer Fluid Level Switch harness connector. Connect a jumper wire between cavity 1 and cavity 2. Turn the ignition on and wait approximately 1 minute. Does the VF display ″LOWASH″? Yes → Replace the Washer Fluid Level Switch in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Washer Fluid Level Switch harness connector. Measure the resistance between ground and the Washer Fluid Level Switch Ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Washer Fluid Level Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*LOW WASH MESSAGE NOT OPERATING PROPERLY — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Washer Fluid Level Switch harness connector. Disconnect the Instrument Cluster harness connector. Measure the resistance of the Low Washer Fluid Sense circuit. Is the resistance below 5.0 ohms? Yes → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Low Washer Fluid Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ONE GAUGE INOPERATIVE

POSSIBLE CAUSES
POWERTRAIN CONTROL MODULE DTCS
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display any PCM DTCs? Yes → Refer to the DRIVEABILITY category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Perform the Instrument Cluster Self Test. **NOTE: The Self Test can be initiated manually by depressing and holding the Trip Reset button while turning the ignition on, or by using the DRBIII®.** Observe the gauge in question while the Instrument Cluster performs the Self Test. The gauges should position at the following calibrations points: Speedometer MPH: 0, 30, 60, 90, 120, 90, 60, 30, 0 Speedometer kPH: 0, 60, 120, 180, 240, 180, 120, 60, 0 Tachometer Gas: 0, 1000, 3000, 5000, 7000, 5000, 3000, 1000, 0 Tachometer Diesel: 0, 1000, 3000, 5000, 3000, 1000, 0 Fuel: 1/4, 1/2, 3/4, F, 3/4, 1/2, 1/4, E Coolant: Lo, 1/4, 1/2, 3/4, HI, 3/4, 1/2, 1/4, Lo Did the gauge in question operate properly? Yes → Test Complete. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*PANEL DIMMING INOPERATIVE

POSSIBLE CAUSES
PANEL ILLUMINATION DTC PRESENT
ILLUMINATION BULB(S)
FUSED PARK LAMP RELAY OUTPUT CIRCUIT SHORT TO GROUND
FUSED PARK LAMP RELAY OUTPUT CIRCUIT OPEN
PARK LAMP RELAY OUTPUT CIRCUIT OPEN
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL SHORT TO VOLTAGE
ILLUMINATED COMPONENT INTERNALLY SHORTED
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display any MIC or BCM DTCs? Yes → Refer to symptom list for problems related to BCM or Instrument Cluster DTCs No → Go To 2	All
2	Turn the ignition on. Turn the Park Lamps on and adjust the dimming switch to maximum brightness. Are all of the Instrument Cluster illumination bulbs inoperative? Yes → Go To 3 No → Replace the Illumination Bulb(s) as necessary in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Remove and inspect the #9 Fuse in the Junction Block. If the fuse is open, replace with proper rated fuse. Turn the Park Lamps on for 1 minute. Turn the ignition off. Remove and inspect the #9 Fuse in the Junction Block. Is the #9 Fuse in the Junction Block open? Yes → Using the wiring diagram/schematic as a guide, repair the Fused Park Lamp Relay Output circuit for a short to ground (between the Junction Block and the Instrument Cluster). Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*PANEL DIMMING INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition on. Turn the Park Lamps on. Measure the voltage between the #9 Fuse in the Junction Block and ground. Is the voltage above 10.5 volts? Yes → Go To 5 No → Repair the Park Lamp Relay Output circuit for an open (between the Park Lamp Relay and the #9 Fuse in the Junction Block). Perform BODY VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Turn the ignition on. Turn the Park Lamps on. Measure the voltage between the Fused Park Lamp Relay Output circuit and ground. Is the voltage above 10.5 volts? Yes → Go To 6 No → Repair the Fused Park Lamp Relay Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Check connectors - Clean/repair as necessary. Measure the voltage between the Fused Panel Lamps Dimmer Switch circuit and ground. Is there any voltage present? Yes → Repair the Fused Panel Lamps Dimmer Switch Signal circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off. Ensure that the Instrument Cluster harness connector is connected. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors to all of the illuminated components. Turn the ignition on. Turn the Park Lamps on. While disconnecting components, inspect for Instrument Cluster illumination. Does the Instrument Cluster illumination operate after disconnecting any component? Yes → Replace the illuminated component as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Go To 8	All

*PANEL DIMMING INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the Instrument Cluster harness connector. Using the wiring diagram/schematic as a guide, ensure that all illuminated components are disconnected. Measure the resistance between ground and the Fused Panel Lamps Dimmer Switch circuit. Is the resistance below 5.0 ohms? Yes → Repair the Fused Panel Lamps Dimmer Switch Signal circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

*SEAT BELT INDICATOR ALWAYS ON

POSSIBLE CAUSES
ACM DTC PRESENT
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Ensure that the seat belt buckles are not damaged and are buckled. With the DRBIII® select MIC, in Inputs/Outputs, read the Seatbelt Lamp state. Does the DRBIII® display "On"? Yes → Refer to Seat Belt symptom(s) in the Airbag category. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*VTSS INDICATOR INOPERATIVE

POSSIBLE CAUSES
BCM OR ITM DTC PRESENT
VTSS INDICATOR DRIVER CIRCUIT OPEN
BODY CONTROL MODULE
INSTRUMENT CLUSTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the VTSS is enabled before proceeding with this test.** Turn the ignition on. With the DRBIII®, read Body Control Module and Intrusion Transceiver Module DTCs. Does the DRBIII® display any DTCs? Yes → Refer to the VEHICLE THEFT / SECURITY category and perform the appropriate symptom. No → Go To 2	All
2	Turn the ignition off. Disconnect the BCM C1 harness connector. Measure the voltage between the VTSS Indicator Driver circuit and ground. Is the voltage above 10.5 volts? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Instrument Cluster Harness connector. Disconnect the BCM C1 harness connector. Measure the resistance of the VTSS Indicator Driver circuit. Is the resistance above 5.0 ohms? Yes → Repair the VTSS Indicator Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Replace and configure the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DIMMING LEVEL SWITCH INPUT CIRCUIT HIGH

When Monitored and Set Condition:

DIMMING LEVEL SWITCH INPUT CIRCUIT HIGH

When Monitored: Ignition on.

Set Condition: BCM detects a voltage greater than 4.75 volts on the dimming level switch input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
PANEL LAMPS DIMMER SWITCH MUX OPEN
SHORT TO BATTERY
MULTIFUNCTION SWITCH
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Actuate the Dimming Level Switch. With the DRBIII®, read the DTC information. Does the DRBIII® read: Dimming Level Switch Input CKT High? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the BCM C2 harness connector. Turn the ignition on to check the Courtesy Lamp operation. Did the Courtesy Lamps come on? Yes → Go To 3 No → Repair the Panel Lamps Dimmer Switch MUX circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

DIMMING LEVEL SWITCH INPUT CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Ensure the Junction Block C24 harness connector on the front of the junction block is connected. Turn on all overhead, map and rear rearing lamps by their own individual switches. This will disconnect each lamp from the Courtesy Lamp Driver Circuit. Did any lamp fail to light when it was turned on by it's own switch? Yes → Repair the short to battery condition. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Junction Block C24 harness connector from the front of the junction block. Remove the Body Control Module from the junction block. Measure the voltage of the Courtesy Lamps Driver circuit. Is there any voltage on the Courtesy Lamps Driver Circuit? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DIMMING LEVEL SWITCH INPUT CIRCUIT LOW

When Monitored and Set Condition:

DIMMING LEVEL SWITCH INPUT CIRCUIT LOW

When Monitored: Ignition ON.

Set Condition: BCM detects a voltage less than 0.25 volts on the dimming level switch input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
PANEL LAMPS DIMMER SWITCH MUX OPEN
PANEL LAMPS DIMMER SWITCH MUX CIRCUIT SHORT TO GROUND
MULTIFUNCTION SWITCH
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Actuate the Dimming Level Switch. With the DRBIII®, read the DTC information. Does the DRBIII® read: Dimming Level Switch Input CKT Low? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the BCM C2 harness connector. Cycle the ignition switch off than back on. Did any of the Courtesy Lamps come on? Yes → Go To 3 No → Repair the Panel Lamps Dimmer Switch MUX for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

DIMMING LEVEL SWITCH INPUT CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
3	Ensure the Junction Block C24 harness connector on the front of the junction block is connected. Turn on all overhead, map and rear rearing lamps by their own individual switches. This will disconnect each lamp from the Courtesy Lamp Driver Circuit. Did any lamp fail to light when it was turned on by it's own switch? Yes → Repair the Panel Lamps Dimmer Switch MUX circuit for a short to ground condition. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the Junction Block C24 harness connector from the front of the junction block. Remove the Body Control Module from the junction block. Measure the voltage of the Courtesy Lamps Driver circuit. Is voltage present on the Courtesy Lamps Driver Circuit? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*COURTESY LAMPS INOPERATIVE-ALL LAMPS

POSSIBLE CAUSES
JUNCTION BLOCK
COURTESY LAMPS DRIVER CIRCUIT OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Gain access to the junction block C24 Harness connector. While back probing, measure the voltage of the Courtesy Lamp Driver circuit. Is the voltage above 10.0 volts? Yes → Go To 2 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
2	Using a jumper wire, test the Courtesy Lamps Driver circuit to the Junction Block C24 connector and ground. Do the courtesy lamps come on? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Courtesy Lamp Driver circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*COURTESY LAMPS INOPERATIVE-OVERHEAD LAMPS

POSSIBLE CAUSES
INTERMITTENT CONDITION
JUNCTION BLOCK
OPEN BULB
COURTESY LAMP DRIVER CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Turn the Courtesy Lamps on. Verify that the Courtesy Lamps are inoperative. Do the Courtesy Lamps operate normally? Yes → The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Remove and inspect any inoperative courtesy lamp bulbs. Are any of the inspected bulbs open or shorted? Yes → Replace the applicable open bulb. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition on. Measure the voltage of the Courtesy Lamp Driver circuit to ground. Is the voltage above 10.0 volts? Yes → Repair the Courtesy Lamps Driver circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*COURTESY LAMPS STAY ON AT ALL TIMES

POSSIBLE CAUSES
COURTESY LAMPS DRIVER HEADLINER CIRCUIT SHORT TO GROUND
COURTESY LAMPS DRIVER CIRCUIT BODY HARNESS SHORT TO GROUND
PANEL LAMPS DIMMER SWITCH MUX SHORT TO GROUND
MULTIFUNCTION SWITCH
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ensure the Dimmer Switch is off. Close all the passenger doors. Disconnect the Junction Block C24 connector from the front of the junction block. Observe the Courtesy Lamps. Did the Courtesy Lamps turn off? Yes → Repair the Courtesy Lamps Driver circuit in the headliner harness for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Ensure the Dimmer Switch is off. Close all the passenger doors. Disconnect the Junction Block C24 harness connector from the Junction Block. Observe the Courtesy Lamps. Did Courtesy Lamps turn off? Yes → Repair the Courtesy Lamps Driver circuit in the Body Harness for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Body Control Module C2 connector. Disconnect the Multifunction Switch harness connector. Measure the resistance of the Panel Lamps Dimmer Switch MUX circuit to ground. Is the resistance below 5.0 ohms? Yes → Repair the Panel Lamps Dimmer Switch MUX circuit for a short to ground condition. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*COURTESY LAMPS STAY ON AT ALL TIMES — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Body Control Module C2 connector. Disconnect the Multifunction Switch harness connector. Turn the ignition on. Measure the resistance of the Multifunction Switch Ground circuit. Is the resistance below 5.0 ohms? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

DOOR LOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored and Set Condition:

DOOR LOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored: With ignition on.

Set Condition: The BCM detects a low circuit on the Door Lock Relay Control circuit even though it is not attempting to lock the doors for more than 5 seconds. If the BCM is not grounding its side of the relay coil, the output should be high.

POSSIBLE CAUSES
RELAY OPEN OR SHORTED
CODE ACTIVE
JUNCTION BLOCK - DOOR LOCK RELAY CONTROL SHORT TO GROUND
JUNCTION BLOCK - DOOR LOCK RELAY CONTROL OPEN
BODY CONTROL MODULE - OPEN OR SHORTED

TEST	ACTION	APPLICABILITY
1	**NOTE: If the door locks are totally inoperative, check fuse #6 before proceeding.** Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR LOCK RELAY CONTROL CIRCUIT OPEN/ SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Ensure the relay is completely plugged in. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Door Lock Relay from the Junction Block. Install a substitute relay in place of the Door Lock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR LOCK RELAY CONTROL CIRCUIT OPEN/ SHORT TO GROUND? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR LOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Door Lock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Measure the resistance between ground and the Door Lock Relay Control circuit in the relay connector of the Junction Block.. Is the resistance below 100.0 ohms? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Remove the Door Lock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Door Lock Relay Control circuit between the Relay connector and the Junction Block - BCM connector. Is the resistance below 2.0 ohms? Yes → Go To 5 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DOOR LOCK RELAY CONTROL SHORT TO VOLTAGE

When Monitored and Set Condition:

DOOR LOCK RELAY CONTROL SHORT TO VOLTAGE

When Monitored: With ignition on.

Set Condition: The BCM detects a high circuit on the Door Lock Relay Control circuit when it is attempting to lock the doors for more than 5 seconds. If the BCM is not able to ground its side of the relay coil, the control circuit remains high.

POSSIBLE CAUSES
RELAY SHORTED
CODE ACTIVE
JUNCTION BLOCK - DOOR LOCK RELAY CONTROL SHORT TO VOLTAGE
BODY CONTROL MODULE - SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR LOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Door Lock Relay from the Junction Block. Install a substitute relay in place of the Door Lock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR LOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR LOCK RELAY CONTROL SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Door Lock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Turn the ignition on. Measure the voltage of the Door Lock Relay Control circuit in the relay connector of the Junction Block.. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE

When Monitored and Set Condition:

DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE

When Monitored: Whenever the ignition is on.

Set Condition: When the BCM detects a voltage of greater than 4.75 volts on the door lock switch mux input for over 5 seconds, this code will set. The normal voltage on the circuit is between 0.25 and 4.75 volts depending on switch positions. NOTE: Left and right switches are in parallel.

POSSIBLE CAUSES
CODE ACTIVE
LEFT DOOR LOCK SWITCH GND WIRE OPEN
LEFT DOOR LOCK SWITCH MUX WIRE OPEN
LEFT DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE
RIGHT DOOR LOCK SWITCH GND WIRE OPEN
RIGHT DOOR LOCK SWITCH MUX WIRE OPEN
RIGHT DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE
LEFT DOOR LOCK SWITCH - OPEN
LEFT DOOR LOCK SWITCH - SHORTED
RIGHT DOOR LOCK SWITCH - OPEN
RIGHT DOOR LOCK SWITCH - SHORTED
JUNCTION BLOCK OPEN
BODY CONTROL MODULE - DOOR LOCK SWITCH MUX OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times from both door lock switches With the DRBIII®, read DTCs. Does the DRBIII® display DRIVER DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
2	Disconnect the Junction Block C2 connector. Measure the voltage between ground and the Door Lock Switch Mux circuit cavity 14 in the C2 connector. Measure the voltage between ground and the Door Lock Switch Mux circuit cavity 10 in the C2 connector.. Which cavity had greater than 0.5 volts? Cavity 14 - Left Door Go To 3 Cavity 10 - Right Door Go To 4 Neither circuit over 0.5 volts. Go To 5	All
3	Disconnect the Junction Block C2 connector. Disconnect the Left Door Lock Switch connector. Measure the voltage between ground and the Door Lock Switch Mux circuit cavity 14 in the C2 connector.. Is there any voltage present? Yes → Repair the Door Lock Switch Mux wire for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Left Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All
4	Disconnect the Junction Block C2 connector. Disconnect the Right Door Lock Switch connector. Measure the voltage between ground and the Door Lock Switch Mux circuit cavity 10 in the C2 connector.. Is there any voltage present? Yes → Repair the Door Lock Switch Mux wire for a short to voltage.. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Right Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All
5	Disconnect the Junction Block C2 connector. Measure the resistance between the Door Lock Switch Ground cavity 5 and the Door Lock Switch Mux circuit cavity 10 in the C2 connector.. Measure the resistance between the Door Lock Switch Ground cavity 11 and the Door Lock Switch Mux circuit cavity 14 in the C2 connector.. Which circuit was NOT between 4500 and 5500 ohms? Cavities 5 & 10 - Right Door Go To 6 Cavities 11 & 14 - Left Door Go To 9 Both were approximately 5000 ohms. Go To 12	All

DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
6	Disconnect the Junction Block C2 connector. Disconnect the Right Door Lock Switch connector. Measure the resistance of the Door Lock Switch Mux circuit between cavity 10 in the C2 connector and the Right Door Lock Switch connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Door Lock Switch Mux wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All
7	Disconnect the Junction Block C2 connector. Disconnect the Right Door Lock Switch connector. Measure the resistance of the Door Lock Switch Ground circuit between cavity 5 in the C2 connector and the Right Door Lock Switch connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Door Lock Switch Ground wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All
8	If there are no possible causes remaining, view repair. Repair Replace the Right Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All
9	Disconnect the Junction Block C2 connector. Disconnect the Left Door Lock Switch connector. Measure the resistance of the Door Lock Switch Mux circuit between cavity 14 in the C2 connector and the Left Door Lock Switch connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the Door Lock Switch Mux wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All
10	Disconnect the Junction Block C2 connector. Disconnect the Left Door Lock Switch connector. Measure the resistance of the Door Lock Switch Ground circuit between cavity 11 in the C2 connector and the Left Door Lock Switch connector. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the Door Lock Switch Ground wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All
11	If there are no possible causes remaining, view repair. Repair Replace the Left Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR LOCK SWITCH OPEN OR SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
12	Disconnect the battery ground cable. Disconnect all the Junction Block connectors and remove the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Door Lock Switch Mux circuit between cavity 23 in the Junction Block - Body Control Module connector and cavity 10 in the Junction Block C2. Measure the resistance of the Door Lock Switch Mux circuit between cavity 23 in the Junction Block - Body Control Module connector and cavity 14 in the Junction Block C2. Measure the resistance of the Door Lock Switch Ground circuit between cavity 12 in the Junction Block - Body Control Module connector and cavity 5 in the Junction Block C2. Measure the resistance of the Door Lock Switch Ground circuit between cavity 12 in the Junction Block - Body Control Module connector and cavity 11 in the Junction Block C2. Is the resistance below 1.0 ohm for each circuit? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DOOR LOCK SWITCH SHORT TO GROUND

When Monitored and Set Condition:

DOOR LOCK SWITCH SHORT TO GROUND

When Monitored: Whenever the ignition is on.

Set Condition: When the BCM detects a voltage of less than 0.25 volts on the door lock switch mux input for over 5 seconds, this code will set. The normal voltage on the circuit is between 0.25 and 4.75 volts depending on switch positions. NOTE: Left and right switches are in parallel.

POSSIBLE CAUSES
CODE ACTIVE
LEFT DOOR LOCK SWITCH MUX WIRE SHORT TO GROUND
RIGHT DOOR LOCK SWITCH MUX WIRE SHORT TO GROUND
LEFT DOOR LOCK SWITCH
RIGHT DOOR LOCK SWITCH
JUNCTION BLOCK SHORT TO GROUND
BODY CONTROL MODULE - DOOR LOCK SWITCH MUX SHORT TO GROUND

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR LOCK SWITCH SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Door Lock Switch Mux circuit cavity 14 in the C2 connector.. Is the resistance below 100 ohms? Yes → Go To 3 No → Go To 4	All

DOOR LOCK SWITCH SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Disconnect the Junction Block C2 connector. Disconnect the Left Door Lock Switch connector. Measure the resistance between ground and the Door Lock Switch Mux circuit cavity 14 in the C2 connector.. Is the resistance below 100 ohms? Yes → Repair the Door Lock Switch Mux wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Left Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All
4	Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Door Lock Switch Mux circuit cavity 10 in the C2 connector.. Is the resistance below 100 ohms? Yes → Go To 5 No → Go To 6	All
5	Disconnect the Junction Block C2 connector. Disconnect the Right Door Lock Switch connector. Measure the resistance between ground and the Door Lock Switch Mux circuit cavity 10 in the C2 connector.. Is the resistance below 100 ohms? Yes → Repair the Door Lock Switch Mux wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Right Door Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All
6	Disconnect the Junction Block C2 connector. Remove the Body Control Module from the Junction Block. Measure the resistance between ground and the Door Lock Switch Mux circuit cavity 23 in the Junction Block - Body Control Module connector.. Is the resistance below 100 ohms? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored and Set Condition:

DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored: With ignition on.

Set Condition: The BCM detects a low circuit on the Door Unlock Relay Control circuit even though it is not attempting to unlock the doors for more than 5 seconds. If the BCM is not grounding its side of the relay coil, the output should be high.

POSSIBLE CAUSES
RELAY OPEN OR SHORTED
CODE ACTIVE
JUNCTION BLOCK - DOOR UNLOCK RELAY CONTROL SHORT TO GROUND
JUNCTION BLOCK - DOOR UNLOCK RELAY CONTROL OPEN
BODY CONTROL MODULE - OPEN OR SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. **NOTE: NOTE: If the door locks are totally inoperative, check fuse #6 before proceeding.** With the DRBIII®, read DTCs. Does the DRBIII® display DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN/ SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Ensure the relay is completely plugged in. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Door Unlock Relay from the Junction Block. Install a substitute relay in place of the Door Unlock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN/ SHORT TO GROUND? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Measure the resistance between ground and the Door Unlock Relay Control circuit in the relay connector of the Junction Block.. Is the resistance below 100.0 ohms? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Remove the Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Door Unlock Relay Control circuit between the Relay connector and the Junction Block - BCM connector. Is the resistance below 2.0 ohms? Yes → Go To 5 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DOOR UNLOCK RELAY CONTROL SHORT TO VOLTAGE

When Monitored and Set Condition:

DOOR UNLOCK RELAY CONTROL SHORT TO VOLTAGE

When Monitored: With ignition on.

Set Condition: The BCM detects a high circuit on the Door Unlock Relay Control circuit when it is attempting to unlock the doors for more than 5 seconds. If the BCM is not able to ground its side of the relay coil, the control circuit remains high.

POSSIBLE CAUSES
RELAY SHORTED
CODE ACTIVE
JUNCTION BLOCK - DOOR UNLOCK RELAY CONTROL SHORT TO VOLTAGE
BODY CONTROL MODULE - SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Door Unlock Relay from the Junction Block. Install a substitute relay in place of the Door Unlock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DOOR UNLOCK RELAY CONTROL SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Turn the ignition on. Measure the voltage of the Door Unlock Relay Control circuit in the relay connector of the Junction Block.. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored and Set Condition:

DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND

When Monitored: With ignition on.

Set Condition: The BCM detects a low circuit on the Driver Door Unlock Relay Control circuit even though it is not attempting to unlock the doors for more than 5 seconds. If the BCM is not grounding its side of the relay coil, the output should be high.

POSSIBLE CAUSES
RELAY OPEN OR SHORTED
CODE ACTIVE
JUNCTION BLOCK - DRIVER DOOR UNLOCK RELAY CONTROL SHORT TO GROUND
JUNCTION BLOCK - DRIVER DOOR UNLOCK RELAY CONTROL OPEN
BODY CONTROL MODULE - OPEN OR SHORTED

TEST	ACTION	APPLICABILITY
1	**NOTE: NOTE: If the door locks are totally inoperative, check fuse #6 before proceeding.** Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Ensure the relay is completely plugged in. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Driver Door Unlock Relay from the Junction Block. Install a substitute relay in place of the Driver Door Unlock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN/SHORT TO GROUND? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT OPEN OR SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Driver Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Measure the resistance between ground and the Driver Door Unlock Relay Control circuit in the relay connector of the Junction Block.. Is the resistance below 100.0 ohms? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Remove the Driver Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Driver Door Unlock Relay Control circuit between the Relay connector and the Junction Block - BCM connector. Is the resistance below 2.0 ohms? Yes → Go To 5 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored and Set Condition:

DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored: With ignition on.

Set Condition: The BCM detects a high circuit on the Driver Door Unlock Relay Control circuit when it is attempting to unlock the driver door for more than 5 seconds. If the BCM is not able to ground its side of the relay coil, the control circuit remains high.

POSSIBLE CAUSES
RELAY SHORTED
CODE ACTIVE
JUNCTION BLOCK - DRIVER UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
BODY CONTROL MODULE - SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Driver Door Unlock Relay from the Junction Block. Install a substitute relay in place of the Driver Door Unlock Relay. With the DRBIII®, erase DTCs. Operate the Door Locks several times. With the DRBIII®, read DTCs. Does the DRBIII® display DRIVER UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

DRIVER DOOR UNLOCK RELAY CONTROL CIRCUIT SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Driver Door Unlock Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Turn the ignition on. Measure the voltage of the Driver Unlock Relay Control circuit in the relay connector of the Junction Block.. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

LEFT CYLINDER LOCK SWITCH SHORT TO GROUND

When Monitored and Set Condition:

LEFT CYLINDER LOCK SWITCH SHORT TO GROUND

When Monitored: Whenever the ignition is on.

Set Condition: When the BCM detects a voltage of less than 0.25 volts on the left cylinder lock switch mux input for over 5 seconds, this code will set. The normal voltage on the circuit is between 0.25 and 5.0 volts depending on switch position.

POSSIBLE CAUSES
BCM - LEFT CYLINDER LOCK SWITCH CIRCUIT SHORT TO GROUND.
CODE ACTIVE
LEFT CYLINDER LOCK SWITCH WIRE SHORT TO GROUND.
LEFT CYLINDER LOCK SWITCH - SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Operate the door locks several times from both cylinder lock switches With the DRBIII®, read DTCs. Does the DRBIII® display LEFT CYLINDER LOCK SWITCH SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Left Cylinder Lock Switch Mux circuit. Is the resistance below 1000 ohms? Yes → Go To 3 No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

LEFT CYLINDER LOCK SWITCH SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module C2 connector. Disconnect the Left Cylinder Lock Switch connector. Measure the resistance between ground and the Left Cylinder Lock Switch Mux circuit. Is the resistance below 1000 ohms ohms? Yes → Repair the Left Cylinder Lock Switch wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Left Cylinder Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
RKE KEY FOB #1 BATTERY VOLTAGE LOW

When Monitored and Set Condition:

RKE KEY FOB #1 BATTERY VOLTAGE LOW

When Monitored: Anytime an RKE message is received from the RKE #1 transmitter.

Set Condition: RKE receiver detects an RKE FOB battery low signal (less than 3 volts) for 5 consecutive button presses.

POSSIBLE CAUSES
BATTERIES LOW
CODE ACTIVE
TRANSMITTER - LOW VOLTAGE OUTPUT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Using the RKE transmitter #1, press the UNLOCK button six times or more. With the DRBIII®, read DTCs. Does the DRBIII® display RKE KEY FOB #1 BATTERY VOLTAGE LOW? Yes → Go To 2 No → Problem is intermittent and not present at this time. Check the voltage of each battery in FOB #1 and ensure they above 3.0 volts each. Perform BODY VERIFICATION TEST - VER 1.	All
2	Test the voltage of each battery in the RKE #1 transmitter.. Is the voltage at or above 3.0 in each battery? Yes → Replace the RKE Transmitter. Perform BODY VERIFICATION TEST - VER 1. No → Replace the batteries and press the unlock button on the transmitter six times to clear the DTC.. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

RKE KEY FOB #2 BATTERY VOLTAGE LOW

When Monitored and Set Condition:

RKE KEY FOB #2 BATTERY VOLTAGE LOW

When Monitored: Anytime an RKE message is received from the RKE #2 transmitter.

Set Condition: RKE receiver detects an RKE FOB battery low signal (less than 3 volts) for 5 consecutive button presses.

POSSIBLE CAUSES
BATTERIES LOW
CODE ACTIVE
TRANSMITTER - LOW VOLTAGE OUTPUT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Using the RKE transmitter #2, press the UNLOCK button six times or more. With the DRBIII®, read DTCs. Does the DRBIII® display RKE KEY FOB #2 BATTERY VOLTAGE LOW? Yes → Go To 2 No → Problem is intermittent and not present at this time. Check the voltage of each battery in FOB #2 and ensure they above 3.0 volts each. Perform BODY VERIFICATION TEST - VER 1.	All
2	Test the voltage of each battery in the RKE #2 transmitter.. Is the voltage at or above 3.0 in each battery? Yes → Replace the RKE Transmitter. Perform BODY VERIFICATION TEST - VER 1. No → Replace the batteries and press the unlock button on the transmitter six times to clear the DTC.. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
RKE KEY FOB #3 BATTERY VOLTAGE LOW

When Monitored and Set Condition:

RKE KEY FOB #3 BATTERY VOLTAGE LOW

When Monitored: Anytime an RKE message is received from the RKE #3 transmitter.

Set Condition: RKE receiver detects an RKE FOB battery low signal (less than 3 volts) for 5 consecutive button presses.

POSSIBLE CAUSES
BATTERIES LOW
CODE ACTIVE
TRANSMITTER - LOW VOLTAGE OUTPUT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Using the RKE transmitter #3, press the UNLOCK button six times or more. With the DRBIII®, read DTCs. Does the DRBIII® display RKE KEY FOB #3 BATTERY VOLTAGE LOW? Yes → Go To 2 No → Problem is intermittent and not present at this time. Check the voltage of each battery in FOB #3 and ensure they above 3.0 volts each. Perform BODY VERIFICATION TEST - VER 1.	All
2	Test the voltage of each battery in the RKE #3 transmitter.. Is the voltage at or above 3.0 in each battery? Yes → Replace the RKE Transmitter. Perform BODY VERIFICATION TEST - VER 1. No → Replace the batteries and press the unlock button on the transmitter six times to clear the DTC.. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
RKE KEY FOB #4 BATTERY VOLTAGE LOW

When Monitored and Set Condition:

RKE KEY FOB #4 BATTERY VOLTAGE LOW

When Monitored: Anytime an RKE message is received from the RKE #4 transmitter.

Set Condition: RKE receiver detects an RKE FOB battery low signal (less than 3 volts) for 5 consecutive button presses.

POSSIBLE CAUSES
BATTERIES LOW
CODE ACTIVE
TRANSMITTER - LOW VOLTAGE OUTPUT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Using the RKE transmitter #4, press the UNLOCK button six times or more. With the DRBIII®, read DTCs. Does the DRBIII® display RKE KEY FOB #3 BATTERY VOLTAGE LOW? Yes → Go To 2 No → Problem is intermittent and not present at this time. Check the voltage of each battery in FOB #4 and ensure they above 3.0 volts each. Perform BODY VERIFICATION TEST - VER 1.	All
2	Test the voltage of each battery in the RKE #4 transmitter.. Is the voltage at or above 3.0 in each battery? Yes → Replace the RKE Transmitter. Perform BODY VERIFICATION TEST - VER 1. No → Replace the batteries and press the unlock button on the transmitter six times to clear the DTC.. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
RKE UNABLE TO ENTER PROGRAM MODE

When Monitored and Set Condition:

RKE UNABLE TO ENTER PROGRAM MODE

When Monitored: While attempting to program RKE.

Set Condition: Lack of response from the RKE module while attempting to put it in program mode.

POSSIBLE CAUSES
CODE ACTIVE
RKE MODULE
RKE UNABLE TO ENTER PROGRAM MODE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. With the DRBIII®, attempt to enter RKE PROGRAM mode. With the DRBIII®, read DTCs. Does the DRBIII® display RKE UNABLE TO ENTER PROGRAM MODE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Perform BODY VERIFICATION TEST - VER 1.	All
2	**Note: This DTC will only set when attempting to enter the program RKE mode.** Replace the Remote Keyless Entry Module. With the DRB, Clear DTC's With the DRB, attempt to enter the RKE program mode. With the DRB, check DTC's. Did this DTC reset? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → The original RKE module was defective. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
TAILGATE CYLINDER LOCK SWITCH SHORT TO GROUND

When Monitored and Set Condition:

TAILGATE CYLINDER LOCK SWITCH SHORT TO GROUND

When Monitored: Whenever the ignition is on.

Set Condition: When the BCM detects a voltage of less than 0.25 volts on the tailgate cylinder lock switch mux input for over 5 seconds, this code will set. The normal voltage on the circuit is between 0.25 and 5.0 volts depending on switch position.

POSSIBLE CAUSES
BCM - TAILGATE CYLINDER LOCK SWITCH CIRCUIT SHORT TO GROUND.
CODE ACTIVE
TAILGATE CYLINDER LOCK SWITCH WIRE SHORT TO GROUND.
TAILGATE CYLINDER LOCK SWITCH - SHORTED

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Lock and unlock the tailgate several times from the tailgate cylinder lock switch. With the DRBIII®, read DTCs. Does the DRBIII® display TAILGATE CYLINDER LOCK SWITCH SHORT TO GROUND? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Tailgate Cylinder Lock Switch Mux circuit. Is the resistance below 1000 ohms? Yes → Go To 3 No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

TAILGATE CYLINDER LOCK SWITCH SHORT TO GROUND — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module C2 connector. Disconnect the Tailgate Cylinder Lock Switch connector. Measure the resistance between ground and the Tailgate Cylinder Lock Switch Mux circuit. Is the resistance below 1000 ohms? Yes → Repair the Tailgate Cylinder Lock Switch wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Tailgate Cylinder Lock Switch. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
TAILGATE LOCK MOTOR SHORT TO VOLTAGE

When Monitored and Set Condition:

TAILGATE LOCK MOTOR SHORT TO VOLTAGE

When Monitored: Whenever the ignition is on.

Set Condition: When the BCM detects voltage on either the Tailgate Lock Driver or Unlock Driver circuit for longer than 5 seconds when the Tailgate is not being actuated. If there is, the BCM will disable the lock functions to protect the BCM.

POSSIBLE CAUSES
TAILGATE LOCK OR UNLOCK CIRCUIT SHORT TO VOLTAGE
CODE ACTIVE
JUNCTION BLOCK - SHORT TO VOLTAGE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Cycle the ignition switch from Off to On and wait 10 seconds. With the DRBIII®, read DTCs. Does the DRBIII® display TAILGATE LOCK MOTOR SHORT TO VOLTAGE? Yes → Go To 2 No → Problem is intermittent and not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
2	Disconnect the Junction Block C2 connector. Measure the voltage between Tailgate Lock Driver circuit and ground. Is there any voltage present? Yes → Repair the Tailgate Lock or Unlock Driver for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

TAILGATE LOCK MOTOR SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block C connectors are connected at this time.** Turn the ignition on. Measure the voltage between the Tailgate Lock Driver circuit in the Junction Block - BCM connector and ground. Measure the voltage between the Tailgate Unlock Driver circuit in the Junction Block - BCM connector and ground. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ALL DOORS FAIL TO LOCK

POSSIBLE CAUSES
DTC'S PRESENT
KEY-IN IGNITION SWITCH SHORTED
DOOR LOCK RELAY OUTPUT CIRCUIT SHORT TO GROUND
DOOR LOCK RELAY

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Power Door Lock related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Close both front doors. Insert the key in the ignition switch but do not turn the switch on. Does the Chime continue to sound? Yes → Refer to symptom list for problems related to CHIME.. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Remove the Door Lock, the Door Unlock and the Driver Door Unlock relays from the Junction Block. Measure the resistance between ground and the Lock Relay Output circuit in the Lock relay connector. Is the resistance below 1000.0 ohms? Yes → Repair the Lock Relay Output circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Door Lock Relay. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ALL PASSENGER DOORS FAIL TO LOCK AND UNLOCK

POSSIBLE CAUSES
DTC'S PRESENT
DOOR UNLOCK RELAY OUTPUT CIRCUIT OPEN
DOOR UNLOCK RELAY

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Power Door Lock related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Remove the Door Unlock Relay from the Junction Block. Using a 12-volt test light connected to ground, check the Door Unlock Relay Output circuit (cavity 30) in the relay connector.. With the DRBIII®, actuate the Door Lock Relay. Does the test light illuminate brightly when the relay is actuated? Yes → Replace the Door Unlock Relay. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Door Unlock Relay Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ALL PASSENGER DOORS FAIL TO UNLOCK

POSSIBLE CAUSES
DTC'S PRESENT
DOOR UNLOCK RELAY OUTPUT CIRCUIT SHORT TO GROUND
DOOR UNLOCK RELAY

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Power Door Lock related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Remove the Door Lock, the Door Unlock and the Driver Door Unlock relays from the Junction Block. Measure the resistance between ground and the Door Unlock Relay Output circuit (cavity 30) in the Door Unlock relay connector.. Is the resistance below 1000.0 ohms? Yes → Repair the Door Unlock Relay Output circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Door Unlock Relay. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*AUTO DOOR LOCKS INOPERATIVE

POSSIBLE CAUSES
AUTO (ROLLING) DOOR LOCKS NOT ENABLED
DOOR AJAR STATUS
PCM DTC'S PRESENT
BODY CONTROL MODULE - AUTO LOCKS INOPERATIVE

TEST	ACTION	APPLICABILITY
1	With the DRBIII select: "Body Controller", "Miscellaneous", "Auto Door Locks" Does the DRBIII® show "Auto Door Locks: ENABLED"? Yes → Go To 2 No → With the DRBIII, enable the Auto (Rolling) Door Locks, open and close the driver door at least once and retest the System. Perform BODY VERIFICATION TEST - VER 1.	All
2	Ensure all doors are closed. With the DRBIII read all DOOR AJAR states Do any door ajar states show CLOSED? Yes → Refer to symptom list for problems related to DOOR AJAR. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII read "Engine" DTC's. Are there any TPS DTC's present? Yes → Refer to symptom list for problems related to DRIVEABILITY.. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*DRIVER DOOR FAILS TO LOCK AND UNLOCK

POSSIBLE CAUSES
DOOR LOCK MOTOR - OPEN
DRIVER DOOR UNLOCK RELAY OUTPUT WIRE OPEN
DOOR LOCK RELAY OUTPUT WIRE OPEN

TEST	ACTION	APPLICABILITY
1	Remove the inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the Driver Door Lock Motor connector. Remove the key from the ignition switch. Connect a test light between the Door Lock Relay Output and the Driver Door Unlock Relay Output circuits in the door lock motor connector. Press the door lock switch to the Lock and Unlock positions. Did the test light illuminate brightly when the lock switch was pressed in both directions? Yes → Replace the Door Lock Motor. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn ignition off. Remove the inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the Door Lock Motor connector. Using a 12-volt test light connected to ground, check the Driver Door Unlock Relay Output circuit. With the DRBIII®, actuate the DRIVER DOOR UNLOCK RELAY. Does the test light illuminate brightly when the relay is actuated? Yes → Go To 3 No → Repair the Driver Door Unlock Relay Output wire. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn ignition off. Remove the inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the Door Lock Motor connector. Using a 12-volt test light connected to ground, check the Door Lock Relay Output circuit. With the DRBIII®, actuate the Door Lock Relay. Does the test light illuminate brightly when the relay is actuated? Yes → Test Complete. No → Repair the Door Lock Relay Output wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*DRIVER DOOR FAILS TO UNLOCK

POSSIBLE CAUSES
DTC'S PRESENT
DRIVER DOOR UNLOCK RELAY
DRIVER DOOR UNLOCK RELAY OUTPUT WIRE SHORT TO GROUND

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Power Door Lock related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Install a substitute Relay in place of the Driver Door Unlock Relay. Remove the key from the ignition switch. Press the door lock switch to the Lock and Unlock positions. Did the Driver Door Lock and Unlock? Yes → Replace the Driver Door Unlock Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn ignition off. Remove the Driver Door Unlock relay from the Junction Block. Remove the Driver Door inner trim panel and gain access to the door lock motor connector. Disconnect the Driver Door Lock Motor connector. Measure the resistance between ground and the Driver Door Unlock Relay Output circuit (cavity 30) in the relay connector. Is the resistance below 1000.0 ohms? Yes → Repair the Driver Door Unlock Relay Output wire for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*FLIP-UP GLASS RELEASE INOPERATIVE

POSSIBLE CAUSES
FLIP-UP GLASS RELEASE MOTOR
FLIP-UP GLASS RELEASE SWITCH
GROUND CIRCUIT OPEN
TAILGATE SWITCH GROUND
FLIP-UP GLASS RELEASE MOTOR DRIVER WIRE OPEN
FLIP-UP GLASS RELEASE SWITCH SENSE OPEN
BODY CONTROL MODULE - FLIP-UP GLASS RELEASE MOTOR DRIVER OPEN
BODY CONTROL MODULE - FLIP-UP GLASS RELEASE SWITCH SENSE OPEN

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the FLIP-UP GLASS REL SW state. Observe the DRBIII® and move the tailgate handle from open to close positions. Does the DRBIII® display OPEN then CLOSED as the handle is moved? Yes → Go To 2 No → Go To 6	All
2	Disconnect the Flip-Up Glass Release Motor connector. Connect a 12-volt test light between the Flip-Up Glass Release Motor Driver circuit and the ground circuit in the motor connector. With the DRBIII®, actuate the RELEASE FLIP-UP GLASS. Does the test light illuminate brightly when the motor is actuated? Yes → Replace the Flip-Up Glass Release Motor. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Flip-Up Glass Release Motor connector. Using a 12-volt test light connected to 12-volts, check the Ground circuit in the motor connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*FLIP-UP GLASS RELEASE INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Flip-Up Glass Release Motor connector. Connect a jumper wire between Flip-Up Glass Release Motor Driver circuit and ground in the motor connector. Disconnect the Body Control Module C1 connector. Measure the resistance between ground and the Flip-Up Glass Release Motor Driver circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Flip-Up Glass Release Motor Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All
6	Remove the tailgate trim panel. Disconnect the Flip-Up Glass Release Switch. connector. Connect a jumper wire between Flip-Up Glass Release Switch. circuit and Tailgate Switch Ground circuit in the switch connector. With the DRBIII® in Inputs/Outputs, read the Flip-Up Glass Rel Sw state. Does the DRBIII® display CLOSED? Yes → Replace the Flip-Up Glass Release Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	Remove the tailgate trim panel. Disconnect the Flip-Up Glass Release Switch. connector. Using a 12-volt test light connected to 12-volts, check the Tailgate Switch Ground circuit. Does the test light illuminate brightly? Yes → Go To 8 No → Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
8	Remove the tailgate trim panel. Disconnect the Flip-Up Glass Release Switch. connector. Connect a jumper wire between Flip-Up Glass Release Switch. Sense circuit and ground. Disconnect the Body Control Module C1 connector. Measure the resistance between ground and the Flip-Up Glass Release Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the Flip-Up Glass Release Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*FLIP-UP GLASS RELEASE INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
9	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ONE PASSENGER DOOR FAILS TO LOCK AND UNLOCK

POSSIBLE CAUSES
DOOR LOCK MOTOR - OPEN
DOOR UNLOCK RELAY OUTPUT WIRE OPEN
DOOR LOCK RELAY OUTPUT WIRE OPEN

TEST	ACTION	APPLICABILITY
1	Remove the inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the appropriate Door Lock Motor connector. Connect a test light between the Lock Relay Output and the Unlock Relay Output circuits in the door lock motor connector. Press the door lock switch to the Lock and Unlock positions. Did the test light illuminate when the lock switch was pressed in both directions? Yes → Replace the Door Lock Motor. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn ignition off. Remove the appropriate inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the Door Lock Motor connector. Using a 12-volt test light connected to ground, check the Door Unlock Relay Output circuit. With the DRBIII®, actuate the DOOR UNLOCK RELAY. Does the test light illuminate brightly when the relay is actuated? Yes → Go To 3 No → Repair the Door Unlock Relay Output wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn ignition off. Remove the appropriate inner door trim panel to gain access to the Door Lock Motor connector. Disconnect the Door Lock Motor connector. Using a 12-volt test light connected to ground, check the Door Lock Relay Output circuit. With the DRBIII®, actuate the Door Lock Relay. Does the test light illuminate brightly when the relay is actuated? Yes → Test Complete. No → Repair the Door Lock Relay Output wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RKE INOPERATIVE

POSSIBLE CAUSES
RKE DTC'S PRESENT
TEST TRANSMITTER WITH TESTER
RKE TRANSMITTER NOT PROGRAMMED
RKE TRANSMITTER NOT PROGRAMMED
RKE TRANSMITTER DEFECTIVE
REMOTE KEYLESS ENTRY MODULE
RKE MODULE - RECEIVER INOPERABLE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any RKE related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	**NOTE: Ensure the voltage of each battery in the transmitter is greater than 3.0 volts before proceeding.** Do you have access to the Miller Tool ″9001 RF DETECTOR″? ? Yes → Go To 3 No → Go To 5	All
3	Using the 9001 RF Detector, follow the instructions on the back of the tester and test the transmitter several times. Does the signal strength measure ″STRONG″? Yes → Go To 4 No → Replace the transmitter. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition on Place transmission in the Park position. With the DRBIII® select, BODY, BODY COMPUTER, MISCELLANEOUS, then PROGRAM RKE. Follow the instructions on the screen. Exit PROGRAM RKE. Activate the Door Locks using the RKE Transmitter. Did the door locks respond properly to the RKE transmitter commands? Yes → Repair complete. Perform BODY VERIFICATION TEST - VER 1. No → Remove the Body Control Module from the Junction Block. Remove the RKE module from the BCM. Check the connections. If the connections are okay, replace the RKE Module. Perform BODY VERIFICATION TEST - VER 1.	All

*RKE INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
5	With the DRBIII® select BODY, BODY COMPUTER, MISCELLANEOUS, then PROGRAM RKE. Follow instructions on the screen. Exit PROGRAM RKE. Try the Door Locks using the Transmitter. Did the Door Locks respond properly to the Transmitter commands ? Yes → Repair complete. Using the DRB, program all other Transmitters used with this Vehicle. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Secure a known good Transmitter. Using the DRBII® select BODY, BODY COMPUTER, MISCELLANEOUS then PROGRAM RKE. Follow the instructions on the DRBIII® screen. Exit PROGRAM RKE. Try the Door Locks using the Transmitter. Did the Door Locks respond properly to the Transmitter commands ? Yes → Replace the Transmitter. Program all Transmitters that will be used with this Vehicle. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Remove the Body Control Module from the Junction Block. Remove the RKE module from the BCM. Check the connections. If the connections are okay, replace the Remote Keyless Entry Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*RKE RANGE TO SHORT FROM ALL TRANSMITTERS

POSSIBLE CAUSES
DTC'S PRESENT
RKE ANTENNA CIRCUIT OPEN
RKE ANTENNA CIRCUIT SHORT TO GROUND
RKE MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Power Door Lock related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Body Control Module C2 connector. Measure the resistance of the RKE Antenna circuit between cavities 1 and ′12 in the BCM C2 connector. Is the resistance below 2.0 ohms? Yes → Go To 3 No → Repair the RKE Antenna circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the RKE Antenna circuit in the BCM C2 connector. Is the resistance below 1000.0 ohms? Yes → Repair the RKE Antenna circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	If there are no possible causes remaining, view repair. Repair Replace the Remote Keyless Entry Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*TAILGATE CYLINDER LOCK SWITCH INOPERATIVE

POSSIBLE CAUSES
DTC'S PRESENT
TAILGATE SWITCH GROUND CIRCUIT OPEN
TAILGATE CYLINDER LOCK SWITCH MUX WIRE OPEN
TAILGATE CYLINDER LOCK SWITCH OPEN
BODY CONTROL MODULE -TAILGATE CYLINDER LOCK SWITCH OPEN

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Tailgate related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Tailgate Cylinder Lock Switch connector. Turn the ignition and all lights off. Measure the resistance between ground and the Tailgate Switch Ground circuit. Is the resistance below 15.0 ohms? Yes → Go To 3 No → Repair the Tailgate Switch Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Disconnect the Tailgate Cylinder Lock Switch connector. Turn the ignition on. Measure the voltage between ground and the Tailgate Cylinder Lock Switch circuit. Is the voltage above 4.9 volts? Yes → Replace the Tailgate Cylinder Lock Swich. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Disconnect the Tailgate Cylinder Lock Switch connector. Connect a jumper wire between the Tailgate Cylinder Lock Switch Mux circuit in the Lock Motor connector and ground. Disconnect the Body Control Module C2 connector. Measure the resistance between ground and the Tailgate Cylinder Lock Switch Mux circuit. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Tailgate Cylinder Lock Switch Mux wire for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*TAILGATE LOCK INOPERATIVE

POSSIBLE CAUSES
DTC'S PRESENT
TAILGATE LOCK DRIVER OPEN
TAILGATE LOCK MOTOR OPEN
TAILGATE LOCK DRIVER SHORT TO GROUND
TAILGATE UNLOCK DRIVER OPEN
TAILGATE UNLOCK DRIVER SHORT TO GROUND
JUNCTION BLOCK OPEN
BODY CONTROL MODULE - TAILGATE DRIVER OPEN

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Tailgate related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Tailgate Lock Motor connector. Connect a test light between the Tailgate Lock Driver circuit and the Tailgate Unlock Driver circuit in the Lock Motor connector. With the DRBIII actuate the UNLOCK TAILGATE. With the DRBIII actuate the LOCK TAILGATE. Did the test light illuminate when the motor was actuated in both directions? Yes → Replace the Tailgate Lock Motor. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Disconnect the Tailgate Lock Motor connector. Connect a jumper wire between Tailgate Lock Driver circuit and ground in the Lock Motor connector. Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Tailgate Lock Driver circuit in the Junction Block C2 connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the Tailgate Lock Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

*TAILGATE LOCK INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Disconnect the Tailgate Lock Motor connector. Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Tailgate Lock Driver circuit in the Junction Block C2 connector. Is the resistance below 1000.0 ohms? Yes → Repair the Tailgate Lock Driver circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Disconnect the Tailgate Lock Motor connector. Connect a jumper wire between Tailgate Unlock Driver circuit and ground in the Lock Motor connector. Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Tailgate Unlock Driver circuit in the Junction Block C2 connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Tailgate Unlock Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
6	Disconnect the Tailgate Lock Motor connector. Disconnect the Junction Block C2 connector. Measure the resistance between ground and the Tailgate Unlock Driver circuit in the Junction Block C2 connector. Is the resistance below 1000.0 ohms? Yes → Repair the Tailgate Unlock Driver circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 7	All
7	Remove the Junction Block. Remove the Body Control Module from the Junction Block. Measure the resistance of the Tailgate Lock Driver circuit between Junction Block C2 connector and the Junction Block - BCM connector. Measure the resistance of the Tailgate Unlock Driver circuit between Junction Block C2 connector and the Junction Block - BCM connector. Is the resistance below 1.0 ohm on both circuits? Yes → Go To 8 No → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1.	All
8	If there are no possible causes remaining, view repair. Repair Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:
BCM MESSAGE NOT RECEIVED (EXPORT ONLY)
PRE-ARM TIMEOUT FAILURE (EXPORT ONLY)

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be BCM MESSAGE NOT RECEIVED (EXPORT ONLY).

When Monitored and Set Condition:

BCM MESSAGE NOT RECEIVED (EXPORT ONLY)

When Monitored: Whenever the ITM sends bus messages to the BCM.

Set Condition: If the ITM does not receive status messages from the BCM.

PRE-ARM TIMEOUT FAILURE (EXPORT ONLY)

When Monitored: During the VTSS pre-arm process.

Set Condition: If the ITM does not receive arm message from the BCM after sixty seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ITM COMMUNICATION WITH THE BCM
INTRUSION TRANSCEIVER MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, enter Body Computer. Was the DRB able to I/D or communicate with the Body Computer? Yes → Go To 2 No → Refer to the Communication category for the related symptom(s). Perform BODY VERIFICATION TEST - VER 1.	All

BCM MESSAGE NOT RECEIVED (EXPORT ONLY) — Continued

TEST	ACTION	APPLICABILITY
2	With the DRB, erase ITM DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. With the DRB, read Intrusion Transceiver Module DTC's. Did this DTC reset? Yes → Replace the Intrusion Transceiver Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced or partially broken wires. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored and Set Condition:

HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

When Monitored: With the ignition on.

Set Condition: When the BCM detects unwanted voltage on the horn relay control circuit.

POSSIBLE CAUSES
CODE ACTIVE
HORN RELAY SHORTED
JUNCTION BLOCK - HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Attempt to operate the VTSS horn by actuating with the DRBIII®. With the DRBIII®, read DTCs. Does the DRBIII® display HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 2 No → The condition that caused this symptom is not currently present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. Perform BODY VERIFICATION TEST - VER 1.	All
2	Remove the Horn Relay from the Junction Block. Install a substitute relay in place of the Horn Relay. With the DRBIII®, erase DTCs. With the DRBIII®, actuate the Horn Relay. With the DRBIII®, read DTCs. Does the DRBIII® display HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE? Yes → Go To 3 No → Replace the original relay. Perform BODY VERIFICATION TEST - VER 1.	All

HORN RELAY CONTROL CIRCUIT SHORT TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Horn Relay from the Junction Block. Remove the Body Control Module from the Junction Block. **NOTE: Ensure the Junction Block connectors are reconnected at this time.** Turn the ignition on. Measure the voltage of the Horn Relay Control circuit in the relay connector of the Junction Block. Is there any voltage present? Yes → Replace the Junction Block. Perform BODY VERIFICATION TEST - VER 1. No → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:
ITM - EEPROM FAILURE (EXPORT ONLY)
LOOPBACK FAILURE (EXPORT ONLY)

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ITM - EEPROM FAILURE (EXPORT ONLY).

When Monitored and Set Condition:

ITM - EEPROM FAILURE (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed and during change of the VTSS state.

Set Condition: If the EEPROM erase/write does not correctly complete the operation.

LOOPBACK FAILURE (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed, pre-armed or reset.

Set Condition: If an internal ITM bus test performed fails.

POSSIBLE CAUSES
INTERMITTENT CONDITION
INTRUSION TRANSCEIVER MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. With the DRBIII®, read Intrusion Transceiver Module DTC's. Does the DRBIII® display the same DTC? Yes → Replace the Intrusion Transceiver Module. Perform BODY VERIFICATION TEST - VER 1. No → The condition that caused this symptom is currently not present. Test complete. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
ITM - TRANSDUCER FAILURE (EXPORT ONLY)

When Monitored and Set Condition:

ITM - TRANSDUCER FAILURE (EXPORT ONLY)

When Monitored: Continuously during VTSS pre-arm mode.

Set Condition: The ITM sends a test ultrasonic signal during the pre-arm process. If the test signal is not correctly received, the code will be set.

POSSIBLE CAUSES
BLOCKED INTRUSION TRANSCEIVER MODULE SENSORS
INTERMITTENT CONDITION
INTRUSION TRANSCEIVER MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. With the DRBIII®, read Intrusion Transceiver Module DTC's. Does the DRBIII® display: ITM Transducer Failure? Yes → Go To 2 No → The condition that caused this symptom is currently not present. Test complete. Perform BODY VERIFICATION TEST - VER 1.	All
2	Inspect the louvers of the Intrusion Transceiver Module for blockage from dust or debris. Were there any problems found? Yes → Clean as necessary. Perform VTSS VERIFICATION TEST - 1A. No → Replace the Intrusion Transceiver Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
ITM - VIN MISMATCH (EXPORT ONLY)

When Monitored and Set Condition:

ITM - VIN MISMATCH (EXPORT ONLY)

When Monitored: While the ITM is being disarmed.

Set Condition: If the ITM stored VIN does not match with the BCM.

POSSIBLE CAUSES
INTRUSION TRANSCEIVER MODULE
BODY CONTROL MODULE
CHECK VIN IN BCM AND ITM WITH VIN IN PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Do not attempt to use either an ITM and/or a Siren from another vehicle.** With the DRBIII® display and record the VIN in the Intrusion Transceiver Module. With the DRBIII® select Body Computer. Display and record the VIN in the BCM. With the DRBIII® select Engine. Display and record the VIN in the PCM. Does the VIN in the ITM and the VIN in the BCM match the VIN in the PCM? Yes → Go To 2 No → Replace the Module(s) with the incorrect VIN. Perform BODY VERIFICATION TEST - VER 1.	All
2	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS using the RKE and turn the ignition on. With the DRBIII®, read Intrusion Transceiver Module DTC's. Does the DRBIII® display: ITM VIN Mismatch? Yes → Replace the Intrusion Transceiver Module. Perform BODY VERIFICATION TEST - VER 1. No → The condition that caused this symptom is currently not present. Test complete. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

NO SERIAL COMMUNICATION (EXPORT ONLY)
SIREN COMMUNICATION FAILURE (EXPORT ONLY)

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be NO SERIAL COMMUNICATION (EXPORT ONLY).

When Monitored and Set Condition:

NO SERIAL COMMUNICATION (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed.

Set Condition: If the Intrusion Transceiver Module does not receive messages from the Siren.

SIREN COMMUNICATION FAILURE (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed.

Set Condition: If the Siren does not receive messages from the Intrusion Transceiver Module.

POSSIBLE CAUSES
INTERMITTENT CONDITION
OPEN FUSED B+ CIRCUIT
SIREN SIGNAL CONTROL CIRCUIT OPEN
SIREN SIGNAL CONTROL CIRCUIT SHORT TO GROUND
INTRUSION TRANSCEIVER MODULE
OPEN GROUND CIRCUIT
VTSS SIREN

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. Does the DRBIII® display the same DTC? Yes → Go To 2 No → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. Perform BODY VERIFICATION TEST - VER 1.	All

NO SERIAL COMMUNICATION (EXPORT ONLY) — Continued

TEST	ACTION	APPLICABILITY
2	Gain access to the VTSS Siren. Disconnect the Siren connector. Measure the voltage of the Fused B(+) circuit in the Siren connector. Is the voltage above 10.0 volts? Yes → Go To 3 No → Repair the Fused B+ circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Disconnect the Siren connector. Using a 12-volt test light connected to 12-volts, check the ground circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the ground circuit for an open. Perform VTSS VERIFICATION TEST - 1A.	All
4	Use the DRBIII® and set up as follows: Use the Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable. Select DRBIII® Standalone. Select lab scope. Select Live. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Press F2 again when complete. Disconnect the Siren connector. Connect the black lead to the chassis ground. Connect the red lead to the Siren Signal Control circuit in the Siren connector. Start the engine and hold the engine RPM's above 600. Observe the voltage displayed on the DRBIII® Lab Scope. Is there a voltage square wave present 1 to 2 seconds? Yes → Replace the VTSS Siren. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Disconnect the Siren harness connector. Disconnect the Intrusion Transceiver Module harness connector. Measure the resistance between ground and the Siren Signal Control circuit. Is the resistance above 5.0 ohms? Yes → Go To 6 No → Repair the Siren Signal Control circuit for a short to ground. Perform VTSS VERIFICATION TEST - 1A.	All

NO SERIAL COMMUNICATION (EXPORT ONLY) — Continued

TEST	ACTION	APPLICABILITY
6	Disconnect the Siren harness connector. Disconnect the Intrusion Transceiver Module harness connector. Measure the resistance of the Siren Signal Control circuit between the Intrusion Transceiver Module and the Siren connector. Is the resistance below 5.0 ohms? Yes → Replace the Intrusion Transceiver Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Siren Signal Control circuit for an open. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
PCM MESSAGE NOT RECEIVED (EXPORT ONLY)

When Monitored and Set Condition:

PCM MESSAGE NOT RECEIVED (EXPORT ONLY)

When Monitored: With the ignition on.

Set Condition: The ITM does not receive PCI bus messages from the PCM for 12 seconds.

POSSIBLE CAUSES
PCM MESSAGE NOT RECEIVED
ATTEMPT TO COMMUNICATE WITH THE PCM
PCI BUS CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB enter System Tests then PCM Monitor. Does the DRB display: PCM is active on BUS? Yes → With the DRB, erase ITM DTCs. Cycle the ignition switch, wait 1 minute then recheck for ITM DTCs. If DTC resets, replace the Intrusion Transceiver Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition on. With the DRB, attempt to communicate with the PCM. Was the DRB able to communicate with the PCM? Yes → Go To 3 No → Refer to the communication category and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRBIII® from the Data Link connector. Measure the resistance of the PCI Bus circuit between the Data Link connector and the PCM connector. Is the resistance below 5.0 ohms? Yes → Replace the Powertrain Control Module in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
SIREN BATTERY HAS BEEN TAMPERED (EXPORT ONLY)

When Monitored and Set Condition:

SIREN BATTERY HAS BEEN TAMPERED (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed.

Set Condition: If the siren detects the loss of vehicle battery voltage.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HARNESS TAMPERING
INTRUSION TRANSCEIVER MODULE

TEST	ACTION	APPLICABILITY
1	Inspect the wiring harness to the siren for any signs of tampering or damage. Were there any problems found? Yes → Repair wiring as necessary. Perform VTSS VERIFICATION TEST - 1A. No → Go To 2	All
2	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. With the DRBIII®, read Intrusion Transceiver Module DTC's. Does the DRBIII® display: Siren Battery Has Been Tampered? Yes → Replace the Siren in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced or partially broken wires. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:
SIREN EEPROM FAILURE (EXPORT ONLY)
SIREN INTERNAL BATTERY (EXPORT ONLY)
SIREN ROM FAILURE (EXPORT ONLY)

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be SIREN EEPROM FAILURE (EXPORT ONLY).

When Monitored and Set Condition:

SIREN EEPROM FAILURE (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed.

Set Condition: If the checksum of the EEPROM does not calculate to the correct value.

SIREN INTERNAL BATTERY (EXPORT ONLY)

When Monitored: Continuously with engine rpm over 600.

Set Condition: When the internal battery within the siren does not charge as expected, the ITM sets this code.

SIREN ROM FAILURE (EXPORT ONLY)

When Monitored: Continuously while the VTSS is armed.

Set Condition: If the checksum of the ROM does not calculate to the correct value.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SIREN

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the current Intrusion Transceiver Module DTC's. Turn the ignition off. Arm the VTSS and wait 1 minute. Disarm the VTSS and turn the ignition on. With the DRBIII®, read Intrusion Transceiver Module DTC's. Does the DRBIII® display the same DTC? Yes → Replace the Siren. Perform BODY VERIFICATION TEST - VER 1. No → The condition that caused this symptom is currently not present. Test complete. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*ALARM TRIPS ON ITS OWN

POSSIBLE CAUSES
LAST ALARM CAUSE
ATTEMPT TO TRIP ALARM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the Last Alarm Caused By state. Were there any causes displayed? Yes → Check for a possible intermittent condition with the circuit indicated by the DRBIII®. Perform VTSS VERIFICATION TEST - 1A. No → Go To 2	All
2	Is this an export vehicle equipped with a hood ajar switch? Yes → Go To 3 No → Go To 4	All
3	Remove the ignition key (but keep in hand). Lock the vehicle and close all the doors, liftgate and hood. Allow the VTSS to arm. Lightly tap on hood near ajar switch to simulate wind and noise vibration. Did the VTSS trip to the alarming state? Yes → Replace the hood ajar switch. Perform VTSS VERIFICATION TEST - 1A. No → Go To 4	All
4	**NOTE: The condition that caused the alarm is not present at this time. The following list may help in indentifying the intermittent condition.** Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect related wiring harnesses. Look for chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for loose connections, broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform VTSS VERIFICATION TEST - 1A. No → Test Complete.	All

Symptom:
*DRIVER DOOR DOES NOT TRIP VTSS

POSSIBLE CAUSES
DRIVER DOOR AJAR CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the DRVR DOOR AJAR SW status. Open the driver door. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom DRIVER DOOR AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*FLIP-UP GLASS DOES NOT TRIP VTSS

POSSIBLE CAUSES
FLIP-UP GLASS AJAR CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the FLIP-UP GLASS AJAR SW status. Open the Tailgate. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom FLIP-UP GLASS AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*HAZARD LAMPS INOPERATIVE WITH VTSS

POSSIBLE CAUSES
HAZARD SWITCH
ACTUATE HAZARD LAMPS WITH DRB
HAZARD LAMP CONTROL CIRCUIT
HAZARD LAMP CONTROL OPEN
HAZARD LAMP OPERATION
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Attempt to operate the Hazard Lamps with the Hazard Lamp switch. Do the hazard lamps operate from the Hazard Lamp switch? Yes → Go To 2 No → Refer to the Service Information to repair the Hazard Lamps. Perform VTSS VERIFICATION TEST - 1A.	All
2	Turn the Hazard Lamp switch off. With the DRBIII®, actuate the Hazard Lamps. Do the Hazard Lamps operate while actuating? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the Hazard Lamp switch off. Disconnect the Body Control Module C1 connector. Connect a jumper wire between Hazard Lamp Control circuit and ground. Did the Hazard Lamps operate? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All
4	Disconnect the Hazard Switch connector. Disconnect the Body Control Module C1 connector. Measure the resistance of the Hazard Lamp Control circuit between the BCM C1 connector and the Hazard Switch connector. Is the resistance below 5.0 ohms? Yes → Replace the Hazard Switch. Perform VTSS VERIFICATION TEST - 1A. No → Repair the Hazard Lamp Control circuit for an open between the BCM and the Hazard Switch. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*HEADLAMPS FAIL TO FLASH WITH VTSS

POSSIBLE CAUSES
INCORRECT COUNTRY CODE PROGRAMMED IN BCM
LOW BEAM HEADLAMPS INOPERATIVE
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the Low Beam Headlamps on. Do the Low Beam Headlamps operate properly? Yes → Go To 2 No → Refer to symptom LOW BEAM HEADLAMPS WILL NOT TURN ON in the EXTERIOR LIGHTING category. Perform VTSS VERIFICATION TEST - 1A.	All
2	With the DRBIII® in Miscellaneous check the Body Control Module country code setting. Is the country code correct? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Program the correct country code setting. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*HOOD DOES NOT TRIP VTSS (EXPORT ONLY)

POSSIBLE CAUSES
HOOD AJAR SWITCH CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the HOOD AJAR SW status. Open the hood. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom HOOD AJAR CIRCUIT OPEN in the DOOR AJAR section.	All

Symptom:
*HORN FAILS TO SOUND WITH VTSS

POSSIBLE CAUSES
INCORRECT COUNTRY CODE PROGRAMMED IN BCM
HORN OPERATION
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	The Horn must be operational from the horn button for the results of this test to be valid. Open the Drivers door window. Remove the key from the Ignition switch. Lock the doors with the RKE transmitter or power door lock switch. Close all the doors and tailgate. Wait approximately 15 seconds for the VTSS indicator to flash at a slower rate indicating the Vehicle Theft Security System is armed. Manually unlock the driver door lock. Trip the VTSS by opening the drivers door. Did the Horn sound when the VTSS was tripped? Yes → The condition that caused this symptom is not currently present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. Perform VTSS VERIFICATION TEST - 1A. No → Go To 2	All
2	With the DRBIII® in Miscellaneous check the Body Control Module country code setting. Is the country code correct? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Program the correct country code setting. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*INTRUSION TRANSCEIVER MODULE SENSITIVITY (EXPORT ONLY)

POSSIBLE CAUSES
INTERIOR TYPE SELECTED IN ITM

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Miscellaneous, check the Current Status of the Interior Type. Is the Interior Type selected correct? Yes → Test Complete. No → Program the correct interior type. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*LEFT REAR DOOR DOES NOT TRIP VTSS

POSSIBLE CAUSES
PASSENGER DOOR AJAR CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the PASS DOOR AJAR SW status. Open the Left Rear door. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom LEFT REAR DOOR AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*PASSENGER DOOR DOES NOT TRIP VTSS

POSSIBLE CAUSES
PASSENGER DOOR AJAR CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the PASS DOOR AJAR SW status. Open the passenger door. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom PASSENGER DOOR AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*RIGHT REAR DOOR DOES NOT TRIP VTSS

POSSIBLE CAUSES
PASSENGER DOOR AJAR CIRCUIT MALFUNCTION
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. With the DRBIII®, read the PASS DOOR AJAR SW status. Open the Right Rear door. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom RIGHT REAR DOOR AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*TAILGATE DOES NOT TRIP VTSS

POSSIBLE CAUSES
TAILGATE AJAR SWITCH CIRCUIT
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Note: The VTSS must arm properly for the result of this test to be valid. Open the Liftgate. Does the DRBIII® display CLOSED? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Refer to symptom TAILGATE AJAR CIRCUIT OPEN in the DOOR AJAR section. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*VTSS DOES NOT DISARM WITH THE LEFT CYLINDER LOCK SWITCH

POSSIBLE CAUSES
DISARM SWITCHES DISABLED
DTC'S PRESENT
DOOR LOCK SWITCH GROUND CIRCUIT OPEN
LEFT CYLINDER LOCK SWITCH MUX WIRE OPEN
LEFT CYLINDER LOCK SWITCH OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are there any Left Cylinder Lock Switch related codes present? Yes → Refer to symptom list for problems related to POWER DOOR LOCKS/RKE. Perform VTSS VERIFICATION TEST - 1A. No → Go To 2	All
2	With the DRBIII® in Inputs/Outputs, read the Disarm SW state. Does the DRBIII® display Enabled? Yes → Go To 3 No → With the DRBIII®, enable the Disarm Switches. Perform BODY VERIFICATION TEST - VER 1.	All
3	Disconnect the Left Door Cylinder Lock Switch connector. Turn the ignition and all lights off. Measure the resistance between ground and the Door Lock Switch Ground circuit. Is the resistance below 15.0 ohms? Yes → Go To 4 No → Repair the Door Lock Switch Ground circuit for an open. Perform VTSS VERIFICATION TEST - 1A.	All
4	Disconnect the Left Cylinder Lock Switch connector. Turn the ignition on. Measure the voltage between ground and the Left Cylinder Lock Switch circuit. Is the voltage above 4.9 volts? Yes → Replace the Left Cylinder Lock Switch. Perform VTSS VERIFICATION TEST - 1A. No → Go To 5	All

*VTSS DOES NOT DISARM WITH THE LEFT CYLINDER LOCK SWITCH — Continued

TEST	ACTION	APPLICABILITY
5	Disconnect the Left Cylinder Lock Switch connector. Disconnect the Body Control Module C2 connector. Connect a jumper wire between the Left Cylinder Lock Switch MUX circuit in the Left Cylinder Lock Switch connector and ground. Measure the resistance between ground and the Left Cylinder Lock Switch MUX circuit. Is the resistance below 5.0 ohms? Yes → Replace and program the Body Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Left Cylinder Lock Switch MUX wire for an open. Perform VTSS VERIFICATION TEST - 1A.	All

Symptom:
*VTSS WILL NOT ARM

POSSIBLE CAUSES
CHECK THE VTSS STATUS
CHECK FOR DTCS AND VTSS ARMING INHIBITORS
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, check that the Theft Alarm is enabled. Was the Theft Alarm enabled? Yes → Go To 2 No → With the DRBIII®, enable the Vehicle Theft Security System VTSS. Perform VTSS VERIFICATION TEST - 1A.	All
2	Ensure the tailgate, flip-up glass and all doors are closed. With the DRBIII®, read the active DTC's and the ajar switch states. Does the DRBIII® display any closed switches or VTSS related DTC's? Yes → Refer to the Symptom List and diagnose the appropriate symptom in the DOOR AJAR or VTSS category. Perform VTSS VERIFICATION TEST - 1A. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER HIGH/LOW RELAY OUTPUT CIRCUIT HIGH

When Monitored and Set Condition:

WIPER HIGH/LOW RELAY OUTPUT CIRCUIT HIGH

When Monitored: With ignition on.

Set Condition: BCM detects a high level on the Wiper High/Low relay output when it is attempting to turn the wipers on for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN CIRCUIT BREAKER
WIPER HIGH/LOW RELAY
BODY CONTROL MODULE
FRONT WIPER PARK SWITCH SENSE CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Front Wipers on. With the DRBIII®, read the DTC information. Does the DRBIII® read: WIPER HIGH/LOW RELAY CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the PDC to make certain the Wiper High/Low Relay is present. Is the Wiper High/Low Relay present? Yes → Go To 3 No → Replace the missing Wiper High/Low Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check the Junction Block Circuit Breaker #3. Is the Circuit Breaker open? Yes → Replace the open Circuit Breaker. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

WIPER HIGH/LOW RELAY OUTPUT CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the Wiper High/Low Relay. Turn the Wipers On. Do the Wipers operate normally? Yes → Replace the Wiper High/Low Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Wiper High/Low Relay. Measure the voltage of the Fused B+ circuit of the Wiper High/Low Relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Front Wiper Park Switch Sense circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER HIGH/LOW RELAY OUTPUT CIRCUIT LOW

When Monitored and Set Condition:

WIPER HIGH/LOW RELAY OUTPUT CIRCUIT LOW

When Monitored: With ignition on.

Set Condition: BCM detects a low (ground) signal on the wiper on/off relay output even though it is not attempting to drive the output for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
WIPER HIGH/LOW RELAY SHORT TO GROUND
WIPER HIGH/LOW RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Wipers on. With the DRBIII®, read the DTC information. Does the DRBIII® read: WIPER HIGH/LOW RELAY OUTPUT CIRCUIT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Wiper High/Low Relay. Measure the resistance between ground and the Wiper High/Low Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Wiper High/Low Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

WIPER HIGH/LOW RELAY OUTPUT CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Wiper High/Low Relay harness connector. Measure the voltage of the Wiper High/Low Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Wiper High/Low Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER MODE SWITCH CIRCUIT HIGH

When Monitored and Set Condition:

WIPER MODE SWITCH CIRCUIT HIGH

When Monitored: With the ignition on.

Set Condition: BCM detects a voltage greater than 4.75 volts on the Wiper Mode Switch Input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MULTIFUNCTION SWITCH
FRONT WIPER SWITCH MUX CIRCUIT OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase all BCM DTC's. Turn the Wipers on. With the DRBIII®, read DTCs. Does the DRBIII® display: WIPER MODE SWITCH CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Multifunction Switch harness connector. Connect a jumper wire between the Front Wiper Switch MUX circuit to ground. Turn the ignition on. With the DRBIII®, select Body, Body Controller and read: Wiper Switch volts. Does the DRBIII® display: Multifunction Switch voltage below 0.5volts? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

WIPER MODE SWITCH CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Multifunction Switch harness connector. Measure resistance of the Front Wiper Switch MUX circuit from the Body Control Module connector to the Multifunction Switch harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Front Wiper Switch MUX circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER MODE SWITCH CIRCUIT LOW

When Monitored and Set Condition:

WIPER MODE SWITCH CIRCUIT LOW

When Monitored: With the igntion on.

Set Condition: BCM detects a voltage less than 0.25 volts on the Wiper Mode Switch Input for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MULTIFUNCTION SWITCH SHORTED
FRONT WIPER SWITCH MUX CIRCUIT SHORT TO GROUND
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Wipers on. With the DRBIII®, read DTCs. Does the DRBIII® display: WIPER MODE SWITCH CIRCUIT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Multifunction Switch harness connector. Turn the ignition on. With the DRBIII®, select Body, Body Control Module and read: Multifunction Switch voltage.. Does the DRBIII® display: Multifunction Switch voltage above 4.75 volts? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

WIPER MODE SWITCH CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Body Control Module harness connector. Disconnect the Multifunction Switch harness connector. Measure resistance between ground and the Front Wiper Switch MUX circuit. Is the resistance above 5.0 ohms? Yes → Repair the Front Wiper Switch MUX Circuit for a short to ground condition. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER ON/OFF RELAY OUTPUT CIRCUIT HIGH

When Monitored and Set Condition:

WIPER ON/OFF RELAY OUTPUT CIRCUIT HIGH

When Monitored: With the ignition on.

Set Condition: BCM detects a high level on the Wiper On/Off Relay output when it is attempting to turn the wipers on for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
MISSING RELAY
OPEN CIRCUIT BREAKER
WIPER ON/OFF RELAY
BODY CONTROL MODULE
FRONT WIPER PARK SWITCH SENSE CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Front Wipers on. With the DRBIII®, read the DTC information. Does the DRBIII® read: WIPER ON/OFF RELAY CIRCUIT HIGH? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Check the PDC to make certain the Wiper On/Off Relay is present. Is the Wiper On/Off Relay present? Yes → Go To 3 No → Replace the missing Wiper On/Off Relay. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Check the Junction Block Circuit Breaker #3. Is the Circuit Breaker open? Yes → Replace the open Circuit Breaker. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

WIPER ON/OFF RELAY OUTPUT CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a known good relay in place of the Wiper On/Off Relay. Turn the Wipers On. Do the Wipers operate normally? Yes → Replace the Wiper On/Off Relay. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off Remove the Wiper On/Off Relay. Measure the voltage of the Fused B+ circuit of the Wiper On/Off Relay. Is the voltage above 10 volts? Yes → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Front Wiper Park Switch Sense circuit for an open condition. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER ON/OFF RELAY OUTPUT CIRCUIT LOW

When Monitored and Set Condition:

WIPER ON/OFF RELAY OUTPUT CIRCUIT LOW

When Monitored: With the ignition on.

Set Condition: BCM detects a low (ground) signal on the Wiper On/Off Relay output even though it is not attempting to drive the output for more than 5 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
WIPER ON/OFF RELAY SHORT TO GROUND
WIPER ON/OFF RELAY
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, clear all BCM DTC's. Turn the Wipers on. With the DRBIII®, read the DTC information. Does the DRBIII® read: WIPER ON/OFF RELAY OUTPUT CIRCUIT LOW? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Wiper On/Off Relay. Measure the resistance between ground and the Wiper On/Off Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Wiper On/Off Relay Control circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Wiper On/Off Relay harness connector. Measure the voltage of the Wiper On/Off Relay harness connector coil side feed circuit to ground. Is the voltage above 10.0 volts? Yes → Replace the Wiper On/Off Relay. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
WIPER PARK SWITCH FAILURE

When Monitored and Set Condition:

WIPER PARK SWITCH FAILURE

When Monitored: With the Wipers on (any speed).

Set Condition: BCM fails to detect a park signal from the wiper motor for 8 consecutive seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
FRONT WIPER PARK SWITCH SENSE CIRCUIT OPEN
FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORT TO GROUND
GROUND CIRCUIT OPEN
WIPER MOTOR
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase all BCM DTC's. Turn the Wipers on. With the DRBIII®, read DTCs. Does the DRBIII® display: WIPER PARK SWITCH FAILURE? Yes → Go To 2 No → The condition is not present at this time. Monitor DRBIII parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins that may apply. Visually inspect the related wiring harness and connector terminals. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Disconnect the Junction Block C3 harness connector. Turn the ignition on. Measure the voltage of the Wiper Park Switch Sense circuit in the Front Wiper Motor harness connector. Is there any voltage present? Yes → Repair the Wiper Park Switch Sense circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Go To 3	All

WIPER PARK SWITCH FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Disconnect the Junction Block C3 harness connector. Measure the resistance of the Wiper Park Switch Sense circuit between the Junction Block C3 harness connector and the Wiper Motor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the Front Wiper Park Switch Sense circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Disconnect the Junction Block C3 harness connector. Measure the resistance between ground and the Wiper Park Switch Sense circuit in the Junction Block C3 harness connector. Is the resistance below 100.0 ohms? Yes → Repair the Front Wiper Park Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Using a 12-volt test light connected to 12-volts, test the Ground circuit in the Front Wiper Motor harness connector. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Wiper Motor Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Turn the ignition on. Connect a jumper wire from the Wiper Park Switch Sense circuit to ground. With the DRBIII® in Inputs/Outputs read: Wiper Park Switch state. Did the Wiper Park Switch Input change state when connected to ground? Yes → Replace the Wiper Motor. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*FRONT WASHER PUMP INOPERATIVE

POSSIBLE CAUSES
FRONT WASHER PUMP
FRONT WASHER PUMP GROUND CIRCUIT OPEN
MULTIFUNCTION SWITCH
FRONT WASHER PUMP SENSE CIRCUIT OPEN
FRONT WASHER PUMP DRIVER CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
BODY CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the Front Washer Pump harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the Front Washer Pump Driver circuit. Actuate the Front Washers. Does the test light illuminate brightly? Yes → Replace the Front Washer Pump. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Front Washer Pump. Using a 12-volt test light connected to 12-volts, check the Front Washer Pump Ground circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Front Washer Pump Ground Circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the right side Multifunction Switch harness connector. Connect a jumper wire between the Fused Ignition Switch Output circuit and the Front Washer Pump Sense circuit in the Multifunction Switch harness connector. Turn the ignition on. Does the Front Washer Pump operate? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*FRONT WASHER PUMP INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the right side Multifunction Switch. Disconnect the Body Control Module. Measure the resistance of the Front Washer Pump Sense circuit. Is the resistance above 5.0 ohms? Yes → Repair the Front Washer Pump Sense Circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Front Washer Pump. Disconnect the Body Control Module from the Junction Block. Measure the resistance of the Front Washer Pump Driver circuit. Is the resistance above 5.0 ohms? Yes → Repair the Front Washer Pump Driver Circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the Multifunction Switch. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit. Does the test light illuminate brightly? Yes → Repair the Fused Ignition Switch Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Body Control Module. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*FRONT WIPER LOW SPEED INOPERATIVE

POSSIBLE CAUSES
MULTIFUNCTION SWITCH
FRONT WIPER MOTOR GROUND CIRCUIT OPEN
FRONT WIPER MOTOR LOW DRIVER CIRCUIT OPEN
FRONT WIPER MOTOR
FUSED IGNITION SWITCH OUTPUT CIRCUIT

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the right side Multifunction Switch harness connector. Connect a jumper wire between the Fused Ignition Switch Output circuit and the Front Wiper Motor Low Driver circuit in the Multifunction Switch harness connector. Turn the ignition on. Does the Front Wiper Motor function normally? Yes → Replace the Multifunction Switch. Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Disconnect the Front Wiper Motor. Using a 12-volt test light connected to 12-volts, check the Front Wiper Motor Ground circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Front Wiper Motor Ground Circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Front Wiper Motor. Disconnect the right side Multifunction Switch. Measure the resistance of the Front Wiper Motor Low Driver circuit. Is the resistance above 5.0 ohms? Yes → Repair the Front Wiper Motor Low Driver Circuit for an open. Perform BODY VERIFICATION TEST - VER 1. No → Go To 4	All

*FRONT WIPER LOW SPEED INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Front Wiper Motor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the Front Wiper Motor Low Driver circuit. Turn the Front Wipers on to Low. Does the test light illuminate brightly? Yes → Replace the Front Wiper Motor. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Fused B+ Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Verification Tests

45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1	APPLICABILITY
1. Connect the DRBIII® to the Data Link Connector. 2. Reconnect any disconnected components. 3. With the DRBIII®, erase DTC's. 4. With the DRBIII®, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT above 43° Celsius 110° Fahrenheit. 5. Check the Transmission fluid and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure. **6. NOTE: If the TCM has been replaced or if the transmission has been repaired or replaced it is necessary to perform the DRBIII® Quick Learn Procedure.** 7. Road test the vehicle. With the DRBIII®, monitor TPS. Make fifteen to twenty 1-2, 2-3, and 3-4 upshifts and (4 - 4 Prime for 545RFE only). 8. Perform these shifts from a standing start to 97 Km/h 60 MPH with a constant throttle opening of 20 to 25 degrees. 9. Below 40 Km/h 25 MPH, make five to eight wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown. 10. Check for DTC's during the road test. **11. NOTE: Use the EATX OBDII task manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.** 12. Perform the Battery Disconnect with the DRBIII®, this will clear the EATX EVENT DATA. Were any Trouble Codes set during the road test? Yes → Refer to the Symptom List for the appropriate diagnostic tests. No → Repair is complete.	All

ABS VERIFICATION TEST - VER 1	APPLICABILITY
1. Turn the ignition off. 2. Connect all previously disconnected components and connectors. 3. Ensure all accessories are turned off and the battery is fully charged. 4. Ensure that the Ignition is on, and with the DRBIII®, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning. 5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules. 6. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom. 7. If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops. **8. Caution: Ensure braking capability is available before road testing.** 9. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list. 10. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete. Are any DTC's present or is the original concern still present? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

Verification Tests — Continued

AIRBAG VERIFICATION TEST - VER 1	APPLICABILITY
1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery. **2. WARNING: TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** 3. Connect the DRBIII® to the Data Link Connector - use the most current software available. 4. Use the DRBIII® and erase the stored codes in all airbag system modules. 5. Turn the Ignition Off, and wait 15 seconds before turning the Ignition On. 6. Wait one minute, and read active codes and if there are none present read the stored codes. 7. Note: If equipped with Airbag On-Off switch, read the DTC's in all switch positions. 8. Note: Read the DTC's in all airbag system related modules. 9. If the DRBIII® shows any active or stored codes, return to the Symptom list and follow path specified for that trouble code. If no active or stored codes are present, the repair is complete. Are any DTC's present or is the original condition still present? YES Repair is not complete, refer to appropriate symptom list. NO Repair is complete.	All

BODY VERIFICATION TEST - VER 1	APPLICABILITY
1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors. **2. NOTE: If the SKIM or PCM/ECM was replaced, refer to the service information for proper programming procedures.** 3. If the Instrument Cluster was replaced, use the DRBIII® to insure the proper warning indicators are configured. 4. If the Body Control Module was replaced, turn the ignition on for 15 seconds (to learn VIN). If the vehicle is equipped with VTSS, use the DRBIII® and enable VTSS. 5. Program tire size, country code, radio EQ setting and all RKE transmitters (if RKE Module was replaced) and other options as necessary. 6. (Export only) If the Intrusion Transceiver Module ITM was replaced, use the DRBIII® to enable ITM and Program Interior Type. 7. (Export only) If the Siren was replaced perform the DRBIII® Siren Replacement procedure. 8. Ensure all accessories are turned off and the battery is fully charged. 9. With the DRBIII®, record and erase all DTC's from ALL modules. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern. 10. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTC's from ALL modules. Are any DTC's present or is the original condition still present? Yes → Repair is not complete, refer to the appropriate symptom. No → Repair is complete.	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 1	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. Inspect the engine oil for contamination. If oil contamination is suspected, change the oil and filter. 3. If the PCM was not replaced skip steps 4 through 6 and continue the verification. 4. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. Attempt to start the engine. 8. If the conditions cannot be duplicated, erase all DTCs with the DRBIII® Is the vehicle still unable to start and/or are there any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptoms list (Diagnostic Procedure). No → Repair is complete.	All

POWERTRAIN VERIFICATION TEST VER - 2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a NO TROUBLE CODE repair, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes or the symptom no longer exists, the repair was successful and testing is complete. 4. If the initial or another symptom exists, the repair is not complete. Check all technical service bulletins or flash updates and return to Symptoms if necessary. 5. If this verification procedure is being performed after a DTC repair, perform steps 6 through 13. 6. Connect the DRBIII® to the data link connector. Using the DRBIII® erase any diagnostic trouble codes and reset all values. 7. If the PCM was not replaced, skip steps 8 through 10 and continue with the verification. 8. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer System (SKIS), Secret Key data must be updated to enable start. 9. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 10. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 11. Road test the vehicle. If the test is for an A/C DTC, ensure it is operating during the following test. 12. Drive the vehicle for at least 5 minutes at or around 64 Kmh (40 mph). Ensure the transmission shifts through all gears. At some point stop the vehicle and turn off the engine for at least 10 seconds. 13. With the DRBIII®, read DTCs. Are there any DTC(s) present? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). No → Repair is complete.	All

Verification Tests — Continued

ROAD TEST VERIFICATION - VER-2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete. 4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary. 5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue. 6. If the Engine Control Module (ECM) has not been changed, perform steps 7 and 8, otherwise, continue with step 9. 7. With the DRB III®, erase all diagnostic trouble codes (DTCs), then disconnect the DRB III®. 8. Turn the ignition off for at least 10 seconds. 9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11. 10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position. 11. Ensure no DTCs remain by performing steps 12 through 15. 12. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Relay Control Circuit, drive the vehicle for at least 5 minutes with the A/C on. 13. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue. 14. Upon completion of the road test, turn the engine off and check for DTCs with the DRB III®. 15. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

SKIS VERIFICATION	APPLICABILITY
1. Reconnect all previously disconnected components and connectors. 2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKIM. This number can be obtained from the vehicle's invoice or Chrysler's Customer Center (1-800-992-1997). **3. NOTE: When entering the PIN, care should be taken because the SKIM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PINs are entered, the SKIM will Lock Out the DRB for 1 hour.** 4. To exit Lock Out mode, the ignition key must remain in the Run position continually for 1 hour. Turn off all accessories and connect a battery charger if necessary. 5. With the DRB, select Theft Alarm, SKIM and Miscellaneous. Then, select the desired procedure and follow the steps that will be displayed. 6. If the SKIM has been replaced, ensure all of the vehicle ignition keys are programmed to the new SKIM. **7. NOTE: Prior to returning vehicle to the customer, perform a module scan to be sure that all DTCs are erased. Erase any DTCs that are found.** 8. With the DRB, erase all DTCs. Perform 5 ignition key cycles leaving the key on for at least 90 seconds per cycle. 9. With the DRB, read the SKIM DTCs. Are there any SKIM DTCs? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

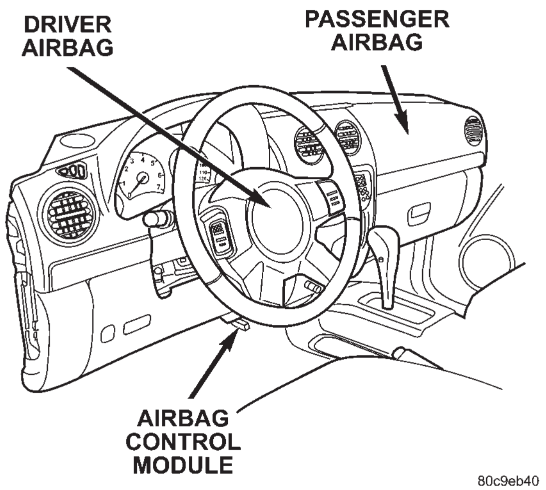
Verification Tests — Continued

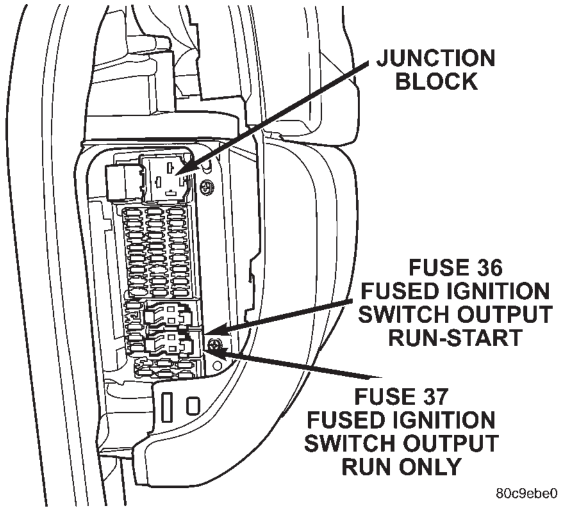
VTSS VERIFICATION TEST - 1A	APPLICABILITY
1. Ensure all doors, tailgate, and tailgate flip-up glass are closed. 2. Open the driver door. 3. Remove the ignition key (but keep in hand). 4. Lock the doors with RKE transmitter or power door lock switch. 5. Close the driver door. 6. - If the VTSS Indicator Lamp flashes rapidly and after approximately 16 seconds changes to a slower flash, the system is operational. 7. - If the indicator fails to flash as described, there is a problem with the system. Select the Identifying VTSS symptom from the Symptom List to troubleshoot. Does the VTSS Indicator Lamp flash as specified? Yes → Repair is complete. No → Repair is not complete, refer to appropriate symptom.	All

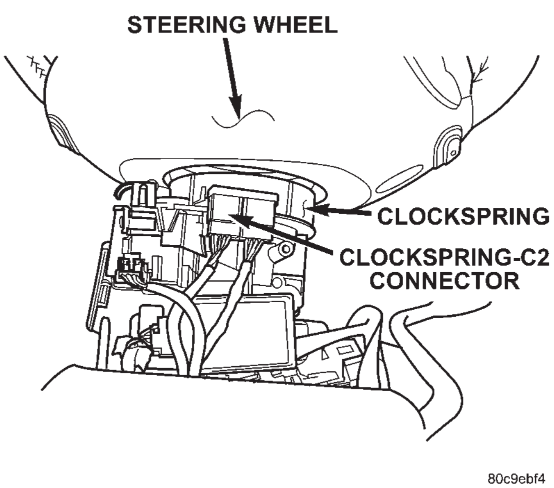
NOTES

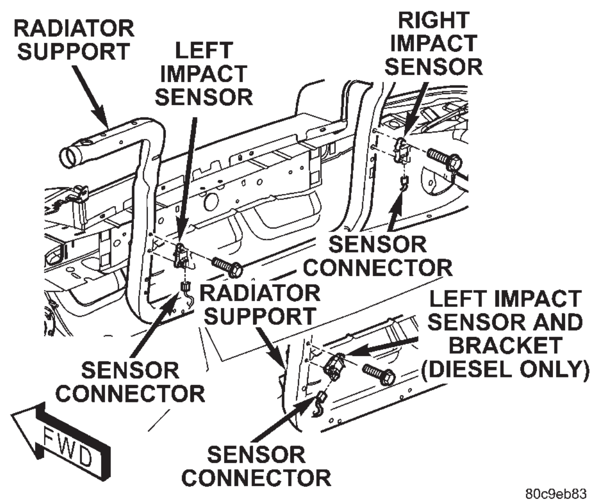
8.0 COMPONENT LOCATIONS

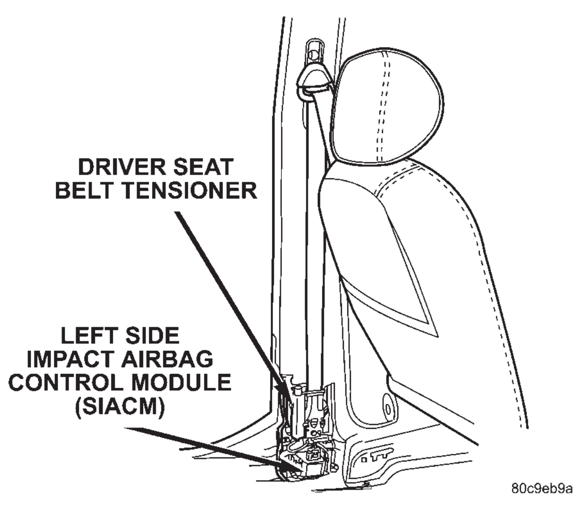
8.1 AIRBAG SYSTEM

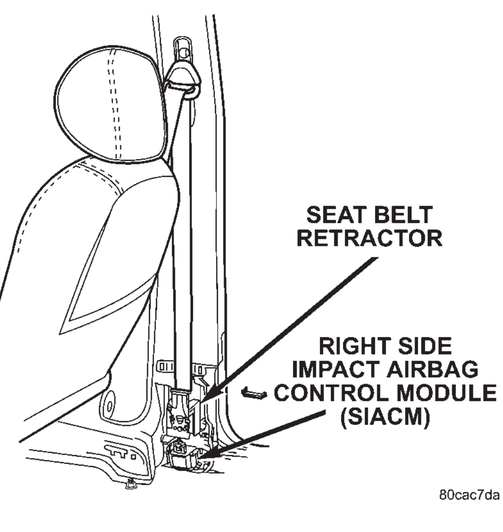




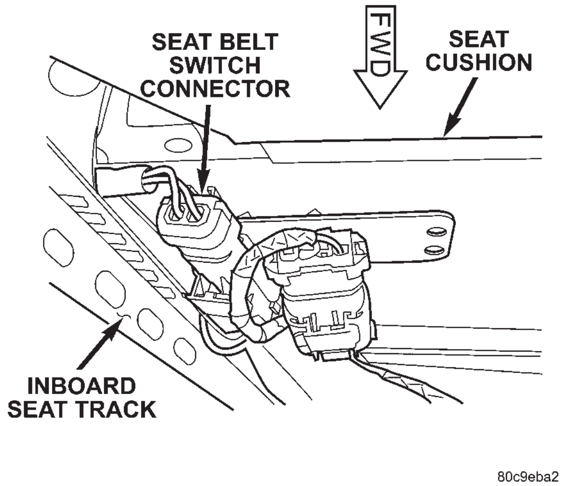


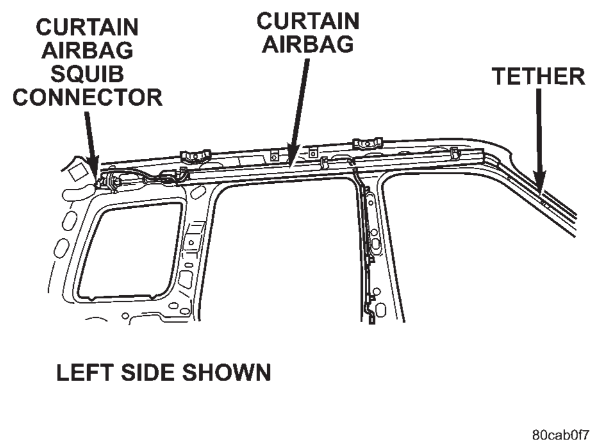






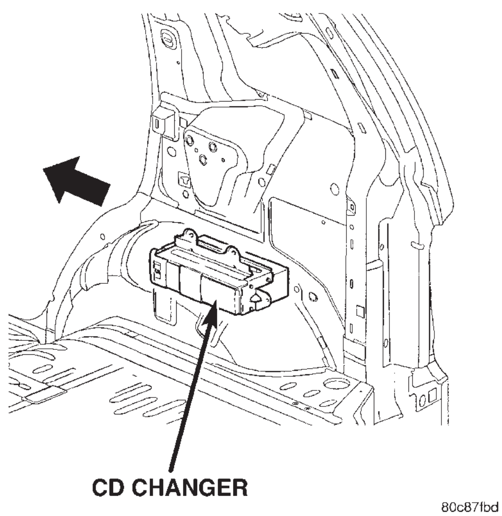
8.1 AIRBAG SYSTEM (Continued)





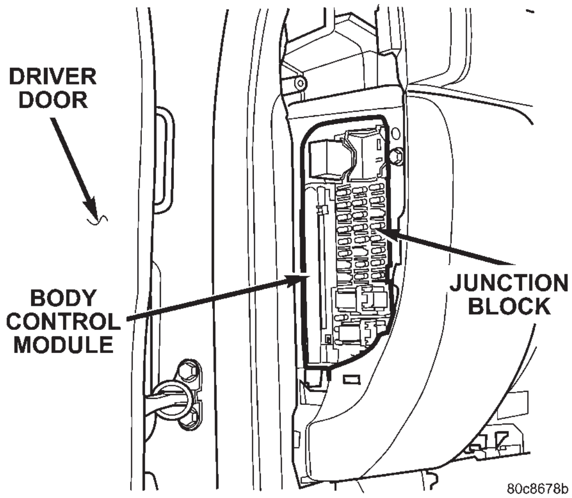
8.2 AUDIO

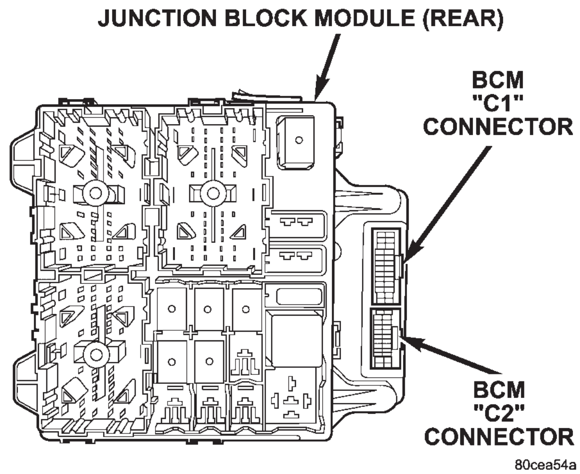
8.2.1 CD CHANGER



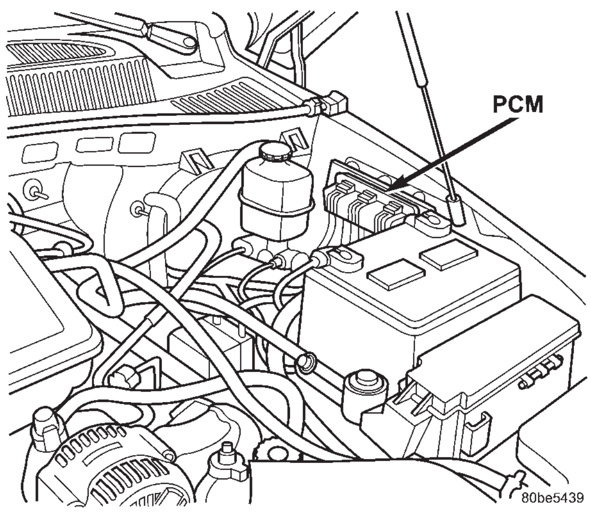
8.3 COMMUNICATION

8.3.1 BODY CONTROL MODULE AND JUNCTION BLOCK (JUNCTION BLOCK MODULE)

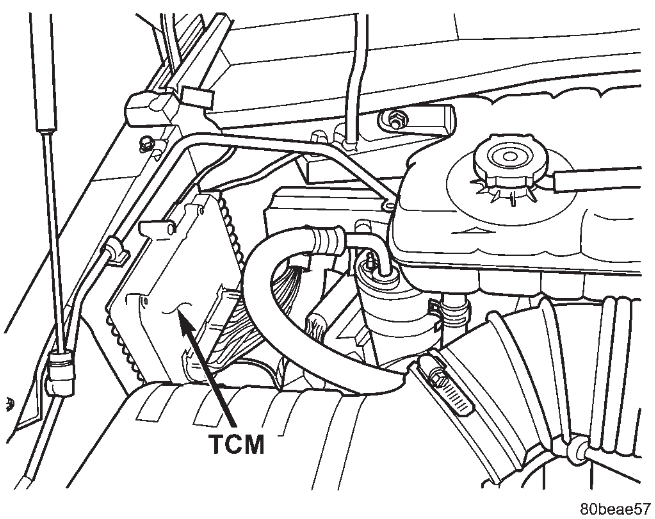




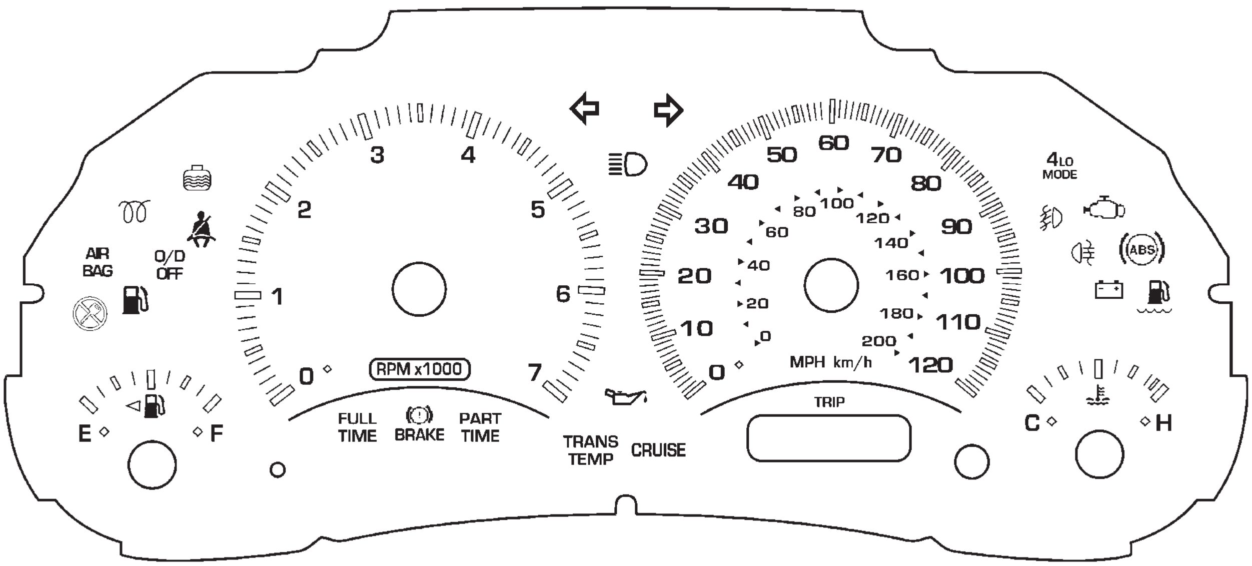
8.3.2 POWERTRAIN CONTROL MODULE



8.3.3 TRANSMISSION CONTROL MODULE



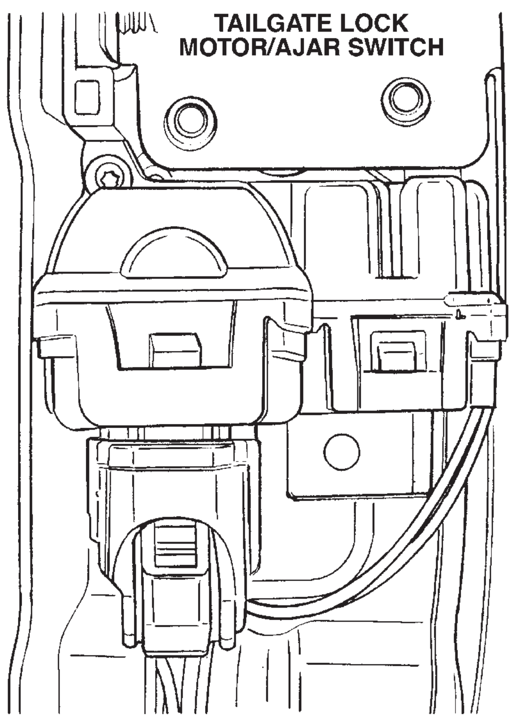
8.4 INSTRUMENT CLUSTER



80c9f3fd

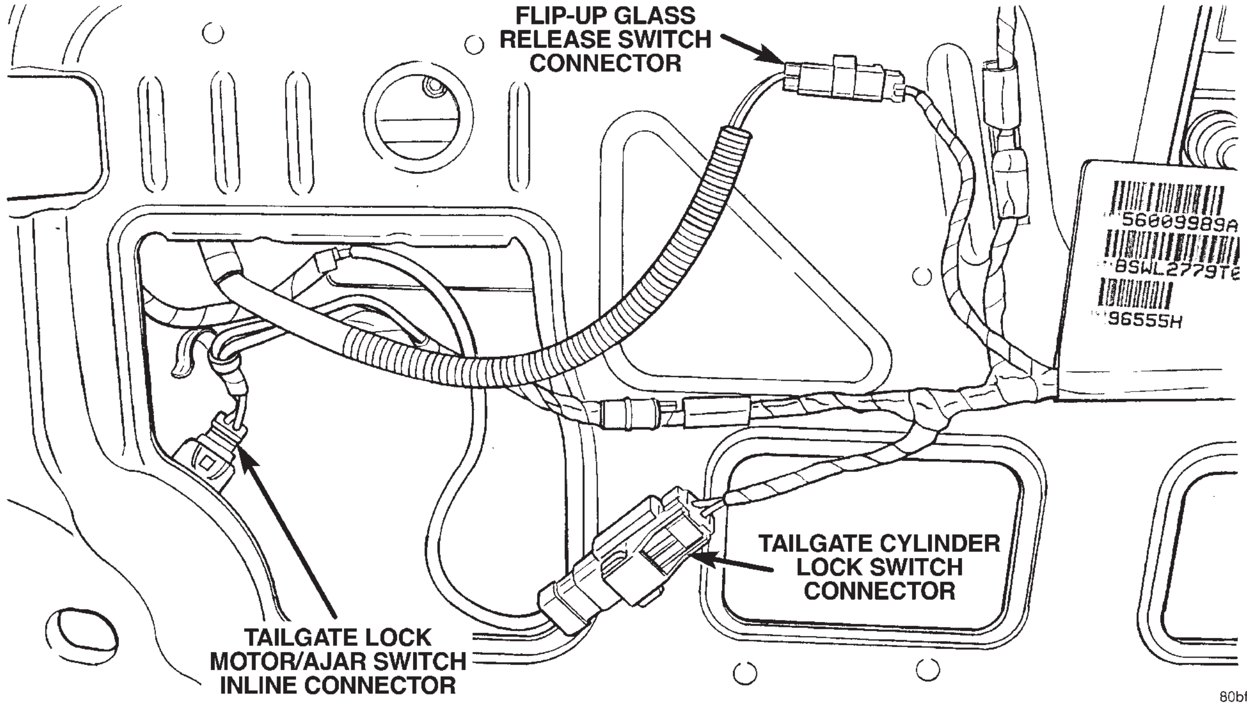
8.5 POWER DOOR LOCKS

8.5.1 TAILGATE LOCK MOTOR



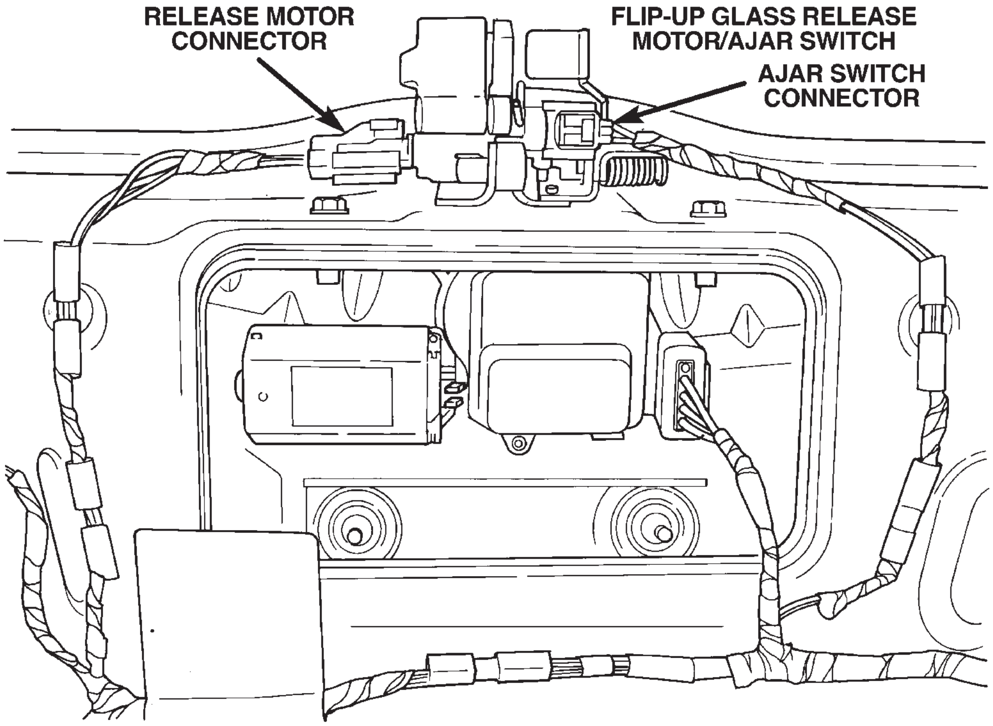
80bf1f0c

8.5.2 TAILGATE CONNECTORS



80bf1f41

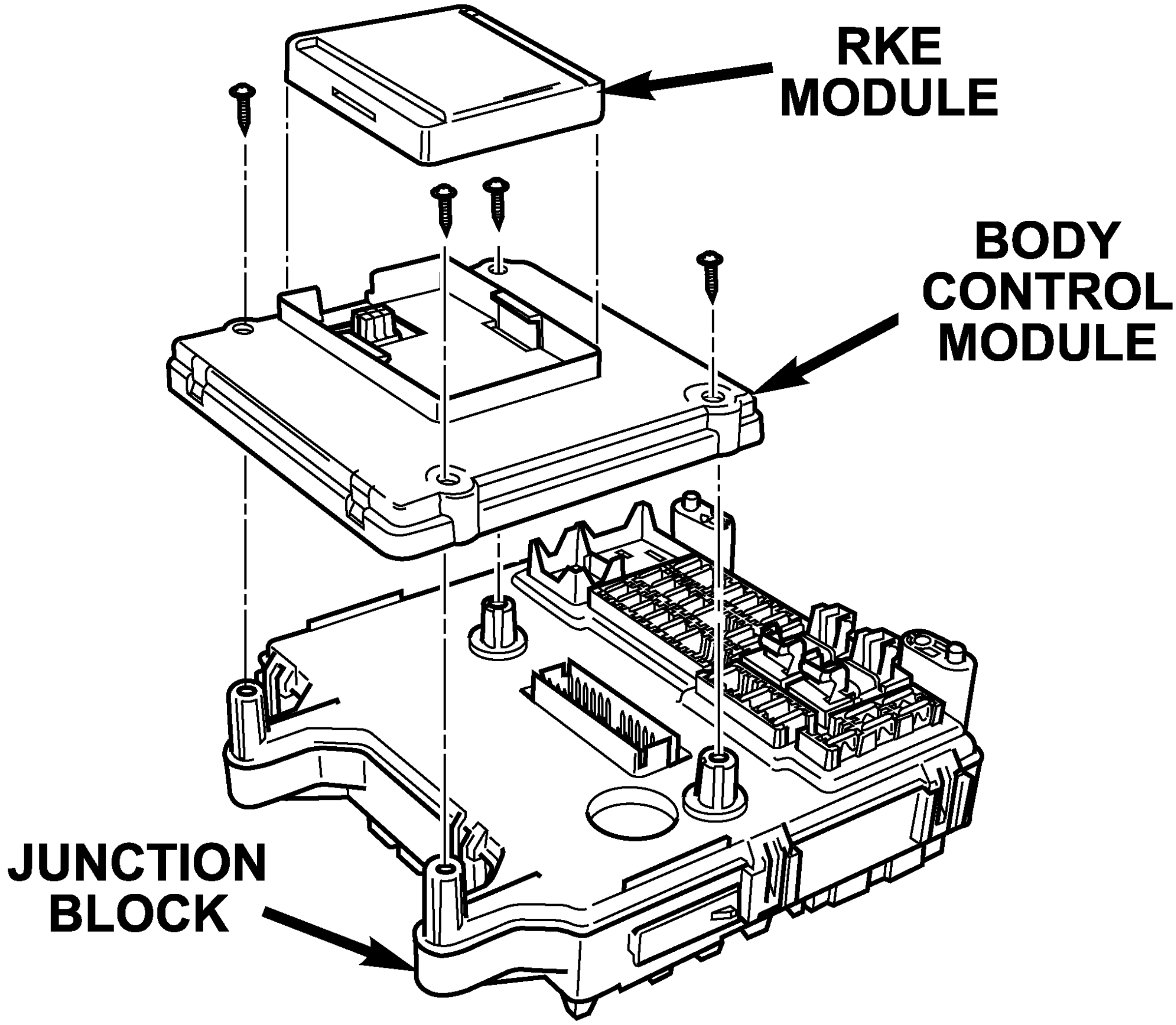
8.5.3 FLIP-UP GLASS RELEASE



80bf1f62

8.5 POWER DOOR LOCKS (Continued)

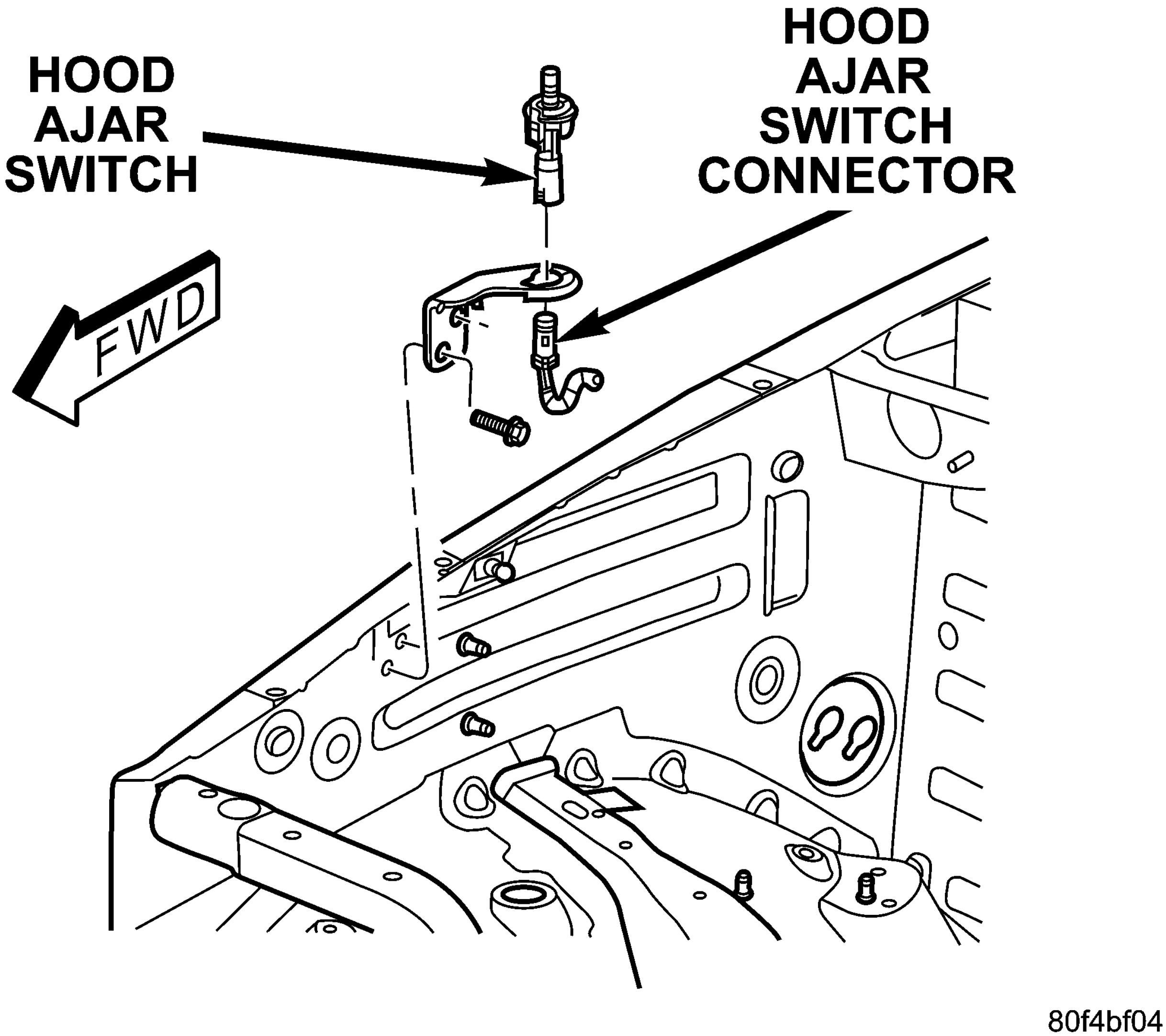
8.5.4 RKE MODULE



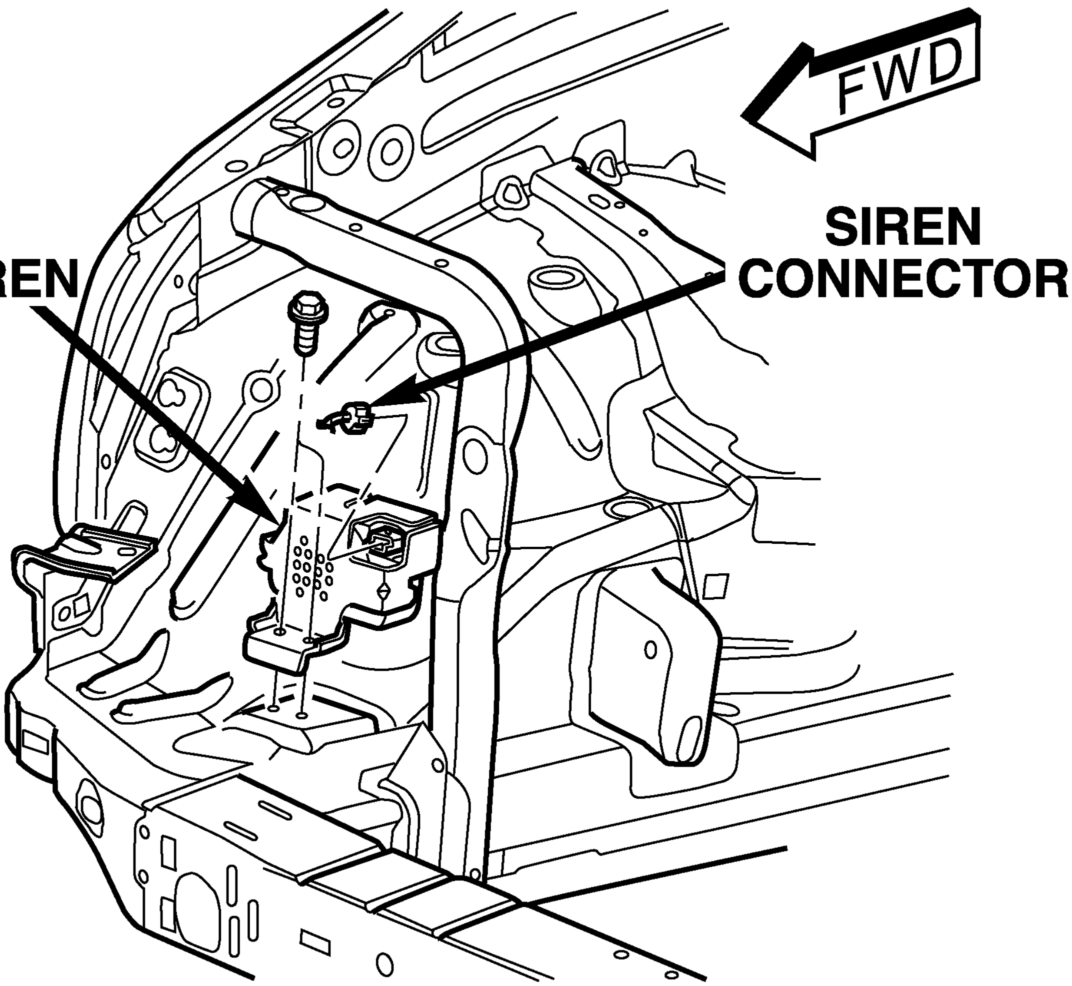
80ee924b

8.6 VEHICLE THEFT SECURITY SYSTEM

8.6.1 HOOD AJAR SWITCH (EXPORT)

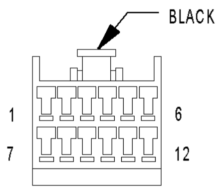


8.6.2 SIREN (EXPORT)



80f46e7d

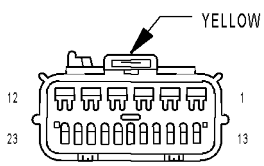
9.0 CONNECTOR PINOUTS



A/C-HEATER CONTROL C2

A/C-HEATER CONTROL C2

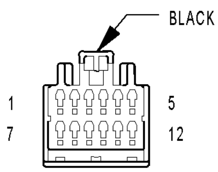
CAV	CIRCUIT	FUNCTION
1	C35 20DG/YL	MODE DOOR DRIVER (A)
2	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
3	-	-
4	-	-
5	-	-
6	C79 20VT/BK	REAR WINDOW DEFOGGER CONTROL
7	-	-
8	Z12 20BK/TN	GROUND
9	-	-
10	-	-
11	-	-
12	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT



AIRBAG CONTROL MODULE C1 (ORC C1)

AIRBAG CONTROL MODULE C1 (ORC C1)

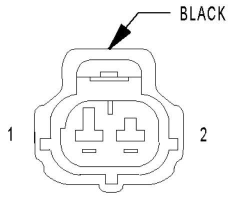
CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1
3	-	-
4	-	-
5	R53 18OR/YL	DRIVER SEAT BELT TENSIONER LINE 2
6	R55 18OR/BK	DRIVER SEAT BELT TENSIONER LINE 1
7	R61 18OR/LB	DRIVER SQUIB 2 LINE 1
8	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
9	R62 18OR/YL	PASSENGER SQUIB 2 LINE 2
10	R64 18TN/YL	PASSENGER SQUIB 2 LINE 1
11	R42 18BK/YL	PASSENGER SQUIB 1 LINE 1
12	R44 18DG/YL	PASSENGER SQUIB 1 LINE 2
13	-	-
14	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
15	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
16	Z6 18BK/PK	GROUND
17	-	-
18	-	-
19	-	-
20	-	-
21	D25 18YL/VT/OR	PCI BUS
22	-	-
23	-	-



AIRBAG CONTROL MODULE C2 (ORC C2)

AIRBAG CONTROL MODULE C2 (ORC C2)

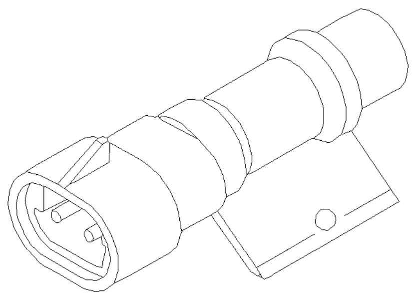
CAV	CIRCUIT	FUNCTION
1	-	-
2	R59 20LB	DRIVER SEAT BELT SWITCH GROUND
3	R57 20DG	DRIVER SEAT BELT SWITCH SENSE
4	-	-
5	R60 20VT	PASSENGER SEAT BELT SWITCH GROUND
6	R58 20GY	PASSENGER SEAT BELT SWITCH SENSE
7	R48 20TN	RIGHT FRONT IMPACT SENSOR SIGNAL
8	R46 20BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
9	-	-
10	-	-
11	R47 20DB/LB	LEFT FRONT IMPACT SENSOR GROUND
12	R49 20LB/OR	LEFT FRONT IMPACT SENSOR SIGNAL



AMBIENT TEMPERATURE SENSOR

AMBIENT TEMPERATURE SENSOR

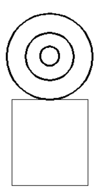
CAV	CIRCUIT	FUNCTION
1	G31 18VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
2	G32 18DB/OR	AMBIENT TEMPERATURE SENSOR RETURN



AMBIENT TEMPERATURE SENSOR (SENSOR SIDE)

AMBIENT TEMPERATURE SENSOR (SENSOR SIDE)

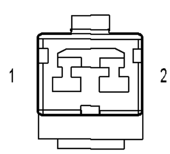
CAV	CIRCUIT	FUNCTION
1	-	AMBIENT TEMPERATURE SENSOR SIGNAL
2	-	AMBIENT TEMPERATURE SENSOR RETURN



ANTENNA (EXCEPT EXPORT)

ANTENNA (EXCEPT EXPORT)

CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



ANTENNA MODULE C1 (EXPORT)

ANTENNA MODULE C1 (EXPORT)

CAV	CIRCUIT	FUNCTION
1	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-

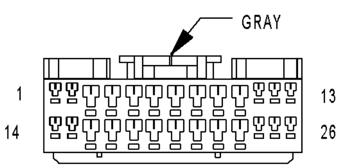
CONNECTOR PINOUTS

CONNECTOR VIEW NOT AVAILABLE

ANTENNA MODULE C2 (EXPORT)

ANTENNA MODULE C2 (EXPORT)

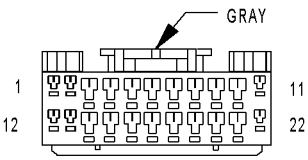
CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



BODY CONTROL MODULE C1

BODY CONTROL MODULE C1

CAV	CIRCUIT	FUNCTION
1	Z103 16BK/OR	GROUND
2	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
3	Y98 20GY/DB	INSTRUMENT CLUSTER WAKE UP SIGNAL
4	G75 20TN	LEFT FRONT DOOR AJAR SWITCH SENSE
5	G74 20TN/RD	RIGHT FRONT DOOR AJAR SWITCH SENSE
6	G70 20BR/TN (EXCEPT BASE)	HOOD AJAR SWITCH SENSE
7	G78 20TN/BK	TAILGATE AJAR SWITCH SENSE
8	G26 20LB	KEY-IN IGNITION SWITCH SENSE
9	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
10	M3 20PK/DB	REAR COURTESY LAMP CONTROL
11	V10 18BR	WASHER PUMP DRIVER
12	L91 20DB/PK	HAZARD LAMP CONTROL
13	V21 20DB/RD	REAR WIPER ON DRIVER
14	Z231 16BK/WT	SIGNAL GROUND
15	D25 18YL/VT/WT	PCI BUS
16	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
17	P101 20OR/PK	FLIP-UP GLASS RELEASE SWITCH SENSE
18	-	-
19	L118 20BR/YL (RENEGADE)	LIGHTBAR SWITCH SENSE
20	B22 18LG/YL (DIESEL)	VEHICLE SPEED SIGNAL
20	B22 18LG/YL (GAS)	VEHICLE SPEED OUTPUT
21	G69 20BK/OR	VTSS INDICATOR DRIVER
22	G76 20TN/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
23	C79 20VT/BK	REAR WINDOW DEFOGGER CONTROL
24	C19 18BR	A/C ON/OFF CONTROL
25	Z3 16BK/OR	GROUND
26	P100 18OR/BR	FLIP-UP GLASS RELEASE MOTOR DRIVER



BODY CONTROL MODULE C2

BODY CONTROL MODULE C2

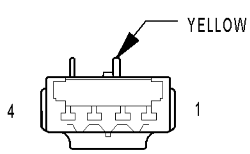
CAV	CIRCUIT	FUNCTION
1	Y66 20GY (EXCEPT BASE)	RKE ANTENNA
2	G910 20VT/BR	TAILGATE SWITCH GROUND
3	G77 20TN/OR	LEFT REAR DOOR AJAR SWITCH SENSE
4	L80 20WT/DG	HEADLAMP SWITCH RETURN
5	L307 20LG/OR	HEADLAMP SWITCH MUX
6	G73 18LG/OR (RHD)	LEFT CYLINDER LOCK SWITCH MUX
6	G72 18DG/OR (LHD EXCEPT BASE)	RIGHT CYLINDER LOCK SWITCH MUX
7	L27 20WT/TN (EXCEPT BASE)	FRONT FOG LAMP SWITCH SENSE
8	E21 20OR/RD	PANEL LAMPS DIMMER SWITCH MUX
9	G72 18DG/OR (RHD)	RIGHT CYLINDER LOCK SWITCH MUX
9	G73 18LG/OR (LHD EXCEPT BASE)	LEFT CYLINDER LOCK SWITCH MUX
10	V52 20DG/RD	FRONT WIPER SWITCH MUX
11	X10 20RD/DB (EXCEPT BASE)	RADIO CONTROL MUX RETURN
12	Y66 20GY (EXCEPT BASE)	RKE ANTENNA
13	-	-
14	-	-
15	G32 20DB/OR (EXCEPT BASE)	AMBIENT TEMPERATURE SENSOR RETURN
16	Z20 20BK/WT (RHD)	GROUND
17	G71 18VT/YL	TAILGATE CYLINDER LOCK SWITCH MUX
18	G31 20VT/LG (EXCEPT BASE)	AMBIENT TEMPERATURE SENSOR SIGNAL
19	L324 20WT/LG	HIGH BEAM SWITCH SENSE
20	F512 18PK/OR	VEHICLE SPEED SENSOR SUPPLY
21	B12 18DG/OR	VEHICLE SPEED SIGNAL
22	X20 20RD/BK (EXCEPT BASE)	RADIO CONTROL MUX

CONNECTOR VIEW NOT AVAILABLE

BODY CONTROL MODULE C3 (PREMIUM)

BODY CONTROL MODULE C3 (PREMIUM)

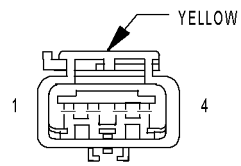
CAV	CIRCUIT	FUNCTION
1	Y60	RKE DATA
2	Y62	RKE SUPPLY
3	Y61	RKE PROGRAM
4	Y63	RKE GROUND
5	Y64	RKE ANTENNA (+)
6	Y65	RKE ANTENNA (-)



C202

C202

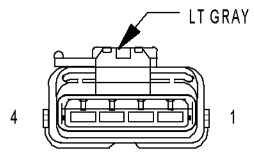
CAV	CIRCUIT
1	-
2	-
3	R53 18OR/YL
4	R55 18OR/BK



C202

C202

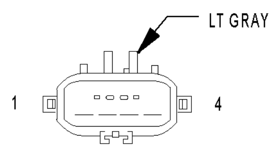
CAV	CIRCUIT
1	-
2	-
3	R53 18OR/YL
4	R55 18OR/BK



C311

C311

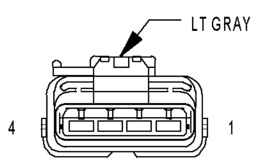
CAV	CIRCUIT
1	F37 14RD/LB (MIDLINE/ HIGHLINE)
2	R57 18DG (LHD)
2	R58 18GY (RHD)
3	Z238 14BK/WT (MIDLINE/ HIGHLINE)
4	R59 18LB (LHD)
4	R60 18VT (RHD)



C311

C311

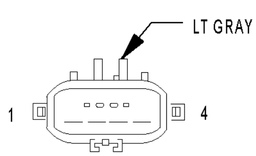
CAV	CIRCUIT
1	F37 18RD/LB (EXCEPT BASE)
2	R57 18DG (LHD)
2	R58 18GY (RHD)
3	Z238 14BK/WT (EXCEPT BASE)
4	R59 18LB (LHD)
4	R60 18VT (RHD)



C313

C313

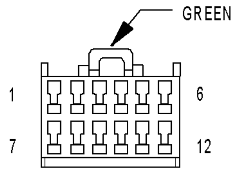
CAV	CIRCUIT
1	F37 14RD/LB (HIGHLINE)
2	R58 18GY (LHD)
2	R57 18DG (RHD)
3	Z238 14BK/WT (HIGHLINE)
4	R60 18VT (LHD)
4	R59 18LB (RHD)



C313

C313

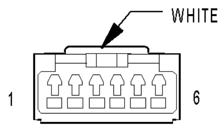
CAV	CIRCUIT
1	F34 14RD/LB (HIGHLINE)
2	R58 18GY (LHD EXCEPT BASE)
2	R57 DG (RHD)
2	R58 18DG (LHD BASE)
3	Z238 14BK/WT (HIGHLINE)
4	R60 18LB (LHD BASE)
4	R60 18VT (LHD EXCEPT BASE)
4	R59 18LB (RHD)



CD CHANGER

CD CHANGER

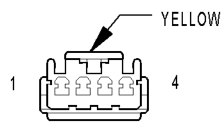
CAV	CIRCUIT	FUNCTION
1	X41 20WT/DG	AUDIO OUT LEFT
2	-	-
3	-	-
4	Z17 20BK	GROUND
5	X112 20RD	IGNITION SWITCH OUTPUT
6	X160 20YL	B(+)
7	X40 20WT/RD	AUDIO OUT RIGHT
8	Z30 20WT/BK	GROUND
9	-	-
10	-	-
11	Z9 20BK/DB	GROUND
12	D25 20YL/VT	PCI BUS



CLOCKSPRING C1

CLOCKSPRING C1

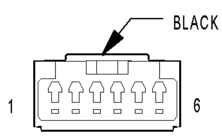
CAV	CIRCUIT	FUNCTION
1	-	-
2	X3 20BK/RD	HORN RELAY CONTROL
3	X20 20RD/BK (PREMIUM)	RADIO CONTROL MUX
4	X10 20RD/DB (PREMIUM)	RADIO CONTROL MUX RETURN
5	K4 20BK/LB	SENSOR GROUND
6	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL



CLOCKSPRING C2

CLOCKSPRING C2

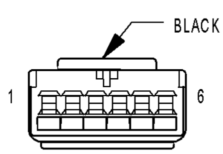
CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1
3	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
4	R61 18OR/LB	DRIVER SQUIB 2 LINE 1



CLOCKSPRING C3

CLOCKSPRING C3

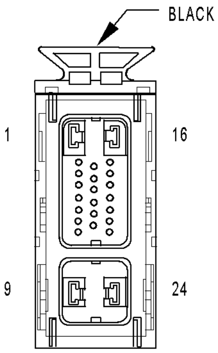
CAV	CIRCUIT	FUNCTION
1	-	-
2	X3 20BK/RD	HORN RELAY CONTROL
3	X20 20RD/BK (PREMIUM)	RADIO CONTROL MUX
4	X10 20RD/DB (PREMIUM)	RADIO CONTROL MUX RETURN
5	K4 20BK/LB (EXCEPT BASE)	SENSOR GROUND
6	V37 20RD/LG (EXCEPT BASE)	SPEED CONTROL SWITCH SIGNAL



COMPASS MINI-TRIP COMPUTER (PREMIUM)

COMPASS MINI-TRIP COMPUTER (PREMIUM)

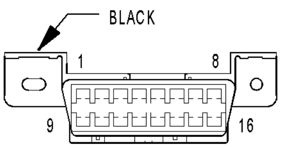
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20YL/VT	PCI BUS
3	M1 20PK	FUSED B(+)
4	Z2 20BK/LG	CLEAN GROUND
5	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	-	-



CONTROLLER
ANTILOCK
BRAKE

CONTROLLER ANTILOCK BRAKE

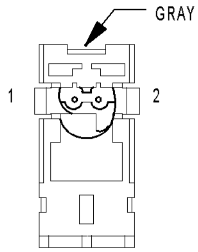
CAV	CIRCUIT	FUNCTION
1	Z101 12BK/OR	GROUND
2	-	-
3	-	-
4	-	-
5	D25 18YL/VT	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	D24 18WT/DG	FLASH ABS
9	A20 12RD/DB	FUSED B(+)
10	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
11	-	-
12	-	-
13	B12 18DG/OR	VEHICLE SPEED SIGNAL
14	-	-
15	-	-
16	Z102 12BK/OR	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL
20	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)



DATA
LINK
CONNECTOR

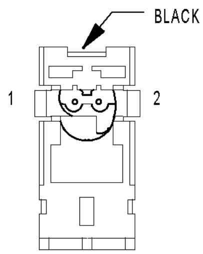
DATA LINK CONNECTOR

CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



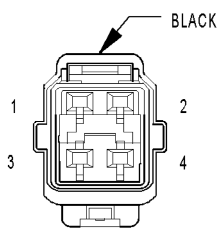
DRIVER AIRBAG SQUIB 1

CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1



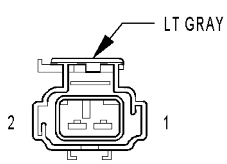
DRIVER AIRBAG SQUIB 2

CAV	CIRCUIT	FUNCTION
1	R63 18TN/LB	DRIVER SQUIB 2 LINE 2
2	R61 18OR/LB	DRIVER SQUIB 2 LINE 1



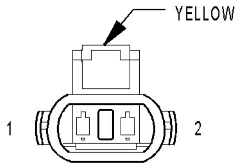
DRIVER DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE)

CAV	CIRCUIT	FUNCTION
1	G75 20TN (LHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
1	G74 20TN/RD (RHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG (LHD)	GROUND
2	Z351 20BK/LG (RHD)	GROUND
3	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



DRIVER SEAT BELT SWITCH

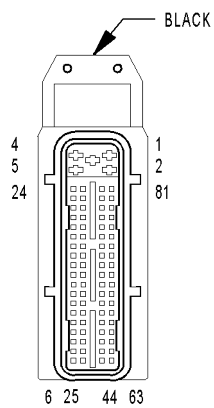
CAV	CIRCUIT	FUNCTION
1	R57 18DG	DRIVER SEAT BELT SWITCH SENSE
2	R59 18LB	DRIVER SEAT BELT SWITCH GROUND



DRIVER
SEAT BELT
TENSIONER

DRIVER SEAT BELT TENSIONER

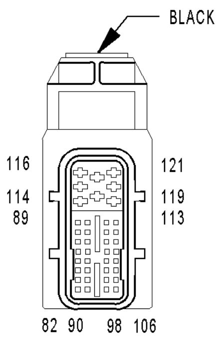
CAV	CIRCUIT	FUNCTION
1	R55 18OR/BK	DRIVER SEAT BELT TENSIONER LINE 1
2	R53 18OR/YL	DRIVER SEAT BELT TENSIONER LINE 2



ENGINE CONTROL MODULE C1 (DIESEL)

ENGINE CONTROL MODULE C1 (DIESEL)

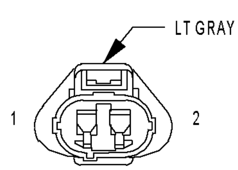
CAV	CIRCUIT	FUNCTION
1	Z108 14BK/DG	GROUND
2	Z108 14BK/DG	GROUND
3	K20 18DG	GENERATOR FIELD CONTROL
4	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
5	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
6	-	-
7	D25 20VT/YL	PCI BUS
8	K944 20BK/LB	CAMSHAFT POSITION SENSOR GROUND
9	K44 20TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL
12	-	-
13	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
14	-	-
15	K81 20VT/TN	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
16	K80 20BK/VT	FUEL PRESSURE SENSOR GROUND
17	-	-
18	-	-
19	F92 20YL/BR	FUSED B(+)
20	Z109 20BK/DB	GROUND
21	K4 20BK/LB	SENSOR GROUND
22	F1 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	K6 20VT/WT	SENSOR REFERENCE VOLTAGE B
24	K3 20LB/BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
25	-	-
26	-	-
27	-	-
28	-	-
29	K77 20BR/WT	TRANSFER CASE POSITION SENSOR INPUT
30	G60 20GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
31	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
32	K118 20PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR GROUND
35	K852 20VT/WT	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
36	-	-
37	-	-
38	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
39	K226 20DB/WT	FUEL LEVEL SENSOR SIGNAL
40	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K21 20BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
42	Y101 18BK/OR	CRANKSHAFT POSITION SENSOR SHIELD
43	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL 2
44	-	-
45	-	-
46	-	-
47	L50 20WT/TN	PRIMARY BRAKE SWITCH SIGNAL
48	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
49	-	-
50	-	-
51	-	-
52	-	-
53	-	-
54	-	-
55	B22 20DG/YL	VEHICLE SPEED SIGNAL
56	-	-
57	T10 20/YL/DG (A/T)	TORQUE MANAGEMENT REQUEST SENSE
58	-	-
59	-	-
60	K7 20OR	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL
62	-	-
63	-	-
64	K151 20WT	LOW IDLE POSITION SWITCH SENSE
65	-	-
66	-	-
67	-	-
68	-	-
69	C13 20DB/OR	A/C CLUTCH RELAY CONTROL
70	-	-
71	-	-
72	K236 20GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
73	-	-
74	K90 20TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
75	K132 20DG/LB	CABIN HEATER RELAY CONTROL
76	-	-
77	K152 20WT	GLOW PLUG RELAY NO. 1 CONTROL
78	-	-
79	-	-
80	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL
81	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL)

CAV	CIRCUIT	FUNCTION
100	-	-
101	C18 20DB	A/C HIGH PRESSURE SWITCH SIGNAL
102	-	-
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	-
109	-	-
110	-	-
111	-	-
112	T411 18WT/PK (A/T)	TRS T41 SENSE (P/N)
113	-	-
114	-	-
115	K14 2.5mmLB/BR	FUEL INJECTOR NO. 4 CONTROL
116	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
117	-	-
118	K11 2.5mmWT/DB	FUEL INJECTOR NO. 1 CONTROL
119	K12 2.5mmTN	FUEL INJECTOR NO. 2 CONTROL
120	K13 2.5mmYL/WT	FUEL INJECTOR NO. 3 CONTROL
121	-	-
82	D21 20PK	SCI TRANSMIT
83	K244 20BR/WT (A/T)	ENGINE SPEED SIGNAL
84	-	-
85	-	-
86	-	-
87	-	-
88	-	-
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-

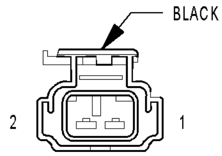


ENGINE COOLANT LEVEL SENSOR (DIESEL)

ENGINE COOLANT LEVEL SENSOR (DIESEL)

CAV	CIRCUIT	FUNCTION
1	G18 18PK/BK	LOW COOLANT FLUID LEVEL SENSE
2	Z246 18BK/GY	GROUND

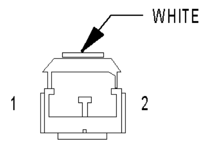
CONNECTOR PINOUTS



FLIP-UP GLASS RELEASE MOTOR

FLIP-UP GLASS RELEASE MOTOR

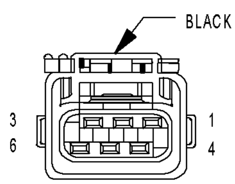
CAV	CIRCUIT	FUNCTION
1	Z235 18BK	GROUND
2	P100 18OR/BR	FLIP-UP GLASS RELEASE MOTOR DRIVER



FLIP-UP GLASS RELEASE SWITCH

FLIP-UP GLASS RELEASE SWITCH

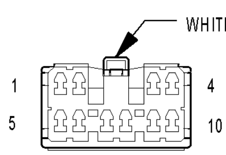
CAV	CIRCUIT	FUNCTION
1	G910 20VT/BR	TAILGATE SWITCH GROUND
2	P101 20OR/PK	FLIP-UP GLASS RELEASE SWITCH SENSE



FRONT WIPER MOTOR

FRONT WIPER MOTOR

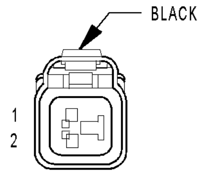
CAV	CIRCUIT	FUNCTION
1	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
3	-	-
4	Z141 14BK	GROUND
5	V3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
6	V4 14RD/YL	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT



HAZARD SWITCH/ COMBINATION FLASHER

HAZARD SWITCH/COMBINATION FLASHER

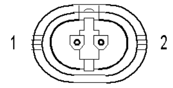
CAV	CIRCUIT	FUNCTION
1	A15 18PK/OR	FUSED B(+)
2	Z3 18BK/OR	GROUND
3	L62 18BR/RD	RIGHT TURN SIGNAL
4	L91 20DB/PK	HAZARD LAMP CONTROL
5	L305 20LB/WT	LEFT TURN SWITCH SENSE
6	-	-
7	L63 18DG/RD	LEFT TURN SIGNAL
8	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
9	L302 20LB/YL	RIGHT TURN SWITCH SENSE
10	E2 20OR	PANEL LAMPS DRIVER



HIGH NOTE HORN

HIGH NOTE HORN

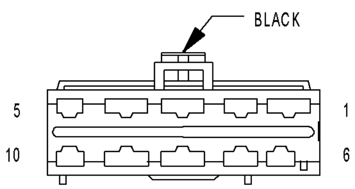
CAV	CIRCUIT	FUNCTION
1	X2 18DG/RD	HORN RELAY OUTPUT
2	Z141 18BK	GROUND



HOOD AJAR SWITCH (EXCEPT BASE)

HOOD AJAR SWITCH (EXCEPT BASE)

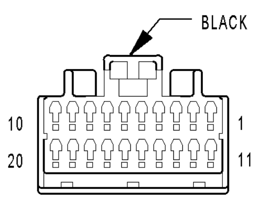
CAV	CIRCUIT	FUNCTION
1	G70 18BR/TN	HOOD AJAR SWITCH SENSE
2	Z142 18BK/WT	GROUND



IGNITION SWITCH

IGNITION SWITCH

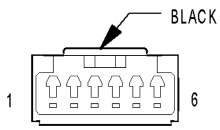
CAV	CIRCUIT	FUNCTION
1	A1 12RD	FUSED B(+)
2	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
3	F81 12TN	IGNITION SWITCH OUTPUT (RUN-ACC)
4	A25 12DB	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	A41 12YL	IGNITION SWITCH OUTPUT (START)
7	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
8	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
9	A2 12PK/BK	FUSED B(+)
10	Z232 16BK/LB	GROUND



INSTRUMENT CLUSTER

INSTRUMENT CLUSTER

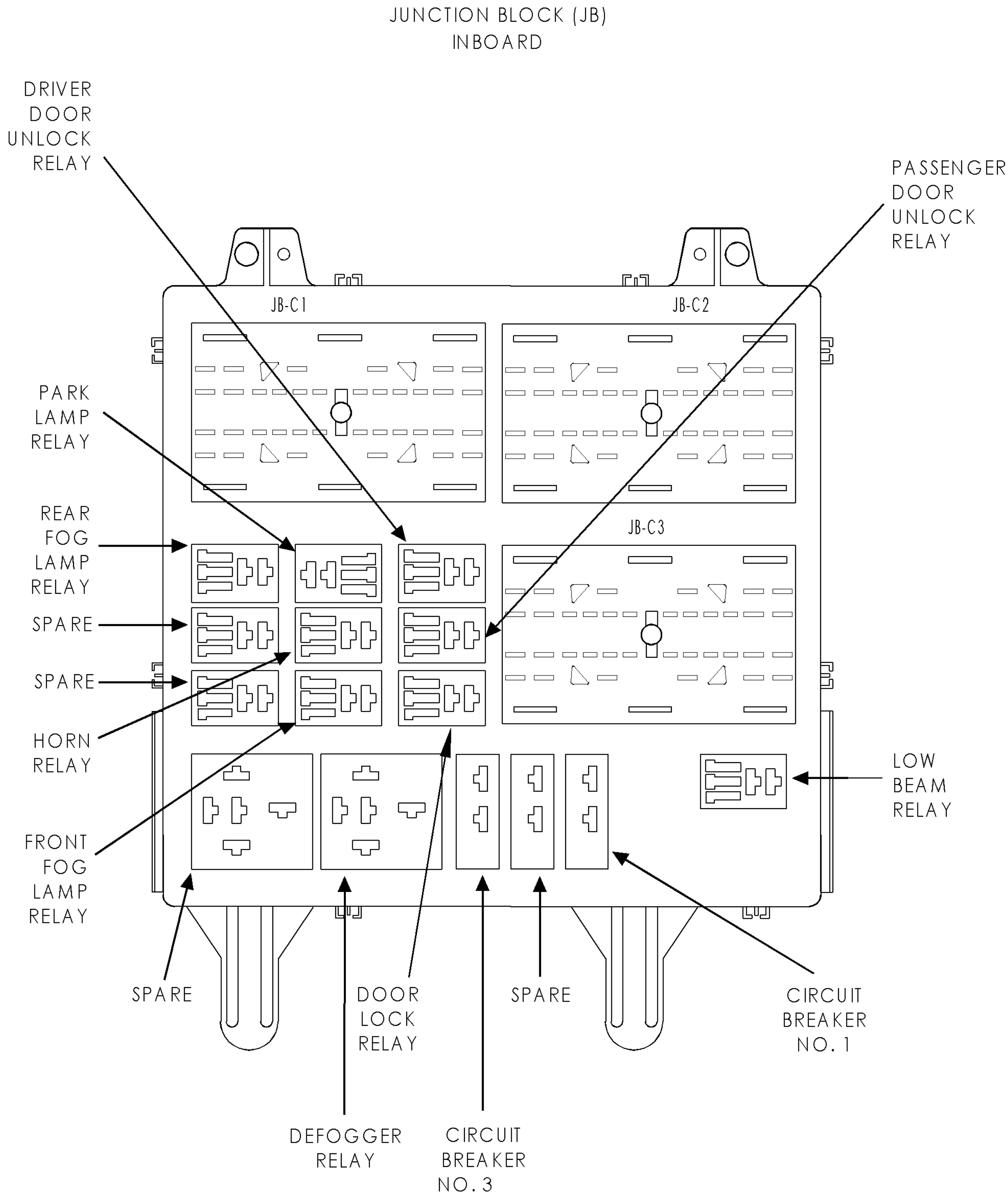
CAV	CIRCUIT	FUNCTION
1	Z105 20BK/LG	GROUND
2	-	-
3	Y98 20GY/DB	INSTRUMENT CLUSTER WAKE UP SIGNAL
4	-	-
5	G18 20PK/BK	LOW COOLANT FLUID LEVEL SENSE
6	L63 20DG/RD	LEFT TURN SIGNAL
7	G9 20GY/BK	PARK BRAKE SWITCH SENSE
8	G69 20BK/OR	VTSS INDICATOR DRIVER
9	-	-
10	M1 20PK	FUSED B(+)
11	L78 20DG/YL	FUSED PARK LAMP RELAY OUTPUT
12	E2 20OR	PANEL LAMPS DRIVER
13	-	-
14	D25 20YL/VT/RD	PCI BUS
15	-	-
16	L62 20BR/RD	RIGHT TURN SIGNAL
17	G11 20WT/BK	RED BRAKE WARNING INDICATOR DRIVER
18	G29 20BK/TN	LOW WASHER FLUID SENSE
19	F87 20TN/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
20	-	-



INTRUSION TRANSCEIVER MODULE (EXPORT)

INTRUSION TRANSCEIVER MODULE (EXPORT)

CAV	CIRCUIT	FUNCTION
1	Z2 20BK/LG	GROUND
2	-	-
3	X75 20DG	SIREN SIGNAL CONTROL
4	-	-
5	D25 20YL/VT	PCI BUS
6	M1 20PK	FUSED B(+)


JUNCTION BLOCK (JB)
INBOARD
DRIVER DOOR UNLOCK RELAY
PASSENGER DOOR UNLOCK RELAY
JB-C1
JB-C2
JB-C3
PARK LAMP RELAY
REAR FOG LAMP RELAY
SPARE
SPARE
HORN RELAY
FRONT FOG LAMP RELAY
LOW BEAM RELAY
SPARE
DOOR LOCK RELAY
SPARE
CIRCUIT BREAKER NO. 1
DEFOGGER RELAY
CIRCUIT BREAKER NO. 3

FUSES (JB)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F38 16RD/WT	FUSED B(+)
2	10A	INTERNAL	FUSED B(+)
3	15A	INTERNAL	FUSED B(+)
4	10A	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
5	10A	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
6	20A	INTERNAL	FUSED B(+)
7	-	SPARE	-
8	-	SPARE	-
9	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
10	-	SPARE	-
11	15A	A15 18PK/OR	FUSED B(+)
12	15A	F32 18PK/DB	FUSED B(+)
13	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	-	SPARE	-
15	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	20A	F41 16PK/VT	FUSED B(+)
17	15A	F70 18PK/BK	FUSED B(+)
18	20A	F60 16DG/RD	FUSED B(+)
19	15A	INTERNAL	FUSED B(+)
20	20A	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
21	-	SPARE	-
22	10A	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
23	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
24	10A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
25	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
26	10A	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
27	10A	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
28	-	SPARE	-
29	30A	A3 16RD/WT (HIGHLINE)	FUSED B(+)
30	10A	INTERNAL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
31	20A	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
32	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
33	10A	INTERNAL	FUSED B(+)
34	15A	INTERNAL	FUSED B(+)
35	-	SPARE	-
36	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
37	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
38	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
39	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)

DEFOGGER RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B (+)
85	INTERNAL	REAR WINDOW DEFOGGER RELAY CONTROL
86	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
87	INTERNAL	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

DOOR LOCK RELAY

CAV	CIRCUIT	FUNCTION
30	P33 18OR/BK	LOCK RELAY OUTPUT
85	INTERNAL	FUSED B(+)
86	INTERNAL	DOOR LOCK RELAY CONTROL
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

DRIVER DOOR UNLOCK RELAY

CAV	CIRCUIT	FUNCTION
30	P34 18PK/BK	DRIVER DOOR UNLOCK RELAY OUTPUT
85	INTERNAL	DRIVER DOOR UNLOCK RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

FRONT FOG LAMP RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FRONT FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	L39 16LB	FRONT FOG LAMP RELAY OUTPUT
87A	-	-

HIGH BEAM RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	HIGH BEAM RELAY CONTROL
87	INTERNAL	HIGH BEAM RELAY OUTPUT
87A	-	-

LOW BEAM RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	LOW BEAM RELAY CONTROL
87	INTERNAL	LOW BEAM RELAY OUTPUT
87A	-	-

PARK LAMP RELAY

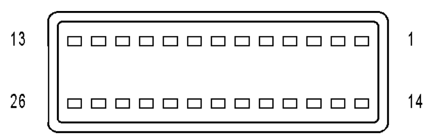
CAV	CIRCUIT	FUNCTION
30	INTERNAL	PARK LAMP RELAY OUTPUT
85	INTERNAL	PARK LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

PASSENGER DOOR UNLOCK RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	PASSENGER DOOR UNLOCK RELAY OUTPUT
85	INTERNAL	PASSENGER DOOR UNLOCK RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

REAR FOG LAMP RELAY

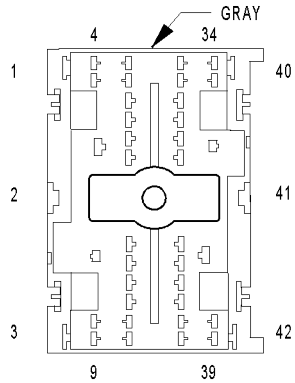
CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	REAR FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
86	INTERNAL	FUSED B(+)
87A	-	-
87	L38 18BR/WT	REAR FOG LAMP RELAY OUTPUT



JUNCTION BLOCK
BODY CONTROL MODULE-JB

JUNCTION BLOCK BODY CONTROL MODULE-JB

CAV	CIRCUIT	FUNCTION
1	X3	HORN RELAY CONTROL
2	P334	DOOR UNLOCK RELAY CONTROL
3	L308	PARK LAMP RELAY CONTROL
4	L96 (PREMIUM)	REAR FOG LAMP RELAY CONTROL
5	P109 (EXCEPT BASE)	DRIVER DOOR UNLOCK RELAY CONTROL
6	C80	REAR WINDOW DEFOGGER RELAY CONTROL
7	-	-
8	Z300	GROUND
9	F35	FUSED B(+)
10	L309	HIGH BEAM RELAY CONTROL
11	P31	TAILGATE UNLOCK DRIVER
12	P37	DOOR LOCK SWITCH GROUND
13	L94	LOW BEAM RELAY CONTROL
14	F89	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
15	M1	FUSED B(+)
16	F87	FUSED IGNITION SWITCH OUTPUT (RUN-START)
17	L26 (EXCEPT BASE)	FRONT FOG LAMP RELAY CONTROL
18	P333	DOOR LOCK RELAY CONTROL
19	V16	FRONT WIPER HIGH/LOW RELAY CONTROL
20	V55	FRONT WIPER PARK SWITCH SENSE
21	V14	FRONT WIPER ON/OFF RELAY CONTROL
22	P30	TAILGATE LOCK DRIVER
23	P36	DOOR LOCK SWITCH MUX
24	M2	COURTESY LAMP DRIVER
25	Z131	GROUND
26	M20	COURTESY LAMP LOAD SHED



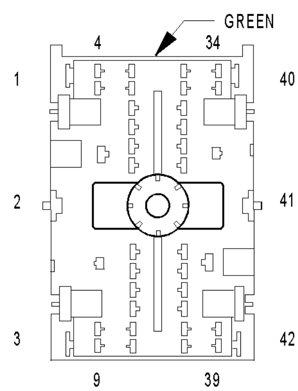
JUNCTION BLOCK C1

JUNCTION BLOCK C1

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	A21 12RD/DB	IGNITION SWITCH OUTPUT (RUN-START)
4	E2 20OR	PANEL LAMPS DRIVER
5	E2 20OR	PANEL LAMPS DRIVER
6	-	-
7	X3 20BK/RD	HORN RELAY CONTROL
8	L78 20DG/YL (EXCEPT EXPORT)	FUSED PARK LAMP RELAY OUTPUT
8	L78 18DG/YL (EXPORT)	FUSED PARK LAMP RELAY OUTPUT
9	F1 20DB (PREMIUM)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
10	E2 20OR	PANEL LAMPS DRIVER
11	E2 20OR	PANEL LAMPS DRIVER
12	M1 20PK	FUSED B(+)
13	F33 20PK/RD	FUSED B(+)
14	-	-
15	M1 20PK	FUSED B(+)
16	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
17	Z300 16BK	GROUND
18	-	-
19	-	-
20	Z131 10BK/GY	GROUND
21	L309 20LG/WT	HIGH BEAM RELAY CONTROL
22	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	M2 20YL	COURTESY LAMP DRIVER
24	M2 20YL	COURTESY LAMP DRIVER
25	F33 20PK/RD (PREMIUM)	FUSED B(+)
26	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
27	M1 20PK	FUSED B(+)
28	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
29	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
30	-	-
31	F87 20TN/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
32	-	-
33	F38 16RD/WT	FUSED B(+)
34	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
35	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
36	-	-
37	F32 18PK/DB	FUSED B(+)
38	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
39	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
40	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
41	A15 18PK/OR	FUSED B(+)
42	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)

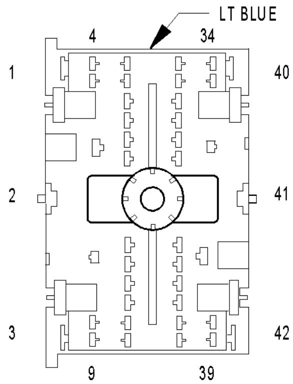
JUNCTION BLOCK C2

CAV	CIRCUIT	FUNCTION
1	F37 14RD/LB (MIDLINE/ HIGHLINE)	FUSED B(+)
2	-	-
3	C15 12BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
4	F89 18OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P37 20LG (EXCEPT BASE)	DOOR LOCK SWITCH GROUND
6	P33 18OR/BK (EXCEPT BASE)	LOCK RELAY OUTPUT
7	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
8	P34 18PK/BK (EXCEPT BASE)	DRIVER DOOR UNLOCK RELAY OUTPUT
9	P35 18OR/VT (EXCEPT BASE)	UNLOCK RELAY OUTPUT
10	P36 20PK/VT (EXCEPT BASE)	DOOR LOCK SWITCH MUX
11	P37 20LG (EXCEPT BASE)	DOOR LOCK SWITCH GROUND
12	M20 20BR	COURTESY LAMP LOAD SHED
13	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
14	P36 20PK/VT (EXCEPT BASE)	DOOR LOCK SWITCH MUX
15	P30 16OR/WT	TAILGATE LOCK DRIVER
16	F70 18PK/BK	FUSED B(+)
17	L77 18BK/YL	FUSED LEFT INBOARD TAIL LAMP
18	M1 20PK	FUSED B(+)
19	M1 20PK	FUSED B(+)
20	E2 20OR	PANEL LAMPS DRIVER
21	E2 20OR	PANEL LAMPS DRIVER
22	-	-
23	V23 20BR/PK (HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN)
24	V23 20BR/PK (EXCEPT BASE)	FUSED IGNITION SWITCH OUTPUT (RUN)
25	V23 20BR/PK (MIDLINE/ HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN)
26	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
27	-	-
28	A6 16RD/BK (MIDLINE/ HIGHLINE)	FUSED B(+)
29	-	-
30	M2 18YL	COURTESY LAMP DRIVER
31	C16 18LB/YL (EXCEPT BASE)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
32	F14 18LG/YL (SIDE AIR-BAG)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
33	F14 18LG/YL (SIDE AIR-BAG)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
34	L38 18BR/WT (HIGHLINE)	REAR FOG LAMP RELAY OUTPUT
35	P31 16PK/WT	TAILGATE UNLOCK DRIVER
36	-	-
37	F60 16DG/RD (MIDLINE/ HIGHLINE)	FUSED B(+)
38	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
39	C16 18LB/YL (EXCEPT BASE)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
40	F85 16VT/WT (MIDLINE/ HIGHLINE)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
41	F41 16PK/VT	FUSED B(+)
42	A3 16RD/WT (HIGHLINE)	FUSED B(+)



JUNCTION BLOCK C2

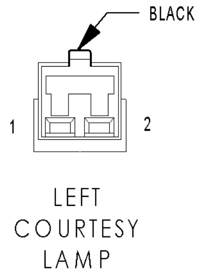
CONNECTOR PINOUTS



JUNCTION BLOCK C3

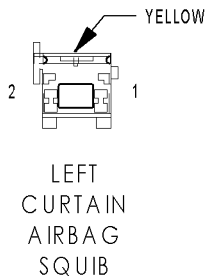
JUNCTION BLOCK C3

CAV	CIRCUIT	FUNCTION
1	A12 10RD/TN	FUSED B(+)
2	A13 10PK/WT	FUSED B(+)
3	A4 12BK/PK	FUSED B(+)
4	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
5	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
6	-	-
7	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
8	F1 20DB (RHD)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	F1 18DB (LHD)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
9	V6 16DB/YL (LHD)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	V6 14DB/YL (RHD)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	-	-
11	A12 10RD/TN	FUSED B(+)
12	-	-
13	-	-
14	-	-
15	V14 18RD/VT	FRONT WIPER ON/OFF RELAY CONTROL
16	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
17	-	-
18	V16 18VT/YL	FRONT WIPER HIGH/LOW RELAY CONTROL
19	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
20	-	-
21	-	-
22	-	-
23	-	-
24	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
25	-	-
26	-	-
27	-	-
28	L77 18BK/YL	FUSED LEFT INBOARD TAIL LAMP
29	M1 18PK	FUSED B(+)
30	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
31	-	-
32	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
33	L39 18LB	FRONT FOG LAMP RELAY OUTPUT
34	A18 10PK	FUSED B(+)
35	-	-
36	-	-
37	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
38	F22 18DB/PK (ABS)	FUSED IGNITION SWITCH OUTPUT (RUN)
39	X2 18DG/RD	HORN RELAY OUTPUT
40	A18 10PK	FUSED B(+)
41	-	-
42	A7 10RD/BK	FUSED B(+)



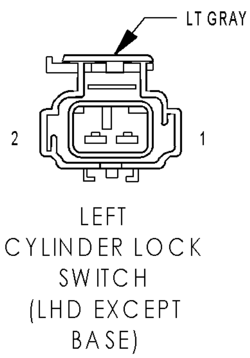
LEFT COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



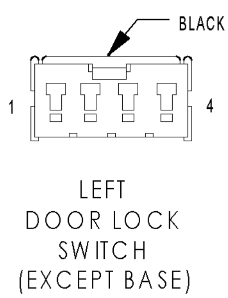
LEFT CURTAIN AIRBAG SQUIB

CAV	CIRCUIT	FUNCTION
1	R77 18YL/RD	LEFT CURTAIN SQUIB 1 LINE 2
2	R75 18YL/BK	LEFT CURTAIN SQUIB 1 LINE 1



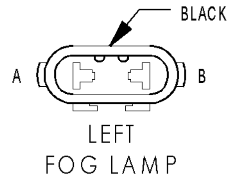
LEFT CYLINDER LOCK SWITCH (LHD EXCEPT BASE)

CAV	CIRCUIT	FUNCTION
1	P37 18LG	DOOR LOCK SWITCH GROUND
2	G73 18LG/OR	LEFT CYLINDER LOCK SWITCH MUX



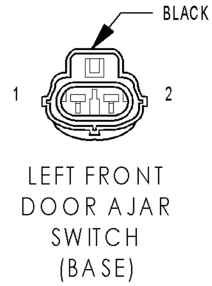
LEFT DOOR LOCK SWITCH (EXCEPT BASE)

CAV	CIRCUIT	FUNCTION
1	P36 20PK/VT	DOOR LOCK SWITCH MUX
2	Z350 20BK/LG	GROUND
3	F89 20OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	P37 20LG	DOOR LOCK SWITCH GROUND



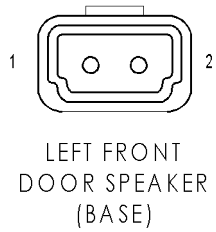
LEFT FOG LAMP

CAV	CIRCUIT	FUNCTION
A	Z141 18BK	GROUND
B	L39 18LB	FRONT FOG LAMP RELAY OUTPUT



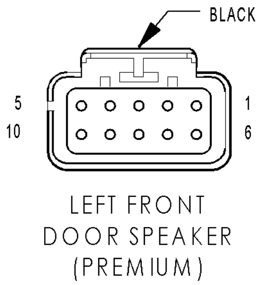
LEFT FRONT DOOR AJAR SWITCH (BASE)

CAV	CIRCUIT	FUNCTION
1	G75 20TN	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND



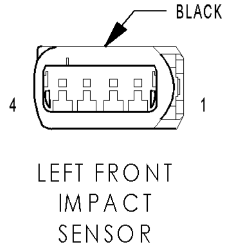
LEFT FRONT DOOR SPEAKER (BASE)

CAV	CIRCUIT	FUNCTION
1	X53 18DG	LEFT FRONT SPEAKER (+)
2	X55 18BR/RD	LEFT FRONT SPEAKER (-)



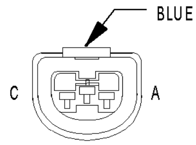
LEFT FRONT DOOR SPEAKER (PREMIUM)

CAV	CIRCUIT	FUNCTION
1	X53 18DG	LEFT FRONT SPEAKER (+)
2	X55 18BR/RD	LEFT FRONT SPEAKER (-)
3	Z9 16BK	GROUND
4	X81 18YL/BK	AMPLIFIED HIGH LEFT FRONT SPEAKER (-)
5	X91 18WT/BK	AMPLIFIED LOW LEFT REAR SPEAKER (-)
6	X57 18BR/LB	LEFT REAR SPEAKER (-)
7	X51 18BR/YL	LEFT REAR SPEAKER (+)
8	X13 16BK/RD	RADIO CHOKE OUTPUT
9	X83 18YL/RD	AMPLIFIED HIGH LEFT FRONT SPEAKER (+)
10	X93 18WT/RD	AMPLIFIED LOW LEFT REAR SPEAKER (+)



LEFT FRONT IMPACT SENSOR

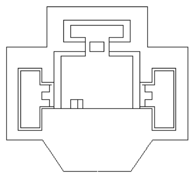
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R47 18DB/LB	LEFT FRONT IMPACT SENSOR GROUND
4	R49 18LB	LEFT FRONT IMPACT SENSOR SIGNAL



LEFT
HEADLAMP
(EXCEPT EXPORT)

LEFT HEADLAMP (EXCEPT EXPORT)

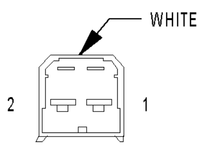
CAV	CIRCUIT	FUNCTION
A	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
B	Z141 18BK	GROUND
C	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT



LEFT
HEADLAMP
(EXPORT)

LEFT HEADLAMP (EXPORT)

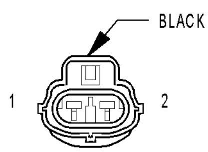
CAV	CIRCUIT	FUNCTION
1	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
2	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
3	Z141 18BK	GROUND



LEFT INSTRUMENT
PANEL SPEAKER

LEFT INSTRUMENT PANEL SPEAKER

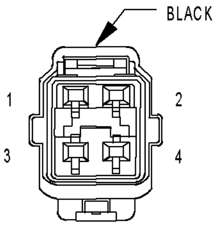
CAV	CIRCUIT	FUNCTION
1	X53 18DG (BASE/ LOWLINE)	LEFT FRONT SPEAKER (+)
1	X83 18YL/RD (MIDLINE/ PREMIUM)	AMPLIFIED HIGH LEFT FRONT SPEAKER (+)
2	X81 18YL/BK (MIDLINE/ PREMIUM)	AMPLIFIED HIGH LEFT FRONT SPEAKER (-)
2	X55 18BR/RD (BASE/ LOWLINE)	LEFT FRONT SPEAKER (-)



LEFT REAR
DOOR AJAR
SWITCH
(BASE)

LEFT REAR DOOR AJAR SWITCH (BASE)

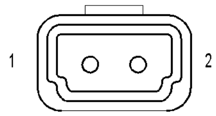
CAV	CIRCUIT	FUNCTION
1	G77 20TN/WT	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND



LEFT REAR
DOOR LOCK MOTOR/
AJAR SWITCH
(EXCEPT BASE)

LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE)

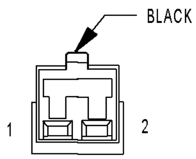
CAV	CIRCUIT	FUNCTION
1	G77 20TN/WT	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



LEFT REAR
DOOR SPEAKER

LEFT REAR DOOR SPEAKER

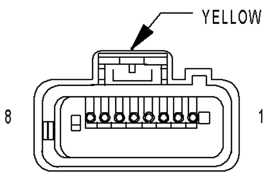
CAV	CIRCUIT	FUNCTION
1	X93 18WT/RD (PREMIUM)	AMPLIFIED LOW LEFT REAR SPEAKER (+)
1	X51 18BR/YL (BASE)	LEFT REAR DOOR SPEAKER (+)
2	X57 18BR/LB (BASE)	LEFT REAR DOOR SPEAKER (-)
2	X91 18WT (PREMIUM)	AMPLIFIED LOW LEFT REAR SPEAKER (-)



LEFT
REMOTE RADIO
SWITCH
(PREMIUM)

LEFT REMOTE RADIO SWITCH (PREMIUM)

CAV	CIRCUIT	FUNCTION
1	X10 20RD/DB	RADIO CONTROL MUX RETURN
2	X20 20RD/BK	RADIO CONTROL MUX

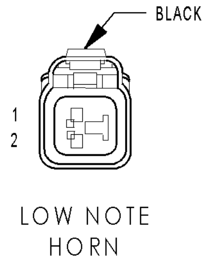


LEFT SIDE IMPACT
AIRBAG CONTROL
MODULE (LSIACM)

LEFT SIDE IMPACT AIRBAG CONTROL MODULE (LSIACM)

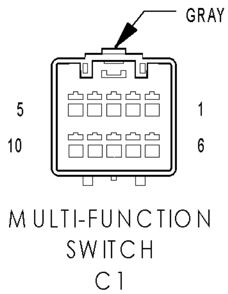
CAV	CIRCUIT	FUNCTION
1	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R77 18YL/RD	LEFT CURTAIN SQUIB 1 LINE 2
4	R75 18YL/BK	LEFT CURTAIN SQUIB 1 LINE 1
5	Z104 18BK/YL	GROUND
6	-	-
7	-	-
8	D25 18YL/VT	PCI BUS

CONNECTOR PINOUTS



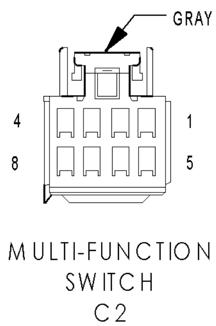
LOW NOTE HORN

CAV	CIRCUIT	FUNCTION
1	X2 18DG/RD	HORN RELAY OUTPUT
2	Z141 18BK	GROUND



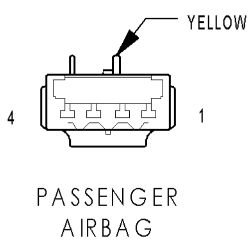
MULTI-FUNCTION SWITCH C1

CAV	CIRCUIT	FUNCTION
1	E21 20OR/RD	PANEL LAMPS DIMMER SWITCH MUX
2	L27 20WT/TN (EXCEPT BASE)	FRONT FOG LAMP SWITCH SENSE
3	-	-
4	L80 20WT/DG	HEADLAMP SWITCH RETURN
5	L307 20LG/OR	HEADLAMP SWITCH MUX
6	L305 20LB/WT	LEFT TURN SWITCH SENSE
7	L309 20LG/WT	HIGH BEAM RELAY CONTROL
8	Z12 18BK/TN	GROUND
9	L324 20WT/LG	HIGH BEAM SWITCH SENSE
10	L302 20LB/YL	RIGHT TURN SWITCH SENSE



MULTI-FUNCTION SWITCH C2

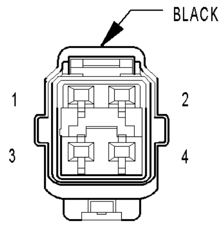
CAV	CIRCUIT	FUNCTION
1	V21 20DB/RD	REAR WIPER ON DRIVER
2	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
3	V20 18BK/WT	WASHER MOTOR SENSE
4	V52 20DG/RD	FRONT WIPER SWITCH MUX
5	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
6	-	-
7	V10 18BR	WASHER PUMP DRIVER
8	-	-



PASSENGER AIRBAG

CAV	CIRCUIT	FUNCTION
1	R62 18OR/YL	PASSENGER SQUIB 2 LINE 2
2	R64 18TN/YL	PASSENGER SQUIB 2 LINE 1
3	R42 18BK/YL	PASSENGER SQUIB 1 LINE 1
4	R44 18DG/YL	PASSENGER SQUIB 1 LINE 2

CONNECTOR PINOUTS

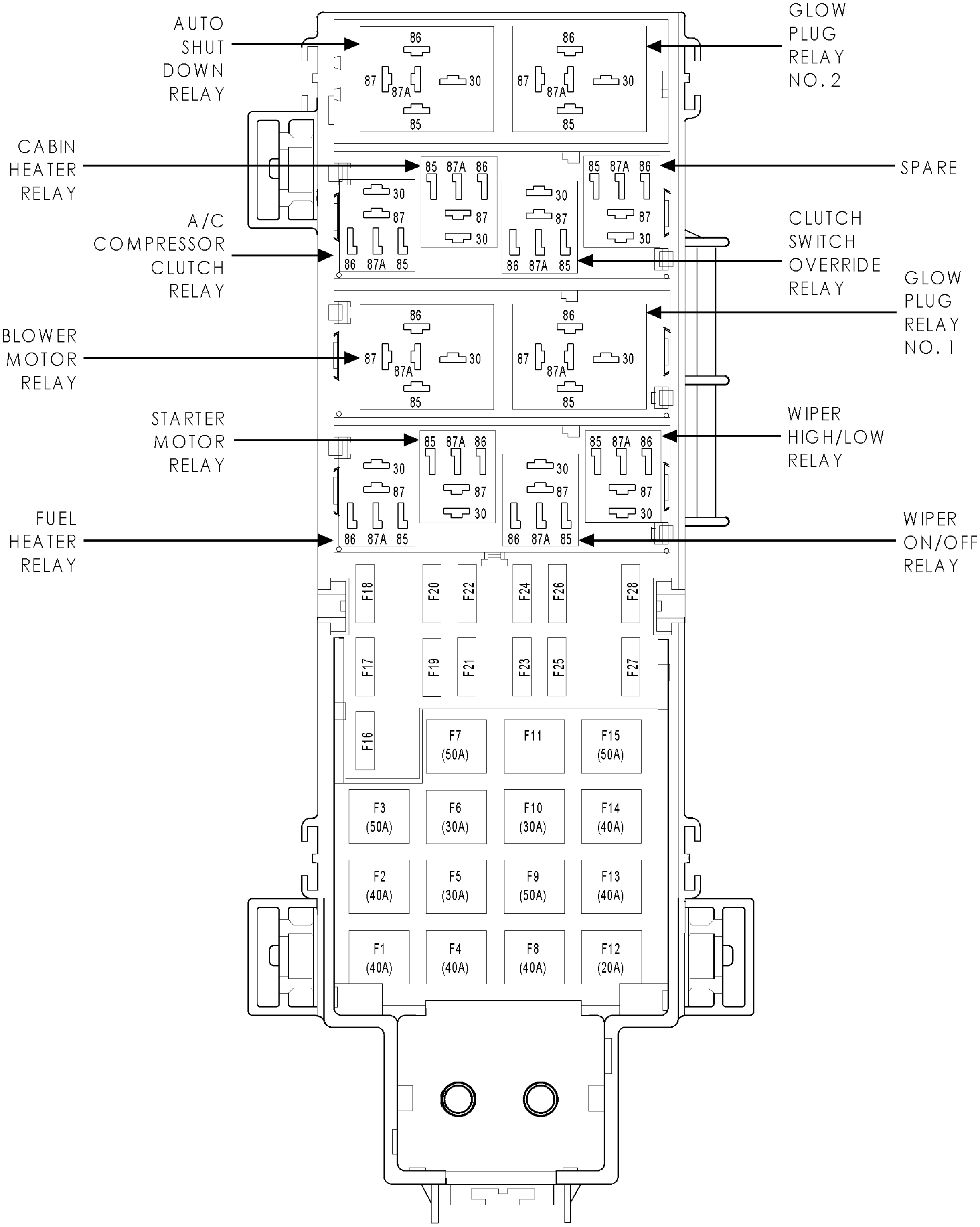


PASSENGER
DOOR LOCK MOTOR/
AJAR SWITCH
(EXCEPT BASE)

PASSENGER DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE)

CAV	CIRCUIT	FUNCTION
1	G74 20TN/WT (LHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
1	G75 20TN/WT (RHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
2	Z350 20BK/LG (RHD)	GROUND
2	Z351 20BK/LG (LHD)	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT

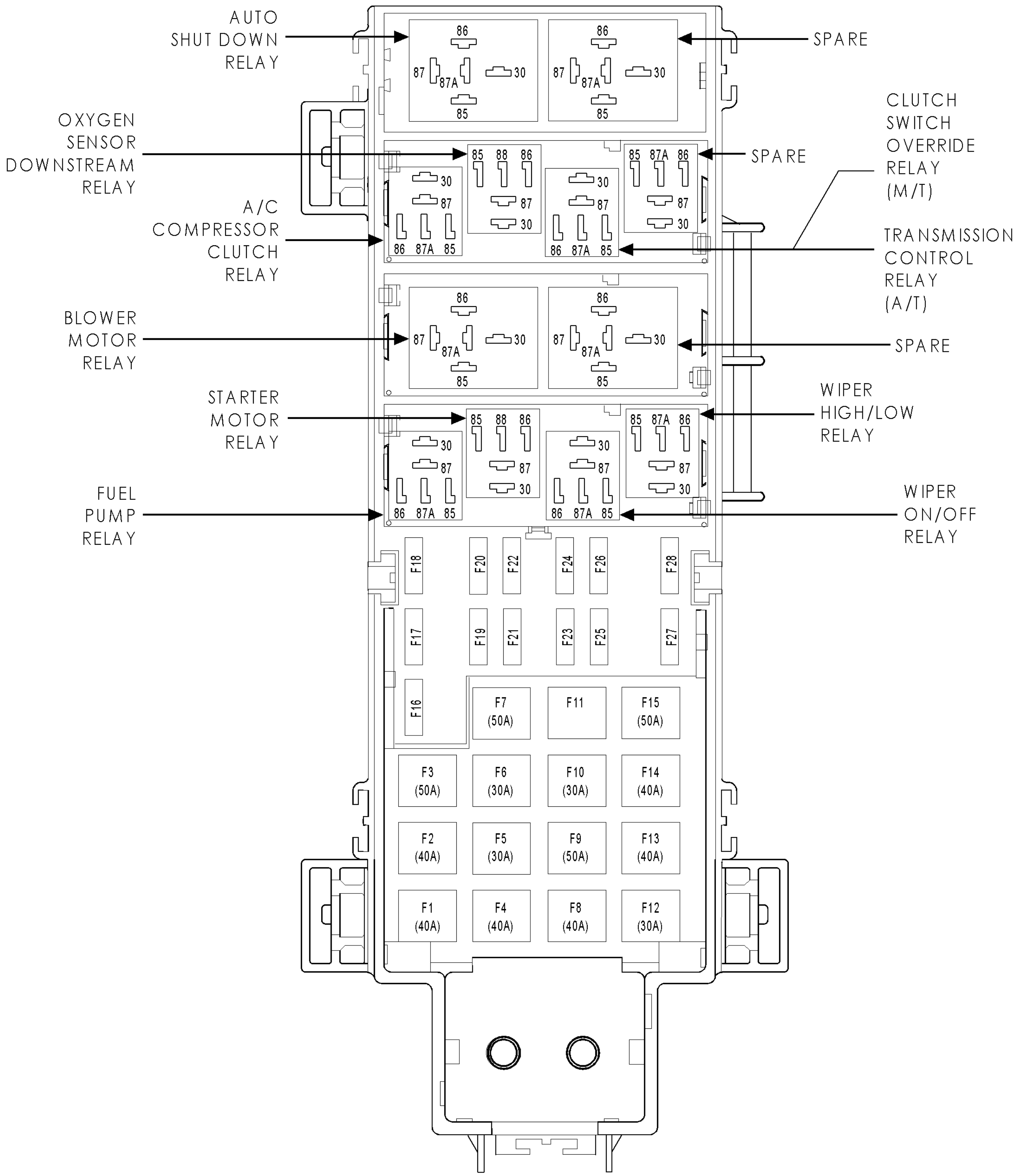
POWER DISTRIBUTION CENTER
DIESEL



FUSES (DIESEL)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	30A	A99 14RD/VT (M/T)	FUSED B(+)
2	30A	A32 14RD/DB (A/T)	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG	FUSED B(+)
5	30A	A32 14RD/DB	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
6	-	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	50A	A54 10RD	FUSED B(+)
11	50A	A58 10RD/GY	FUSED B(+)
12	20A	A34 16LB/RD	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
21	-	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	-	-	-
25	20A	A20 12RD/DB	FUSED B(+)
26	10A	F92 18YL/BR	FUSED B(+)
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
28	-	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

POWER DISTRIBUTION CENTER
GAS



FUSES (GAS)

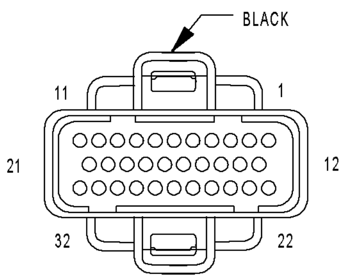
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	40A	C24 12DB/PK	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG (ABS)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	30A	A99 14RD/VT	FUSED B(+)
11	-	-	-
12	30A	A32 14RD/DB (SECURITY A/T)	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	20A	A14 16RD/WT	FUSED B(+)
24	20A	A14 16RD/WT	FUSED B(+)
25	20A	A20 12RD/DB (ABS)	FUSED B(+)
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

WIPER HIGH/LOW RELAY

CAV	CIRCUIT	FUNCTION
30	V60 16YL/DG	FRONT WIPER ON/OFF RELAY OUTPUT
85	V16 18VT/YL	FRONT WIPER HIGH/LOW RELAY CONTROL
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87A	V3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
87	V4 14RD/YL	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT

WIPER ON/OFF RELAY

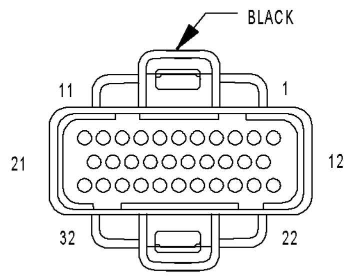
CAV	CIRCUIT	FUNCTION
30	V60 16YL/DG	FRONT WIPER ON/OFF RELAY OUTPUT
85	V14 18RD/VT	FRONT WIPER ON/OFF RELAY CONTROL
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
86	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87A	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
87	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87A	V55 16TN/RD	FRONT WIPER PARK SWITCH SENSE
87	V6 16DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



POWERTRAIN CONTROL MODULE C1 (2.4L)

POWERTRAIN CONTROL MODULE C1 (2.4L)

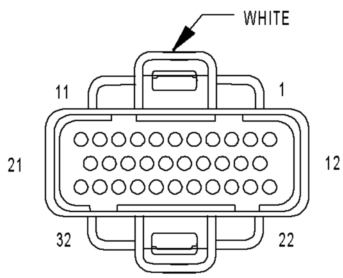
CAV	CIRCUIT	FUNCTION
1	-	-
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	K4 18BK/LB	SENSOR GROUND
5	-	-
6	-	-
7	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	T141 18YL/RD	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	-	-
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	-	-
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	-	-
30	-	-
31	Z107 14BK/DB	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C1 (3.7L)

POWERTRAIN CONTROL MODULE C1 (3.7L)

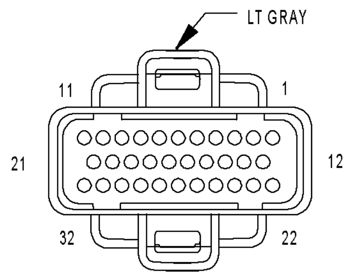
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
4	K4 18BK/LB	SENSOR GROUND
5	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
6	T41 18BK/WT (A/T)	PARK/NEUTRAL POSITION SWITCH SENSE
7	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	F45 18YL/BR (A/T)	FUSED IGNITION SWITCH OUTPUT (START)
13	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z107 14BK/DB	GROUND
31	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C2 (GAS)

POWERTRAIN CONTROL MODULE C2 (GAS)

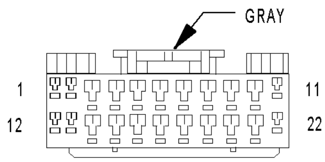
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K38 18GY (3.7L)	FUEL INJECTOR NO. 5 DRIVER
7	-	-
8	-	-
9	K17 18DB/TN (2.4L)	IGNITION COIL NO. 2 DRIVER
9	K92 14TN/PK (3.7L)	COIL ON PLUG DRIVER NO. 2
10	K20 18DG	GENERATOR FIELD
11	-	-
12	K58 18BR/DB (3.7L)	FUEL INJECTOR NO. 6 DRIVER
13	-	-
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	K173 18LG	RADIATOR FAN RELAY CONTROL
18	-	-
19	C18 18DB	A/C PRESSURE SIGNAL
20	-	-
21	-	-
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	K6 18VT/WT	5 VOLT SUPPLY
32	-	-



POWERTRAIN CONTROL MODULE C3 (GAS)

POWERTRAIN CONTROL MODULE C3 (GAS)

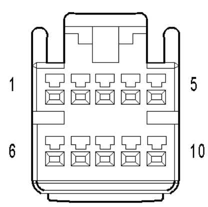
CAV	CIRCUIT	FUNCTION
1	C13 18DG	A/C CLUTCH RELAY CONTROL
2	-	-
3	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	K90 18TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
7	K42 18DB/LB (3.7L)	KNOCK SENSOR NO. 1 SIGNAL
7	K42 18DB/LB (2.4L)	NOT USED
8	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
9	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18YL/RD	SPEED CONTROL SUPPLY
12	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY SENSE INPUT
13	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
14	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE
15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
16	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
16	K299 18BR/WT (3.7L)	OXYGEN SENSOR 2/1 HEATER CONTROL
17	B22 18DG/YL	VEHICLE SPEED OUTPUT
18	K142 18GY/BK (3.7L)	KNOCK SENSOR NO. 2 SIGNAL
18	K142 18GY/BK (2.4L)	NOT USED
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
21	-	-
22	C21 18DB/OR	A/C SWITCH SENSE
23	-	-
24	K29 18WT/PK	BRAKE SWITCH SENSE
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG	SCI RECEIVE (PCM)
30	D25 18YL/VT	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL



RADIO C1

RADIO C1

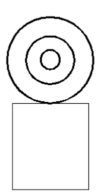
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	F89 18OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	E2 20OR	PANEL LAMPS DRIVER
4	-	-
5	-	-
6	-	-
7	X54 18VT	RIGHT FRONT SPEAKER (+)
8	X56 18DB/RD	RIGHT FRONT SPEAKER (-)
9	X55 18BR/RD	LEFT FRONT SPEAKER (-)
10	X53 18DG	LEFT FRONT SPEAKER (+)
11	Z9 16BK	GROUND
12	M1 20PK	FUSED B(+)
13	X16 18LG (MIDLINE/ PREMIUM)	ANTENNA RELAY OUTPUT
14	D25 18YL/VT	PCI BUS
15	-	-
16	-	-
17	-	-
18	X51 18BR/YL	LEFT REAR SPEAKER (+)
19	X57 18BR/LB	LEFT REAR SPEAKER (-)
20	X58 18DB/OR	RIGHT REAR SPEAKER (-)
21	X52 18DB/WT	RIGHT REAR SPEAKER (+)
22	Z9 16BK	GROUND



RADIO C2

RADIO C2

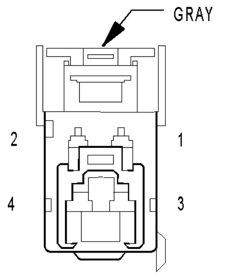
CAV	CIRCUIT	FUNCTION
1	X40 20WT/RD	AUDIO OUT RIGHT
2	Z30 20WT/BK	GROUND
3	Z9 20BK/DB	GROUND
4	D25 20YL/VT	PCI BUS
5	X112 20RD	IGNITION SWITCH OUTPUT
6	X41 20WT/DG	AUDIO OUT LEFT
7	Z17 20BK	GROUND
8	-	-
9	-	-
10	X160 20YL	B(+)



RADIO C3

RADIO C3

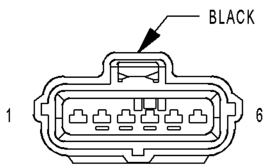
CAV	CIRCUIT	FUNCTION
1	X30 BK	RADIO ANTENNA CORE
2	X31 BK	RADIO ANTENNA SHIELD



RADIO CHOKE
(MIDLINE/PREMIUM)

RADIO CHOKE (MIDLINE/PREMIUM)

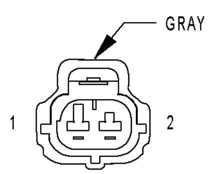
CAV	CIRCUIT	FUNCTION
1	F60 16DG/RD	FUSED B(+)
2	X13 16BK/RD	RADIO CHOKE OUTPUT
3	X16 18LG	ANTENNA RELAY OUTPUT
4	Z140 16BK/LG	GROUND



REAR
WIPER
MOTOR

REAR WIPER MOTOR

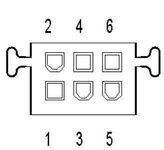
CAV	CIRCUIT	FUNCTION
1	Z235 18BK	GROUND
2	V21 20DB/RD	REAR WIPER ON DRIVER
3	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
4	V22 20BR/YL	REAR WIPER INTERMITTENT DRIVER
5	F70 18PK/BK	FUSED B(+)
6	-	-



RED BRAKE
WARNING INDICATOR
SWITCH

RED BRAKE WARNING INDICATOR SWITCH

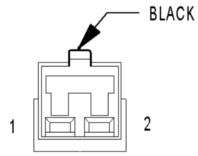
CAV	CIRCUIT	FUNCTION
1	G11 18WT/BK	RED BRAKE WARNING INDICATOR DRIVER
2	Z142 18BK/WT	GROUND



REMOTE KEYLESS
ENTRY MODULE
(EXCEPT BASE)

REMOTE KEYLESS ENTRY MODULE (EXCEPT BASE)

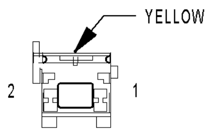
CAV	CIRCUIT	FUNCTION
1	Y60	RKE DATA
2	Y62	RKE SUPPLY
3	Y61	RKE PROGRAM
4	Y63	RKE GROUND
5	Y64	RKE ANTENNA (+)
6	Y65	RKE ANTENNA (-)



RIGHT
COURTESY
LAMP

RIGHT COURTESY LAMP

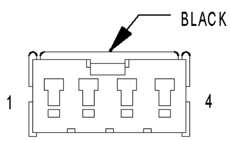
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



RIGHT
CURTAIN
AIRBAG
SQUIB

RIGHT CURTAIN AIRBAG SQUIB

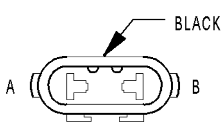
CAV	CIRCUIT	FUNCTION
1	R76 18YL/DB	RIGHT CURTAIN SQUIB 1 LINE 2
2	R74 18YL/BR	RIGHT CURTAIN SQUIB 1 LINE 1



RIGHT
DOOR LOCK
SWITCH
(EXCEPT BASE)

RIGHT DOOR LOCK SWITCH (EXCEPT BASE)

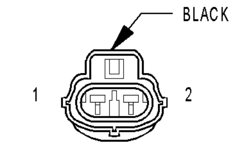
CAV	CIRCUIT	FUNCTION
1	P36 20PK/VT	DOOR LOCK SWITCH MUX
2	Z351 20BK/LG	GROUND
3	F89 20OR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	P37 20LG	DOOR LOCK SWITCH GROUND



RIGHT
FOG LAMP

RIGHT FOG LAMP

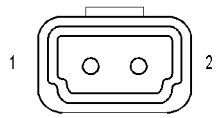
CAV	CIRCUIT	FUNCTION
A	Z142 18BK/WT	GROUND
B	L39 18LB	FRONT FOG LAMP RELAY OUTPUT



RIGHT FRONT DOOR AJAR SWITCH (BASE)

RIGHT FRONT DOOR AJAR SWITCH (BASE)

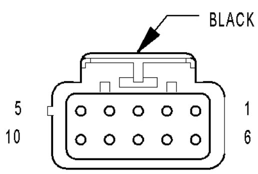
CAV	CIRCUIT	FUNCTION
1	G74 20TN/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND



RIGHT FRONT DOOR SPEAKER (BASE)

RIGHT FRONT DOOR SPEAKER (BASE)

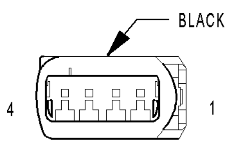
CAV	CIRCUIT	FUNCTION
1	X54 18VT	RIGHT FRONT SPEAKER (+)
2	X56 18DB/RD	RIGHT FRONT SPEAKER (-)



RIGHT FRONT DOOR SPEAKER (PREMIUM)

RIGHT FRONT DOOR SPEAKER (PREMIUM)

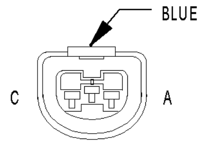
CAV	CIRCUIT	FUNCTION
1	X54 18VT	RIGHT FRONT SPEAKER (+)
2	X56 18DB/RD	RIGHT FRONT SPEAKER (-)
3	Z9 16BK	GROUND
4	X86 18OR/RD	AMPLIFIED HIGH RIGHT FRONT SPEAKER (-)
5	X92 18TN/BK	AMPLIFIED LOW RIGHT REAR SPEAKER (-)
6	X58 18DB/OR	RIGHT REAR DOOR SPEAKER (-)
7	X52 18DB/WT	RIGHT REAR DOOR SPEAKER (+)
8	X13 16BK/RD	RADIO CHOKE OUTPUT
9	X84 18TN/BK	AMPLIFIED HIGH RIGHT FRONT SPEAKER (+)
10	X94 18TN/VT	AMPLIFIED LOW RIGHT REAR SPEAKER (+)



RIGHT FRONT IMPACT SENSOR

RIGHT FRONT IMPACT SENSOR

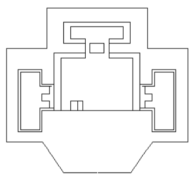
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R46 18BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
4	R48 18TN	RIGHT FRONT IMPACT SENSOR SIGNAL



RIGHT HEADLAMP (EXCEPT EXPORT)

RIGHT HEADLAMP (EXCEPT EXPORT)

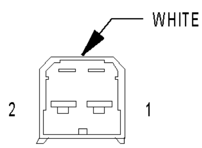
CAV	CIRCUIT	FUNCTION
A	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
B	Z142 18BK/WT	GROUND
C	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT



RIGHT HEADLAMP (EXPORT)

RIGHT HEADLAMP (EXPORT)

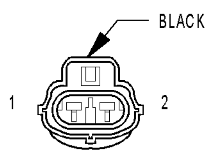
CAV	CIRCUIT	FUNCTION
1	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
2	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
3	Z142 18BK/WT	GROUND



RIGHT INSTRUMENT PANEL SPEAKER

RIGHT INSTRUMENT PANEL SPEAKER

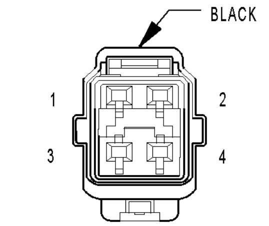
CAV	CIRCUIT	FUNCTION
1	X54 18VT (BASE/ LOWLINE)	RIGHT FRONT SPEAKER (+)
1	X84 18TN/BK (MIDLINE/ PREMIUM)	AMPLIFIED HIGH RIGHT FRONT SPEAKER (+)
2	X86 18OR/RD (MIDLINE/ PREMIUM)	AMPLIFIED HIGH RIGHT FRONT SPEAKER (-)
2	X56 18DB/RD (BASE/ LOWLINE)	RIGHT FRONT SPEAKER (-)



RIGHT REAR DOOR AJAR SWITCH (BASE)

RIGHT REAR DOOR AJAR SWITCH (BASE)

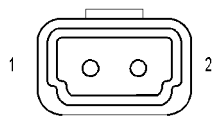
CAV	CIRCUIT	FUNCTION
1	G76 20TN/WT	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND



RIGHT REAR
DOOR LOCK MOTOR/
AJAR SWITCH
(EXCEPT BASE)

RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH (EXCEPT BASE)

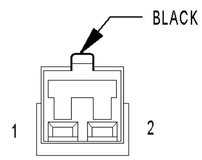
CAV	CIRCUIT	FUNCTION
1	G76 20TN/WT	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z351 20BK/LG	GROUND
3	P35 18OR/VT	UNLOCK RELAY OUTPUT
4	P33 18OR/BK	LOCK RELAY OUTPUT



RIGHT REAR
DOOR SPEAKER

RIGHT REAR DOOR SPEAKER

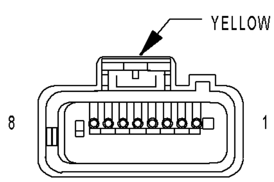
CAV	CIRCUIT	FUNCTION
1	X94 18TN/VT (PREMIUM)	AMPLIFIED LOW RIGHT REAR SPEAKER (+)
1	X52 18DB/WT (BASE)	RIGHT REAR DOOR SPEAKER (+)
2	X58 18DB/OR (BASE)	RIGHT REAR DOOR SPEAKER (-)
2	X92 18TN/BK (PREMIUM)	AMPLIFIED LOW RIGHT REAR SPEAKER (-)



RIGHT
REMOTE RADIO
SWITCH
(PREMIUM)

RIGHT REMOTE RADIO SWITCH (PREMIUM)

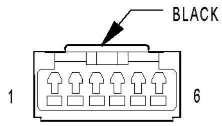
CAV	CIRCUIT	FUNCTION
1	X10 20RD/DB	RADIO CONTROL MUX RETURN
2	X20 20RD/BK	RADIO CONTROL MUX



RIGHT SIDE IMPACT
AIRBAG CONTROL
MODULE (RSIACM)

RIGHT SIDE IMPACT AIRBAG CONTROL MODULE (RSIACM)

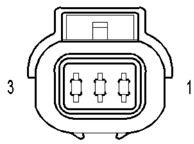
CAV	CIRCUIT	FUNCTION
1	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	R76 18YL/DB	RIGHT CURTAIN SQUIB 1 LINE 2
4	R74 18YL/BR	RIGHT CURTAIN SQUIB 1 LINE 1
5	Z100 18BK/YL	GROUND
6	-	-
7	-	-
8	D25 18YL/VT	PCI BUS



SENTRY KEY IMMOBILIZER MODULE (EXCEPT BASE)

SENTRY KEY IMMOBILIZER MODULE (EXCEPT BASE)

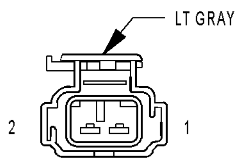
CAV	CIRCUIT	FUNCTION
1	F33 20PK/RD	FUSED B(+)
2	Z11 20BK/WT	GROUND
3	F1 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	Z110 20BK/TN	GROUND
5	D25 20YL/VT/BK	PCI BUS
6	-	-



SIREN (EXPORT)

SIREN (EXPORT)

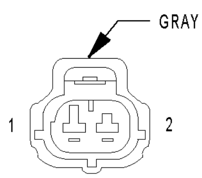
CAV	CIRCUIT	FUNCTION
1	Z142 18BK/WT	GROUND
2	X75 18DG	SIREN SIGNAL CONTROL
3	M1 18PK	FUSED B(+)



TAILGATE CYLINDER LOCK SWITCH

TAILGATE CYLINDER LOCK SWITCH

CAV	CIRCUIT	FUNCTION
1	G910 20VT/BR	TAILGATE SWITCH GROUND
2	G71 18VT/YL	TAILGATE CYLINDER LOCK SWITCH MUX

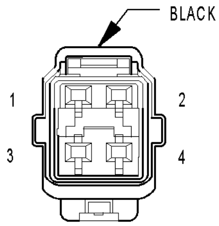


TAILGATE FLIP-UP AJAR SWITCH

TAILGATE FLIP-UP AJAR SWITCH

CAV	CIRCUIT	FUNCTION
1	G80 20YL/WT	FLIP-UP GLASS AJAR SWITCH SENSE
2	Z235 18BK	GROUND

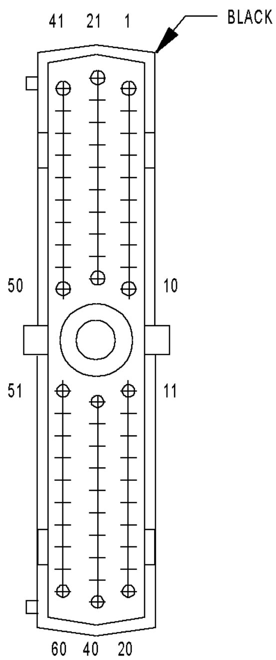
CONNECTOR PINOUTS



TAILGATE
LOCK MOTOR/
AJAR SWITCH

TAILGATE LOCK MOTOR/ AJAR SWITCH

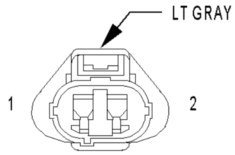
CAV	CIRCUIT	FUNCTION
1	P31 16PK/WT	TAILGATE UNLOCK DRIVER
2	P30 16OR/WT	TAILGATE LOCK DRIVER
3	G78 20TN/BK	TAILGATE AJAR SWITCH SENSE
4	G910 20VT/BR	TAILGATE SWITCH GROUND



TRANSMISSION CONTROL MODULE

TRANSMISSION CONTROL MODULE

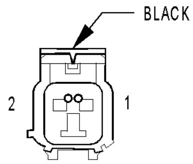
CAV	CIRCUIT	FUNCTION
1	T1 18LG/BK	TRS T1 SENSE
2	T4 18PK/OR (EXCEPT 4TRLE)	TRS T2 SENSE
3	T3 18VT	TRS T3 SENSE
4	-	-
5	-	-
6	K24 18GY/BK (3.4L)	CRANKSHAFT POSITION SENSOR SIGNAL
6	K244 20BR/WT (DIESEL)	ENGINE SPEED SIGNAL
7	D21 20PK (DIESEL)	SCI TRANSMIT
7	D21 18PK (3.4L)	SCI TRANSMIT
8	F45 18YL/BR (3.4L)	FUSED IGNITION SWITCH OUTPUT (START)
8	F45 18YL/RD (DIESEL)	FUSED IGNITION SWITCH OUTPUT (START)
9	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 18YL/DG (3.4L)	TORQUE MANAGEMENT REQUEST SENSE
10	T10 20YL/DG (DIESEL)	TORQUE MANAGEMENT REQUEST SENSE
11	F1 18DB (3.4L)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	F1 20DB (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	K22 18OR/DB (GAS)	THROTTLE POSITION SENSOR SIGNAL
12	K22 18OR/DB (DIESEL)	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
13	T13 18DB/BK	SPEED SENSOR GROUND
14	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
15	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
16	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
17	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
18	T591 18YL/DB (EXCEPT 4TRLE)	PRESSURE CONTROL SOLENOID CONTROL
19	T119 18WT/DB	2C SOLENOID CONTROL
20	T20 18LB	LOW/REVERSE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	B22 20DG/YL (DIESEL)	VEHICLE SPEED OUTPUT
29	T29 18GY (EXCEPT 4TRLE)	UNDERDRIVE PRESSURE SWITCH SENSE
30	T38 18VT/TN (EXCEPT 4TRLE)	LINE PRESSURE SENSOR SIGNAL
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	T16 14RD (EXCEPT 4TRLE)	TRANSMISSION CONTROL RELAY OUTPUT
37	Z113 14BK/YL (EXCEPT 4TRLE)	GROUND
38	T39 18GY/LB (EXCEPT 4TRLE)	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
39	Z113 14BK/YL (EXCEPT 4TRLE)	GROUND
40	T140 18VT/LG (EXCEPT 4TRLE)	PRESSURE CONTROL SOLENOID CONTROL
41	T411 18WT/PK	TRS T41 SENSE (P/N)
42	T42 18VT/WT	TRS T42 SENSE
43	D25 18VT/YL	PCI BUS
43	D25 20VT/YL	PCI BUS
44	-	-
45	-	-
46	D20 18LG	SCI RECEIVE
47	T147 18LB (EXCEPT 4TRLE)	2C PRESSURE SWITCH SENSE
47	T47 18DB (4TRLE)	
48	T48 18DB	4C PRESSURE SWITCH SENSE
49	T6 18OR/WT	OVERDRIVE OFF SWITCH SENSE
50	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
51	K4 18BK/LB (3.4L)	SENSOR GROUND
52	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
53	Z112 14BK/LB (3.4L)	GROUND
53	Z112 14BK (DIESEL)	GROUND
54	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	T59 18PK (EXCEPT 4TRLE)	UNDERDRIVE SOLENOID CONTROL
56	A30 14RD/WT	FUSED B(+)
57	Z113 14BK/YL	GROUND
58	-	-
59	T159 18DG/WT (EXCEPT 4TRLE)	4C SOLENOID CONTROL
59	T59 18PK (4TRLE)	
60	T60 18BR	OVERDRIVE SOLENOID CONTROL



WASHER FLUID LEVEL SWITCH

WASHER FLUID LEVEL SWITCH

CAV	CIRCUIT	FUNCTION
1	G29 18BK/TN	LOW WASHER FLUID SENSE
2	Z141 18BK	GROUND



WASHER PUMP

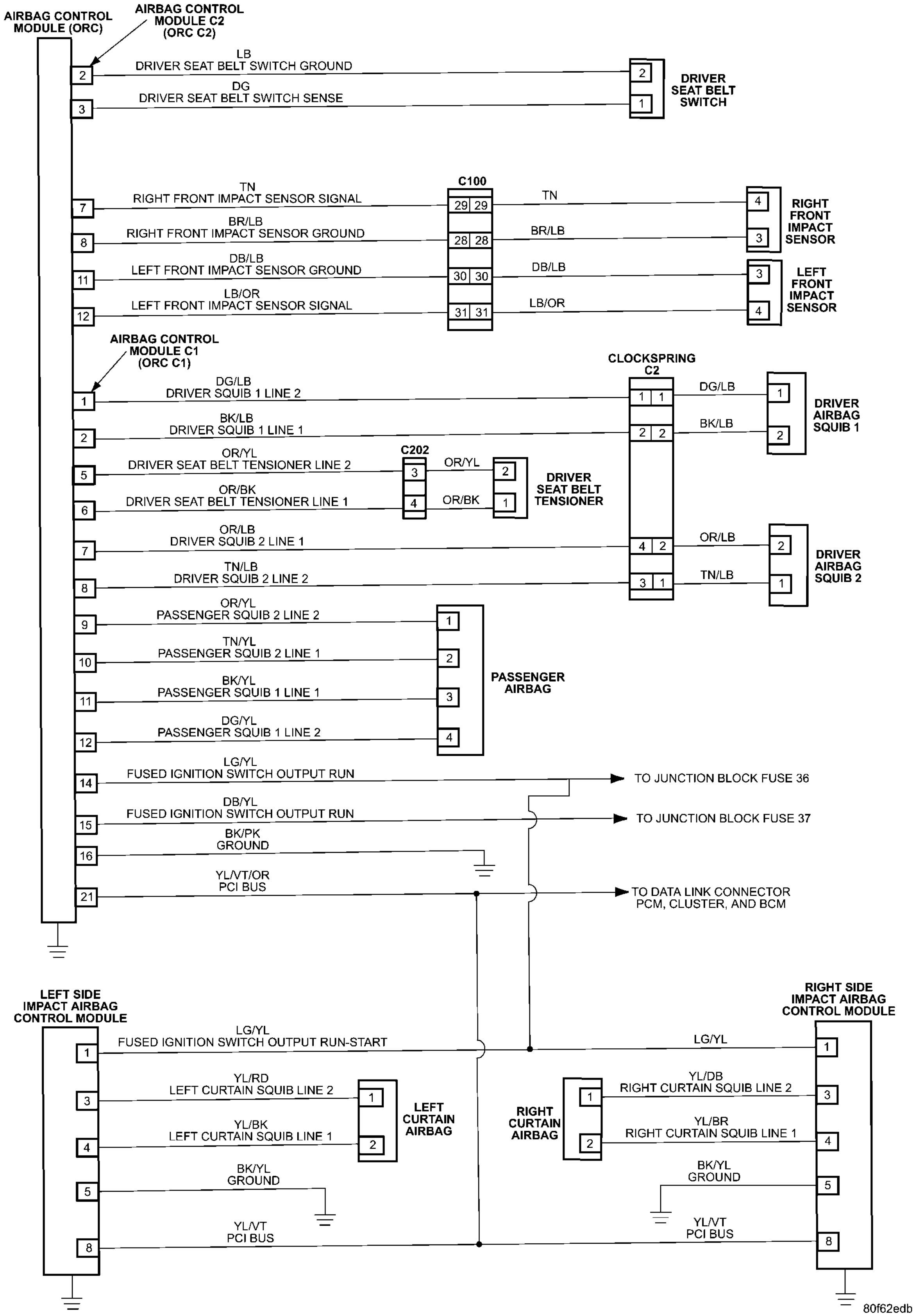
WASHER PUMP

CAV	CIRCUIT	FUNCTION
1	V20 18BK/WT	WASHER MOTOR SENSE
2	V10 18BR	WASHER PUMP DRIVER

NOTES

10.0 SCHEMATIC DIAGRAMS

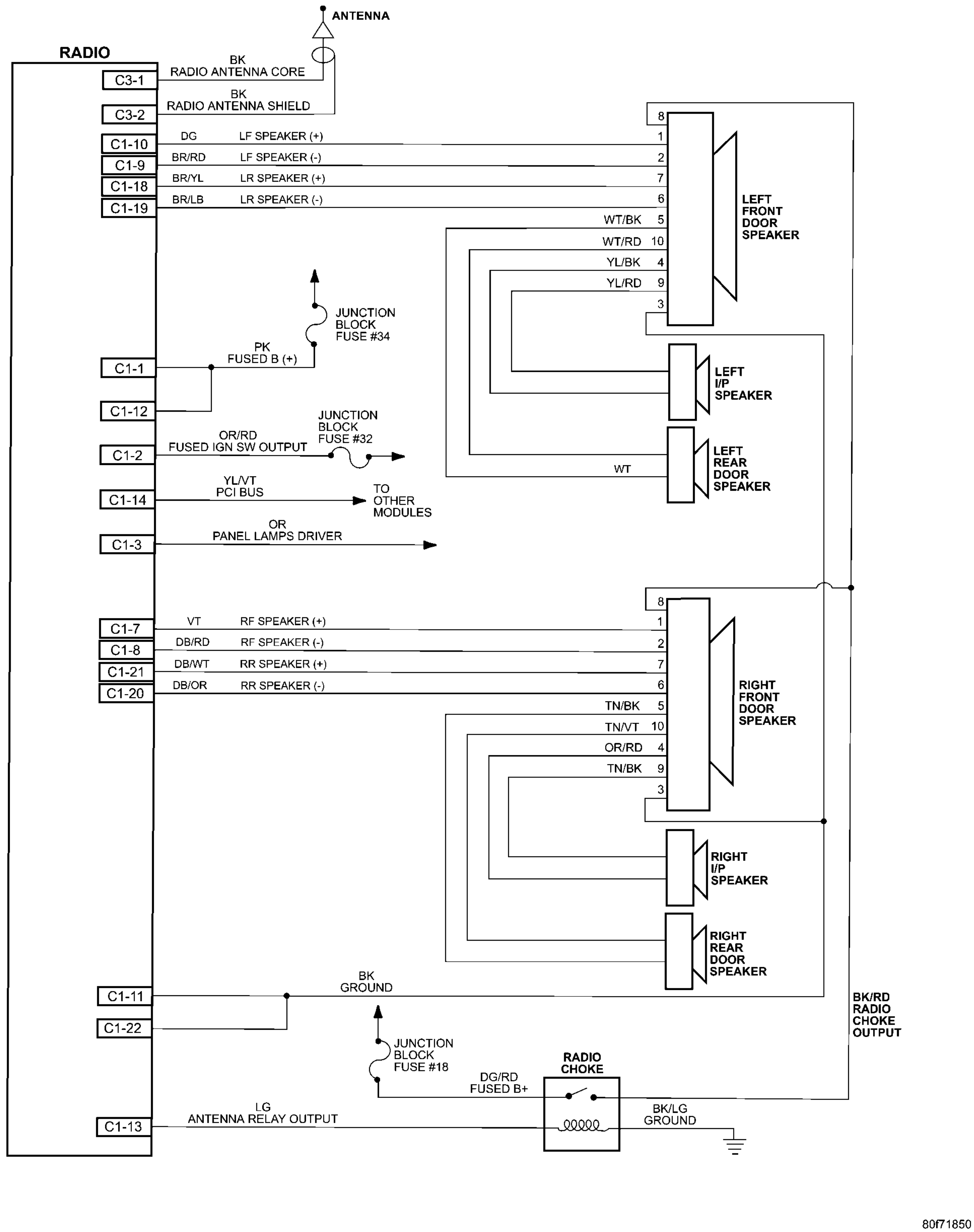
10.1 AIRBAG SYSTEM



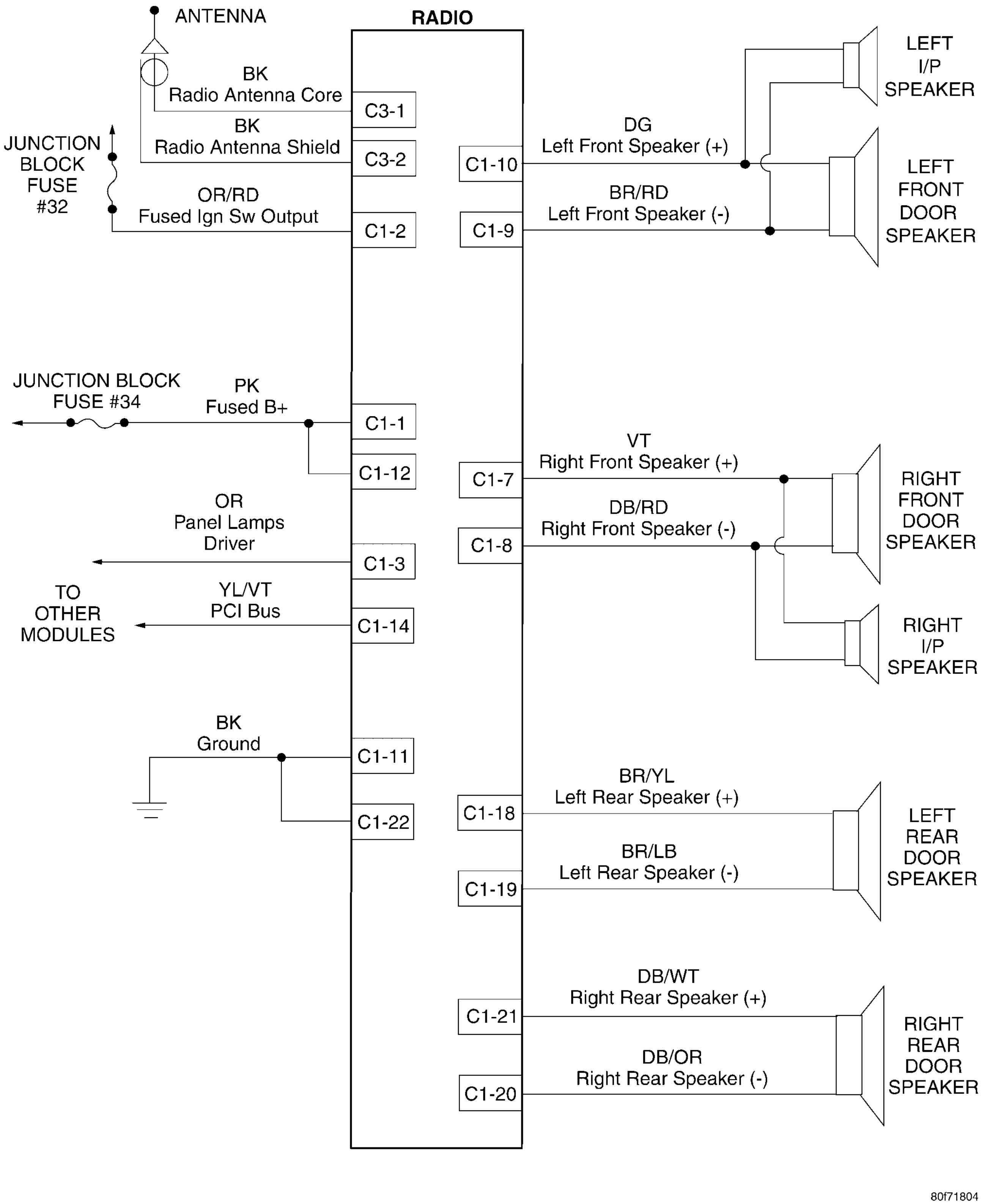
SCHEMATIC DIAGRAMS

10.2 AUDIO

10.2.1 PREMIUM AUDIO SYSTEM

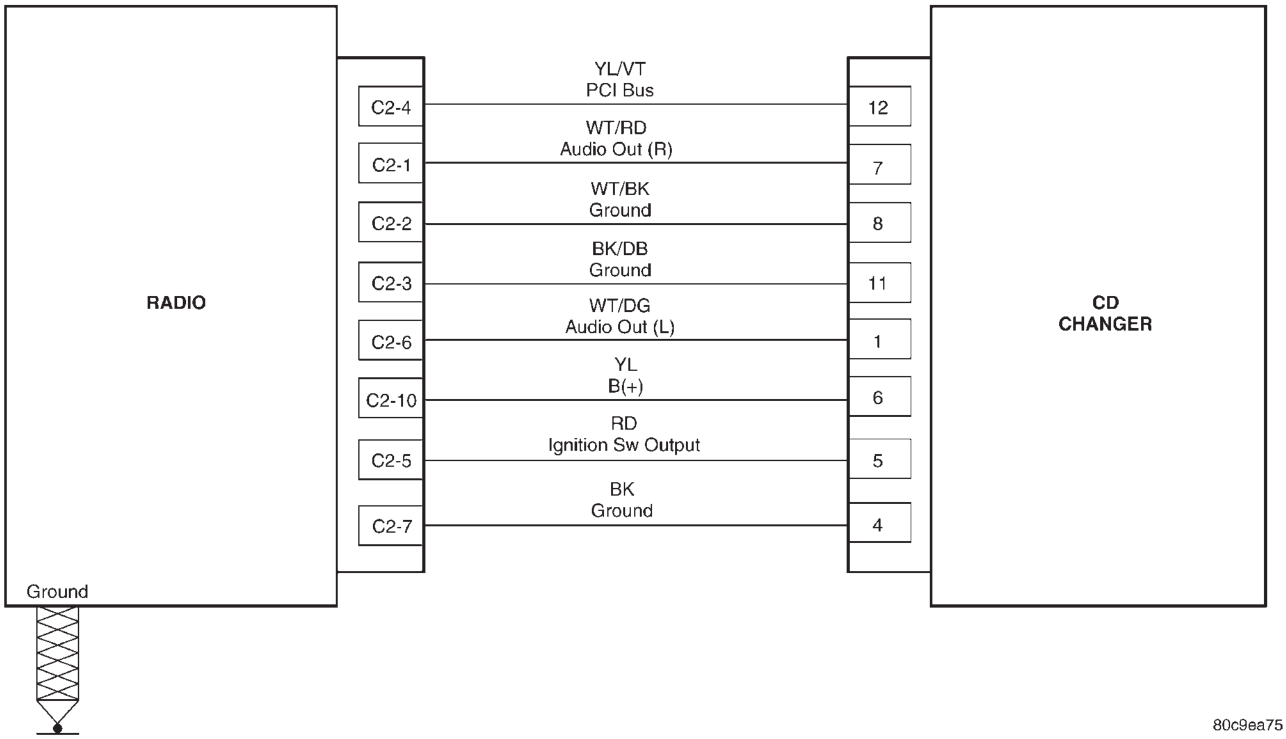


10.2.2 BASE AUDIO SYSTEM

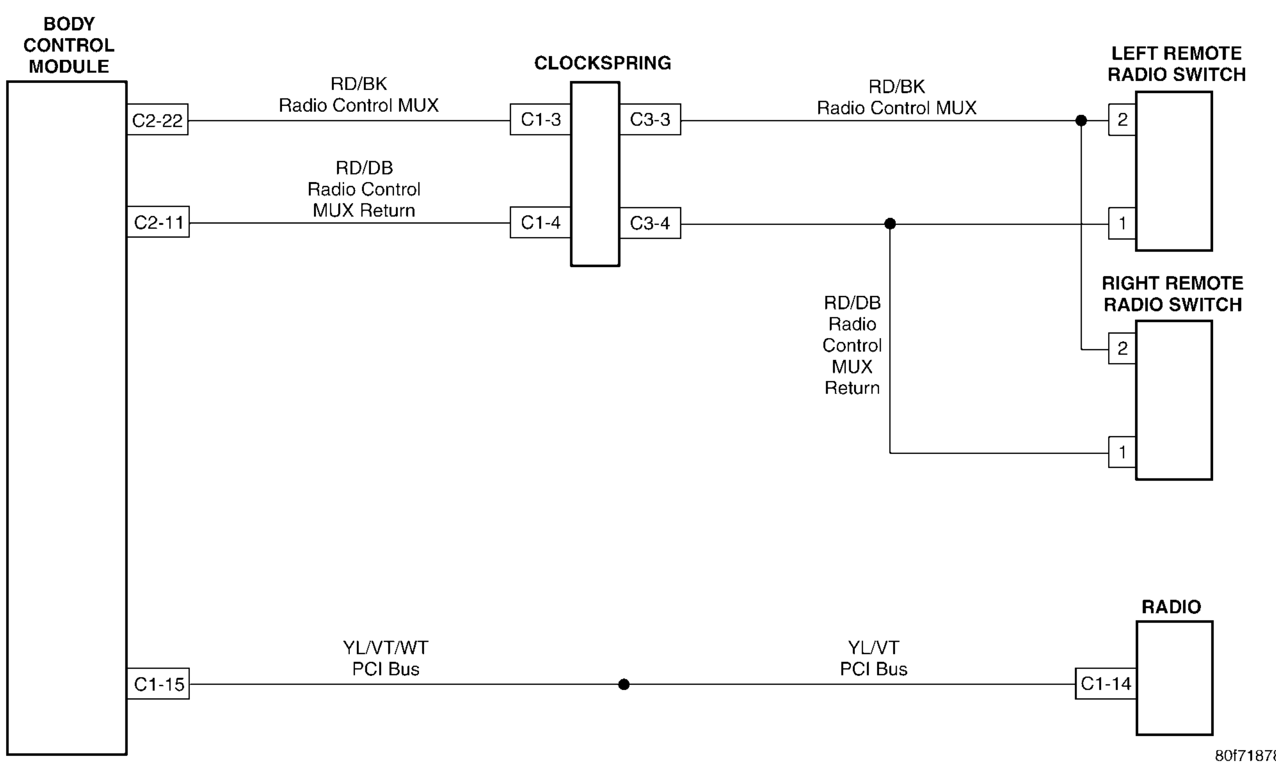


SCHEMATIC DIAGRAMS

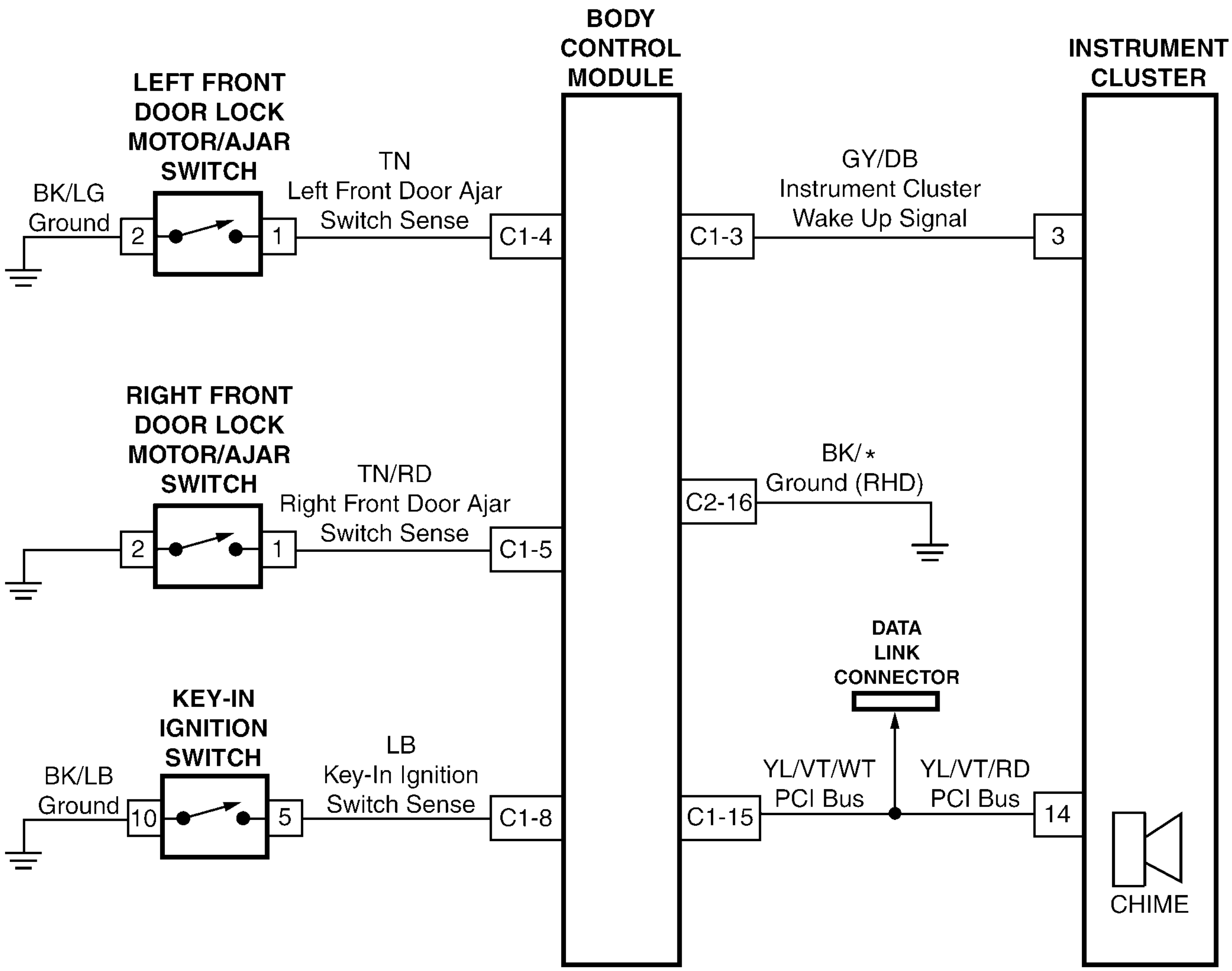
10.2.3 CD CHANGER



10.2.4 REMOTE RADIO CONTROLS



10.3 CHIME



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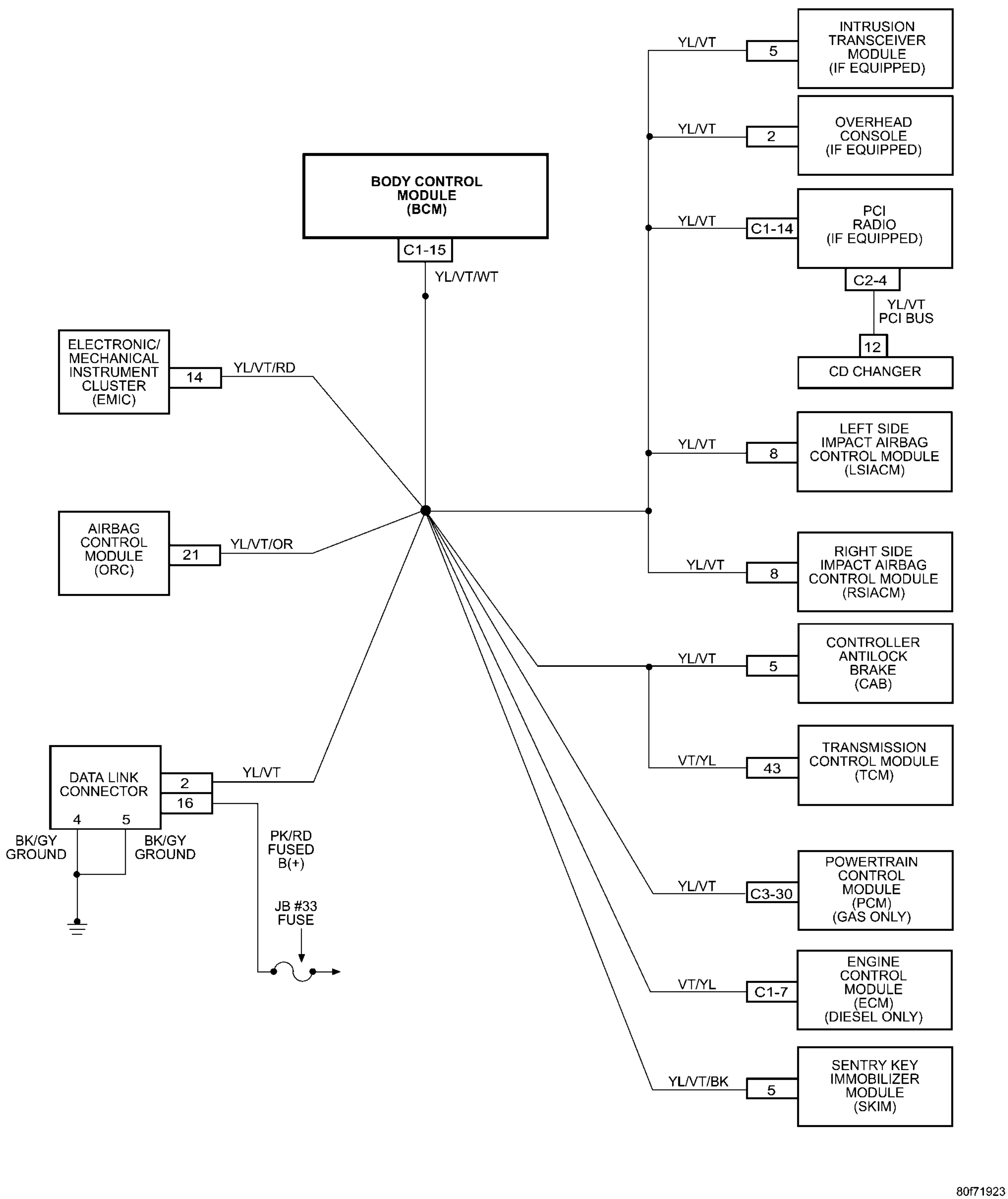
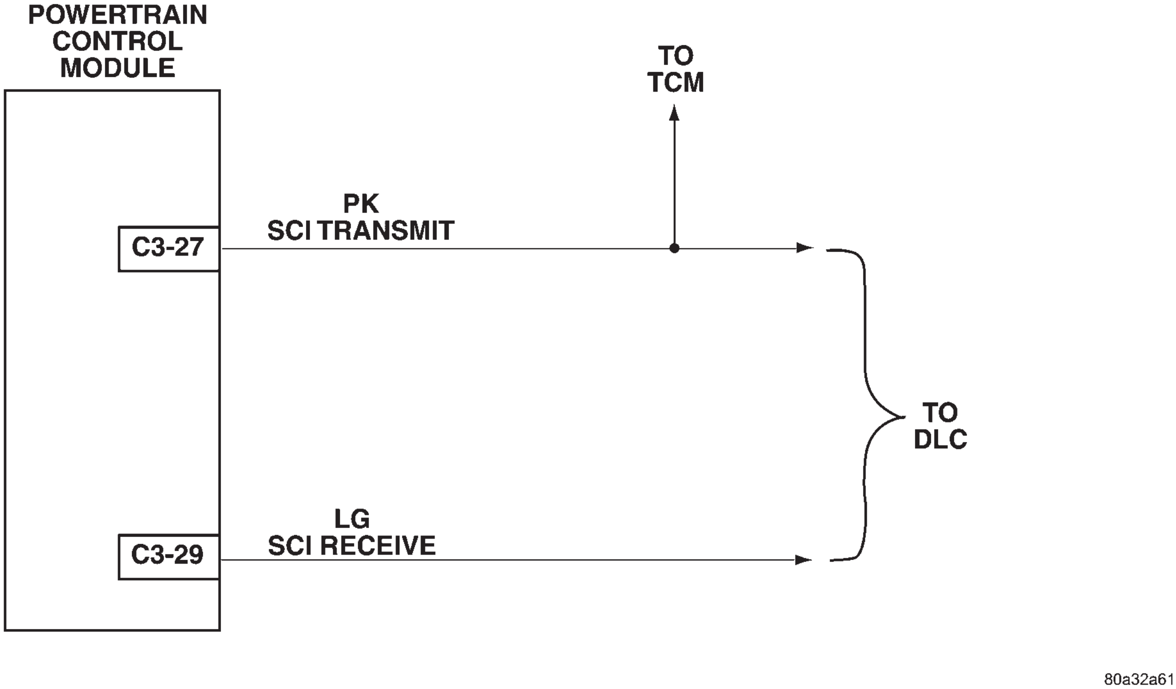
10.4 COMMUNICATION

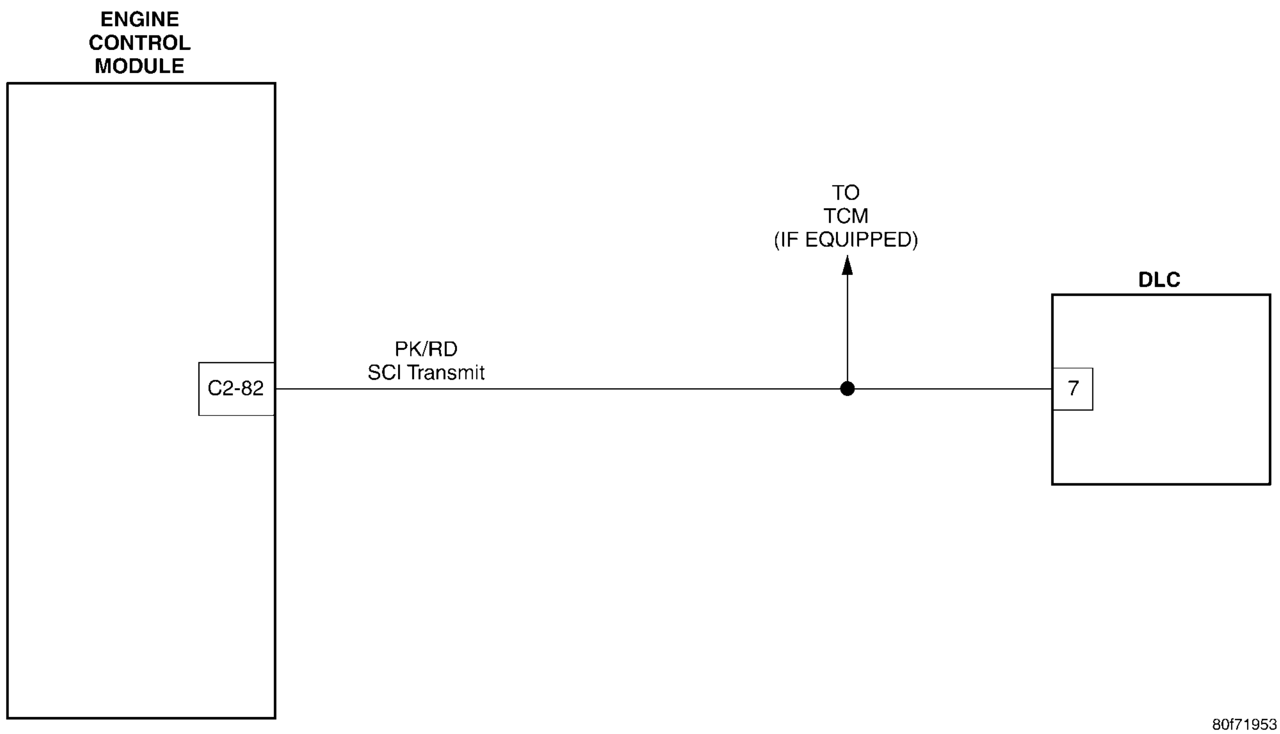
10.4.1 INTER-MODULE AND DRB COMMUNICATION



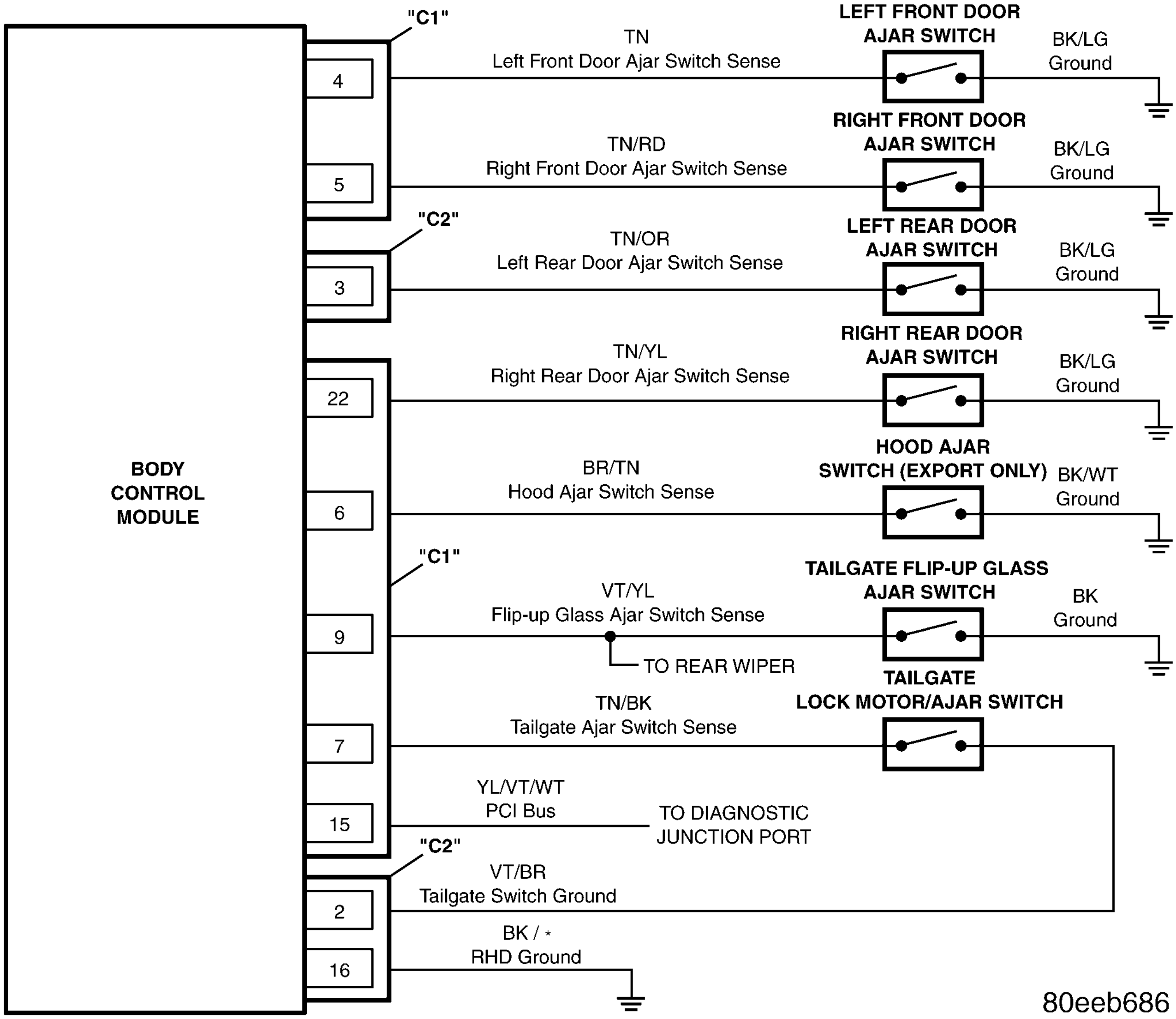
10.4.2 PCM COMMUNICATION — GAS ONLY



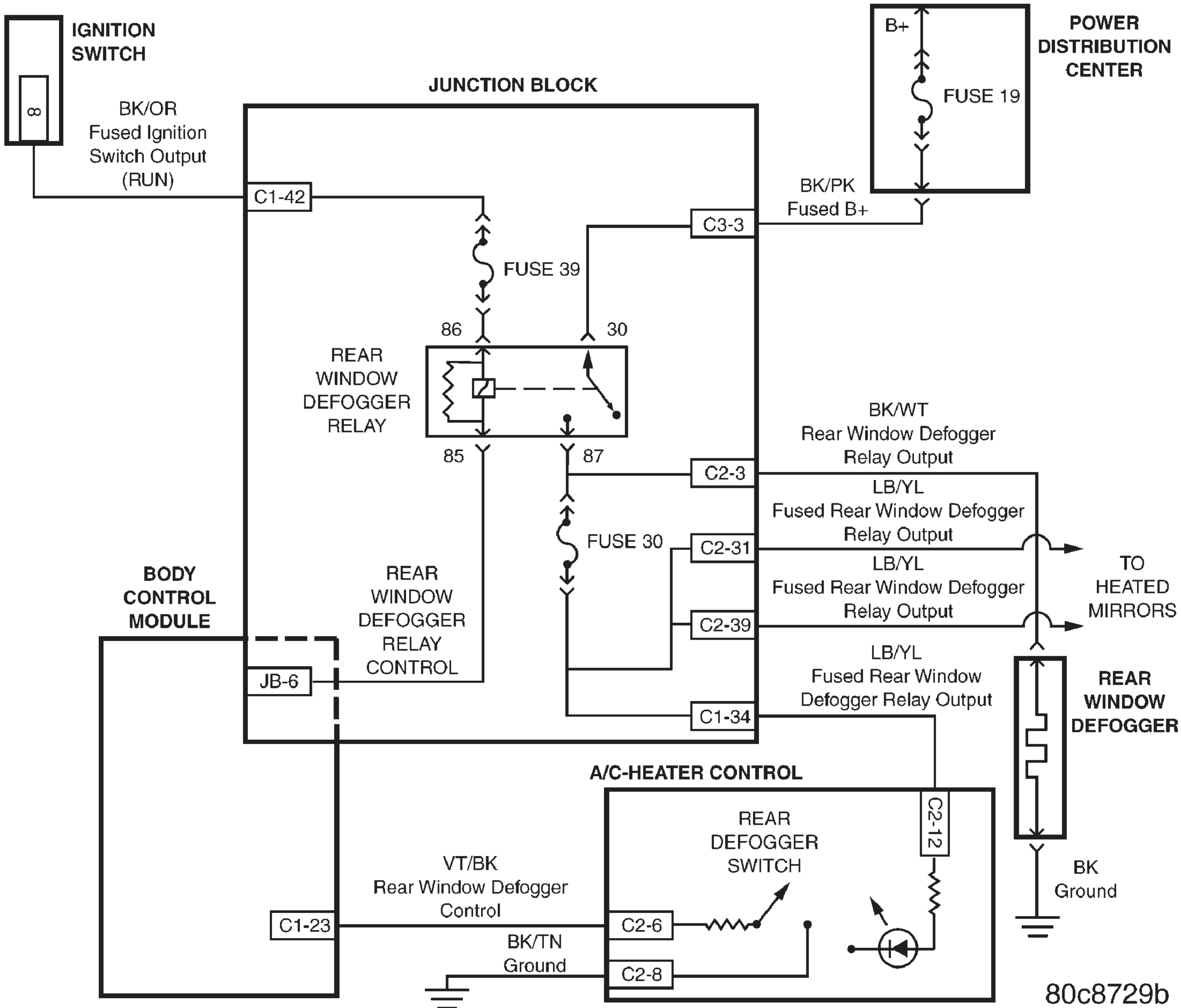
10.4.3 ECM COMMUNICATION — DIESEL ONLY



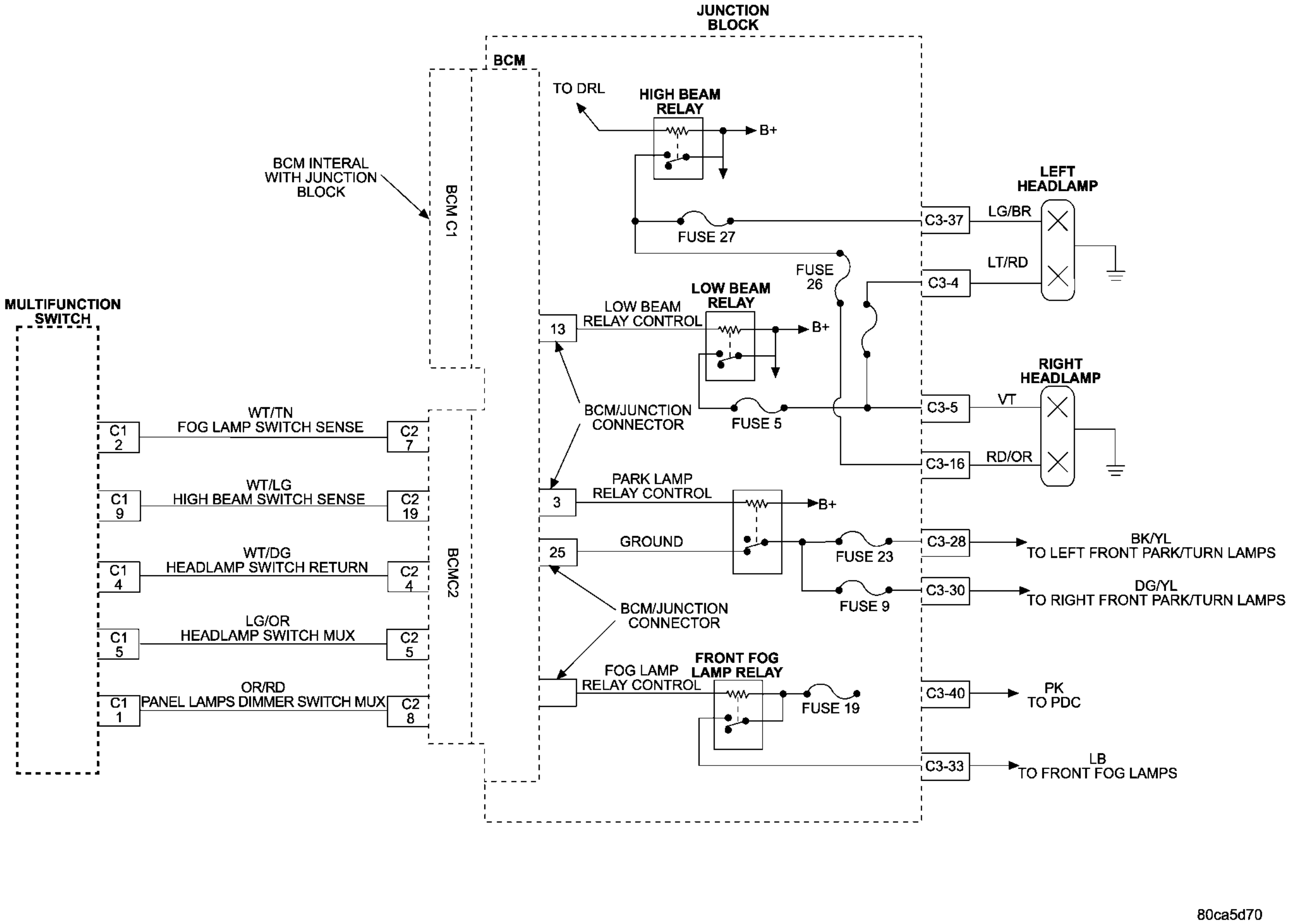
10.5 DOOR AJAR SYSTEM



10.6 ELECTRICALLY HEATED SYSTEM

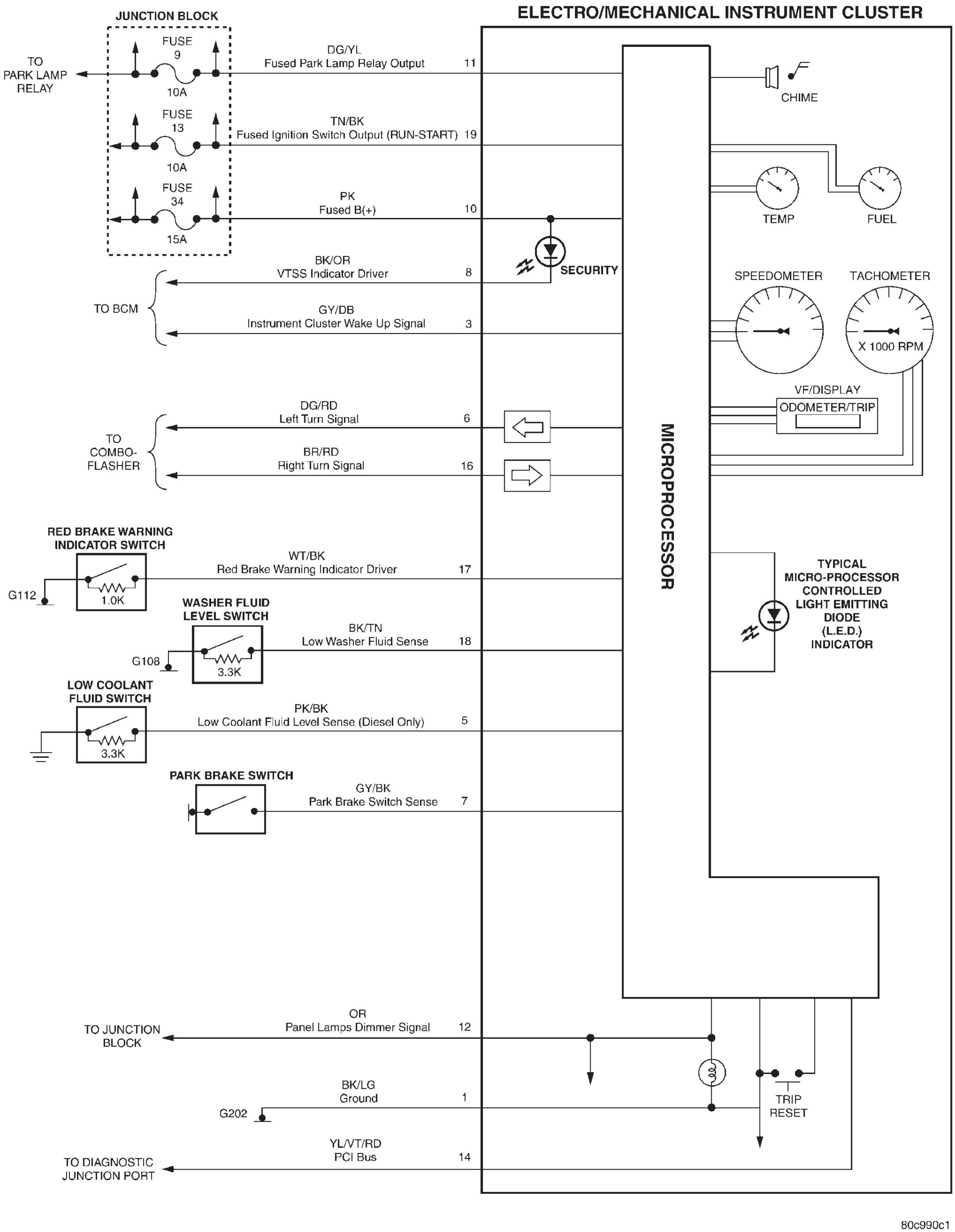


10.7 EXTERIOR LIGHTING

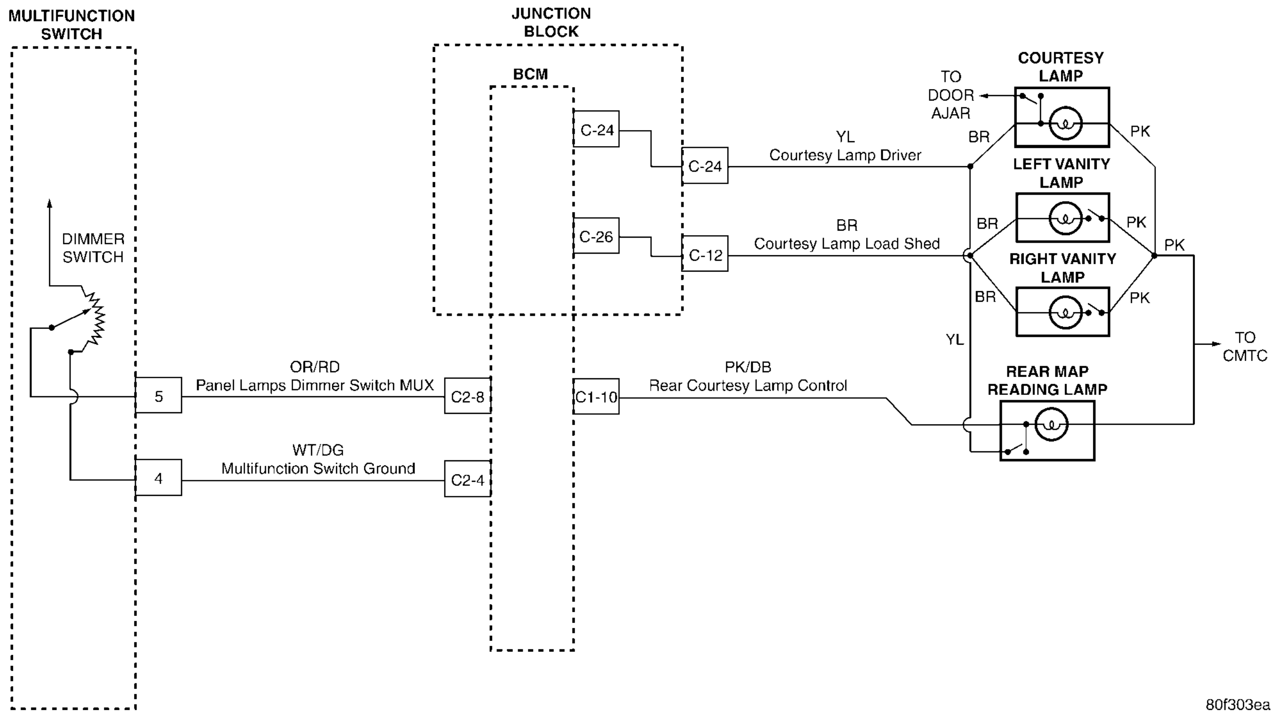


SCHEMATIC DIAGRAMS

10.8 INSTRUMENT CLUSTER

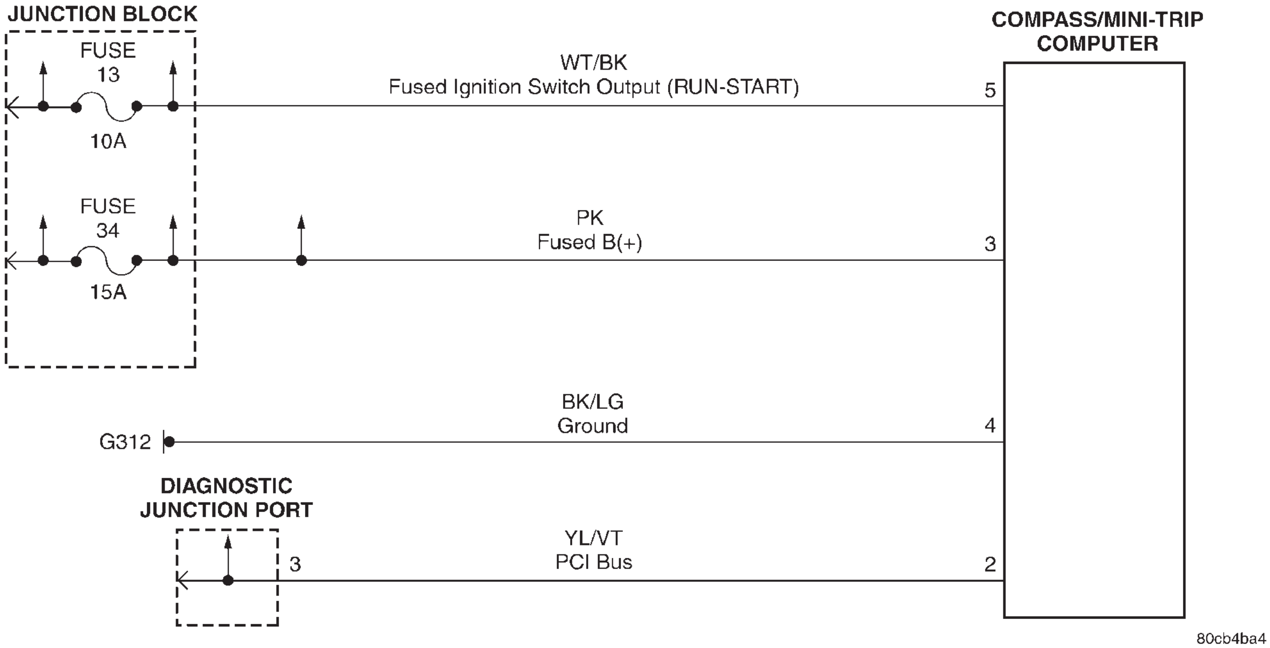


10.9 INTERIOR LIGHTING



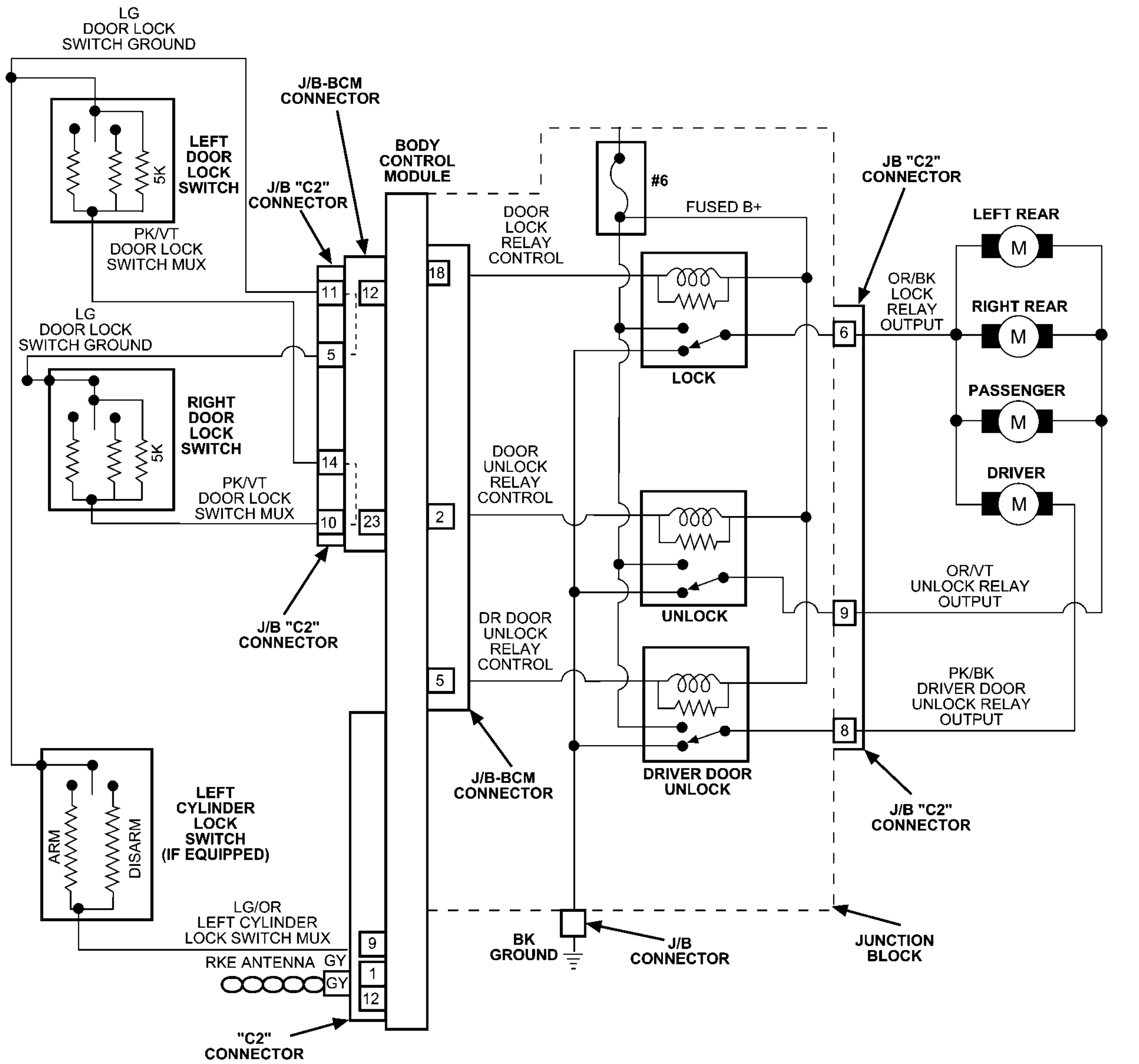
10.10 OVERHEAD CONSOLE

10.10.1 ELECTRONIC VEHICLE INFORMATION CENTER (EVIC)



10.11 POWER DOOR LOCKS

10.11.1 DOORS



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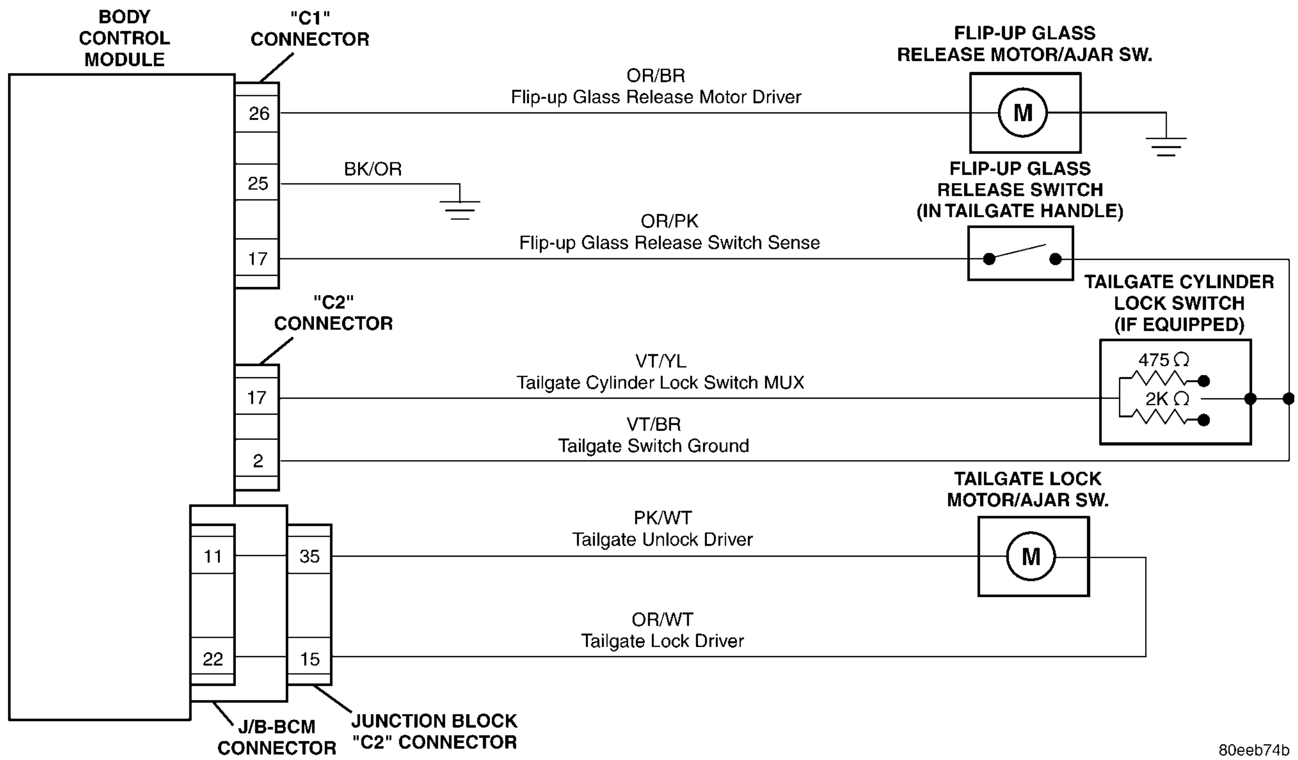
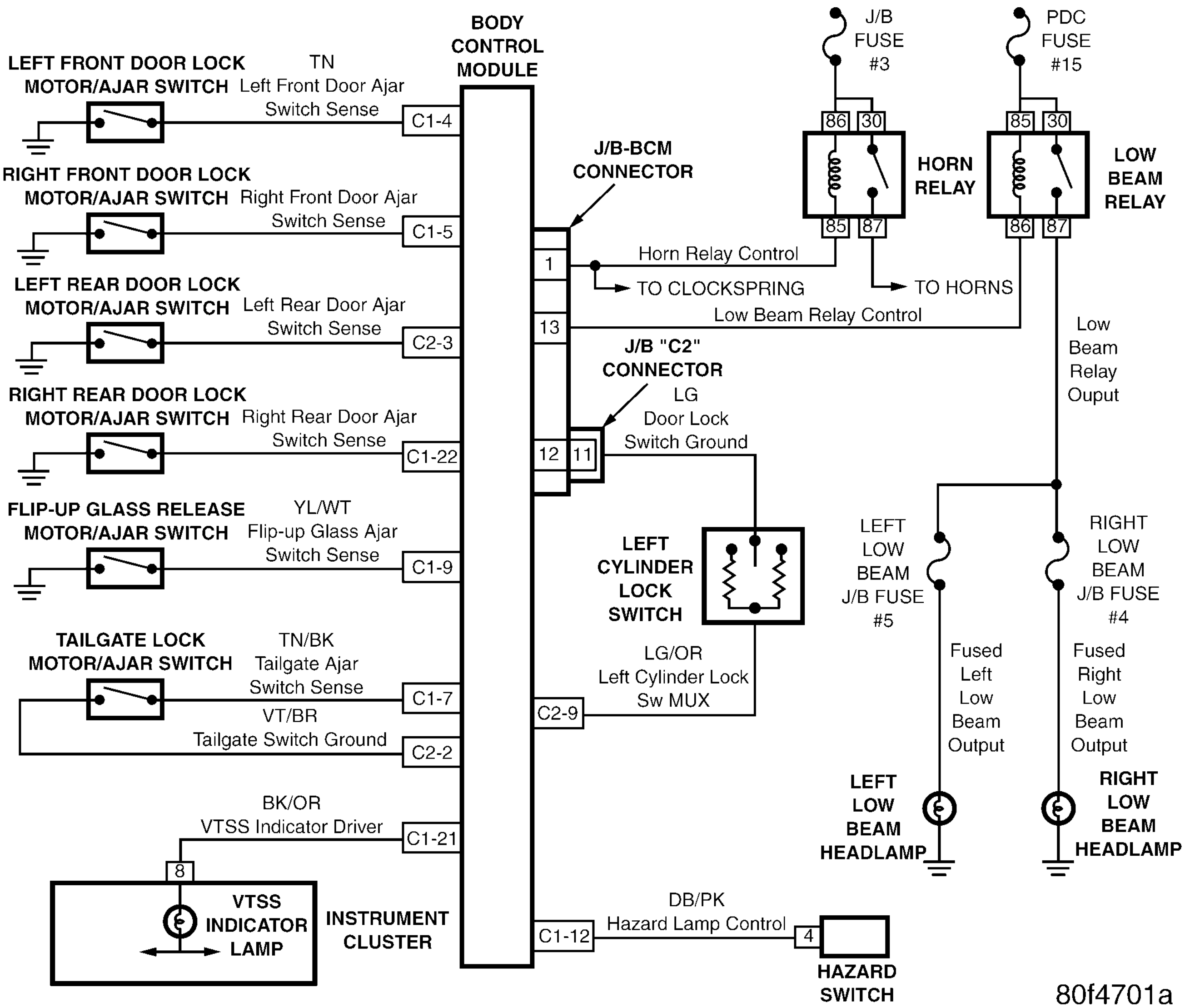
10.11.2 TAILGATE AND FLIP-UP GLASS

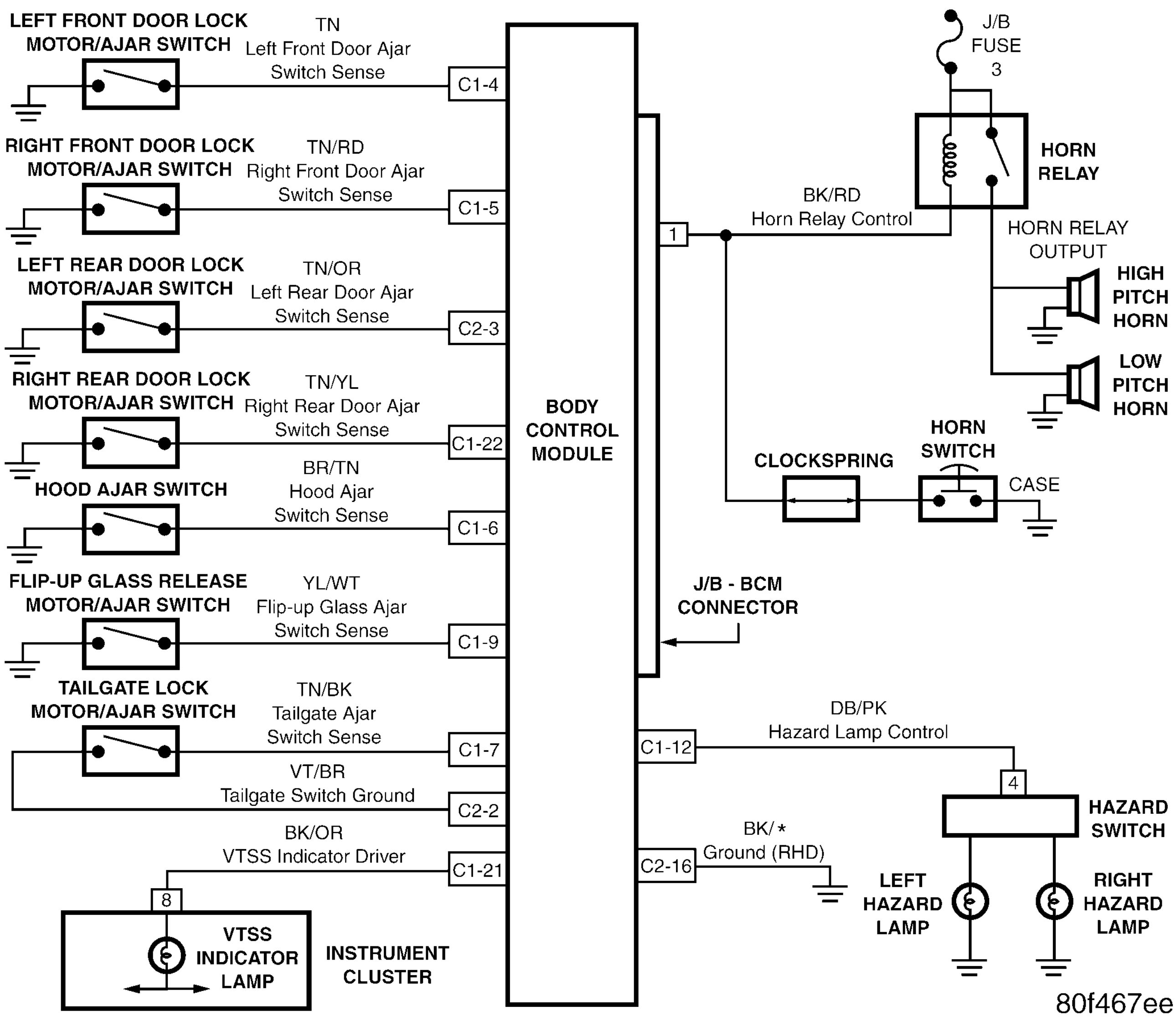


10.12 VEHICLE THEFT SECURITY SYSTEM (VTSS)

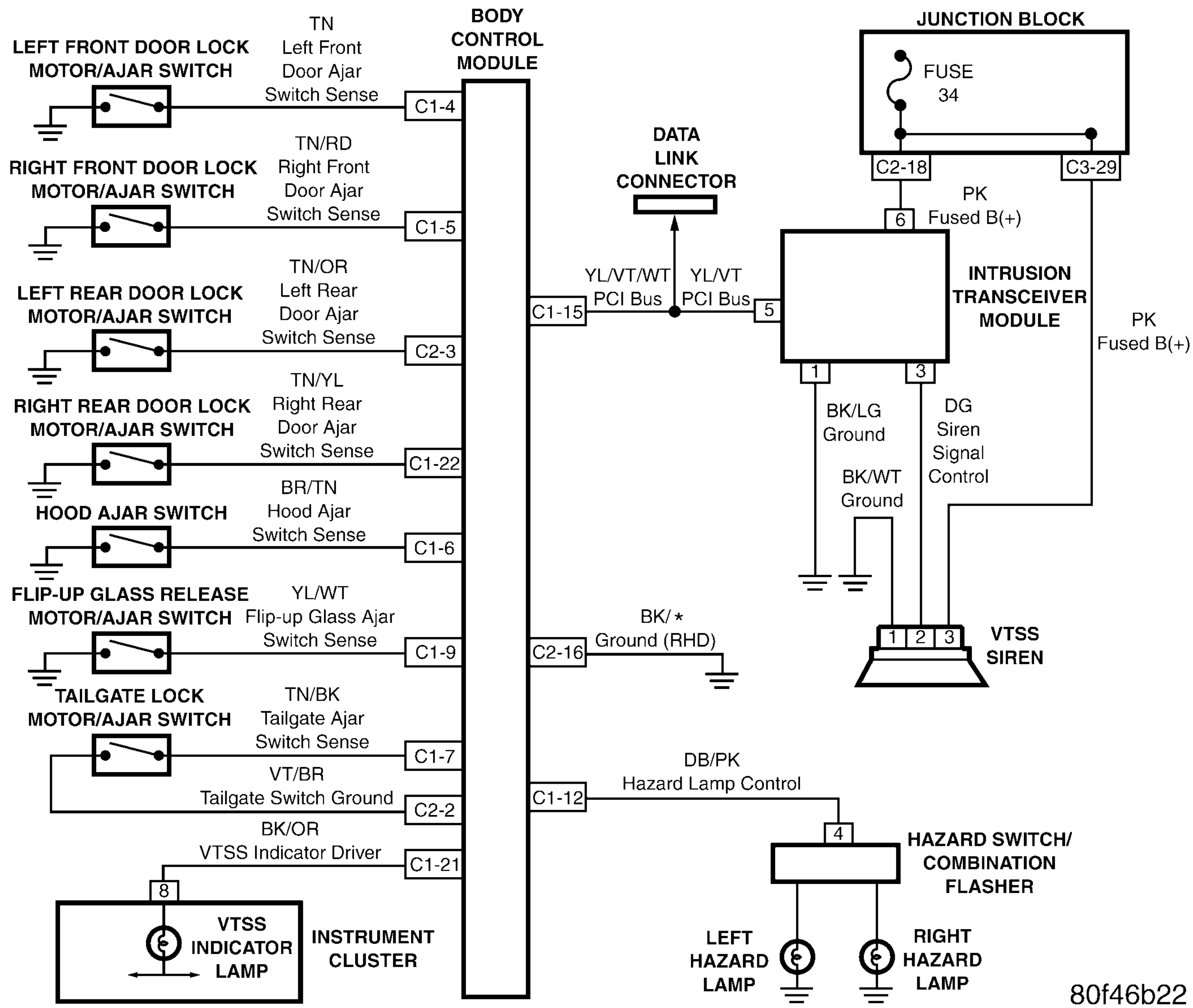
10.12.1 VTSS



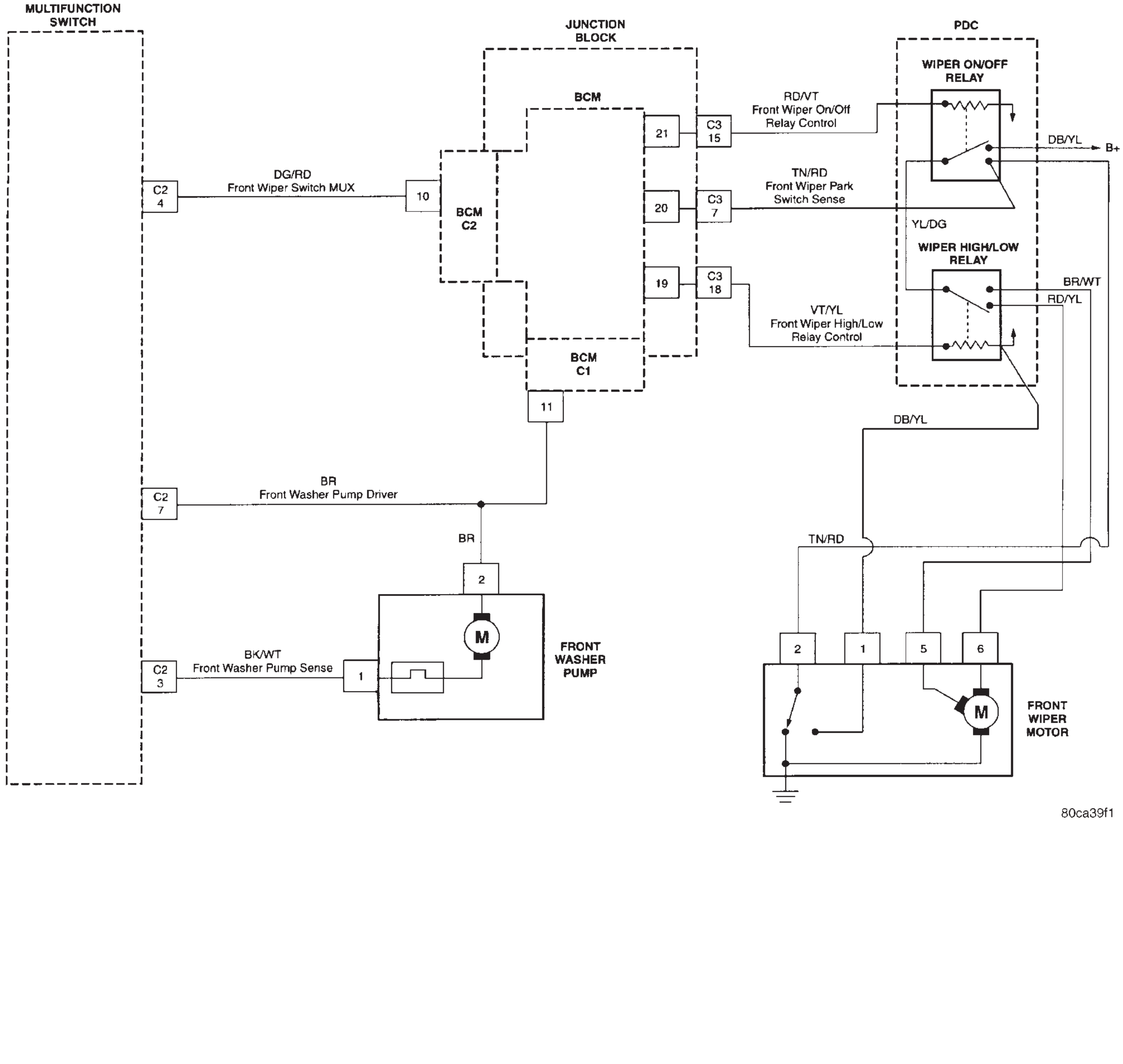
10.12.2 BASE - VTSS (EXPORT ONLY)



10.12.3 PREMIUM - VTSS (EXPORT ONLY)



10.13 WINDSHIELD WIPERS



NOTES

TABLE OF CONTENTS

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1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, instructions, and graphics needed to diagnose the 2003 Jeep Liberty Mark 20e Antilock Braking System (ABS) problems. The diagnostics in this manual are based on the failure condition or symptom being present at time of diagnosis.

Follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the CAB. If the DRBIII® displays a “No Response” condition, you must diagnose that first.
2. Read DTC’s (diagnostic trouble codes) with the DRBIII®.
3. If no DTC’s are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

All component location views are in Section 8.0. All connector pinouts are in Section 9.0. All schematics are in Section 10.0.

An * placed before the symptom description indicates a symptom with no associated DTC.

When repairs are required, refer to the appropriate service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE CODE. It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

1.1 SYSTEM COVERAGE

This diagnostic manual covers the Teves Mark 20e Antilock Braking System (ABS) found on the Jeep Liberty.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the antilock brake system is done in six basic steps:

- verification of symptom
- verification of any related symptoms
- symptom analysis
- problem isolation
- repair of isolated problem
- verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

Vehicles equipped with the Teves Mark 20e antilock brake system can be identified by the presence of the combined Controller Antilock Brake (CAB) and Hydraulic Control Unit (HCU)/Pump Motor assembly mounted by the master cylinder.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 TEVES MARK 20e SYSTEM DESCRIPTION

A Controller Antilock Brake (CAB) is used to monitor wheel speeds and to modulate (control) hydraulic pressure in each brake channel to prevent wheel lock-up during braking. The CAB also provides a vehicle speed signal (VSS) to the Body Control Module (BCM).

During a non-ABS stop, the system functions as a standard front/rear split configuration. The primary supplies brake fluid pressure to the front brakes, and the secondary supplies the rear brakes. A conventional combination/proportioning valve is not used. This system uses the existing ABS solenoids to replace and perform the same functions that the combination and proportioning valves do. The CAB has a special software program called Electronic Variable Brake Proportioning (EVBP), that monitors the wheel speeds so that when certain criteria are met the software will enable the solenoids to perform the same brake fluid management control as the combination/proportioning valves.

During an ABS stop, the system still uses the front/rear hydraulic split; however, the brake system pressure is further split into three control channels. During ABS operation, the front wheels are controlled independently and are on two separate control channels. The rear wheels are controlled together through one control channel. By using separate control channels for each front wheel, more steering control is maintained during maximum braking.

During an antilock stop, “wheel lock-up” does not necessarily mean that the wheel has locked, it means only that the wheel is turning slower than the vehicle speed. This is called “wheel slip” and is indicated as a percentage. 0% slip means that the wheel is rolling free and 100% slip means that the wheel is locked. The antilock system maintains an average of approximately 20% wheel slip.

It is important to remember that the antilock brake system does not shorten the vehicle stopping distance under all driving conditions, but provides improved control of the vehicle while stopping. Vehicle stopping distance is still dependent on vehicle speed, weight, tires, road surface, and other factors.

3.1.1 PEDAL FEEL/VEHICLES CHARACTERISTICS

There are several pedal feel/vehicle characteristics that are considered normal for antilock braking that may require further explanation.

When stopping conditions activate the antilock brakes, the driver may feel some vibrations/pulsations in the brake pedal and may hear the solenoid valves clicking and the pump motor running. The vibrations/pulsations are caused by the isolating, building and decaying of brake fluid pressure within the brake lines. The ABS prevents complete wheel lock-up, but some wheel slip is required for the best braking performance. This slip may result in some tire chirping, depending on the road surface. The chirping should not be interpreted as total wheel lock-up. Total wheel lock-up leaves black tire marks on dry pavement, antilock braking may leave some light marks.

At the end of an ABS stop, the ABS may function all the way down to near 0 km/h (0 mph). There may be a slight brake pedal drop anytime the ABS is deactivated.

In case of braking on a bumpy surface, the ABS module may activate the ABS function when it detects wheel locking tendencies due to wheel hop. In that event, the brake pedal may pulsate with a perceived loss of deceleration. ABS braking may also be activated at times while on dry pavement with sand, gravel, or other loose debris on the road.

It should be noted that the pulsating pedal feel characteristic will not illuminate the brake warning lamps or set a trouble code that is stored in the Controller Antilock Brake (CAB). When investigating a hard pedal feel, inspect the sensor and tone wheel teeth for chips/broken teeth, damaged sensor pole tips, excessive runout of the tone wheel, or excessive air gap.

3.1.2 SYSTEM COMPONENTS

ANTILOCK BRAKE SYSTEM

- controller antilock brake (CAB)
- vacuum booster
- master cylinder (w/center valves)
- hydraulic control unit (HCU)
- valve block assembly: 6 valve solenoids (3 inlet valves, 3 outlet valves)
  3 accumulators
- pump/motor assembly:
  1 motor
  2 pumps
- internal G (acceleration) sensor
- 1 internal proportioning valve
- 3 wheel speed sensor/tone wheel assemblies
- ABS warning indicator
- fuses and wiring harness

3.1.3 ABS AND RED BRAKE WARNING INDICATOR

The amber ABS warning indicator is located in the instrument cluster. It is used to inform the driver that the antilock function has been turned off due to a system malfunction. On the KJ, the CAB controls the lamp indirectly. The CAB monitors its own functions. If the CAB determines that the ABS indicator should be on, the CAB sends a message via the PCI BUS to the instrument cluster and the cluster turns on the indicator. The instrument cluster sends an “are you there” message over the PCI BUS, if the CAB does not respond the instrument cluster will illuminate the ABS indicator.

The red brake warning indicator is located in the instrument cluster. It can be activated by application of the parking brake, a leak in the front or rear wheel brake hydraulic circuit which causes the master cylinder reservoir to be low on fluid, or by turning the ignition switch to the start position. The red brake warning indicator can also be turned on if the brake fluid level switch circuit becomes open or shorted to ground.

3.1.4 CONTROLLER ANTILOCK BRAKE (CAB)

The antilock brake controller (CAB) is a microprocessor-based device that monitors wheel speeds and controls the antilock functions.

The primary functions of the CAB are:

- monitor wheel speeds
- detect wheel locking tendencies
- control fluid pressure modulations to the brakes during antilock stop operation
- control the ABS warning indicator
- monitor the system for proper operation
- provide communication to the DRBIII® while in diagnostic mode
- store diagnostic information in non-volatile memory

The CAB continuously monitors the wheel speed sensors. When a wheel locking tendency is detected, the CAB will command the appropriate HCU valve to modulate brake fluid pressure to that wheel. Brake pedal position is maintained during an antilock stop by being a closed system with the use of 3 accumulators. The CAB continues to control pressure in individual hydraulic circuits until a wheel locking tendency is no longer present. The CAB turns on the pump/motor during an antilock stop.

The antilock brake system is constantly monitored by the CAB for the proper operation. If the CAB detects a system malfunction, it can disable the antilock system and activate the ABS warning indicator. If the antilock function is disabled, the system will revert to standard base brake system operation.

The CAB inputs include the following:

- three wheel speed sensors
- brake lamp switch
- ignition switch
- battery voltage
- diagnostic communication (PCI BUS)
- G-sensor (internal acceleration sensor)

The CAB outputs include the following:

- six valve/solenoid drivers
- pump/motor actuation
- ABS warning indicator actuation
- diagnostic communication (PCI BUS)

3.1.5 HYDRAULIC CONTROL UNIT

The hydraulic control unit (HCU) contains the valve block assembly, and the pump/motor assembly.

Valve Block Assembly: The valve block assembly contains 6 valves with three inlet valves and three outlet valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring loaded in the closed position. During an antilock stop, these valves are cycled to maintain the proper slip ratio for each channel. The CAB monitors wheel speeds. If the CAB detects a wheel deceleration that is disproportionate to the other wheels, it will close the inlet valve to that wheel. This prevents any increase in fluid pressure. If the wheel continues to decelerate disporportionately, the CAB opens the outlet valve for that wheel to release fluid pressure from that channel. The released fluid is routed to the accumulators. When the wheel speed is no longer disproportionate to the other wheels, the inlet valve will return to its normally open position and the outlet valve will return to the normally closed position.

Pump/Motor Assembly: The pump/motor assembly provides the extra amount of fluid needed during antilock braking. The pump is supplied fluid that is released to the accumulators when the outlet valve is opened during an antilock stop. The pump is also used to drain the accumulator circuits after the antilock stop is complete. The pump is operated by an integral electric motor. This motor is controlled by the CAB. The CAB turns on the motor when an antilock stop is detected. The pump continues to run during the antilock stop and is turned off approximately 3-5 seconds after the stop is complete. The CAB monitors the pump/motor operation internally.

3.1.6 SENSORS

Wheel Speed Sensors and Tone Wheels: One wheel speed sensor (WSS) is located at each front wheel and another mounted to the rear axle. Each sensor sends a small digital signal to the control module (CAB). The CAB sends 12 volts to the sensor. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when a toothed sensor ring (tone wheel) passes by a stationary magnetic sensor (wheel speed sensor). The CAB measures the voltage and amperage of the digital signals for each wheel.

The front wheel sensor is attached to the hub housing. The tone wheel is an integral part of the front hub. The rear speed sensor is mounted to the axle housing. The rear tone wheel is bolted to the ring gear inside the rear differential housing. **The wheel speed sensor air gap is NOT adjustable. Because of internal circuitry, a resistance check of wheel speed sensors will not determine correct or incorrect function.**

Correct antilock system operation is dependent on wheel speed signals from the wheel speed sensors. The vehicle's wheels and tires should all be the same size and type to generate accurate signals. In addition, the tires should be inflated to the recommended pressures for optimum system operation. Variations in wheel and tire size or significant variations in inflation pressure can produce inaccurate wheel speed signals; however, the system will continue to function when using the mini-spare. When driven over rough road surfaces, the rear wheel speed sensor signals may be erratic and cause a false trouble code.

G (Acceleration) Sensor: The CAB monitors the acceleration sensor at all times. The sensor assembly contains three mercury sensors that monitor vehicle deceleration rates (G-force). Sudden rapid changes in vehicle and wheel deceleration rate trigger the sensor, sending a signal to the CAB. The sensor assembly provides three deceleration rates; two for forward braking and one for rearward braking. The G-Sensor is mounted inside the CAB and is not separately serviceable.

3.2 ABS DIAGNOSTIC TROUBLE CODES

The Teves Mark 20e Antilock Brake System (ABS) module may report any of the diagnostic trouble codes (DTCs) listed in this book's table of contents.

Diagnostic trouble codes are retained in memory until erased using the DRBIII®, or automatically erased after 255 key cycles or 3,500 miles.

3.2.1 SYSTEM INITIALIZATION

System initialization starts when the key is turned to "RUN". At this point, the CAB performs a complete self-check of all electrical components in the antilock brake systems.

At 20 km/h (12 mph) a dynamic test may be performed. If the brake lamp switch is activated the test will be run at 40 km/h (24 mph) regardless of the brake lamp switch state. This will momentarily run the pump/motor. If during the dynamic test, the driver has his/her foot on the brake pedal, he/she may feel the test through brake pedal pulsations. This is a normal condition.

If any component causes a diagnostic trouble code during system initialization or dynamic check, the CAB will illuminate the ABS warning indicator.

3.2.2 DIAGNOSTIC MODE

For a Mark 20e system to enter a diagnostic mode, vehicle speed must be below 10 km/h (6 mph) and no ABS condition present. If vehicle speed is not below 10 km/h (6 mph), a "No Response" message could be displayed by the DRBIII®. The following are characteristics of diagnostic mode:

- The amber ABS warning indicator will blink rapidly. If a hard trouble code is present, such as a CAB Power Feed Circuit diagnostic trouble code, the ABS warning indicator will be illuminated without blinking until the diagnostic trouble code condition is corrected.
- Antilock operation is disabled.

3.2.3 INTERMITTENT DIAGNOSTIC TROUBLE CODES

If the malfunction is not present while performing a test procedure, the diagnostic procedures will not locate the problem. In this case, the code can only suggest an area to inspect. Check for the following:

- loose or corroded conditions
- damaged components (sensors, tone wheels)
- damaged wiring
- excessive axle shaft runout
- hydraulic system leaks
- regular brake system problems, non-ABS related

If no obvious problems are found, erase diagnostic trouble codes and with the key on, wiggle the wire harness and connectors. Recheck for codes periodically as you work through the system. This procedure may uncover a difficult to locate malfunction.

3.2.4 FREEZE FRAME

Freeze Frame takes a "snapshot" of specific vehicle information the instant an ABS failure is recognized and stores this information into the CAB memory. This information can be accessed using the DRBIII® to help diagnose the fault. Freeze Frame will capture the first time failure or only a new failure that occurs during the current igntion cycle.

3.3 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading diagnostic trouble codes, erasing diagnostic trouble codes and other DRBIII® functions.

3.4 DRBIII® ERROR MESSAGES

Under normal operation, the DRBIII® will display one of only two error messages:

— User-Requested WARM Boot or User-Requested COLD Boot

If the DRBIII® should display any other error message, record the entire display and call the STAR Center for information and assistance. This is a sample of such an error message display:

```
ver: 2.14
date: 26 Jul93
file: key_itf.cc
date: Jul 26 1993
line: 548
err: 0x1
User-Requested COLD Boot

Press MORE to switch between this display
   and the application screen.
Press F4 when done noting information.
```

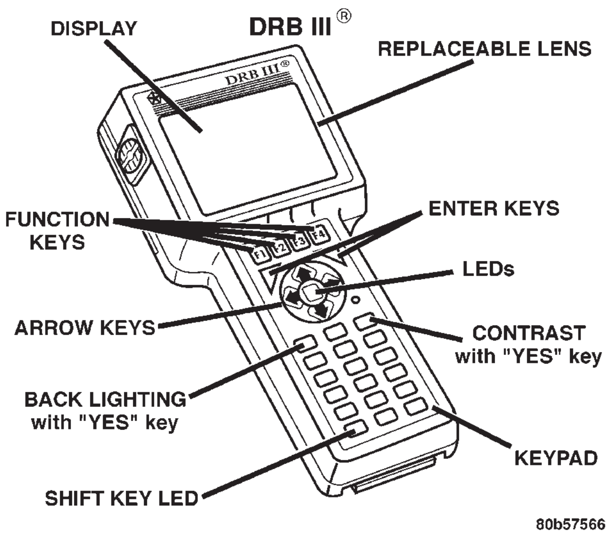
3.4.1 DRBIII® DOES NOT POWER UP (BLANK SCREEN)

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage (data link 16-way connector cavity 16). A minimum of 11 volts is required to adequately power the DRBIII®. Also check for a good ground at the DLC.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of faulty cable or vehicle wiring.

3.4.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.



4.0 DISCLAIMERS, SAFETY, WARNINGS

4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the parking brake does not hold the front drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing an antilock brake problem, it is important to follow approved procedures where applicable. These procedures can be found in the service manual. Following these procedures is very important to the safety of individuals diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the antilock brake system are intended to be serviced in assembly only. Attempting to remove or repair certain subcomponents may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS OR POSSIBLY FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATIONS LIMITS.

Follow the vehicle manufacturer's service specifications at all times.

- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.

Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0 - 500 peak volts AC 0 - 500 volts DC
Ohms (resistance)*	0 - 1.12 megohms
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-58 - 1100°F -50 - 600°C

* Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

4.3 WARNING

4.3.1 VEHICLE DAMAGE WARNINGS

Before disconnecting any control module, make sure the ignition is "off". Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage it and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second code could be set, making diagnosis of the original problem more difficult.

4.3.2 ROAD TESTING A COMPLAINT VEHICLE

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read the DRBIII® screen while in motion. Do not hang the DRBIII® from the rear view mirror or operate it yourself. Have an assistant available to operate the DRBIII®.

4.4 DIAGNOSIS

1. Your diagnostic test procedure must begin with a thorough visual inspection of the ABS system for damaged components or disconnected connectors. The brake lamps must be operational, and if they are not, repair them prior to continuing.
2. Connect the DRBIII® to the data link connector located under the dash. If the DRBIII® does not power up, check the power and ground supplies to the connector.
3. Select "Antilock Brakes". Turn the ignition on. If the DRBIII® displays "No Response", refer to Communication in the Body Diagnostic Procedures manual to diagnose the symptom.
4. Read and record all ABS diagnostic trouble codes. If the "CAB Power Feed Circuit" diagnostic trouble code is present, it must be repaired prior to addressing any other DTC's. If any additional codes are present, proceed to the appropriate test.
5. If there are no diagnostic trouble codes present, select "Inputs/Outputs" and read the brake switch input as your press and release the brake pedal. If the display does not match the state of the pedal, perform the proper test. Read the "G-Sensor" status, with the vehicle on a level surface, both switches should read "CLOSED". If the status is not correct, perform the proper test. If a problem with the amber "ABS" warning indicator exists, refer to the proper test.
6. If no other problems are found, it will be necessary to road test the vehicle. **THE DRBIII® MUST NOT BE CONNECTED TO THE DATA LINK CONNECTOR WHEN ROAD TESTING FOR PROPER ANTILOCK OPERATION. THE SYSTEM IS DISABLED WHILE IN DIAGNOSTIC MODE.** Perform several antilock stops from above 50 Km/h (30 mph) and then repeat steps 2, 3, and 4. If any diagnostic trouble codes are present, proceed to the appropriate test.
7. The following conditions should be considered "NORMAL" operation, and no repairs should be attempted to correct them.
   – Brake pedal feedback during an ABS stop (clicking, vibrating)

– Clicking, groaning or buzzing at 10 Km/h (6 mph) (drive off self test)
– Groaning noise during an ABS stop
– Slight brake pedal drop and pop noise when ignition is initially turned on
– Brake pedal ratcheting down at the end of an ABS stop

8. If the complaint is ABS "cycling" at the end of a stop at low speeds, it may be caused by a marginal wheel speed sensor signal. The sensor air gap, tone wheel condition, and/or brakes hanging up are possible causes of this condition.
9. After a road test in which no problems were found, refer to any Technical Service Bulletins that may apply.

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box)
jumper wires
ohmmeter
voltmeter
test light

6.0 GLOSSARY OF TERMS

ABS	antilock brake system
BCM	Body Control Module
CAB	controller antilock brake
DC	direct current
DLC	data link connector
DRB	diagnostic read-out box
EMI	electro magnetic interference
EVBP	Electronic Variable Brake Proportioning
HCU	hydraulic control unit
J/B	junction block
JTEC	Jeep and Truck Engine Controller
LF	left front
LR	left rear
PCI	Programmable Communication Interface
PCM	Powertrain Control Module
PDC	power distribution center
P/M	pump motor
RF	right front
RR	right rear
RFI	radio frequency interference
SOL	solenoid
WSS	wheel speed sensor

NOTES

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom:
BUS SYSTEM COMMUNICATION FAILURE

When Monitored and Set Condition:

BUS SYSTEM COMMUNICATION FAILURE

When Monitored: Ignition on. Continuously monitors.

Set Condition: When the CAB detects a short on the PCI Bus circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ELECTRO-MECHANICAL INSTRUMENT CLUSTER DTC PRESENT
BUS CIRCUIT OPEN
CAB - INTERNAL FAILURE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read Freeze Frame information. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display BUS SYSTEM COMMUNICATION FAILURE? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, read EMIC DTCs. Does the DRBIII® display NO ABS BUS MESSAGES RECEIVED? Yes → Refer to symptom NO ABS BUS MESSAGES RECEIVED in the BODY/INSTRUMENT CLUSTER category. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the negative (-) battery cable. Disconnect the CAB harness connector. **NOTE: check connector - Clean/repair as necessary.** Measure the resistance of the Bus circuit between the CAB connector and the Data Link Connector (DLC). Is the resistance below 5.0 ohms? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

BUS SYSTEM COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CAB INTERNAL FAILURE

When Monitored and Set Condition:

CAB INTERNAL FAILURE

When Monitored: Ignition on. The CAB monitors its internal microprocessors for correct operation.

Set Condition: If the CAB detects an internal fault, the DTC is set.

POSSIBLE CAUSES
INTERMITTENT DTC
DAMAGED CAB/CAB HARNESS CONNECTOR
CAB - GROUND CIRCUIT OPEN
ABS VALVE FUSED B(+) CIRCUIT OPEN
ABS PUMP FUSED B(+) CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display CAB INTERNAL FAILURE? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB/CAB harness connector for damage. Is ther any broken, bent, pushed out, corroded or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the CAB harness connector ground circuits. Did the test light illuminate? Yes → Go To 4 No → Repair the CAB Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

CAB INTERNAL FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Using a 12-volt test light connected to ground, probe the ABS Valve Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Go To 5 No → Repair the ABS Valve Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Using a 12-volt test light connected to ground, probe the ABS Pump Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the ABS Pump Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
CLUSTER LAMP FAILURE

When Monitored and Set Condition:

CLUSTER LAMP FAILURE

When Monitored: Ignition on. Continuous.

Set Condition: When the CAB receives a bus message from the Instrument Cluster that the Cluster cannot illuminate the ABS Warning Indicator.

POSSIBLE CAUSES
INSTRUMENT CLUSTER OR ABS DTC PRESENT
INSTRUMENT CLUSTER
CAB--NO DTC SIGNAL TO THE INSTRUMENT CLUSTER
CAB -- PERMANENT FAULT SIGNAL
CAB--NO KEY-ON BULB CHECK SIGNAL

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Are there any Instrument Cluster or ABS DTCs present? Yes → Refer to the appropriate category for the related symptom(s). Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Perform the Key-on Bulb Check. Does the ABS Warning Indicator light and then go out after a few seconds? Yes → Go To 3 No. Light remains after bulb check. Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No. Indicator never comes on. Go To 4	All

CLUSTER LAMP FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: The DRBIII® communication with the CAB must be operational for the result of this test to be valid.** Turn the ignition off. Remove ABS Valve fuse from the PDC. Perform the Key-on Bulb Check. Does the ABS Indicator remain on after the bulb check? Yes → Test Complete. No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
4	**NOTE: The following steps will initiate the Instrument Cluster self test.** Turn the ignition off. Press and hold the odometer reset button. Turn the ignition to RUN. Observe the Instrument Cluster indicators. Release the odometer reset button. Did the ABS Indicator illuminate during the Instrument Cluster self test? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Instrument Cluster in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
G-SENSOR FAILURE

When Monitored and Set Condition:

G-SENSOR FAILURE

When Monitored: Ignition ON. Continuously monitored when speed is greater than 2 km/h (1 mph) and there is no Brake Lamp Switch input.

Set Condition: When the CAB detects a condition outside programmed parameters from the internal G-Sensor.

POSSIBLE CAUSES
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, record and erase DTC's. With the DRBIII®, read DTCs. Does the DRBIII® display G-SENSOR FAILURE? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

LEFT FRONT SENSOR CIRCUIT FAILURE
REAR SENSOR CIRCUIT FAILURE
RIGHT FRONT SENSOR CIRCUIT FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be LEFT FRONT SENSOR CIRCUIT FAILURE.

When Monitored and Set Condition:

LEFT FRONT SENSOR CIRCUIT FAILURE

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

REAR SENSOR CIRCUIT FAILURE

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

RIGHT FRONT SENSOR CIRCUIT FAILURE

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

POSSIBLE CAUSES
INTERMITTENT CONDITION
WHEEL SPEED SENSOR OR CONNECTOR DAMAGE
WHEEL SPEED SENSOR SIGNAL CIRCUIT FAULT
WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT SHORT TO GROUND
WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT OPEN
WHEEL SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
WHEEL SPEED SENSOR SIGNAL CIRCUIT OPEN
CAB - 12 VOLT SUPPLY CIRCUIT FAULT
CAB - SIGNAL CIRCUIT FAULT
WHEEL SPEED SENSOR 12 VOLT SUPPLY SHORT TO GROUND
WHEEL SPEED SENSOR SIGNAL CIRCUIT INOPERATIVE

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read the Freeze Frame information. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. **NOTE: The CAB must sense all four wheels at 25km/h (15 mph) before it will extinguish the ABS indicators.** Does the DRBIII® display SENSOR CIRCUIT FAILURE? Yes → Go To 2 No → Go To 13	All
2	Turn the ignition off. Inspect the CAB connector, affected Wheel Speed Sensor, and affected Wheel Speed Sensor connector. Is the affected Wheel Speed Sensor or any of the connectors damaged? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the affected Wheel Speed Sensor connector. **Note: Check connector - Clean/repair as necessary.** Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and ground. Is the voltage above 10 volts? Yes → Go To 6 No → Go To 4	All
4	Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor 12 Volt Supply circuit. Does the test light illuminate? Yes → Repair the affected Wheel Speed Sensor 12 Volt Supply circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 5	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Connect a jumper wire between affected Wheel Speed Sensor 12 Volt Supply circuit and ground. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor 12 Volt Supply circuit. Does the test light illuminate? Yes → Go To 6 No → Repair the affected Wheel Speed Sensor 12 Volt Supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the affected Wheel Speed Sensor connector. **NOTE: Check connector - Clean/repair as necessary.** Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor Signal circuit and ground. Is the voltage above 1 volt? Yes → Repair the affected Wheel Speed Sensor Signal circuit for a short to voltage. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor Signal circuit. Does the test light illuminate? Yes → Repair the affected Wheel Speed Sensor Signal circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Connect a jumper wire between affected Wheel Speed Sensor Signal circuit and ground. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor Signal circuit. Does the test light illuminate? Yes → Go To 9 No → Repair the affected Wheel Speed Sensor Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Remove the CAB harness strain relief to access wires. Reconnect the CAB harness connector. Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and ground. Is the voltage above 10 volts? Yes → Go To 10 No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
10	Turn the ignition off. Remove the CAB harness strain relief to access wires. Reconnect the CAB harness connector. Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and affected Wheel Speed Sensor Signal circuit. Is the voltage above 10 volts? Yes → Go To 11 No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
11	Turn the ignition off. Reconnect ALL affected Wheel Speed Sensor circuit connectors. Disconnect the affected Wheel Speed Sensor connector. Turn the ignition on. Measure the voltage of the affected Wheel Speed Sensor 12 Volt Supply circuit in the affected Wheel Speed Sensor connector while reconnecting the sensor connector. Did the affected Wheel Speed Sensor 12 Volt Supply circuit drop voltage to 0 DC volts? Yes → Replace the affected Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 12	All
12	Turn the ignition off. Reconnect ALL affected Wheel Speed Sensor circuit connectors. Turn the ignition on. Measure the DC voltage of the Wheel Speed Sensor Signal circuit in the affected Wheel Speed Sensor connector. Slowly rotate the wheel. Does the DC voltage toggle between 1.6 volts to .8 volts? Yes → Go To 13 No → Replace the affected Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

LEFT FRONT WHEEL SPEED SIGNAL FAILURE
REAR WHEEL SPEED SIGNAL FAILURE
RIGHT FRONT WHEEL SPEED SIGNAL FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be LEFT FRONT WHEEL SPEED SIGNAL FAILURE.

When Monitored and Set Condition:

LEFT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

REAR WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

RIGHT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

POSSIBLE CAUSES
WHEEL SPEED SIGNAL FAILURE DTC PRESENT
AFFECTED WHEEL SPEED SENSOR SIGNAL INOPERATIVE
AFFECTED WHEEL SPEED SENSOR CONNECTOR DAMAGED
AFFECTED WHEEL SPEED SENSOR TONE WHEEL DAMAGED
AFFECTED WHEEL SPEED SENSOR AIR GAP FAULT
WHEEL BEARING FAULT

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

POSSIBLE CAUSES
BRAKE LINING FAULT
AFFECTED WHEEL SPEED SENSOR CIRCUIT ELECTRICAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read Freeze Frame information. **NOTE: The CAB must sense ALL 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS indicators.** Does the DRBIII® display WHEEL SPEED/SIGNAL FAILURE and SENSOR CIRCUIT FAILURE? Yes → Refer to the affected Wheel Speed SENSOR CIRCUIT FAILURE for the related symptom(s). Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition on. With the DRBIII® in Sensors, monitor ALL the Wheel Speed Sensor Signals while an assistant drives the vehicle. Slowly accelerate as straight as possible from a stop to 24 km/h (15 mph). Is the affected Wheel Speed Signal showing 0 km/h (0 mph)? Yes → Go To 3 No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wiring harness. Refer to any Technical Service Bulletins(TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Inspect the CAB connector, affected Wheel Speed Sensor, and affected Wheel Speed Sensor connector. Is the Wheel Speed Sensor or any connector damaged? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn ignition off. Inspect the affected Tone Wheel for damaged, missing teeth, cracks, or looseness **NOTE: The Tone Wheel teeth should be perfectly square, not bend, or nicked.** Is the affected Tone Wheel OK? Yes → Go To 5 No → Replace the Tone Wheel in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Using a Feeler Gauge, measure the affected Wheel Speed Sensor Air Gap. **NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.** Is the Air Gap OK? Yes → Go To 6 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Inspect the wheel bearings for excessive runout or clearance. **NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.** Is the bearing clearance OK ? Yes → Go To 7 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
7	Turn the ignition off. Visually inspect brakes for locking up due to lining contamination or overheating. Inspect all Components for defects which may cause a Signal DTC to set. Is any Component Damaged? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Refer to symptom SENSOR CIRCUIT FAILURE for further diagnostics. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
PUMP CIRCUIT FAILURE

When Monitored and Set Condition:

PUMP CIRCUIT FAILURE

When Monitored: Ignition on. The CAB commands the pump on at 20 km/h (12 mph) to check its operation, if the brake switch is not applied. If the brake is applied, the test will run at 40 km/h (25 mph). The CAB monitors pump voltage continuously.

Set Condition: The DTC is stored when the CAB detects: 1) Improper voltage decay after the pump was turned off. 2) Pump not energized by the CAB, but voltage is present for 3.5 seconds. 3) Pump is turned on by the CAB, but without sufficient voltage to operate it.

POSSIBLE CAUSES
CAB - PUMP MOTOR RUNNING CONTINUOUSLY
ABS PUMP FUSE
ABS PUMP MOTOR INTERMITTENT DTC
DAMAGED CAB/CAB HARNESS CONNECTOR
ABS PUMP FUSED B(+) CIRCUIT INTERMITTENT SHORT TO GROUND
ABS PUMP FUSED B(+) CIRCUIT SHORT TO GROUND
CAB - INTERNAL FAULT
ABS PUMP MOTOR INOPERATIVE
ABS PUMP MOTOR OPEN
ABS PUMP MOTOR B(+) CIRCUIT OPEN
ABS PUMP MOTOR GROUND CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Turn the ignition on. Monitor the ABS Pump Motor for continuous operation. **NOTE: The CAB must sense ALL wheels at 25 km/h (15 mph) before it will extinguish the ABS indicators.** Is the ABS Pump Motor running continuously? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, actuate the ABS Pump Motor. Did the ABS Pump Motor operate? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Make sure the Pump Motor connecter is secure. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All
4	Turn the ignition off. Remove and inspect the ABS Pump fuse. Is the ABS Pump fuse open? Yes → Go To 5 No → Go To 8	All
5	Turn the ignition off. Visually inspect the ABS Pump Fused B(+) circuit in the wiring harness. Look for any sign of an intermittent short to ground. Is the wiring harness OK? Yes → Go To 6 No → Repair the ABS Pump Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Using a 12-volt test light connected to 12-volts, probe the ABS Pump Fused B(+) circuit fuse terminal. Does the test light illuminate? Yes → Repair the ABS Pump Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Reconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the ABS Pump Fused B(+) circuit fuse terminal. Does the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Replace the ABS Pump fuse. If the fuse is open make sure to check for a short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
8	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off. Reinstall the ABS Pump fuse. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Fused B(+) terminal in the CAB harness connector to the ABS Pump Motor connector RED wired terminal. Connect a 10 gauge jumper wire between the Ground circuit terminal in the CAB harness connector to the ABS Pump Motor connector BLACK wired terminal. Did the ABS Pump Motor operate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Motor connector RED wired terminal and an alternate 40 amp capable B(+) source. Connect a 10 gauge jumper wire between the ABS Pump Motor connector BLACK wired terminal and ground Did the ABS Pump Motor operate? Yes → Go To 11 No → Replace the Hydraulic Control Unit in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Fused B(+) terminal in the CAB harness connector to the ABS Pump Motor connector RED wired terminal. Connect a 10 gauge jumper wire between the ABS Pump Motor connector BLACK wired terminal and ground. Did the ABS Pump Motor operate? Yes → Repair the ABS Pump Motor Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1. No → Repair the ABS Pump Motor Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
SYSTEM OVER VOLTAGE

When Monitored and Set Condition:

SYSTEM OVER VOLTAGE

When Monitored: Ignition on. The CAB monitors the Fused B(+) circuit at all times for proper system voltage.

Set Condition: If the voltage is above 16.5 volts, the Diagnostic Trouble Code (DTC) is set.

POSSIBLE CAUSES
INTERMITTENT DTC
BATTERY CHARGER CONNECTED
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT HIGH
DAMAGED CAB/CAB HARNESS CONNECTOR
CAB - GROUND CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Start the engine. With the DRBIII®, read DTC's. Does the DRBIII® display SYSTEM OVER VOLTAGE? Yes → Go To 2 No → Go To 7	All
2	Is a battery charger connected to the vehicle? Yes → Ensure the battery is fully charged. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

SYSTEM OVER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the CAB connector. **Note: Check connector - Clean/repair as necessary.** Start the engine. Raise engine speed above 1,800 RPM's Measure the voltage between Fused Ignition Switch Output (RUN) circuit and ground. Is the voltage above 16.5 volts ? Yes → Refer to appropriate service information for Charging System testing and repair. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the CAB connector. **Note: Check connector - Clean/repair as necessary.** Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the CAB connector. **Note: Check connector - Clean/repair as necessary.** Using a 12-volt test light connected to 12-volts, probe the Ground circuits. Does the test light illuminate? Yes → Go To 6 No → Repair the Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Reconnect the CAB harness connector. Turn the ignition on. With the DRBIII® in Sensors, read the ignition voltage. Does the DRBIII® display ignition voltage above 16 volts? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7	All

SYSTEM OVER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Ensure the battery is fully charged. Inspect the vehicle for aftermarket accessories that may exceed the Generator System output. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
SYSTEM UNDER VOLTAGE

When Monitored and Set Condition:

SYSTEM UNDER VOLTAGE

When Monitored: Ignition on. The CAB monitors the Fused Ignition Switch Output circuit voltage above 10 km/h (6 mph) continuously for proper system voltage.

Set Condition: If the voltage is below 9.5 volts, the Diagnostic Trouble Code (DTC) is set.

POSSIBLE CAUSES
INTERMITTENT DTC
DAMAGED CAB/CAB HARNESS CONNECTOR
RUNNING BATTERY VOLTAGE LOW
CAB - GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Start the engine. Drive the vehicle above 16 km/h (10 mph) for at least 20 seconds. Stop the vehicle With the DRBIII®, read DTC's. Does the DRBIII® display SYSTEM UNDER VOLTAGE ? Yes → Go To 2 No → Go To 6	All
2	Engine Running. Measure the battery voltage. Is the battery voltage below 10 volts? Yes → Refer to appropriate service information for charging system testing and repair. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

SYSTEM UNDER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the Ground circuits. Does the test light illuminate? Yes → Go To 5 No → Repair the Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output (RUN) circuit. Does the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Fused Ignition Switch Output (RUN) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Ensure the battery is fully charged. Inspect the vehicle for aftermarket accessories that may exceed the Generator System output. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
VALVE POWER FEED FAILURE

When Monitored and Set Condition:

VALVE POWER FEED FAILURE

When Monitored: Ignition ON. The CAB monitors the Valve Fused B(+) circuit at all times for proper system voltage.

Set Condition: If the Valve Fused B(+) is missing, the DTC will be set.

POSSIBLE CAUSES
INTERMITTENT DTC
ABS VALVE FUSE
ABS VALVE FUSED B(+) SUPPLY CIRCUIT OPEN
ABS VALVE FUSED B(+) CIRCUIT OPEN
ABS VALVE FUSED B(+) CIRCUIT INTERMITTENT SHORT TO GROUND
ABS VALVE FUSED B(+) CIRCUIT SHORT TO GROUND
DAMAGED CAB/CAB HARNESS CONNECTOR
CAB - GROUND CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display VALVE POWER FEED FAILURE? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Remove and Inspect the ABS Valve fuse. Is the ABS Valve fuse open? Yes → Go To 3 No → Go To 6	All

VALVE POWER FEED FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Visually inspect the ABS Valve Fused B(+) circuit in the wiring harness. Look for any sign of an intermittent short to ground. Is the wiring harness OK? Yes → Go To 4 No → Repair the ABS Valve Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Disconnect the CAB harness connector. **Note: Check connector - Clean/repair as necessary.** Using a test light connected to 12 volts, probe the ABS Valve Fused B(+) circuit fuse terminal. Did the test light illuminate? Yes → Repair the ABS Valve Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Reconnect the CAB harness connector. **NOTE: The CAB harness connector must be reconnected for the results of this test to be valid.** Using a test light connected to 12 volts, probe the ABS Valve Fused B(+) circuit fuse terminal. Did the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Replace the ABS Valve Fused B(+) fuse. If the fuse is open make sure to check for a short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off. Using a 12-volt test light connected to ground, probe the B(+) supply at the ABS Valve fuse terminal. Did the test light illuminate? Yes → Go To 8 No → Repair the ABS Valve Fused B(+) supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

VALVE POWER FEED FAILURE — Continued

TEST	ACTION	APPLICABILITY
8	Reinstall the ABS Valve fuse. Disconnect the CAB harness connector. Using a 12-volt test light connected to ground, probe the ABS Valve Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Go To 9 No → Repair the ABS Valve Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
9	Turn the ignition off. Using a 12-volt test light connected to 12-volts, probe the ground circuits at the CAB harness connector. Did the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the CAB Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
10	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*BRAKE LAMP SWITCH FAILURE

POSSIBLE CAUSES
CHECK BRAKE LAMP SWITCH OUTPUT
BRAKE LAMP SWITCH B+ OPEN
BRAKE LAMP SWITCH OPEN
BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORT OR OPEN
CAB -- INTERNAL OPEN

TEST	ACTION	APPLICABILITY
1	With the DRBIII® in Inputs/Outputs, read the Brake Lamp Switch state. Press and release the brake pedal. Does the DRBIII® display PRESSED and RELEASED? Yes → The Brake Lamp Switch is OK. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Disconnect the Brake Lamp Switch harness connector. Using a 12-volt test light connected to ground, check the Brake Lamp Switch Fused B+ circuit. Does the test light illuminate brightly ? Yes → Go To 3 No → Repair the Brake Lamp Switch Fused B+ circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
3	Disconnect the Brake Lamp Switch harness connector. Connect a jumper wire between the Brake Lamp Switch B+ and Brake Lamp Switch Output circuits. With the DRBIII® in Inputs/Outputs, read the Brake Lamp Switch state. Does the DRBIII® display PRESSED? Yes → Replace the Brake Lamp Switch in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All
4	Disconnect the CAB harness connector. Disconnect the Brake Lamp Switch harness connector. Check the Brake Lamp Switch Output circuit for a short to voltage and for an open. Is the Brake Lamp Switch Output circuit shorted or open? Yes → Repair the Brake Lamp Switch Output circuit for a short to voltage or an open. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE

POSSIBLE CAUSES
NO RESPONSE FROM CAB
GROUND CIRCUIT OPEN
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
OPEN PCI BUS CIRCUIT
CONTROLLER ANTILOCK BRAKE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **Note: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, attempt to communicate with the Airbag Control Module. With the DRB, attempt to communicate with the Body Control Module (BCM). Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Communications category and perform the symptom PCI Bus Communication Failure. Perform ABS VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe both ground circuits. Is the test light illuminated for both circuits? Yes → Go To 3 No → Repair the ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the CAB harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 4 No → Repair the Fused Ignition Switch Output circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE — Continued

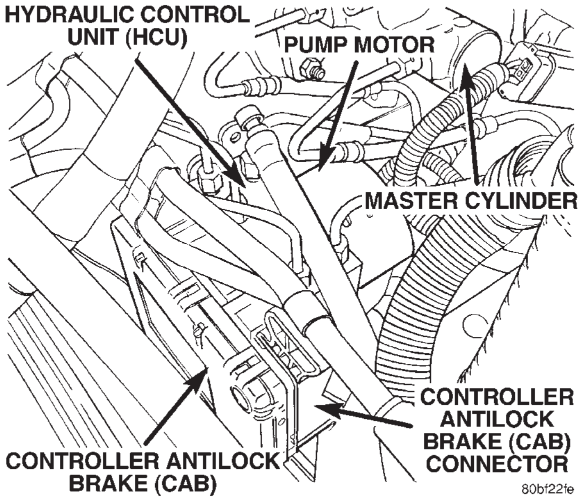
TEST	ACTION	APPLICABILITY
4	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the CAB harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the CAB connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 5 No → Repair the PCI Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Verification Tests

ABS VERIFICATION TEST - VER 1	APPLICABILITY
1. Turn the ignition off. 2. Connect all previously disconnected components and connectors. 3. Ensure all accessories are turned off and the battery is fully charged. 4. Ensure that the Ignition is on, and with the DRBIII, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning. 5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules. 6. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom. **7. NOTE: For Sensor Signal and Pump Motor faults, the CAB must sense all 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator.** 8. If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops. **9. Caution: Ensure braking capability is available before road testing.** 10. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list. 11. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete. Are any DTC's present or is the original concern still present? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

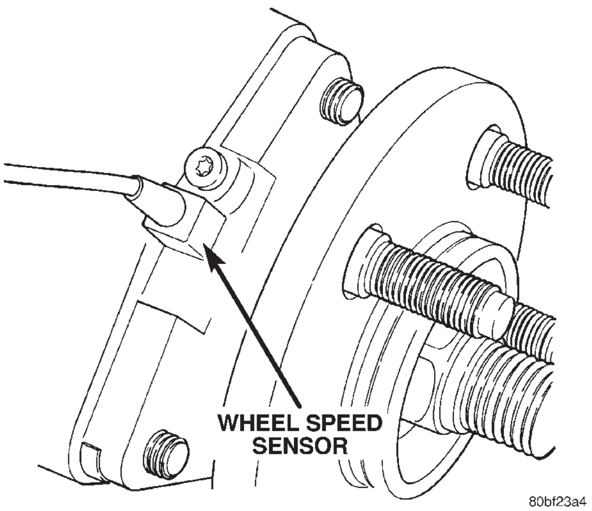
8.0 COMPONENT LOCATIONS

8.1 CONTROLLER ANTILOCK BRAKE, HYDRAULIC CONTROL UNIT, PUMP MOTOR

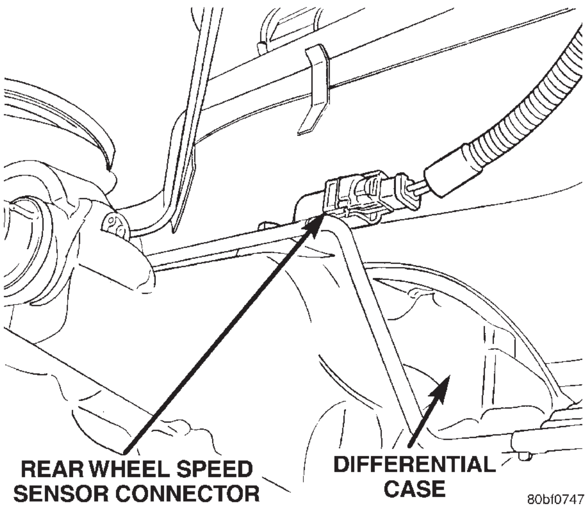


8.2 WHEEL SPEED SENSORS

FRONT



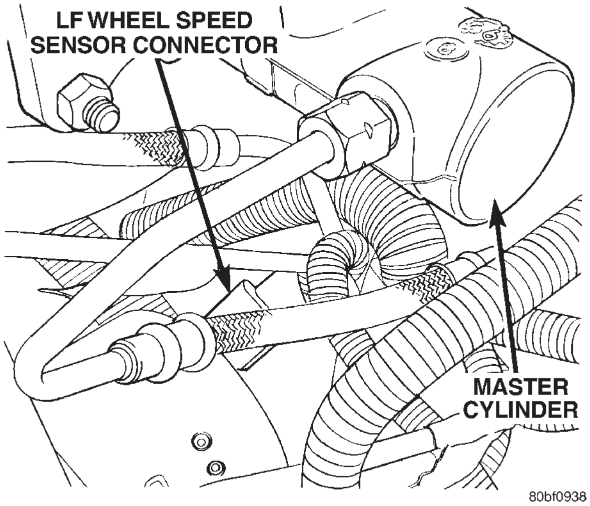
REAR



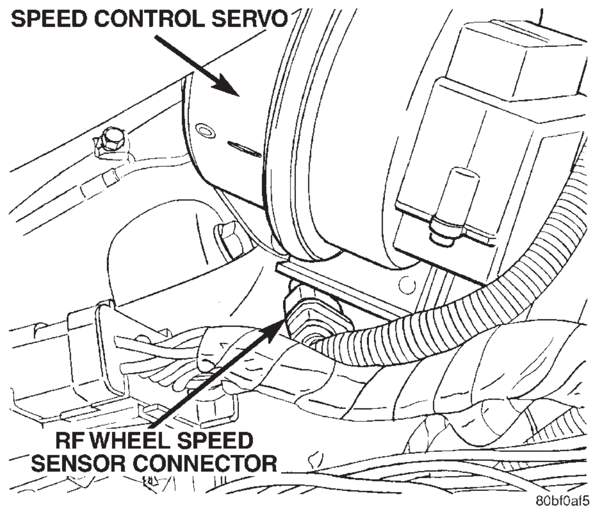
C O M P O N E N T L O C A T I O N S

8.3 WHEEL SPEED SENSOR CONNECTORS

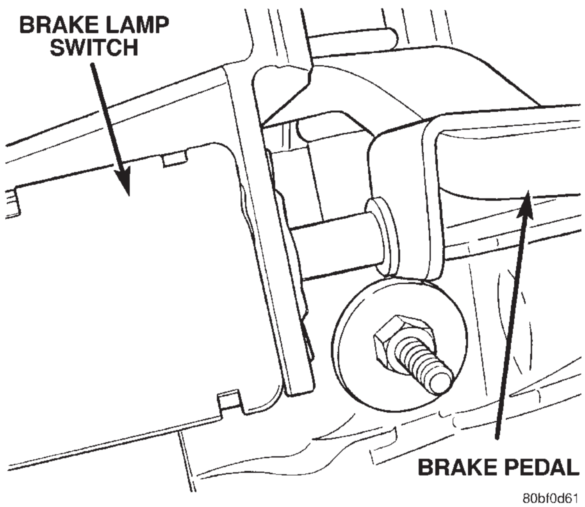
LEFT FRONT



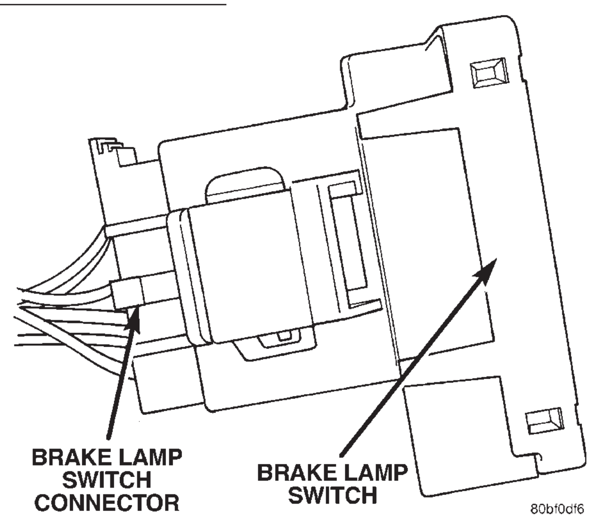
RIGHT FRONT



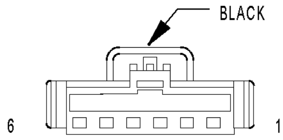
8.4 BRAKE LAMP SWITCH



8.5 BRAKE LAMP SWITCH CONNECTOR

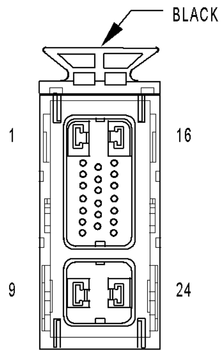


9.0 CONNECTOR PINOUTS



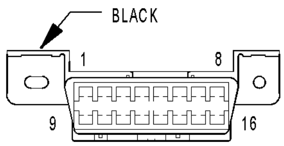
BRAKE LAMP SWITCH

CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN (DIESEL)	PRIMARY BRAKE SWITCH SIGNAL
2	L50 18WT/TN (GAS)	BRAKE LAMP SWITCH OUTPUT
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	V32 18YL/RD	SPEED CONTROL SUPPLY
5	Z3 18BK/OR	GROUND
6	K29 18WT/PK (DIESEL)	SECONDARY BRAKE SWITCH SIGNAL
6	K29 18WT/PK (GAS)	BRAKE SWITCH SENSE



CONTROLLER ANTILOCK BRAKE

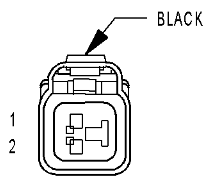
CAV	CIRCUIT	FUNCTION
1	Z101 12BK/OR	GROUND
2	-	-
3	-	-
4	-	-
5	D25 18YL/VT	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	D24 18WT/DG	FLASH ABS
9	A20 12RD/DB	FUSED B(+)
10	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
11	-	-
12	-	-
13	B12 18DG/OR	VEHICLE SPEED SIGNAL
14	-	-
15	-	-
16	Z102 12BK/OR	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL
20	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)



DATA LINK CONNECTOR

DATA LINK CONNECTOR

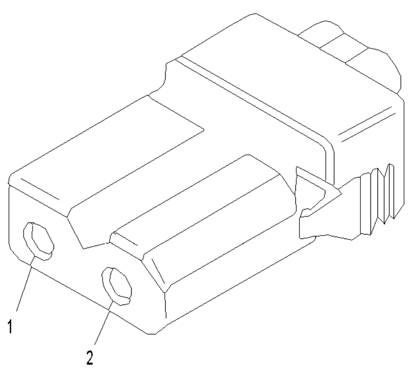
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



LEFT FRONT WHEEL SPEED SENSOR (ABS)

LEFT FRONT WHEEL SPEED SENSOR (ABS)

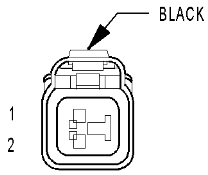
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



PUMP MOTOR CONNECTOR

PUMP MOTOR CONNECTOR

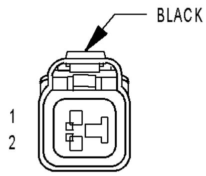
CAV	CIRCUIT	FUNCTION
1	TN	GROUND
2	RD	PUMP/MOTOR RELAY OUTPUT



REAR
WHEEL SPEED
SENSOR

REAR WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL



RIGHT FRONT
WHEEL SPEED
SENSOR
(ABS)

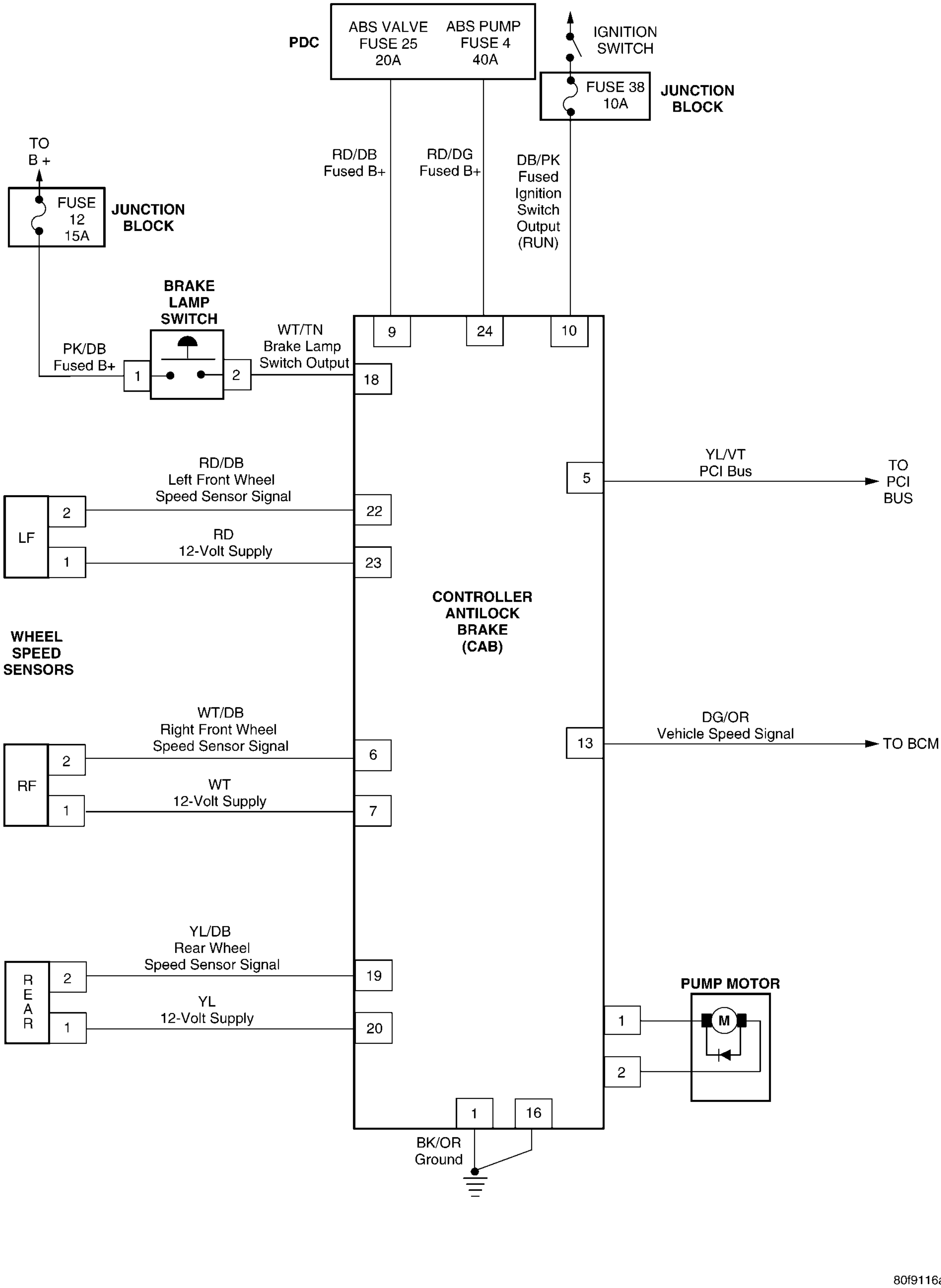
RIGHT FRONT WHEEL SPEED SENSOR (ABS)

CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL

NOTES

10.0 SCHEMATIC DIAGRAMS

TEVES MARK 20e CONTROLLER ANTILOCK BRAKE — ABS



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NOTES

1.0 INTRODUCTION

The procedures contained in this manual include all of the specifications, instructions, and graphics needed to diagnose
*42RLE Electronic Automatic Transmission (EATX) problems
*45RFE/545RFE Electronic Automatic Transmission (EATX) problems
The diagnostics in this manual are based on the failure condition or symptom being present at the time of diagnosis.

When repairs are required, refer to the appropriate volume of the service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added and/or carryover systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE TROUBLE CODE. It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

1.1 SYSTEM COVERAGE

This diagnostic procedures manual covers all 2003 Model Year KJ equipped with a 42RLE or 45RFE/545RFE EATX controlled Automatic Transmission.

1.2 SIX -STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the 42RLE or 45RFE/545RFE electronic transmission is done in six basic steps:

Verification of complaint
Verification of any related symptoms
Symptom analysis
Problem isolation
Repair of isolated problem
Verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

The 42RLE Transmission family can be identified by Visual identification of vehicles equipped with a Solenoid/Pressure Switch Assembly located on the passenger side, and the Transmission Range Sensor, Input Speed Sensor and Output Speed Sensor are located on the drivers side of the transmission. Refer to the Service Information for transmission ID tag descriptions.

The 45RFE/545RFE Transmission family can be identified by confirming the presence of a 23 pin electrical connector on the left-hand side of the transmission oriented vertically near the manual lever. Refer to the Service Information for transmission ID tag descriptions.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 GENERAL DESCRIPTION

42RLE

The 42RLE electronic Transmission is a conventional Transmission in that it uses hydraulically applied clutches to shift a planetary gear train. However, the electronic control system replaces many of the mechanical and hydraulic components used in conventional transmission valve bodies.

45RFE/545RFE

The 45RFE/545RFE electronic transmission is a conventional transmission in that it uses hydraulically applied clutches to shift a planetary gear train. However, the electronic control system replaces many of the mechanical and hydraulic components used in conventional transmission valve bodies.

The 45RFE/545RFE electronic transmission is a fully electronically controlled transmission. The Transmission Control Module (TCM) is similar to (but not the same as) the one used in the 41TE and 42LE transmissions, therefore many similarities exist in function and diagnosis.

The 45RFE/545RFE has an overrunning clutch (used in 1st gear), an electronically controlled torque converter clutch, 3 planetary gear sets, and six clutch packs. The clutches are called 2nd Clutch (2C), 4th Clutch (4C), Low/Reverse Clutch (LR), Reverse Clutch (RC), Underdrive Clutch (UD), and Overdrive Clutch (OD).

Although the 45RFE is considered a 4 speed transmission, it really has 5 forward gear ratios., the 545RFE is considered a 5 speed transmission, it really has 6 forward gear ratios. 2nd gear (1.67:1) and 2nd prime (1.50:1) gear are so close in ratio that they are not considered to be different gear ratios, although both are used as 2nd gear under certain conditions. During most upshift and downshift maneuvers, 2nd gear will be used. 2nd prime gear is only used for a high speed 4-2 downshift. The 545RFE transmission is essentially a software change to the TCM that allows an additional overdrive ratio of (.667:1). The gear ratio of 4th Prime is achieved by applying the 2C and OD clutches. The 4th Prime is used above 52 MPH. All gear ratios in the 45RFE/545RFE are achieved by applying two elements (clutches). During a shift, one element is released and another is applied, resulting in a different ratio. This is called a clutch to clutch shift. In order to perform a 4-2 downshift, two elements would have to be released and two different elements applied. The 2nd prime gear ratio allows a clutch to clutch 4-2' (2nd prime) downshift.

The oil pump in the 45RFE/545RFE is a dual stage positive displacement gear type pump. At idle and low engine speeds, both stages are working. Once the engine speed reaches a point where one side of the pump can supply the necessary system requirements, the second stage is vented. This pump configuration gives the pressure and flow of a large displacement pump at low speeds, and the economy of a small displacement pump at higher engine speeds. The oil pump housing also contains some of the valves that are found in the valve body in a 41TE or 42LE transmission. The Converter Clutch Switch Valve, Converter Clutch Regulator Valve, Torque Converter Limit Valve, and the Pressure Regulator Valve, are all found in the oil pump housing.

The electronic control system consists of a Transmission Control Module (TCM), a Transmission Range Sensor (TRS), an Input Speed Sensor (ISS), an Output Speed Sensor (OSS), a Line Pressure Sensor (LPS), a Transmission Temperature Sensor (TTS), five pressure switches, and seven solenoids. Each clutch pack has a corresponding solenoid and pressure switch except for the reverse clutch, which is controlled by the manual valve. The other two solenoids are called the Multi Select (MS) solenoid and the Pressure Control Solenoid (PCS).

The PCS is used to control line pressure. The 45RFE/545RFE controls line pressure based on inputs to the TCM. The line pressure is torque based (line pressure increases with torque) most of the time, however it is set to a predetermined value just prior to a shift and reverts back to torque based after the shift.

The MS solenoid is used to control the LR clutch during P-R and N-R garage shifts and to control the OD clutch when the Manual Valve is in the ″D″ position as reported by the TRS. If the manual valve is slightly out of position, the TRS will indicate a temporary zone (T3 or T4). In this case the OD clutch will be controlled by the OD solenoid. Note that if the TRS indicates a temporary zone, this is a valid PRNDL code and will not set a DTC P0706(28). If the PRNDL code consistently indicates a temporary zone while the shift lever is in the ″D″ position, this would indicate some sort of mechanical problem in the shift linkage as opposed to an electrical TRS problem. Note: vehicle operation in the T3 temporary zone can set a DTC P1715(65).

3.2 FUNCTIONAL OPERATION

42RLE

The 42RLE electronic Transmission has a fully adaptive control system. The system performs it's functions based on continuous real-time sensor feedback information. The control system automatically adapts to changes in engine performance and friction element variations to provide consistent shift quality. The control system ensures that clutch operation during upshifting and downshifting is more responsive without increased harshness.

The Transmission Control Module (TCM) continuously checks for electrical problems, mechanical problems, and some hydraulic problems. When a problem is sensed, the TCM stores a diagnostic trouble code. Some of these codes cause the Transmission to go into Limp-in or default mode. While in this mode, electrical power is taken away from the Transmission via the TCM, de-energizing the transmission control relay, and taking power from the solenoid pack. When this happens, the only Transmission mechanical functions are:

Park and Neutral
Reverse
Second Gear

No upshifts or downshifts are possible. The position of the manual valve alone allows the three ranges that are available. Although vehicle performance is seriously degraded while in this mode, it allows the owner to drive the vehicle in for service.

Once the DRBIII® is in the EATX portion of the diagnostic program, it constantly monitors the TCM to see if the system is in Limp-in mode. If the Transmission is in Limp-in mode, the DRBIII® will flash the red LED.

45/545RFE

The 45RFE/545RFE electronic transmission has a fully adaptive control system. The system performs its functions based on continuous real-time sensor feedback information. The control system automatically adapts to changes in engine performance and friction element variations to provide consistent shift quality. The control system ensures that clutch operation during upshifting and downshifting is more responsive without increased harshness.

The Transmission Control Module (TCM) continuously checks for electrical problems, mechanical problems, and some hydraulic problems. When a problem is sensed, the TCM stores a diagnostic trouble code (DTC). Some of these codes cause the transmission to go into ″limp-in″ or ″default″ mode. The 45RFE/545RFE has three default modes:

(I) Immediate shutdown - The TCM de-energizes the transmission control relay. This causes the transmission system to immediately default to third gear if shift lever is in the ″D″ position, or 2nd gear if it is in the ″2″ or ″L″ positions. Park, Neutral, and Reverse are still available.

(O) Orderly Shutdown - If the TCM recognizes a problem that does not require an immediate shutdown, the transmission will maintain the current gear and the transmission control relay will remain energized until de-energizing it will not overspeed the engine. When the vehicle speed reaches a reasonable level the TCM de-energizes the transmission control relay. This causes the transmission system to immediately default to third gear if shift lever is in the ″D″ position, or 2nd gear if it is in the ″2″ or ″L″ positions. Park, Neutral, and Reverse are still available.

(L) Logical Shutdown with Recovery - The TCM does not de-energize the Transmission Control Relay. Instead, the transmission will utilize 1st and 3rd gears while in ″D″, and will use 2nd while in ″2″ or ″L″. All transmission operation in this mode will be at a preset line pressure (open loop). The transmission will resume normal operation (recover) if the detected problem goes away. Three recoveries are permitted in a given key, after the fourth occurrence the operation described above will be maintained.

Once the DRBIII is in the ″EATX″ portion of the diagnostic program, it constantly monitors the TCM to see if the system is in limp-in mode. If the transmission is in limp-in mode, the DRBIII® will flash the red LED.

3.2.1 TRANSMISSION OPERATION AND SHIFT SCHEDULING AT VARIOUS OIL TEMPERATURES

The transmission covered in this manual has unique shift schedules depending on the temperature of the transmission oil. The shift schedule is modified to extend the life of the transmission while operating under extreme conditions.

The oil temperature is measured with a Temperature Sensor on the 42RLE, 45/545RFE transmission. The Temperature Sensor is an integral component of the Transmission Range Sensor (TRS). If the Temperature Sensor is faulty the transmission will default to a ″calculated″ oil temperature. Oil temperature will then be calculated using engine coolant temperature, battery/ambient temperature, and engine off time from the Body Control Module (BCM). These inputs are received from the communication bus periodically and are used to initialize the oil temperature at start up. Once the engine is started, the TCM updates the transmission oil temperature based on torque converter slip speed, vehicle speed, gear, and engine coolant temperature to determine an estimated oil temperature during vehicle operation. Vehicles using ″calculated oil temperature″ track oil temperature reasonably accurately during normal operation. However, if a transmission is overfilled, a transmission oil cooler becomes restricted, or if a customer drives aggressively in low gear, the <u>calculated</u> oil temperature will be inaccurate. Consequently the shift schedule selected may be inappropriate for the current conditions.

3.2.2 LINE PRESSURE CONTROL - 45/545RFE

Proper control of the transmission line pressure is essential for proper operation. The 45RFE/545RFE normally uses closed loop line pressure control, where actual line pressure (reported by the line pressure sensor) is continuously monitored. The TCM determines the desired (target) line pressure, which is required, and adjusts the Pressure Control Solenoid (PCS) until the actual line pressure matches the desired line pressure value. In the event of a line pressure sensor failure DTC P0867(CB), the TCM changes to an open loop control at an essentially constant line pressure.

Proper diagnosis of line pressure systems is facilitated by the use of a special tool (T-fitting - Miller #8259) which allows the use of a mechanical pressure gauge to compare the line pressure sensor reading on the DRBIII® to the gauge pressure. Technicians should compare the mechanical gauge reading with the ″actual″ and ″desired″ line pressure reading on the DRBIII®. All three readings should closely match in pressure. Because the mechanical and actual line pressure may not match the desired at low engine speeds (due to low pump output RPM), line pressure should always be checked at 1500 - 2000 RPM.

Typical Line Pressure problems include:

- Mechanical and ″actual″ readings both less than desired
  - If the mechanical and ″actual″ readings do not increase significantly as engine speed is raised above 2000 RPM, the pressure control solenoid is usually at fault. The pressure control solenoid is usually accompanied by DTC's P0867(C8) and P0868(C9). The PCS is located in the Transmission Solenoid/TRS assembly.
  - If the mechanical and ″actual″ readings vary with engine speed (above 2000 RPM), the fault is often a sticking main regulator valve. This valve is located in the transmission pump assembly.
- ″Actual″ reading on the DRBIII® differs from the Mechanical Pressure reading (higher or lower) by

more than 69kPa (10 PSI). This is sometimes accompanied by a DTC P0869(CB). The fault is usually in the Line Pressure Sensor or the Line Pressure Sensor Wiring.

- All three readings match, but the "actual" reading exhibits momentary intermittent pressure increases to 1724 kPa (250 PSI). The line Pressure Sensor is usually the problem. This will cause erratic shift quality (particularly a harsh 3-1 coast down shift), repair by replacing the Line Pressure Sensor.

3.2.3 DRIVE LEARN PROCEDURE-45/545RFE

Procedure To Learn A Smooth 1st Neutral To Drive Shift:

Perform this procedure only if the complaint is for a delayed or harsh shift the first time the transmission is put into gear after the vehicle is allowed to set with the engine not running for at least 10 minutes. Use the following steps to have the TCM learn the 1st N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C).

1. Start the engine only when the engine and ignition have been off for at least ten (10) minutes.
2. With the vehicle at a stop and the service brake applied, record the UD CVI while performing a Neutral to Drive shift. During the shift, the UD CVI will temporarily show a different value which is the 1st N-D UD CVI. The 1st N-D UD CVI account for air entrapment in the UD clutch that may occur after the engine has been off for a period of time.
3. Repeat steps 1 and 2 until the recorded 1st N-D UD CVI value stabilizes.

NOTE: It is important that this procedure be performed when the transmission temperature is between 80 - 110°F (27 - 43°C). If this procedure takes too long to complete fully for the allowed transmission oil temperature, the vehicle may be returned to the customer with an explanation that the shift will improve daily during normal vehicle usage. The TCM also learns at higher oil temperatures, but these values (line pressure correction values) are not available for viewing on the DRB III.

Procedure To Learn A Smooth Neutral To Drive Garage Shift:

Perform this procedure if the complaint is for a delayed or harsh shift when the transmission is put into gear after the vehicle has had its first shift. Use the following steps to have the TCM learn the N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C) to learn the UD CVI. Additional learning occurs at temperatures as low as 0°F and as high as 200°F. This procedure may be performed at any temperature that experiences poor shift quality. Although the UD CVI may not change, shift quality should improve.

1. Start the vehicle engine and shift to drive.
2. Move the vehicle forward to a speed of at least 16 km/h (10 MPH) and come to a stop. This ensures no air is present in the UD hydraulic circuit.
3. Perform repeated N-D shifts at a stop while pausing in Neutral for at least 2-3 seconds and monitor NORM N-D UD CVI volume until the value stabilizes. The value will change during the N-D shift. This is normal since the UD value is different for the N-1 shift then the normal value shown which is used for 4-3 coastdown and kickdowns. Perform repeated shifts in this temperature range until the NORM N-D UD CVI value stabilizes and the N-D shifts become smooth.
4. This procedure may be performed at any temperature that experiences poor N-D shift quality. Although the NORM N-D UD CVI may not change, shift quality should improve.

Procedure To Learn The 1st 2-3 Shift After A Restart Or Shift To Reverse:

Use the following steps to have the TCM learn the 1st 2-3 shift OD CVI.

NOTE: The transmission oil temperature must be above 80°F (27°C).

1. With the vehicle engine running, select reverse gear for over 2 seconds.
2. Shift the transmission to Drive and accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform a 2-3 shift while noting the OD CVI. During the shift, a different value may appear on the screen, which is the 1st 2-3 OD CVI.
3. Repeat steps 1 and 2 until the 1st 2-3 upshift becomes smooth and the 1st 2-3 OD CVI stabilizes.

Procedure To Learn A Smooth 2-3 And 3-4 Upshift:

Use the following steps to have the TCM learn the OD and 4C CVI's.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. Accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform multiple 1-2, 2-3, and 3-4 upshifts. The 2nd 2-3 shift following a restart or shift to reverse will be shown during the shift as a value between the 1st 2-3 OD CVI and the normal OD CVI. Updates to the normal OD CVI will occur after the 2nd shift into 3rd gear, following a restart or shift to reverse.
2. Repeat step 1 until the 2-3 and 3-4 shifts become smooth and the OD and 4C CVI become stable.

Procedure To Learn A Smooth 4-3 Coastdown And Part Throttle 4-3 Kickdown:

Use the following steps to have the TCM learn the UD shift volume.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. At a vehicle speed between 64-97 km/h (40-60 MPH), perform repeated 4-3 kickdown shifts.
2. Repeat step 1 until the UD volume becomes somewhat stable and the shift becomes smooth.

Procedure To Learn A Smooth 1-2 Upshift and 3-2 Kickdown:

Use the following steps to have the TCM learn the 2C shift volume.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. With a vehicle speed below 48 km/h (30 MPH) and the transmission in 3rd gear, perform multiple 3-2 kickdowns.
2. Repeat step 1 until the 3-2 kickdowns become smooth and the 2C CVI becomes stable.

Procedure To Learn A Smooth Manual 2-1 Pulldown Shift As Well As A Neutral To Reverse Shift:

Use the following steps to have the TCM learn the LR volume.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. With the vehicle speed around 40-48 km/h (25-30 MPH) in Manual 2nd, perform manual pulldowns to Low or 1st gear at closed throttle.
2. Repeat step 1 until the LR CVI becomes stable and the manual 2-1 becomes smooth.

Procedure To Learn A Smooth Neutral To Reverse Shift:

Perform the following shifts.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. With the vehicle at a stop, perform Neutral to Reverse shifts until the shift is smooth. An unlearned Neutral to Reverse shift may be harsh or exhibit a double bump.

If any of the shifts are still not smooth after the clutch volume stabilizes, an internal transmission problem may be present.

Procedure To Learn A Smooth 4-5 Upshift for 545RFE:

Use the following steps to have the TCM learn the ALT 2C CVI.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. Accelerate the vehicle through 88 km/h (55mph) at a steady 10-15 degree throttle opening and perform multiple 4-5 upshifts.
2. Repeat step 1 until the 4-5 shift become smooth and the ALT 2C CVI become stable. There is a separate 2C volume used and learned for 4-5 shifts, ALT 2C CVI. It is independent of the 2C CVI learned on 3-2 kickdowns.

3.3 DIAGNOSTIC TROUBLE CODES

Diagnostic trouble codes (DTC's) are codes stored by the Transmission Control Module (TCM) that help us diagnose Transmission problems. They are viewed using the DRBIII® scan tool.

Always begin by performing a visual inspection of the wiring, connectors, cooler lines and the transmission. Any obvious wiring problems or leaks should be repaired prior to performing any diagnostic test procedures. Some engine driveability problems can be misinterpreted as a transmission problem. Ensure that the engine is running properly and that no PCM DTC's are present that could cause a transmission complaint.

If there is a communication bus problem, trouble codes will not be accessible until the problem is fixed. The DRBIII® will display an appropriate message. The following is a possible list of causes for a bus problem:

– open or short to ground/battery in PCI bus circuit.

– internal failure of any module or component on the bus

Each diagnostic trouble code is diagnosed by following a specific testing sequence. The diagnostic test procedures contain step-by-step instructions for determining the cause of a transmission diagnostic trouble code. Possible sources of the code are checked and eliminated one by one. It is not necessary to perform all of the tests in this book to diagnose an individual code. These tests are based on the problem being present at the time that the test is run.

If the TCM records a DTC that will adversely affect vehicle emissions, it will request (via the communication bus) that the PCM illuminate the Malfunction Indicator Lamp (MIL). Although these DTC's will be stored in the TCM immediately as a 1 trip failure, it may take up to five minutes of accumulated trouble confirmation to set the DTC and illuminate the MIL. Three consecutive successful OBDII/EURO III trips or clearing the DTC's with a diagnostic tool (DRBIII® or equivalent) is required to extinguish the MIL. When the TCM requests that the PCM illuminate the MIL, the PCM sets a DTC ($89) to alert the technician that there are DTC's in the TCM. This must also be erased in the PCM in order to extinguish the MIL.

3.3.1 HARD CODE

Any Diagnostic Trouble Code (DTC) that is set whenever the system or component is monitored is a HARD code. This means that the problem is there every time the TCM checks that system or component. Some codes will set immediately at start up and others will require a road test under specific conditions. It must be determined if a code is repeatable (Hard) or intermittent before attempting diagnosis.

3.3.2 ONE TRIP FAILURES

A One Trip Failure, when read from the TCM, is a hard OBDII/EURO III code that has not matured to the full 5 minutes. This DTC can take up to five minutes of problem identification before illuminating the MIL

3.3.3 INTERMITTENT CODE

A diagnostic trouble code that is not there every time the TCM checks the circuit or function is an ″intermittent″ code. Some intermittent codes, are caused by wiring or connector problems. However intermittent Speed ratio codes are usually caused by intermittent hydraulic seal leakage in the clutch and/or accumulator circuits. Intermittent speed ratio codes can be set by intermittent speed sensor circuitry or by line noise being induced onto one or both of the speed sensor signal circuits. Problems that come and go like this are the most difficult to diagnose, they must be looked for under the specific conditions that cause them.

3.3.4 STARTS SINCE SET COUNTER

The Starts Since Set counter counts the number of times the vehicle has started since the most recent DTC was set. The counter will count up to 255 starts. Note that this counter only applies to the last code set.

When there are no diagnostic trouble codes stored in memory, the DRBIII® will display ″NO DTC's PRESENT″ and the reset counter will show ″STARTS SINCE CLEAR″ = XXX.

The number of starts helps determine if the diagnostic trouble code is hard or intermittent.

– If the number of starts is less than 3, the code is usually a hard code.
– If the number of starts is greater than 3, it is considered an intermittent code. This means that the engine has been started most of the time without the code recurring.

3.3.5 TROUBLE CODE ERASURE

A Diagnostic trouble code will be cleared from TCM memory if it has not reset for 40 warm-up cycles.

A warm-up cycle is defined as ″sufficient vehicle operation such that the coolant temperature has risen by at least 22°C (40°F) from engine starting and reaches a minimum temperature of 71°C (160°F).

The Malfunction Indicator Lamp (MIL) will turn off after 3 good trips or when the DTC's are cleared from the TCM.

3.3.6 QUICK LEARN

The Quick Learn function customizes adaptive parameters of the TCM to the transmission characteristics of a vehicle. This gives the customer improved ″as received″ shift quality compared to the initial parameters stored in the TCM.

<u>Notes about Quick Learn Features</u>

The nature of the Quick Learn function requires that certain features must be taken into consideration.

> Quick Learn should generally not be used as a repair procedure unless directed by a repair or diagnostic procedure. If the transmission system is exhibiting a problem that you think is caused by an invalid CVI, you should try to relearn the value by performing the appropriate driving maneuver . In most cases, if a Quick Learn makes a vehicle shift better, the vehicle will return with the same problem.

> Before performing Quick Learn, it is imperative that the vehicle be shifted into OD with the engine running and the oil level set to the correct level. This step will purge air from the clutch circuits to prevent erroneous clutch volume values which could cause poor initial shift quality. Cycle the transmission through all gears 2-3 times immediately before performing Quick

Learn. For best results, Quick Learn should be run with the transmission sump temperature > 90°F.

> If an unused TCM is installed on a vehicle with a HOT engine, Quick Learn will cause the TCM to report a cold calculated oil temperature. This requires monitoring the calculated oil temperature using the DRBIII®. If the temperature is below 16° C (60° F), the transmission must be run at idle or driven in gear until it goes above 16° C (60° F). If the temperature is above 93° C (200° F), the transmission must cool to below 93° C (200° F).

> First gear is engaged in overdrive after Quick Learn is completed. Place the vehicle in park after performing Quick Learn.

The Quick Learn function should be performed:

– Upon installation of a new service TCM
– After replacement or rebuild of internal transmission components or the torque converter
– If one or more of the clutch volumes indexes (CVI's) contain skewed readings because of abnormal conditions.

The Quick Learn procedure is performed with the DRBIII® by selecting ″Transmission″ system then ″Miscellaneous″ functions, then ″Quick Learn″. Follow the procedure instructions displayed on the DRBIII®.

To perform the Quick Learn procedure, the following conditions must be met.

Note: The oil temperature must be between 16°C (60°F) and 93°C (200°F). Above 32°C (90°F) for best results.

Cycle the transmission through all gears 2-3 times immediately before performing Quick Learn.

– It is imperative that the vehicle oil level set to the correct level. Shift the transmission into OD with the engine running, this step will purge the air in the clutch circuits to prevent erroneous clutch volume values, which could cause poor initial shift quality.
– Shift the transmission to neutral.
– The brakes must be applied.
– The engine must be idling.
– The throttle angle (TP sensor) must be less than 3 degrees.
– The shift lever position must stay in neutral, after shifting to neutral the engine idle speed will ramp up to 1600rpm and the DRBIII® will prompt the operator to shift to OD. Do not shift to OD until the engine idle speed stabilizes at 1600rpm.
– The shift lever must stay in OD after the ″Shift to Overdrive″ prompt until the DRBIII® indicates the procedure is complete.

NOTE: The above conditions must be maintained during the procedure to keep the procedure from being aborted.

Note: After the Quick Learn Procedure is complete, the vehicle should be drive learned per the Drive Learn Procedure

3.3.7 CLUTCH VOLUMES-45/545RFE

The LR clutch volume is updated when doing a manual downshift into 1st gear with vehicle speed above 40 km/h (25 MPH) and throttle angle below 5°. The transmission temperature must be above 43° C (110°F).

The clutch volume should be between 45 and 134. **Note: you must manually move the shift lever into the low position.**

The 2C clutch volume is updated when doing a 3-2 shift with throttle angle between 10° and 54°. The transmission temperature must be above 43° C (110°F). The clutch volume should be between 25 and 85

The 2CA clutch volume is updated when doing a 4th-4 prime shift with throttle angle between 10° and 54°. The transmission temperature must be above 43° C (110°F). The clutch volume should be between 25 and 85

The OD clutch volume is updated when doing a 2-3 shift with throttle angle between 10° and 54°. The transmission temperature must be above 43° C (110°F). The clutch volume should be between 30 and 100.

The 4C clutch volume is updated when doing a 3-4 shift with throttle angle between 10° and 54°. The transmission temperature must be above 43° C (110°F). The clutch volume should be between 30 and 85.

The UD clutch volume is updated when doing a 4-3 shift with throttle angle between 10° and 54°. The transmission temperature must be above 43° C (110°F). The clutch volume should be between 30 and 100.

3.3.8 EATX DTC EVENT DATA

EATX DTC EVENT DATA can be used as a diagnostic aid when experiencing Electronic Transmissions with intermittent problems. When a Diagnostic Trouble Code (DTC) is set, the vehicles Transmission inputs are stored in the controller memory and are retrievable with the DRBIII®. This information can be helpful when a DTC can not be duplicated.

The EATX DTC EVENT DATA is located in the DRBIII®, under the Transmission system menu, in the sub-screen Miscellaneous. It is a good practice to document the EATX DTC EVENT DATA before beginning any diagnostic or service procedure.

A thorough understanding of how the transmission works is beneficial in order to interpret the data correctly. These skills are necessary in order to avoid an incorrect diagnosis.

A MASTERTECH video and reference book was produced in January 2002 that explains many of the features of the EATX DTC EVENT DATA with several examples on how to interpret the information and suggested training material to help understand all the specifics.

EATX DTC EVENT DATA can only be erased by:

1. Disconnecting the battery.
2. Performing a DRBIII® QUICK LEARN procedure.
3. Reprogramming the EATX controller.

Erasing Transmission DTCs does **not** clear the EATX DTC EVENT DATA.

3.4 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading trouble codes, erasing trouble codes, and other DRBIII® functions.

3.5 DRBIII® ERROR MESSAGES

Under normal operation, the DRBIII® will display one of only two error messages:

– User-Requested WARM Boot

– User-Requested COLD Boot

If the DRBIII® should display any other error message, record the entire display and call the S.T.A.R. Center.

3.5.1 DRBIII® DOES NOT POWER UP (BLANK SCREEN)

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage. A minimum of 11 volts is required to adequately power the DRBIII®.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of faulty cable or vehicle wiring. For a blank screen, refer to the appropriate Body Diagnostic manual.

3.5.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.

3.5.3 SOME DISPLAY ITEMS READ ″---″

This is caused by the scrolling the DRBIII® display a single line up or down. The line which was scrolled onto the screen might read ″---″. Use the page down or page up function to display the information.

3.6 TRANSMISSION SIMULATOR (MILLER TOOL # 8333) AND ELECTRONIC TRANSMISSION ADAPTER KIT (MILLER TOOL #8333-1A)

Note: Remove the starter Relay when using the transmission simulator
***Failure to remove the Starter Relay can cause a PCM - No Response condition.**
***The removal of the Starter Relay will also prevent the engine from starting in gear.**
***The Transmission Simulator will not accurately diagnose intermittent faults.**

The transmission simulator, simply put, is an electronic device that simulates the electronic functions of any EATX or NGC controlled transmission. The Simulators basic function is to aid the technician in determining if an internal transmission problem exists or if the problem resides in the vehicle wiring or control module. It is only useful for electrical problems. It will not aid in the diagnosis of a failed mechanical component, but it can tell you that the control module and wiring are working properly and that the problem is internal to the transmission.

The ignition switch should be in the lock position before attempting to install the simulator. Follow all instructions included with the simulator. If the feedback from the simulator is in doubt, you can verify it's operation by installing it on a known good vehicle. A ″known good vehicle″ would be defined as a vehicle that does not set any DTC's and drives and shifts as expected.

One important point to remember is that the Simulator receives it's power from the Trans Relay Output circuit. If the transmission system is in Limp-in (Relay open), the simulator will not operate. This is not really an indication of a problem, but an additional symptom. If the simulator does not power up (″P″ led lit), this is an indication that the problem is still present with the simulator hooked up. This indicates that the problem is in the wiring or control module and not the transmission.

Miller Tool # 8333-1A consists of the adapter cables and overlay necessary to adapt the simulator to TE/AE/LE/RLE transmissions.

4.0 DISCLAIMERS, SAFETY, AND WARNINGS

4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. If is especially important to block the wheels on front-wheel drive vehicles: the parking brake does not hold the drive wheels.

Some operations in this manual require that hydraulic tubes, hoses, and fittings, disconnected for inspection or testing purposes. These systems, when fully charged, contain fluid at high preessure.

Before disconnecting any hydraulic tubes, hoses, and fittings, be sure that the system is fully depressurized.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing a Transmission system problem, it is important to follow approved procedures where applicable. These procedures can be found in the service information. Following these procedures is very important to the safety of individuals performing diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic DTC's or error messages may occur. It is extremely important that accurate shift lever position data is available to the TCM. The accuracy of any DTC found in memory is doubtful unless the Shift Lever Test, performed on the DRBIII® Scan Tool, passes without failure.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the Transmission system are intended to be serviced in assembly only. Attempting to remove or repair certain system subcomponents may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service information should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS OR POSSIBLY FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATION LIMITS.

- Follow the vehicle manufacturer's service specifications at all times.
- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.
- Do not exceed the limits shown in the table.

FUNCTION	INPUT LIMIT
Volts	0-500 volts peak AC 0-500 volts DC
Ohms (resistance)*	0-1.12 megohms
Frequency measured Frequency generated	0-10 khz
Temperature	-58-1100°F -50-600C
*Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.	

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measured voltage above 25v DC or 25v AC.
- The circuit being tested must be protected by a 10A fuse or circuit breaker.

- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

4.3 WARNINGS

4.3.1 VEHICLE DAMAGE WARNINGS

Before disconnecting any control module, make sure the ignition is "lock" position. Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation: this will damage the wire and eventually cause the wire to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second DTC could be set, making diagnosis of the original problem more difficult.

When replacing a blown fuse, it is important to use only a fuse having the correct amperage rating. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to blow, it indicates a problem in the circuit that must be corrected.

4.3.2 ROAD TESTING A COMPLAINT VEHICLE

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic DTC or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read DRBIII® screen while in motion. Do not hang the DRBIII® from the rear view mirror or operate it yourself. Have an assistant available to operate the DRBIII®.

Road testing is an essential step in the diagnostic process that must not be overlooked. Along with the diagnostic information obtained from the DRBIII® Scan Tool and the original customer concern, the road test helps verify the problem was current and any repairs performed, fixed the vehicle correctly. Always operate and observe the vehicle under actual driving conditions.

Just as important as the road test is, there are preliminary inspections that should be performed prior to the road test. Always check the fluid level and condition before taking the vehicle on a road test. Determine if the incorrect fluid is being used, improper fluid will result in erratic transmission operation.

Some of the conditions of incorrect fluid level are as follows:

- Delayed engagement
- Poor shifting or erratic shifting
- Excessive noise
- Overheating

The next step is to verify that the shift linkage is correctly adjusted. If the shift linkage is incorrectly adjusted, a number of complaints can result.

The TCM monitors the Shift Lever Position (SLP) Sensor continuously. If the linkage is incorrectly adjusted, the TCM will sense a shift lever position that is not correct for the gear chosen by the driver. This may cause a DTC to be set.

The following complaints may also be the result of an incorrectly adjusted or worn linkage:

- Delayed clutch engagement
- Erratic shifts
- Vehicle will drive in neutral
- Engine will not crank in park or neutral
- Gear shift linkage will be able to be shifted without the key in the ignition
- Not able to remove the ignition key in park
- Parking pawl will not engage properly

The shift linkage should also be adjusted when replacing the Transmission, repairing the valve body, or when repairing any component between the shift lever and the Transmission.

Some questions to ask yourself when performing the road test are as follows:

- Is the complaint or concern what you think the problem is, based on the drivers description of the problem?
- Is the Transmission operating normally, or is there a real problem?
- When does the problem occur?
- Is the problem only in one gear range?
- What temperature does the problem occur?
- Does the vehicle have to sit over night for the problem to occur?
- Does the transmission go into Limp-in mode?

4.3.3 ELECTRONIC PINION FACTOR WARNINGS (IF APPLICABLE)

The pinion factor must be set when replacing the TCM. Note: The pinion factor is a fixed number and cannot be changed or updated in some vehicle applications. If the pinion factor is not set or incorrectly set, any speed related functions will not operate correctly i.e. speedometer, speed control, rolling door locks, other control modules will be affected that depend on speed information.

4.4 BULLETINS AND RECALLS

Always perform all Safety Recalls and Technical Service Bulletins that are applicable to the problem.

5.0 REQUIRED TOOLS AND EQUIPMENT

> DRBIII® (diagnostic read-out box) - DRBIII® must use the latest release level.
> Transmission Simulator (Miller # 8333)
> Electronic Transmission Adapter Kit (Miller # 8333-1A)
> Line Pressure Adapter (Miller #8259)
> Jumper wires
> Test Light (minimum of 25 ohms of resistance)
> Ohmmeter
> Voltmeter
> Pressure gauge 0-2068 kPa (0-300 PSI)

6.0 GLOSSARY OF TERMS

6.1 ACRONYMS

APPS	Accelerator Pedal Position Sensor
BCM	Body Control Module
CKT	Circuit
CVI	Clutch Volume Index
DLC	Data Link Connector
DRBIII®	Diagnostic Readout Box
DTC	Diagnostic Trouble Code
EATX	Electronic Automatic Transmission
EMCC	Electronically Modulated Converter Clutch
FCM	Front Control Module (part of the IPM system)
FEMCC	Full Electronically Modulated Converter Clutch
IOD	Ignition off-draw
IRT	Intelligent Recovery Timer
ISS	Input Speed Sensor
LED	Light Emitting Diode
LPS	Line Pressure Sensor
LR	Low/reverse Clutch
MIC	Mechanical Instrument Cluster
MIL	Malfunction Indicator Lamp
MS	Multi Select
OBDII	On Board Diagnostics
OD	Overdrive Clutch
OSS	Output Speed Sensor
PCI	Programmable Controller Interface (Vehicle bus system)
PCM	Powertrain Control Module
PCS	Pressure Control Solenoid
PEMCC	Partial Electronically Modulated Converter Clutch
REV	Reverse Clutch
SSV	Solenoid Switch Valve
SW	Switch
TCC	Torque Converter Clutch
TCM	Transmission Control Module
TCCM	Transfer Case Control Module
TP	Throttle Position
TRD	Torque Reduction

TRS	Transmission Range Sensor
TTS	Transmission Temperature Sensor
UD	Underdrive Clutch
2C	2nd Clutch
4C	4th Clutch
2/4	2nd and 4th gear Clutch or Pressure Switch

6.2 DEFINITIONS

OBDII/EURO III Trip - A vehicle start and drive cycle such that all once per trip diagnostic monitors have run.

Key Start - A vehicle start and run cycle of at least 20 seconds.

Warm-up Cycle - A vehicle start and run cycle such that the engine coolant must rise to at least 71 C (160° F) and must rise by at least 22 C (40° F) from initial start up. To count as a warm-up cycle, no DTC's may occur during the cycle.

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom:
*NO RESPONSE FROM ECM (PCI BUS) - DIESEL ONLY

POSSIBLE CAUSES
ECM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, enter Body then Body Computer. With the DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, enter Passive Restraints then Airbag. Were you able to establish communications with any of the modules? Yes → Go To 2 No → Refer to symptom PCI Bus Communication Failure in the Communications category. Perform ROAD TEST VERIFICATION - VER-2.	All
2	With the DRB read ECM Diagnostic Trouble Codes. This is to ensure power and grounds to the ECM are operational. **NOTE: If the DRB will not read ECM DTCs, follow the NO RESPONSE TO ECM (SCI only) symptom path.** Turn the ignition off. Disconnect the ECM harness connectors. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to ground. Connect the Red lead to the PCI Bus circuit in the ECM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the PCI Bus circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
*NO RESPONSE FROM PCM (PCI BUS)

POSSIBLE CAUSES
PCM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, enter Body then Body Computer. With the DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, enter Passive Restraints then Airbag. Were you able to establish communications with any of the modules? Yes → Go To 2 No → Refer to symptom PCI Bus Communication Failure in the Communications category. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (PCI BUS) — Continued

TEST	ACTION	APPLICABILITY
2	With the DRB read PCM Diagnostic Trouble Codes. This is to ensure power and grounds to the PCM are operational. **NOTE: If the DRB will not read PCM DTC's, follow the NO RESPONSE TO PCM (SCI only) symptom path.** **NOTE: If the vehicle will not start and the DRBIII® displays a no response message, refer to the appropriate symptom in the powertrain diagnostic procedures.** Turn the ignition off. Disconnect the PCM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. Install DRBIII® SuperCard 2 CH8361 into DRBIII®. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the PCM ground. Connect the Red lead to the PCI Bus circuit in the PCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the PCI Bus circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*NO RESPONSE FROM TRANSMISSION CONTROL MODULE

POSSIBLE CAUSES
NO RESPONSE FROM TRANSMISSION CONTROL MODULE
FUSED IGNITION SWITCH OUTPUT (RUN/ST) CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT SHORT
FUSED B(+) CIRCUIT OPEN
GROUND CIRCUIT(S) OPEN
OPEN PCI BUS CIRCUIT
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **Note: As soon as one or more module communicates with the DRB, answer the question.** With the DRB, attempt to communicate with the Airbag Control Module (ACM). With the DRB, attempt to communicate with the Instrument Cluster. Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Body Communication category and perform the symptom PCI Bus Communication Failure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
2	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output (Run/St) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Fused Ignition Switch Output (Run/St) circuit for an open. Refer to the wiring diagrams location in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM TRANSMISSION CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the starter relay from the PDC. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output (Start) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Observe the test light while momentarily turning the ignition switch to the Start position. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused Ignition Switch Output (Start) circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. With a voltmeter in the millivolt scale, measure the voltage of the Fused Ignition Switch Output (Start) circuit. **NOTE: A no response condition can exist if voltage is present on this circuit with the ignition switch in any position except for the Start position.** **NOTE: Voltage up to .080 millivolts can cause this condition.** **NOTE: Check for after market components that could cause this condition.** Perform this step with the Ignition Switch in every position except for the Start position. Is any voltage present? Yes → Repair the Fused Ignition Switch Output (Start) circuit for a short to voltage. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5 **Note: Reinstall the original Starter Relay.**	All
5	Turn the ignition off. Disconnect the TCM harness connector. Using a 12-volt test light connected to ground, check the Fused B(+) circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B(+) circuit for an open. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM TRANSMISSION CONTROL MODULE — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Using a 12-volt test light connected to 12-volts, check each ground circuit in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly at all the ground circuits? Yes → Go To 7 No → Repair the Ground circuit(s) for an open. Check the main ground connection to engine block and/or chassis. Refer to the wiring diagrams located in the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	**Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.** Disconnect the TCM harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the TCM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Go To 8 No → Repair the PCI Bus circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module in accordance with the service information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0836-4WD MUX SWITCH STUCK

When Monitored and Set Condition:

P0836-4WD MUX SWITCH STUCK

When Monitored: When Transfer Case in 4WD Low.

Set Condition: Four wheel drive (4WD) muxed switch input detected below minimum or above maximum acceptable voltage.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO GROUND
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO SENSOR RETURN CIRCUIT
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transfer Case Position Sensor Input circuit. Is the resistance above 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for an open. No → Go To 3	All

P0836-4WD MUX SWITCH STUCK — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transfer Case Position Sensor Input circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for a short to ground. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Turn the ignition on. Measure the voltage of the Transfer Case Position Sensor Input circuit. Is there any voltage present? Yes → Repair the Transfer Case Position Sensor input circuit for a short to voltage. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance above 1000.0 ohms? Yes → Go To 6 No → Repair the Transfer Case Position Sensor Input circuit for a short to the Sensor Return circuit.	All

P0836-4WD MUX SWITCH STUCK — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 7 No → Replace the Transfer Case Position Sensor.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
8	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Symptom:
P0837-4WD MUX SWITCH PERFORMANCE

When Monitored and Set Condition:

P0837-4WD MUX SWITCH PERFORMANCE

When Monitored: Continuously with the ignition on.

Set Condition: The 4WD muxed switch input detected in an invalid range or irrational switch state.

POSSIBLE CAUSES
RELATED DTCS PRESENT
TRANSFER CASE SHIFTER OUT OF ADJUSTMENT
TRANSFER CASE POSITION SENSOR OUT OF TOLERANCE
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read DTCs. Are any other Transfer Case DTCs present? Yes → Repair all other Transfer Case DTCs before proceeding. No → Go To 2	All
2	Verify proper Transfer Case Shifter adjustment per the Service Information. Is the Transfer Case Shifter adjusted correctly? Yes → Go To 3 No → Adjust the Transfer Case shifter linkage per the Service Information.	All
3	Turn the ignition off to the lock position. Disconnect the PCM harness connector(s). **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Measure the resistance across the Transfer Case Position Sensor signal circuit and Sensor Ground circuit at the PCM harness connector. Place the transfer case in each of the following positions: 2H - resistance should be between 1124 and 1243 ohms. 4H - resistance should be between 650 and 719 ohms. N - resistance should be between 389 and 431 ohms. 4L - resistance should be between 199 and 221 ohms. Were all resistance values in each transfer case position within the specified range? Yes → Go To 4 No → Replace the Transfer Case Position Sensor.	All

P0837-4WD MUX SWITCH PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All

Symptom:
P0838-4WD MODE SENSOR LOW

When Monitored and Set Condition:

P0838-4WD MODE SENSOR LOW

When Monitored: Continuously with the ignition key on.

Set Condition: When the 4WD Mode Sensor input circuit voltage falls below 0.3 volts for 5.72 seconds.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO GROUND
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO SENSOR RETURN CIRCUIT
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transfer Case Position Sensor Input circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for a short to ground. No → Go To 3	All

P0838-4WD MODE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance above 1000.0 ohms? Yes → Go To 4 No → Repair the Transfer Case Position Sensor Input circuit for a short to the Sensor Return circuit.	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 5 No → Replace the Transfer Case Position Sensor.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
6	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Symptom:
P0839-4WD MODE SENSOR HIGH

When Monitored and Set Condition:

P0839-4WD MODE SENSOR HIGH

When Monitored: Continuously with the ignition key on.

Set Condition: When the 4WD Mode Sensor input circuit voltage raises above 4.78 volts for 5.72 seconds.

POSSIBLE CAUSES
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT OPEN
TRANSFER CASE POSITION SENSOR INPUT CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE POSITION SENSOR
POWERTRAIN CONTROL MODULE
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Start the engine and cycle the Transfer Case through all positions. With the DRBIII®, read Transfer Case DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transfer Case Position Sensor Input circuit. Is the resistance above 5.0 ohms? Yes → Repair the Transfer Case Position Sensor input circuit for an open. No → Go To 3	All

P0839-4WD MODE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** Disconnect the Transfer Case Position Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Turn the ignition on. Measure the voltage of the Transfer Case Position Sensor Input circuit. Is there any voltage present? Yes → Repair the Transfer Case Position Sensor input circuit for a short to voltage. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the Powertrain Control Module harness connector. **CAUTION: IF EQUIPPED WITH NGC CONTROLLER, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between the Transfer Case Position Sensor Input circuit and the Sensor Return circuit in the PCM harness connector. Is the resistance between 55 ohms and 1.3k ohms? Yes → Go To 5 No → Replace the Transfer Case Position Sensor.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform the appropriate Powertrain verification test.	All
6	The conditions to set this DTC are not present at this time. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins that may apply.** Were there any problems found? Yes → Repair as necessary. No → Test Complete.	All

Symptom:
P0122-THROTTLE POSITION SENSOR/APPS LOW

When Monitored and Set Condition:

P0122-THROTTLE POSITION SENSOR/APPS LOW

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
TPS SIGNAL CIRCUIT HIGH RESISTANCE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are there any Engine TPS related DTCs present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0122-THROTTLE POSITION SENSOR/APPS LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII® in Transmission Sensors, read the TPS voltage. Is the TPS voltage below 0.5 volts? Yes → Go To 4 No → Go To 6	All
4	Ignition on, engine not running. With the DRBIII® in Transmission Sensors, record the TPS voltage. While back probing the TCM harness connector, measure the voltage of the TPS Signal circuit. Compare the voltage readings between the DRBIII® and the reading from the digital multi meter. Are the voltages within 0.1 volt of each other? Yes → Repair the TPS signal circuit between the TCM harness connector and the splice for high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the point where the TPS signal and sensor ground circuits splice off from the engine circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:

P0123-THROTTLE POSITION SENSOR/APPS HIGH

When Monitored and Set Condition:

P0123-THROTTLE POSITION SENSOR/APPS HIGH

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
SENSOR GROUND CIRCUIT OPEN TO TCM
TPS SIGNAL CIRCUIT OPEN TO TCM
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are there any Engine TPS related DTCs present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0123-THROTTLE POSITION SENSOR/APPS HIGH — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII® in Transmission Sensors, read the TPS voltage. Is the TPS voltage above 4.5 volts? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Disconnect the TPS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TPS Signal Circuit from the TCM harness connector to the TPS harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the TPS Signal circuit between the TCM harness connector and the splice for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TPS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Sensor Ground circuit between the TPS harness connector and the Transmission Control Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Sensor Ground circuit between the TCM harness connector and the splice for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the point where the TPS signal and sensor ground circuits splice off from the engine circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0124- THROTTLE POSITION SENSOR/APPS INTERMITTENT

When Monitored and Set Condition:

P0124- THROTTLE POSITION SENSOR/APPS INTERMITTENT

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set with a throttle angle between 6° and 120.6° with a 5° or higher change under 7.0 milliseconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
THROTTLE POSITION SENSOR
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are any Engine TPS related DTC's present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0124- THROTTLE POSITION SENSOR/APPS INTERMITTENT — Continued

TEST	ACTION	APPLICABILITY
3	Ignition On, Engine Not Running. With the DRBIII®, under Transmission Sensors, monitor the TPS voltage in the following step. Slowly open and close the throttle while checking for erratic voltage changes. Did the TPS voltage change smooth and consistent? Yes → Go To 4 No → Replace the Throttle Position Sensor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0218-HIGH TEMPERATURE OPERATION ACTIVATED

When Monitored and Set Condition:

P0218-HIGH TEMPERATURE OPERATION ACTIVATED

When Monitored: Whenever the engine is running.

Set Condition: Immediately when the Overheat shift schedule is activated 116 C (240 F) Transmission oil temp.

POSSIBLE CAUSES
ENGINE COOLING SYSTEM MALFUNCTION
TRANSMISSION OIL COOLER PLUGGED
HIGH TEMPERATURE OPERATIONS ACTIVATED

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0218-HIGH TEMPERATURE OPERATION ACTIVATED — Continued

TEST	ACTION	APPLICABILITY
2	This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints. This DTC indicates that the Transmission has been operating in the ″Overheat″ shift schedule which may generate a customer complaint. The customer driving patterns may indicate the need for an additional Transmission Oil Cooler. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair the cause of the Transmission Overheating per the Service Information. If indicated install an additional Transmission Oil Cooler. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Perform Engine Cooling System diagnostics per the Service Information Is the Engine Cooling System functioning properly? Yes → Go To 4 No → Repair the cause of the Engine Overheating. Refer to the Service Information for additional repair information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	If there are no possible causes remaining, view repair. Repair Flush or replace the Transmission Oil cooler as necessary per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0562-LOW BATTERY VOLTAGE

When Monitored and Set Condition:

P0562-LOW BATTERY VOLTAGE

When Monitored: With the engine running and the TCM has closed the Transmission Control Relay.

Set Condition: If battery voltage at TCM Transmission Control Relay Output Sense circuit is less than 10.0 volts for 15 seconds. *This DTC generally indicates a gradually falling battery voltage or resistive connections to the TCM.

POSSIBLE CAUSES
RELATED CHARGING SYSTEM DTCS
FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
TRANS CONTROL RELAY OUTPUT TO TCM OPEN OR HIGH RESISTANCE
TRANSMISSION CONTROL RELAY OPEN OR HIGH RESISTANCE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0562-LOW BATTERY VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read the PCM DTC's. Are there any Charging System related DTC's stored in the PCM? Yes → Refer to the Charging System category and repair any PCM Charging System DTC's first. NOTE: After repairing the PCM charging system DTC's, perform the Transmission Verification test to verify the transmission was not damaged. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	**NOTE: Generator, battery, and charging system must be fully functional before performing this test.** With the DRBIII®, read Transmission DTC's. With the DRBIII®, Check the STARTS SINCE SET counter for P0562. **Note: This counter only applies to the last DTC set.** Is the Starts Since Set counter for P0562 set at 0? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Using a 12-volt test light connected to 12-volts, check the ground circuits in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly for all the ground circuits? Yes → Go To 5 No → Repair the Ground circuit(s) for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused B+ circuit in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B+ circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0562-LOW BATTERY VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check both Transmission Control Relay Output circuits in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 7 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	Turn the ignition off to the lock position. Install a substitute Relay in place of the Transmission Control Relay. Start the engine. Using a voltmeter, measure the battery voltage. With the DRBIII®, monitor the Transmission Switched Battery Voltage. Compare the DRBIII® Transmission Switched Battery voltage to the actual battery voltage. Is the DRBIII® voltage within 2.0 volts of the battery voltage? Yes → Replace the Transmission Control Relay. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
9	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0604-INTERNAL TCM

When Monitored and Set Condition:

P0604-INTERNAL TCM

When Monitored:

Set Condition: The TCM is reporting internal errors and must be replaced.

POSSIBLE CAUSES
TCM - INTERNAL ERROR

TEST	ACTION	APPLICABILITY
1	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0605-INTERNAL TCM

When Monitored and Set Condition:

P0605-INTERNAL TCM

When Monitored:

Set Condition: The TCM is reporting internal errors and must be replaced.

POSSIBLE CAUSES
TCM - INTERNAL ERROR

TEST	ACTION	APPLICABILITY
1	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0613-INTERNAL TCM

When Monitored and Set Condition:

P0613-INTERNAL TCM

When Monitored:

Set Condition: The TCM is reporting internal errors and must be replaced.

POSSIBLE CAUSES
TCM - INTERNAL ERROR

TEST	ACTION	APPLICABILITY
1	**NOTE: Make sure this DTC is set in the TCM before making repair.** Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0706-CHECK SHIFTER SIGNAL

When Monitored and Set Condition:

P0706-CHECK SHIFTER SIGNAL

When Monitored: Continuously with the ignition key on.

Set Condition: 3 occurrences in one key start of an invalid PRNDL code which lasts for more than 0.1 second.

POSSIBLE CAUSES
CONDITION P0706 PRESENT
TRS T1 SENSE CIRCUIT OPEN
TRS T3 SENSE CIRCUIT OPEN
TRS T41 SENSE CIRCUIT OPEN
TRS T42 SENSE CIRCUIT OPEN
TRS T1 SENSE CIRCUIT SHORT TO GROUND
TRS T3 SENSE CIRCUIT SHORT TO GROUND
TRS T41 SENSE CIRCUIT SHORT TO GROUND
TRS T42 SENSE CIRCUIT SHORT TO GROUND
TRS T1 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T3 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T41 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T42 SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION RANGE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	Using the DRBIII®, perform the Shift Lever Position Test. Select the test outcome from the following: Test passes Go To 3 Test fails with DTC Go To 4 Test fails without DTC Adjust the shift linkage per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
3	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the DRBIII®, perform the Shift Lever Position Test. When the DRBIII ® instructs you to put the Gear Selector in a particular position, you must do so using the Transmission Simulator. The LED for the gear position in question must be illuminated prior to hitting ″enter″ on the DRBIII®. Did the test pass? Yes → Go To 5 No → Go To 6 **NOTE: Disconnect the Transmission Simulator and reconnect all the harness connectors.**	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Range Sensor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the TRS Sense circuits C1 thru C4. Move the shift lever thru all gear positions, pausing momentarily in each gear position. Watch for one of the circuits to not change state. Pick the one that did not change state. TRS T1 sense (C4) Go To 7 TRS T3 sense (C3) Go To 10 TRS T41 sense (C1) Go To 13 TRS T42 sense (C2) Go To 16	All
7	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T1 Sense circuit from the TCM harness connector to the TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T1 Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T1 circuit in the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TRS T1 Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the TRS T1 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T1 Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 19	All
10	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T3 Sense circuit from the TCM harness connector to the TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T3 Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All
11	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T3 Sense circuit in the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TRS T3 Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PCM. Ignition on, engine not running. Measure the voltage of the TRS T3 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T3 Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 19	All
13	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T41 Sense circuit from the TCM connector to the TRS connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T41 Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T41 Sense circuit in the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TRS T41 Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All
15	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the TRS T41 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T41 Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 19	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T42 Sense circuit from the TCM harness connector to the TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T42 Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
17	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T42 Sense circuit in the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TRS T42 Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 18	All
18	Turn the ignition off to the lock position. Disconnect the TRS harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the TRS T42 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T42 Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 19	All
19	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE

When Monitored and Set Condition:

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set when the desired transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate times are starting temperature to warm up time: (-40° F / -40° C - 35 min) (-20° F / -28° C - 25 min) (20° F / -6.6° C - 20 min) (60° F / 15.5 ° C - 10 min)

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check Transmission DTC's. Are there any other Transmission Temperature Sensor related DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0711. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0712-TRANSMISSION TEMPERATURE SENSOR LOW

When Monitored and Set Condition:

P0712-TRANSMISSION TEMPERATURE SENSOR LOW

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 0.45 seconds.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Transmission DTC's. Are there any Speed Sensor DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0712-TRANSMISSION TEMPERATURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0712. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 8	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector.. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transmission Temperature Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transmission Temperature Sensor Signal circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0712-TRANSMISSION TEMPERATURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0713-TRANSMISSION TEMPERATURE SENSOR HIGH

When Monitored and Set Condition:

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 0.45 seconds.

POSSIBLE CAUSES
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0713. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 3 No → Go To 8	All

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector.. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transmission Temperature Sensor Signal circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Transmission Temperature Sensor Signal circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Transmission Temperature Sensor Signal circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Transmission Temperature Sensor Signal circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT

When Monitored and Set Condition:

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a predetermined period of time.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Transmission DTC's. Are there any Speed Sensor and/or other Temperature Sensor DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0714. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match a non-fluctuating DRBIII® reading ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0715-INPUT SPEED SENSOR ERROR

When Monitored and Set Condition:

P0715-INPUT SPEED SENSOR ERROR

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If there is an excessive change in input RPM in any gear.

POSSIBLE CAUSES
INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR ERROR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine in park. With the DRBIII®, read the Input RPM. Is the Input RPM reading below 400 RPM? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1250″ position. With the DRBIII®, monitor the Input and Output RPM. Does the Input RPM read 3000 RPM and the Output RPM read 1250 RPM +/- 50 RPM? Yes → Go To 4 No → Go To 5 **NOTE: Disconnect the Transmission Simulator and reconnect all harness connectors.**	All
4	If there are no possible causes remaining, view repair. Repair Replace the Input Speed Sensor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Input Speed Sensor Signal circuit from the TCM harness connector to the Input Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Input Speed Sensor Signal circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Input Speed Sensor signal circuit. Is the resistance Below 5.0 ohms? Yes → Repair the Input Speed Sensor Signal circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the Input Speed Sensor harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Input Speed Sensor Signal circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Input Speed Sensor Signal circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Input Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the TRS harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0720-OUTPUT SPEED SENSOR ERROR

When Monitored and Set Condition:

P0720-OUTPUT SPEED SENSOR ERROR

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If there is an excessive change in output RPM in any gear.

POSSIBLE CAUSES
INTERMITTENT WIRING AND CONNECTORS
OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR ERROR
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine in park. Raise the drive wheels off of the ground. **WARNING: PROPERLY SUPPORT THE VEHICLE.** Place transmission in drive, release foot from brake. **WARNING: BE SURE TO KEEP HANDS AND FEET CLEAR OF ROTATING WHEELS.** **Note: The drive wheels must be turning at this point.** With the DRBIII®, read the Output RPM Is the Output RPM below 100 RPM? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1250″ position. With the DRBIII®, read the Input RPM and Output RPM. Does the Input RPM read 3000 and the Output RPM read 1250 ± 50 RPM? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Output Speed Sensor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Output Speed Sensor Signal circuit from the TCM harness connector to the Output Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Output Speed Sensor Signal circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Output Speed Sensor Signal circuit. Is the resistance Below 5.0 ohms? Yes → Repair the Output Speed Sensor Signal circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Simulator. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B(+) and Transmission Control Relay Output circuits in the Transmission Control Relay connector (In PDC). Ignition on, engine not running. Measure the voltage of the Output Speed Sensor Signal circuit in the TCM connector. Is the voltage above 3.0 volts? Yes → Repair Output Speed Sensor Signal circuit short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Output Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the TRS harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B(+) and Transmission Control Relay Output circuits in the Transmission Control Relay connector (In PDC). Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit in the TCM connector. Is the voltage above 3.0 volts? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:

P0725-ENGINE SPEED SENSOR CIRCUIT

When Monitored and Set Condition:

P0725-ENGINE SPEED SENSOR CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: Engine RPM less than 390 or greater than 8000 for more than 2 seconds while the engine is running.

POSSIBLE CAUSES
INTERMITTENT WIRING & CONNECTORS CONDITIONS
EATX RPM SIGNAL CIRCUIT OPEN
EATX RPM SIGNAL CIRCUIT SHORTED TO GROUND
EATX RPM SIGNAL CIRCUIT SHORTED TO VOLTAGE
TRANSMISSION CONTROL MODULE
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0725-ENGINE SPEED SENSOR CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: This code is not a Transmission Input Speed Sensor DTC** With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set at 0? Yes → Go To 3 No → Go To 8	All
3	Turn ignition off to the lock position. Disconnect the Powertrain Control Module (PCM) harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the EATX RPM signal circuit between the TCM connector and the PCM connector. Is the resistance above 5.0 ohms? Yes → Repair the open EATX RPM Signal circuit. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn ignition off to the lock position. Disconnect the Powertrain Control Module (PCM) harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the EATX RPM Signal circuit and ground. Is the resistance below 5.0 ohms? Yes → Repair the EATX RPM Signal circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn ignition off to the lock position. Disconnect the PCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the EATX RPM Signal circuit in the PCM connector. Is the voltage above 10.0 volts? Yes → Repair the EATX RPM Signal circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the PCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the EATX RPM Signal circuit. Is the voltage between 4.5 and 5.5 volts? Yes → Replace and program the Powertrain Control Module per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0725-ENGINE SPEED SENSOR CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check the power and ground circuits of the Transmission Control Module. Check the vehicles battery condition. Were any problems found? Yes → Repair wiring and/or connectors as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0731-GEAR RATIO ERROR IN 1ST

When Monitored and Set Condition:

P0731-GEAR RATIO ERROR IN 1ST

When Monitored: The Transmission Gear Ratio is monitored continuously while the Transmission is in gear.

Set Condition: If the ratio of the input RPM to the output RPM does not match the current Gear Ratio.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, read Transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, or P1794 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0731-GEAR RATIO ERROR IN 1ST — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, perform the 1st Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the Clutch Test pass, Input Speed remain at 0? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not present at this time. Check the gearshift linkage adjustment. Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the clutch test and still sets gear ratio DTC('s), check the Speed Sensors for proper operation. **NOTE: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Check all components related to the Underdrive and L/R clutches. Inspect the Oil Pump per the Service Information and repair or replace as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0732-GEAR RATIO ERROR IN 2ND

When Monitored and Set Condition:

P0732-GEAR RATIO ERROR IN 2ND

When Monitored: The Transmission Gear Ratio is monitored continuously while the Transmission is in Gear.

Set Condition: If the ratio of the input RPM to the output RPM does not match the current Gear Ratio.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
RELATED PRESSURE SWITCH DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION - INTERNAL

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0732-GEAR RATIO ERROR IN 2ND — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, or P1794 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 2nd Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the Throttle Angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the Clutch Test pass, Input Speed remain at 0? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not present at this time. Check the gearshift linkage adjustment. Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the clutch test and still sets Gear Ratio DTC(s), check the Speed Sensors for proper operation. **NOTE: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, read Transmission DTC's. Is the DTC P0845 and/or P0846 present also? Yes → Replace the Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0732-GEAR RATIO ERROR IN 2ND — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem. Check all of the components related to the Underdrive and 2/4 clutches. Inspect the Oil Pump per the Service Information and repair or replace as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:

P0733-GEAR RATIO ERROR IN 3RD

When Monitored and Set Condition:

P0733-GEAR RATIO ERROR IN 3RD

When Monitored: The Transmission Gear Ratio is monitored continuously while the Transmission is in Gear.

Set Condition: If the ratio of the input RPM to the output RPM does not match the current Gear Ratio.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0733-GEAR RATIO ERROR IN 3RD — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, or P1794 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 3rd gear clutch test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the Clutch Test pass, Input Speed remain at 0? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not present at this time. Check the gearshift linkage adjustment. Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the clutch test and still sets Rear Ratio DTC(s), check the Speed Sensors for proper operation. **NOTE: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, read Transmission DTC's. Is the DTC P0870 and/or P0871 present also? Yes → Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0733-GEAR RATIO ERROR IN 3RD — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Check all of the components related to the Underdrive and Overdrive clutches. Inspect the Oil Pump per the Service Information and repair or replace as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0734-GEAR RATIO ERROR IN 4TH

When Monitored and Set Condition:

P0734-GEAR RATIO ERROR IN 4TH

When Monitored: The Transmission Gear Ratio is monitored continuously while the Transmission is in Gear.

Set Condition: If the ratio of the input RPM to the output RPM does not match the current Gear Ratio.

POSSIBLE CAUSES
RELATED DTC’S PRESENT
RELATED PRESSURE SWITCH DTC’S PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION - INTERNAL

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC’s. Check and repair all engine DTC’s prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC’s. Record all DTC’s and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC’s, check and record all CVI’s. Most DTC’s set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB’s related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0734-GEAR RATIO ERROR IN 4TH — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission Control Module DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, or P1794 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 4th gear clutch test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the Clutch Test pass, Input Speed remain at 0? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not present at this time. Check the gearshift linkage adjustment. Gear Ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the clutch test and still sets Gear Ratio DTC(s), check the Speed Sensors for proper operation. **NOTE: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, read Transmission DTC's. Is the DTC P0845 and/or P0846 present also? Yes → Replace the Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0734-GEAR RATIO ERROR IN 4TH — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem. Check all of the components related to the Overdrive and 2/4 clutches. Inspect the Oil Pump per the Service Information and repair or replace as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0736-GEAR RATIO ERROR IN REVERSE

When Monitored and Set Condition:

P0736-GEAR RATIO ERROR IN REVERSE

When Monitored: The Transmission Gear Ratio is monitored continuously while the Transmission is in Gear.

Set Condition: If the ratio of the input RPM to the output RPM does not match the current Gear Ratio.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION - INTERNAL

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, read Transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, P1794, or present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0736-GEAR RATIO ERROR IN REVERSE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, perform the Reverse gear clutch test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the Transmission.** Did the Clutch Test pass, Input Speed remain at 0? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not present at this time. Check the gearshift linkage adjustment. Gear Ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the clutch test and still sets Gear Ratio DTC(s), check the Speed Sensors for proper operation. **NOTE: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem. Check all of the components related to the Reverse and L/R clutches. Inspect the Oil Pump per the Service Information and repair or replace as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored and Set Condition:

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored: During Electronically Modulated Converter Clutch (EMCC) Operation.

Set Condition: A) Transmission must be in EMCC, with input speed > than 1750 RPM. TCC/L-R sol achieves the maximum duty cycle & can't pull engine RPM within 60 RPM of input speed. B) Transmissions is in FEMCC & engine slips TCC > than 100 RPM for 10 seconds.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	Ignition on, engine not running. With the DRBIII®, read Transmission DTC's Is the DTC P0750 and/or P0841 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. With the DRBIII®, record and erase Transmission DTCs. Drive the vehicle until it is fully warmed up to at least 43° C or 110° F. Perform the following steps 3 times. With the DRBIII®, monitor TPS degree. Drive the vehicle to the speed of 83 Km/h or 50 MPH and allow 4th gear to engage for at least 10 seconds. Close the throttle, then tip back in until the throttle angle, TPS degrees, is between 25 and 29 degrees. **NOTE: If you go over 30 TPS degrees, you must back off of the throttle and retry.** Did the TCC engage during any of the attempts? Yes → Go To 4 No → Go To 5	All
4	The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	If there are no possible causes remaining, view repair. Repair Perform the Hydraulic Pressure test in the Service Information. Repair the internal transmission components and torque convertor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0750-LR SOLENOID CIRCUIT

When Monitored and Set Condition:

P0750-LR SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. The solenoids will also be tested immediately after a Gear Ratio or Pressure Switch error is detected.

Set Condition: Three consecutive solenoid continuity test failures, or one failure if a test is run in response to a Gear Ratio or Pressure Switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R SOLENOID CONTROL CIRCUIT OPEN
L/R SOLENOID CONTROL CIRCUIT SHORT TO GROUND
L/R SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
L/R SOLENOID
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	Ignition on, engine not running. With the DRBIII®, read Transmission DTC's Are there any Transmission Control Relay DTC's present? Yes → Refer to symptom list and perform the appropriate symptom for Transmission Control Relay related DTC's. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0750. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0750 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the DRBIII®, actuate the L/R Solenoid. With the Transmission Simulator, monitor the L/R Solenoid LED. Did the L/R Solenoid LED on the Transmission Simulator blink on and off during actuation? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Measure the resistance of the L/R Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the L/R Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Measure the resistance between ground and the L/R Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the L/R Solenoid Control circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the L/R Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the L/R Solenoid Control circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0755-2/4 SOLENOID CIRCUIT

When Monitored and Set Condition:

P0755-2/4 SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. They will also be tested immediately after a Gear Ratio or Pressure Switch error is detected.

Set Condition: Three consecutive Solenoid continuity test failures, or one failure if test is run in response to a Gear Ratio or Pressure Switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2/4 SOLENOID CONTROL CIRCUIT OPEN
2/4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
2/4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
2/4 SOLENOID
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0755-2/4 SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission Control Module DTC's Are there any Transmission Control Relay DTC's present?. Yes → Refer to symptom list and perform the appropriate symptom for Transmission Control Relay related DTC's. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0755 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the DRBIII®, actuate the 2/4 Solenoid. With the Transmission Simulator, monitor the 2/4 Solenoid LED. Did the 2/4 Solenoid LED on the Transmission Simulator blink on and off during actuation? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 2/4 Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 2/4 Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0755-2/4 SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 2/4 Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the 2/4 Solenoid Control circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the 2/4 Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the 2/4 Solenoid Control circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0755-2/4 SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0760-OD SOLENOID CIRCUIT

When Monitored and Set Condition:

P0760-OD SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. They will also be tested immediately after a Gear Ratio or Pressure Switch error is detected.

Set Condition: Three consecutive solenoid continuity test failures, or one failure if test is run in response to a Gear Ratio or Pressure Switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
INTERMITTENT WIRING AND CONNECTORS
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
OD SOLENOID CONTROL CIRCUIT OPEN
OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
OD SOLENOID
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission Control Module DTC's Are there any Transmission Control Relay DTC's present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0760. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0760 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the Transmission Simulator, monitor the OD Solenoid LED. With the DRBIII®, actuate the OD Solenoid. Did the OD Solenoid LED on the Transmission Simulator blink on and off during actuation? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the OD Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the OD Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the OD Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the OD Solenoid Control circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the OD Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the OD Solenoid Control circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0765-UD SOLENOID CIRCUIT

When Monitored and Set Condition:

P0765-UD SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. They will also be tested immediately after a Gear Ratio or Pressure Switch error is detected.

Set Condition: Three consecutive Solenoid continuity test failures, or one failure if test is run in response to a Gear Ratio or Pressure Switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
UD SOLENOID CONTROL CIRCUIT OPEN
UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
UD SOLENOID
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission Control Module DTC's Are there any Transmission Control Relay DTC's present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0765 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. With the DRBIII®, actuate the UD Solenoid. With the Transmission Simulator, monitor the UD Solenoid LED. Did the UD Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the UD Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the UD Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the UD Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the UD Solenoid Control circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. Connect a jumper wire between the Fused B+ circuits and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage of the UD Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the UD Solenoid Control circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0841-LR PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0841-LR PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate DTC is set if one of the Pressure Switches are open or closed at the wrong time in a given gear .

POSSIBLE CAUSES
LOSS OF PRIME DTC P0944 PRESENT
TRANSMISSION CONTROL RELAY DTCS PRESENT
TCM AND WIRING
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other Transmission DTC's. Is the DTC P0944 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, read Transmission DTC's Are there any Transmission Control Relay DTC's present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0841. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 11	All
5	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. On the Transmission Simulator select L/R on the Pressure Switch selector switch. With the DRBIII®, monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the Pressure Switch state change from OPEN to CLOSED when the test button was pressed? Yes → Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the L/R Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the L/R Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the L/R Pressure Switch circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the L/R Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the L/R Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/Pressure Switch Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0845-2/4 HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0845-2/4 HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed > 1000 RPM, the TCM momentarily turns on element pressure to the clutch ckts that don't have pressure to identify the correct pressure sw closes. If the pressure sw does not close 2 times the code sets.

POSSIBLE CAUSES
LOSS OF PRIME P0944 PRESENT
RELATED DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0845-2/4 HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other Transmission DTCs. Is the DTC P0944 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, read Transmission DTC's. Is the DTC P0732, P0734 and/or P0846 present also? Yes → Repair internal transmission as necessary. Refer to the Service Information for the proper repair procedure for components related to the OD clutch. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0845. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 12	All

P0845-2/4 HYDRAULIC PRESSURE TEST FAILURE — Continued

<table>
<tr><th>TEST</th><th>ACTION</th><th>APPLICABILITY</th></tr>
<tr><td>5</td><td>Turn the ignition off to the lock position.
CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.
Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1.
Note: Check connectors - Clean/repair as necessary.
Ignition on, engine not running.
With the Transmission Simulator, select ″2/4″ on the Pressure Switch rotary switch.
With the DRBIII®, monitor the 2/4 Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.
Wiggle the wiring leading to the TCM while pressing the button.
Did the 2-4 Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes → Go To 6

No → Go To 7</td><td>All</td></tr>
<tr><td>6</td><td>If there are no possible causes remaining, view repair.

Repair
Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If there are no problems found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.</td><td>All</td></tr>
<tr><td>7</td><td>Turn the ignition off to the lock position.
Disconnect the TCM harness connector.
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.
Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the 2/4 Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector.
Is the resistance above 5.0 ohms?

Yes → Repair the 2/4 Pressure Switch Sense circuit or an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No → Go To 8</td><td>All</td></tr>
<tr><td>8</td><td>Turn the ignition off to the lock position.
Disconnect the TCM harness connector.
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.
Note: Check connectors - Clean/repair as necessary.
Measure the resistance between ground and the 2/4 Pressure Switch Sense circuit.
Is the resistance below 5.0 ohms?

Yes → Repair the 2/4 Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No → Go To 9</td><td>All</td></tr>
</table>

P0845-2/4 HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2/4 Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the 2/4 Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 11 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate DTC is set if one of the Pressure Switches are open or closed at the wrong time in a given gear .

POSSIBLE CAUSES
TRANSMISSION RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
2/4 PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTC's Are there any Transmission Control Relay DTC's present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less for P0846? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, select 2/4 on the Pressure Switch selector switch. With the DRBIII®, monitor the 2/4 Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the Pressure Switch state change from OPEN to CLOSED when the test button was pressed? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 2/4 Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 2/4 Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 2/4 Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the 2/4 Pressure Switch Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2/4 Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the 2/4 Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0870-OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0870-OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed > 1000 RPM, the TCM momentarily turns on element pressure to the clutch ckts that don't have pressure to identify the correct pressure sw closes. If the pressure sw does not close 2 times the code sets

POSSIBLE CAUSES
LOSS OF PRIME DTC P0944 PRESENT
RELATED DTC'S PRESENT
INTERMITTENT WIRING AND CONNECTORS
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
OD PRESSURE SWITCH SENSE CIRCUIT OPEN
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other Transmission DTCs. Is the DTC P0944 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, read Transmission DTC's. Is the DTC P0733 and/or P0871 present also? Yes → Replace the Transmission or Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0870. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 12	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **NOTE: Check connectors - Clean/repair as necessary.** With the Transmission Simulator, select ″OD″ on the Pressure Switch rotary switch. With the DRBIII®, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Wiggle the wires leading to the TCM while pressing the test button. Did the O/D Pressure Switch state change to closed and remain closed while wiggling the wires? Yes → Go To 6 No → Go To 7	All
6	If there are no possible causes remaining, view repair. Repair Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the OD Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the O/D Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the OD Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the OD Pressure Switch Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the OD Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair OD Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 11 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0871-OD PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0871-OD PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate DTC is set if one of the Pressure Switches are open or closed at the wrong time in a given gear.

POSSIBLE CAUSES
TRANSMISSION CONTROL RELAY DTCS PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
O/D PRESSURE SWITCH SENSE CIRCUIT OPEN
O/D PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
O/D PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
O/D PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC’s. Check and repair all engine DTC’s prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC’s. Record all DTC’s and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC’s, check and record all CVI’s. Most DTC’s set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB’s related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTC's Are there any Transmission Control Relay DTC's present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less for P0871? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. On the Transmission Simulator, select OD on the Pressure Switch selector switch. With the DRBIII®, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the Pressure Switch state change from OPEN to CLOSED when the test button was pressed? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the O/D Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the O/D Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the O/D Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the O/D Pressure Switch circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the O/D Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the O/D Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0884-POWER UP AT SPEED

When Monitored and Set Condition:

P0884-POWER UP AT SPEED

When Monitored: When Transmission Control Module powers up.

Set Condition: This DTC will set if the TCM powers up and senses the vehicle in a valid forward gear (no PRNDL DTCs) with a output speed above 800 RPM (approximately 32Km/h or 20 MPH).

POSSIBLE CAUSES
POWER UP AT SPEED

TEST	ACTION	APPLICABILITY
1	This DTC is set when the TCM is initialized while the vehicle is moving down the road in a valid forward gear. Check all of the Fused B+, Fused Ignition Switch Output, and Ground circuits to the TCM for an intermittent open or short to ground. Were there any problems found? Yes → Repair wiring and/or connectors as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete	All

Symptom:
P0888-RELAY OUTPUT ALWAYS OFF

When Monitored and Set Condition:

P0888-RELAY OUTPUT ALWAYS OFF

When Monitored: Continuously

Set Condition: This code is set when less than 3 volts are present at the transmission control relay output circuits at the Transmission Control Module when the TCM is energizing the relay.

POSSIBLE CAUSES
FUSED B+ CIRCUIT OPEN
TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0888. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set at 0? Yes → Go To 3 No → Go To 5	All

P0888-RELAY OUTPUT ALWAYS OFF — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused B+ circuit in the Transmission Control Relay connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused B+ circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Turn the ignition off to the lock position. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Using a 12-volt test light connected to 12-volts, check the Transmission Control Relay Ground circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Test Complete. No → Repair the Transmission Control Relay Ground circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0890-SWITCHED BATTERY

When Monitored and Set Condition:

P0890-SWITCHED BATTERY

When Monitored: Ignition key is turned from the OFF position to RUN position and/or ignition key is turned from the CRANK position to RUN position.

Set Condition: This DTC is set if the Transmission Control Module senses voltage on any of the Pressure Switch Inputs prior to the TCM energizing the Transmission Control Relay.

POSSIBLE CAUSES
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0890. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0890 set at 0? Yes → Go To 3 No → Go To 5	All

P0890-SWITCHED BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2/4 Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the 2/4 Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the L/R Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the L/R Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0891-TRANSMISSION RELAY ALWAYS ON

When Monitored and Set Condition:

P0891-TRANSMISSION RELAY ALWAYS ON

When Monitored: When the ignition is turned from the OFF position to the RUN position and/or the ignition is turned from the CRANK position to RUN position.

Set Condition: This DTC is set if the Transmission Control Module senses greater than 3.0 volts at the Transmission Control Relay Output terminal of the TCM prior to the TCM energizing the Transmission Control Relay.

POSSIBLE CAUSES
INTERMITTENT WIRING AND CONNECTORS
TRANSMISSION CONTROL RELAY STUCK CLOSED
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE
TRANSMISSION RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0891-TRANSMISSION RELAY ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check the STARTS SINCE SET counter for P0891. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set to 0? Yes → Go To 3 No → Go To 7	All
3	Turn the ignition off to the lock position. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Fused B+ circuit and the Transmission Control Relay Output Circuit in the Transmission Control Relay. Is the resistance above 5.0 ohms? Yes → Go To 4 No → Replace the Transmission Control Relay. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Transmission Control Relay Output circuit in the Solenoid/Pressure Switch Assembly harness connector. Is the voltage above 0.5 volt? Yes → Repair the Transmission Control Relay Output circuit for a short to voltage Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Remove the Transmission Control Relay from the PDC. Ignition on, engine not running. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage of the Transmission Relay Control circuit in the PDC connector. Is the voltage above 0.5 volt? Yes → Repair Transmission Relay Control Circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0891-TRANSMISSION RELAY ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0897-WORN OUT/BURNT TRANSAXLE FLUID

When Monitored and Set Condition:

P0897-WORN OUT/BURNT TRANSAXLE FLUID

When Monitored: With each transition from full Torque Convertor to partial Torque Convertor engagement for A/C bump prevention.

Set Condition: When vehicle shudder is detected during partial engagement (PEMCC).

POSSIBLE CAUSES
WORN OUT/ BURNT TRANSMISSION FLUID

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0897-WORN OUT/BURNT TRANSAXLE FLUID — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Remove the Transmission Oil Pan and Oil Filter per the Service Information. Install a new Transmission Oil Filter per Service Information. Reinstall Transmission Oil Pan, and refill with new Transmission Fluid per the Service Information. **Note: The Transmission Cooler must be flushed before prodceeding.** Start the engine, check and adjust the Transmission Fluid Level per Service Information. Allow the engine to idle for 10 minutes, in Park. Flush the Transmission Oil Cooler per the Service Information. Turn the ignition off. Drain and refill the Transmission Fluid. Flush the Transmission Oil Cooler again. Start the engine, check and adjust the Transmission Fluid Level per Service Information. With the DRBIII®, perform a Battery Disconnect. **Note: This must be done to re enable EMCC during an A/C Clutch engagement.** The vehicle may exhibit intermittent shudder during the first few hundred miles. **Note: The oil will gradually penetrate the TCC friction material and the shudder should disappear.** Erase the DTC and return the vehicle to the customer. Did the Code reset or does the vehicle still shudder after a few thousand miles? Yes → Replace the Torque Convertor per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0944-LOSS OF PRIME

When Monitored and Set Condition:

P0944-LOSS OF PRIME

When Monitored: If the transmission is slipping in any forward gear and the pressure switches are not indicating pressure, a loss of prime test is run.

Set Condition: If the Trans. begins to slip in a forward gear & the press. switch(s) that should be closed are open a loss of prime test begins. Available elements are turned on by the TCM to see if pump prime exists.The code sets if no pressure switches respond.

POSSIBLE CAUSES
SHIFT LEVER POSITION
PLUGGED TRANSMISSION OIL FILTER
TRANSMISSION OIL PUMP
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0944-LOSS OF PRIME — Continued

TEST	ACTION	APPLICABILITY
2	Place the gear selector in park. Start the engine. **NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** The Transmission must be at operating temperature prior to checking pressure. A cold Transmission will give higher readings. Place the Transmission in Reverse. With the DRBIII®, observe the Transmission Pressure Switch states. Are any of the Pressure Switches closed? Yes → Go To 3 No → Go To 5	All
3	The conditions necessary to set this DTC are not present at this time. Test drive the vehicle. Allow the Transmission to shift through all gears and ranges. Did you experience a delayed engagement and/or a no drive condition? Yes → Go To 5 No → Go To 4	All
4	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, perform a Shift Lever Position test. Follow the instructions on the DRBIII®. Did the Shift Lever Position Test pass? Yes → Go To 6 No → Refer to symptom list and perform test for DTC P0706. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Remove and inspect the Transmission Oil Pan and Transmission Oil Filter per the Service Information. Does the Transmission Oil Pan contain excessive debris and/or is the Oil Filter plugged? Yes → Repair the cause of the plugged Transmission Oil Filter. Refer to the Service Information for the proper repair procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0944-LOSS OF PRIME — Continued

TEST	ACTION	APPLICABILITY
7	If there are no possible causes remaining, view repair. Repair Replace the Transmission Oil Pump per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0992- 2-4/OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0992- 2-4/OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed > 1000 RPM, the TCM momentarily turns on element pressure to the clutch ckts that don't have pressure to identify the correct pressure sw closes. If the pressure sw does not close 2 times the code sets.

POSSIBLE CAUSES
CONDITION P0992 PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0992- 2-4/OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The vehicle must be driven to set this DTC, the transmission must be warm or hot with the Engine RPM above 1000 RPM.** This DTC is an indicator of a 2/4 and/or O/D Hydraulic Pressure Switch DTC's present. Perform the tests for P0870 and/or P0845 to determine which switch is failing. If there are no possible causes remaining, view repair. Repair Refer to the Transmission category and perform the appropriate symptom for P0870 and/or P0845. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P1652-SERIAL COMMUNICATION LINK MALFUNCTION

When Monitored and Set Condition:

P1652-SERIAL COMMUNICATION LINK MALFUNCTION

When Monitored: Continuously with engine running.

Set Condition: The DTC sets in approximately 20 seconds if no BUS messages are received by the TCM.

POSSIBLE CAUSES
NO COMMUNICATION WITH MIC
NO COMMUNICATION WITH PCM
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase TCM DTC's. **Note: Erase P0700 DTC in the PCM to turn the MIL light off after making transmission repairs.** Start the engine in park. Did the DTC reset after the engine was started? Yes → Go To 2 No → Go To 5	All
2	Ignition on, engine not running. With the DRBIII®, attempt communication with the MIC Can you communicate with the MIC? Yes → Go To 3 No → Refer to the Communication category for the related symptom(s). Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
3	Ignition on, engine not running. With the DRBIII®, select the following screens in order: ″BODY″ ″MIC″ ″MONITOR DISPLAY″ ″PCI BUS ENGINE INFO″. Does the DRBIII®, read ″NO RESPONSE″ from any of the listed PCM monitors? Yes → Refer to Communication Category for the related symptom(s). Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All

P1652-SERIAL COMMUNICATION LINK MALFUNCTION — Continued

TEST	ACTION	APPLICABILITY
4	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1684-BATTERY WAS DISCONNECTED

When Monitored and Set Condition:

P1684-BATTERY WAS DISCONNECTED

When Monitored: Whenever the key is in the Run/Start position.

Set Condition: This code is set whenever Transmission Control Module (TCM) is disconnected from battery power B+ or ground. It will also be set during the DRBIII® Quick Battery Disconnect procedure.

POSSIBLE CAUSES
QUICK LEARN WAS PERFORMED
RECENT BATTERY DISCONNECTION
TCM WAS REPLACED OR DISCONNECTED
INTERMITTENT WIRING AND CONNECTORS
FUSED B+ CIRCUIT TO TCM OPEN
GROUND CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1684-BATTERY WAS DISCONNECTED — Continued

<table>
<tr><th>TEST</th><th>ACTION</th><th>APPLICABILITY</th></tr>
<tr><td>2</td><td>Turn ignition off to the lock position.
Disconnect the TCM harness connector.
Ignition on, engine not running.
Measure the voltage of the Fused B+ circuit in the TCM harness connector.
Is the voltage below 10.0 volts?

Yes → Go To 3

No → Go To 5</td><td>All</td></tr>
<tr><td>3</td><td>Turn the ignition off to the lock position.
Disconnect the TCM harness connector.
Note: Check connectors - Clean/repair as necessary.
Ignition on, engine not running.
Using a 12-volt test light connected to ground, check the Fused B+ circuit in the TCM harness connector.
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.
Does the test light illuminate brightly?

Yes → Go To 4

No → Repair the Fused B+ circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.</td><td>All</td></tr>
<tr><td>4</td><td>Turn ignition off to the lock position.
Disconnect the TCM harness connector.
Note: Check connectors - Clean/repair as necessary.
Using a 12-volt test light connected to 12-volts, check all the ground circuits in the TCM harness connector.
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.
Does the light illuminate brightly at all the ground circuits?

Yes → Test Complete.

No → Repair the Ground circuit(s) as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.</td><td>All</td></tr>
<tr><td>5</td><td>Has the battery been disconnected, lost it’s charge, or been replaced recently?

Yes → This is the cause of the DTC. Erase the DTC and return the vehicle to the customer.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No → Go To 6</td><td>All</td></tr>
<tr><td>6</td><td>Has the Quick Learn procedure been performed?

Yes → This is the cause of the DTC. Erase the DTC and return the vehicle to the customer.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No → Go To 7</td><td>All</td></tr>
</table>

P1684-BATTERY WAS DISCONNECTED — Continued

TEST	ACTION	APPLICABILITY
7	Has the TCM been replaced or disconnected? Yes → Replacing or disconnecting the TCM will set this DTC. Erase the DTC and return the vehicle to the customer. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:

P1687-NO COMMUNICATION WITH THE MIC

When Monitored and Set Condition:

P1687-NO COMMUNICATION WITH THE MIC

When Monitored: Continuously with engine running.

Set Condition: The code sets in approximately 25 seconds if no BUS messages are received from the MIC.

POSSIBLE CAUSES
OTHER BUS PROBLEMS PRESENT
INTERMITTENT WIRING AND CONNECTORS
MIC - NO COMMUNICATION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, Check the STARTS SINCE SET counter for P1687. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set at 0? Yes → Go To 2 No → Go To 5	All
2	With the DRBIII®, check all of the other modules on the vehicle for evidence of a vehicle bus problem. Bus related DTC's in other modules point to an overall vehicle bus problem. Other symptoms such as a customer complaint of intermittent operation of bus controlled features also indicate a bus problem. Does the PRNDL display indicate "No Bus" or is there any evidence of an overall vehicle bus problem? Yes → Refer to the Communications category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, clear all DTC's. Start the engine in park. With the DRBIII®, read the MIC DTC's. Can the DRBIII® communicate with the MIC? Yes → Go To 4 No → Refer to the Communication category and perform the appropriate symptom related to No Response to MIC. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1687-NO COMMUNICATION WITH THE MIC — Continued

TEST	ACTION	APPLICABILITY
4	Ignition on, engine not running. With the DRBIII®, erase TCM DTC's. Start the engine in park. With the DRBIII®, read Transmission DTC's. Is the DTC, P1687- No Communication with the MIC, present? Yes → Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1694-BUS COMMUNICATION WITH ENGINE MODULE

When Monitored and Set Condition:

P1694-BUS COMMUNICATION WITH ENGINE MODULE

When Monitored: Continuously with ignition key on.

Set Condition: If no bus messages are received from the Powertrain Control Module for 10 seconds.

POSSIBLE CAUSES
NO COMMUNICATION WITH PCM
OTHER BUS PROBLEMS PRESENT
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, Check the STARTS SINCE SET counter for P1694. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P1694 set to 0? Yes → Go To 2 No → Go To 5	All
2	With the DRBIII®, check all of the other modules on the vehicle for evidence of a vehicle bus problem. Bus related DTC's in other modules point to an overall vehicle bus problem. Other symptoms such as a customer complaint of intermittent operation of bus controlled features also indicate a bus problem. Does the PRNDL display indicate ″No Bus″ or is there any evidence of an overall vehicle bus problem? Yes → Refer to the Communication category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, attempt to communicate with the Powertrain Control Module (PCM). Can the DRBIII® communicate with the PCM? Yes → Go To 4 No → Refer to the Communication category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1694-BUS COMMUNICATION WITH ENGINE MODULE — Continued

TEST	ACTION	APPLICABILITY
4	Ignition on, engine not running. With the DRBIII®, erase TCM DTC's. Start the engine in park. With the DRBIII®, read Transmission DTC's. Did the DTC, P1694, return? Yes → Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION

When Monitored and Set Condition:

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION

When Monitored: During an attempted shift into 1st gear.

Set Condition: This DTC is set if three unsuccessful attempts are made to shift into 1st gear in one given ignition start.

POSSIBLE CAUSES
RELATED DTC P0841 PRESENT
L/R PRESSURE SWITCH
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other Transmission DTC's Is the DTC P0841 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P1775. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 10	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay from the PDC. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the FWD Adapter Cable kit, Miller tool #8333-1A. Ignition on, engine not running. With the DRBIII®, monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. With the Transmission Simulator, select the L/R on the Pressure Switch selector. While observing the LR pressure switch state with the DRBIII®, depress the Pressure Switch Test button. Did the L/R Pressure Switch state change from OPEN to CLOSED when the test button was pressed? Yes → Inspect the Solenoid Switch Valve in the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the L/R Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the L/R Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the L/R Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the L/R Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between Fused B+ circuit and the Transmission Control Relay Output circuit. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/Pressure Switch Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 9 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
9	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Test drive the vehicle. Did you experience any 2nd gear launches or no TCC engagement? Yes → Inspect the Valve Body for signs of a stuck valve or other problem in the SSV area. If no problems are found, replace the Solenoid/Pressure Switch Assembly. If excessive debris is present in the Pan or Valve Body, repair cause of the debris as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION

When Monitored and Set Condition:

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION

When Monitored: Continuously when doing partial or full EMCC (PEMCC or FEMCC).

Set Condition: This DTC will set if the TCM senses the L/R Pressure Switch closing while performing PEMCC or FEMCC or after two unsuccessful attempts to perform PEMCC or FEMCC.

POSSIBLE CAUSES
RELATED DTC P0841 PRESENT
L/R PRESSURE SWITCH
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other Transmission DTCs Is the DTC P0841 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P1776. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 10	All
4	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the FWD Adapter Cable kit, Miller tool #8333-1A. Ignition on, engine not running. On the Transmission Simulator select L/R on the Pressure Switch selector switch. With the DRBIII®, monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the Pressure Switch state change from OPEN to CLOSED when the test button was pressed? Yes → Inspect the Solenoid Switch Valve in the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the L/R Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/Pressure Switch Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the L/R Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the L/R Pressure Switch Sense circuit. Is the voltage above 0.5 volts? Yes → Repair the L/R Pressure Switch Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 9 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
9	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
10	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Test drive the vehicle. Did you experience any 2nd gear launches or no TCC engagement? Yes → Inspect the Valve Body for signs of a stuck valve or other problem in the SSV area. If no problems are found, replace the Solenoid/ Pressure Switch Assembly. If excessive debris is present in the Pan or Valve Body, repair the cause of debris as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1790-FAULT IMMEDIATELY AFTER SHIFT

When Monitored and Set Condition:

P1790-FAULT IMMEDIATELY AFTER SHIFT

When Monitored: After a speed ratio error is stored.

Set Condition: This code is set if the associated speed ratio code is stored within 1.3 seconds after a shift.

POSSIBLE CAUSES
CONDITION P1790 PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	This DTC is set along with a gear ratio DTC. Perform the appropriate test for the Gear Ratio DTC stored. **NOTE: Check 1 trip failures if there are no Gear Ratio DTC's current.** If there are no possible causes remaining, view repair. Repair Refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P1793-TRD LINK COMMUNICATION ERROR

When Monitored and Set Condition:

P1793-TRD LINK COMMUNICATION ERROR

When Monitored: The transmission controller pulses the 12 volt TRD signal from the PCM to ground, during torque managed shifts with the throttle angle above 54 degrees. The TRD system is also tested whenever the vehicle is stopped and the engine speed is at idle.

Set Condition: This code is set when the Transmission Control Module (TCM) sends two subsequent torque reduction messages to the Powertrain Control Module (PCM) via the TRD link circuit and does not receive a confirmation from the PCM over the communication bus.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TORQUE MANAGEMENT REQUEST SENSE CIRCUIT OPEN
TORQUE MANAGEMENT REQUEST SENSE SHORT TO GROUND
TORQUE MANAGEMENT REQUEST SENSE CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1793-TRD LINK COMMUNICATION ERROR — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTC's. Are any of the following DTCs P1694, P0731, P0732, P0733, P0734, P0736 present also? Yes → If any of these codes are present, disregard the P1793 DTC and refer to the Transmission category and perform the appropriate symptom. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **Note: This counter only applies to the last DTC set.** Is the STARTS SINCE SET equal to 0? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off to the lock position. Disconnect the PCM harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Torque Management Request Sense circuit from the TCM harness connector to the PCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Torque Management Request Sense circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the PCM harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Torque Management Request Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair Torque Management Request Sense circuit for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Ignition on, engine not running. Measure the voltage of the Torque Management Request Sense circuit. Is the voltage above 10.5 volts? Yes → Repair Torque Management Request Sense circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P1793-TRD LINK COMMUNICATION ERROR — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Ignition on, engine not running. Measure the voltage of the Torque Management Request Sense circuit in the TCM harness connector. Is the voltage above 7.0 volts? Yes → Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
9	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1794-SPEED SENSOR GROUND ERROR

When Monitored and Set Condition:

P1794-SPEED SENSOR GROUND ERROR

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: After a TCM reset in neutral and Input/Output speed ratio equals a ratio of input to output of 2.5 to 1.

POSSIBLE CAUSES
SPEED SENSOR GROUND CIRCUIT OPEN
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	Start the engine in park. With the DRBIII®, observe the Input and Output Speed Sensor readings. Is the Output Speed Sensor reading twice the Input Speed Sensor reading? Yes → Go To 3 No → Go To 6	All

P1794-SPEED SENSOR GROUND ERROR — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A. Ignition on, engine not running. Using the Transmission Simulator, set the selector switch to the 3000/1250 position. Turn the Input/Output switch to ON. With the DRBIII®, read the Input and Output Speed Sensor RPM. Does the Input Speed read 3000 RPM and the Output Speed read 1250 RPM within 50 RPM? Yes → Go To 5 No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect Input and Output Speed Sensor harness connectors. Disconnect the TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Input and Output Speed Sensor harness connectors. Is the resistance above 5.0 ohms on either Speed Sensor Ground circuit? Yes → Repair the Speed Sensor Ground circuit for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1797-MANUAL SHIFT OVERHEAT

When Monitored and Set Condition:

P1797-MANUAL SHIFT OVERHEAT

When Monitored: Whenever engine is running and transmission is in the AutoStick mode.

Set Condition: If the engine temperature exceeds 124° C or 255° F or the transmission temperature exceeds 135° C or 275° F while in AutoStick mode. Note: Aggressive driving or driving in low for extended periods of time in AutoStick® mode will set this DTC.

POSSIBLE CAUSES
MANUAL SHIFT OVERHEAT

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1797-MANUAL SHIFT OVERHEAT — Continued

TEST	ACTION	APPLICABILITY
2	This is an informational DTC only. Check the Engine and Transmission Cooling Systems for proper operation. Check the Radiator Cooling Fan operation. Check the Transmission Cooling Fan operation if equipped. Check the Transmission Fluid Level. Make sure it is not overfilled. **NOTE: Aggressive driving or driving in low for extended periods of time in Autostick® mode will set this DTC.** With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*BACKUP LAMPS COME ON WHILE SHIFTER IS NOT IN REVERSE POSITION

POSSIBLE CAUSES
BACKUP LAMPS ALWAYS ON
BACKUP LAMP SUPPLY CIRCUIT SHORT TO VOLTAGE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Firmly apply brakes. Place the shift lever in the position which causes the Backup Lamps to come on other than Reverse. Do the Backup Lamps come on with the shift lever not in the Reverse position? Yes → Go To 2 No → Go To 4	All
2	Ignition on, engine not running. Place the Shift Lever in the position that causes the Backup Lamps to come on other than Reverse. Disconnect the TRS harness connector. **NOTE: This will cause a DTC P0706 and possibly other DTC's to be stored in the TCM. They must be erased before returning the vehicle to the customer.** Did the Backup Lamps go out when the TRS harness connector was disconnected? Yes → Replace the Transmission Range Sensor per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 3	All
3	Turn the ignition off to the lock position. Disconnect the Transmission TRS harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Back-up Lamp Supply circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the Backup Lamp Supply circuit for a short to voltage. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

*BACKUP LAMPS COME ON WHILE SHIFTER IS NOT IN REVERSE POSITION — Continued

TEST	ACTION	APPLICABILITY
4	The condition is not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. Were there any problems found? Yes → Repair as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:
*BACKUP LAMPS INOPERATIVE

POSSIBLE CAUSES
OPEN LEFT BACKUP LAMP BULB
OPEN RIGHT BACKUP LAMP BULB
BACKUP LAMP GROUND CIRCUIT OPEN
BACKUP LAMP SUPPLY CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
BACKUP LAMP SUPPLY CIRCUIT SHORT TO GROUND
TRANSMISSION RANGE SENSOR
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Place foot firmly on brake pedal. Place the shift lever in the reverse position. Do either of the Backup Lamps work? Yes → Go To 2 No → Go To 3	All
2	The condition is not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring while checking for shorts and open circuits. Were there any problems found? Yes → Repair as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All
3	Remove the left Backup Lamp bulb. Measure the resistance of the Backup Lamp bulb. Is the resistance above 5.0 ohms? Yes → Replace the Backup Lamp bulb. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 4	All
4	Remove the right Backup Lamp bulb. Measure the resistance of the Backup Lamp bulb. Is the resistance above 5.0 ohms? Yes → Replace the Backup Lamp bulb. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 5	All

*BACKUP LAMPS INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off to the lock position. **CAUTION: Remove the Starter Relay. This will prevent the vehicle from being started in gear.** Install the Transmission Simulator, Miller tool #8333 and the FWD Adapter Cable kit, Miller tool #8333-1A. Ignition on, engine not running. Press the "Reverse Light Test" button on the Transmission Simulator while observing the backup lamps. Do either of the back-up lamps come on? Yes → Go To 6 No → Go To 7	All
6	If there are no possible causes remaining, view repair. Repair Replace Transmission Range Sensor per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
7	Remove the Backup Lamp bulb. Using a 12-volt test light connected to 12-volts, check the Backup Lamp Ground circuit in the Backup Lamp socket. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 8 No → Repair the Backup Lamp Ground circuit for an open or high resistance. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
8	Turn the ignition off to the lock position. Remove the Backup Lamp bulb. Disconnect the Transmission TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Backup Lamp Supply circuit from the Backup Lamp Socket to the TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Backup Lamp Supply circuit for an open. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 9	All

*BACKUP LAMPS INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the Transmission TRS harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit in the TRS harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Fused Ignition Switch Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
10	Turn ignition off to the lock position. Remove the Backup Lamp bulb. Disconnect the Transmission TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Backup Lamp Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair Backup Lamp Supply circuit for a short to ground. Check the fuse and replace if necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:
*CHECKING PARK/NEUTRAL SWITCH OPERATION

POSSIBLE CAUSES
P/N POSITION SWITCH SENSE CIRCUIT OPEN
P/N POSITION SWITCH SENSE CIRCUIT SHORTED TO GROUND
TRANSMISSION RANGE SENSOR
PCM - P/N POSITION SWITCH

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the Park/Neutral Position Switch input state. While moving the gear selector through all gear positions, Park to 1 and back to Park, watch the DRBIII® display. Did the DRBIII® display show P/N and D/R in the correct gear positions? Yes → Test Complete. No → Go To 2	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Transmission Range Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the P/N Position Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the P/N Position Switch Sense circuit for an open. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Transmission Range Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the P/N Position Switch Sense circuit. Is the resistance above 100k ohms? Yes → Go To 4 No → Repair the P/N Position Switch Sense circuit for a short to ground. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

*CHECKING PARK/NEUTRAL SWITCH OPERATION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Move the Gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through each gear, measure the resistance between ground and the P/N Position Switch Sense circuit. Did the resistance change from above 10.0 ohms to below 10.0 ohms? Yes → Go To 5 No → Replace the Transmission Range Sensor. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*INCORRECT TRANSMISSION FLUID LEVEL

POSSIBLE CAUSES
INCORRECT FLUID LEVEL

TEST	ACTION	APPLICABILITY
1	The transmission must be above 70 degree F. prior to checking fluid level. Adjusting fluid level on a cold transmission will result in an overfilled transmission. Check the transmission fluid level per the service information. Is the fluid level OK? Yes → Test Complete. No → Adjust fluid level. Repair cause of incorrect fluid level. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:
*NO SPEEDOMETER OPERATION

POSSIBLE CAUSES
NO SPEEDOMETER OPERATION

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, check the pinion factor setting in the TCM. Is the pinion factor missing or set incorrectly? Yes → One possible cause is the pinion factor is not set or is set incorrectly in the TCM. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*TRANSMISSION NOISY WITH NO DTC'S PRESENT

POSSIBLE CAUSES
INCORRECT FLUID LEVEL
INTERNAL TRANSMISSION PROBLEM - NOISY
INTERNAL TRANSMISSION PROBLEM - NOISY WHILE STANDING STILL

TEST	ACTION	APPLICABILITY
1	Check the Transmission Fluid Level per the Service Information. Is the fluid level OK? Yes → Go To 2 No → Adjust fluid level and repair cause of incorrect fluid level. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
2	Place vehicle on hoist. **WARNING: BE SURE TO KEEP HANDS AND FEET CLEAR OF ROTATING WHEELS.** Run vehicle on hoist under conditions necessary to duplicate the noise. **NOTE: It may be necessary to test drive the vehicle to duplicate the noise.** Using Chassis Ears or other suitable listening device, verify the source of the noise. Is the noise coming from the transmission? Yes → Go To 3 No → Test Complete.	All
3	With the shift lever in neutral, raise the engine speed and listen to the noise. **NOTE: THE RADIO MUST BE TURNED OFF. Alternator noise can come through the speakers and be misinterpreted as Transmission Pump Whine. This can happen even with the volume turned down.** Does the noise get louder or change pitch while the engine speed is changing? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem as necessary. Inspect all of the transmission components for signs of wear. If no problems found, replace the Transmission oil pump.. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem as necessary. Inspect all of the transmission components for signs of wear. Pay particular attention to bearings, pinion gears, etc. Repair or replace as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:
*TRANSMISSION SHIFTS EARLY WITH NO DTC'S

POSSIBLE CAUSES
BUS PROBLEMS
CHECK FOR INTERMITTENT WIRING & CONNECTORS
COLD TRANSMISSION

TEST	ACTION	APPLICABILITY
1	Using the DRBIII®, check all other Modules for signs of a PCI bus problem such as bus related DTC's and/or communication problems. Check and diagnose all 1 trip failures as a hard code. Although it takes two occurences of a missed TRD link message to set the DTC P1793, one missed message will cause the transmission to short shift until the next start up. If the vehicle has any indications of a bus problem, the bus must be repaired first Do any of the other modules show signs of a bus problem? Yes → Repair the PCI bus problem. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 2	All
2	**NOTE: If the Transmission shifts too early when the Transmission is cold, this is a normal condition. The software is designed to protect the Transmission from high torque and/or high RPM shifts during cold operation.** Did the problem occur when the Transmission temperature was cold? Yes → This is a normal condition. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors. Wiggle the wires while checking for shorts and open circuits. Although it takes two occurences of a missed TRD link message to set the DTC P1793, one missed message will cause the transmission to short shift until the next start up. If the vehicle has any indications of a bus problem, the bus must be repaired first Were any problems found? Yes → Repair wiring and/or connector as necessary. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*TRANSMISSION SIMULATOR 8333 WILL NOT POWER UP

TEST	ACTION	APPLICABILITY
1	**NOTE: If the Transmission Simulator Miller tool #8333 will not power up, this is a symptom of the Transmission Relay being open, such as Limp-in, and/or this also could be a indication of the Transmission Simulator not installed correctly on the vehicle.** **NOTE: Check the Simulator ground cable connection.** **NOTE: Check all Transmission Simulator harness connections.** Repair these symptoms before having the Transmission Simulator Miller Tool #8333 repaired. Continue Test Complete.	All

Symptom:
P0122-TPS/APPS LOW

When Monitored and Set Condition:

P0122-TPS/APPS LOW

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
TPS SIGNAL CIRCUIT HIGH RESISTANCE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are there any Engine TPS related DTCs present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0122-TPS/APPS LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII® in Transmission Sensors, read the TPS voltage. Is the TPS voltage below 0.5 volts? Yes → Go To 4 No → Go To 6	All
4	Ignition on, engine not running. With the DRBIII® in Transmission Sensors, record the TPS voltage. While back probing the TCM harness connector, measure the voltage of the TPS Signal circuit. Compare the voltage readings between the DRBIII® and the reading from the digital multi meter. Are the voltages within 0.1 volt of each other? Yes → Repair the TPS signal circuit between the TCM harness connector and the splice for high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the point where the TPS signal and sensor ground circuits splice off from the engine circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0122-TPS/APPS LOW - DIESEL

When Monitored and Set Condition:

P0122-TPS/APPS LOW - DIESEL

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored APPS voltage drops below 0.078 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT OPEN
APP SENSOR SIGNAL CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
APP SENSOR SIGNAL CIRCUIT SHORT TO GROUND
5-VOLT SUPPLY CIRCUIT SHORT TO THE SPEED SENSOR GROUND
APP SENSOR SIGNAL CIRCUIT SHORT TO SPEED SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0122-TPS/APPS LOW - DIESEL — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII® in Transmission Sensors, read the TPS/ APPS voltage. Is the TPS/APPS voltage below 0.1 volts? Yes → Go To 3 No → Go To 12	All
3	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Measure the voltage of the 5-volt Supply circuit. Is the voltage below 4.5 volts? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance of the 5-volt Supply circuit between the TCM harness connector and the APP Sensor harness connector. Is the resistance above 5.0 ohms ? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms ? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance between the 5-volt Supply circuit and the Speed Sensor Ground circuit at the APP Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Go To 11 No → Repair the 5-volt Supply circuit for a short to the Speed Sensor Ground circuit. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0122-TPS/APPS LOW - DIESEL — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Connect a jumper wire between the 5-volt Supply circuit and the Accelerator Pedal Position Sensor Signal circuit. Ignition on, engine not running. With the DRBIII® in Transmission Sensors, read the TPS/ APPS voltage. Is the TPS/APPS voltage above 4.5 volts? Yes → Replace the Accelerator Pedal Position Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance of the Accelerator Pedal Position Sensor Signal circuit between the TCM harness connector and the APP Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the APP Sensor Signal circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance between ground and the APP Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the APP Sensor Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the TCM harness connectors. Disconnect the APP Sensor harness connector. Measure the resistance of the Accelerator Pedal Position Sensor Signal between the APP Sensor Signal circuit and the Speed Sensor Ground circuit. Is the resistance below 5.0 ohms? Yes → Repair the APP Sensor Signal circuit for a short to the Speed Sensor Ground circuit. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All

P0122-TPS/APPS LOW - DIESEL — Continued

TEST	ACTION	APPLICABILITY
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0123-TPS/APPS HIGH

When Monitored and Set Condition:

P0123-TPS/APPS HIGH

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
SENSOR GROUND CIRCUIT OPEN TO TCM
TPS SIGNAL CIRCUIT OPEN TO TCM
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are there any Engine TPS related DTCs present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0123-TPS/APPS HIGH — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII® in Transmission Sensors, read the TPS voltage. Is the TPS voltage above 4.5 volts? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Disconnect the TPS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TPS Signal Circuit from the TCM harness connector to the TPS harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the TPS Signal circuit between the TCM harness connector and the splice for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TPS harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Sensor Ground circuit between the TPS harness connector and the Transmission Control Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Sensor Ground circuit between the TCM harness connector and the splice for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the point where the TPS signal and sensor ground circuits splice off from the engine circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0123-TPS/APPS HIGH - DIESEL

When Monitored and Set Condition:

P0123-TPS/APPS HIGH - DIESEL

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set if the monitored APPS voltage rises above 4.94 volts for the period of 0.48 seconds.

POSSIBLE CAUSES
SPEED SENSOR GROUND CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
APP SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
ACCELERATOR PEDAL POSITION SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0123-TPS/APPS HIGH - DIESEL — Continued

TEST	ACTION	APPLICABILITY
2	Ignition on, engine not running. Press the accelerator pedal all the way down to wide open throttle. With the DRBIII® in Transmission Sensors, read the TPS/APPS voltage. Is the TPS/APPS voltage above 4.94 volts? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Ignition on, engine not running. With the DRBIII® in Transmission Sensors, read the TPS/APPS voltage. Is the voltage above 0.5 volts? Yes → Go To 4 No → Go To 5	All
4	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the APP Sensor Signal circuit. Is the voltage above 0.5 volt? Yes → Repair the APP Sensor Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
5	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the 5-volt Supply circuit. Is the voltage above 5.5 volts? Yes → Go To 6 No → Go To 7	All
6	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 5-volt Supply circuit. Is the voltage above 0.5 volt? Yes → Repair the 5-volt Supply circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All

P0123-TPS/APPS HIGH - DIESEL — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the APP Sensor harness connector. Measure the resistance of the Speed Sensor Ground circuit between the TCM harness connector and the APP Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the APP Sensor harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit. Is the voltage above 0.5 volts? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Replace the Accelerator Pedal Position Sensor per the Service Information Ignition on, engine not running. Press the accelerator pedal all the way down to wide open throttle. With the DRBIII® in Transmission Sensors, read the TPS/APPS voltage. Is the TPS/APPS voltage above 4.94 volts? Yes → Go To 10 No → Repair Complete. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0123-TPS/APPS HIGH - DIESEL — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0124-TPS/APPS INTERMITTENT

When Monitored and Set Condition:

P0124-TPS/APPS INTERMITTENT

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set with a throttle angle between 6° and 120.6° with a 5° or higher change under 7.0 milliseconds.

POSSIBLE CAUSES
ENGINE TPS DTC'S PRESENT
THROTTLE POSITION SENSOR
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Engine DTC's. Are any Engine TPS related DTC's present? Yes → Refer to the Powertrain category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0124-TPS/APPS INTERMITTENT — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. With the DRBIII®, under Transmission Sensors, monitor the TPS voltage in the following step. Slowly open and close the throttle while checking for erratic voltage changes. Did the TPS voltage change smooth and consistent? Yes → Go To 4 No → Replace the Throttle Position Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Using the schematics as a guide, inspect the wiring and connectors. Pay particular attention to corroded terminals and all power and ground circuits. Repair as necessary. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0124-TPS/APPS INTERMITTENT - DIESEL

When Monitored and Set Condition:

P0124-TPS/APPS INTERMITTENT - DIESEL

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set with a throttle angle between 6° and 120.6° with a 5° or higher change under 7.0 milliseconds.

POSSIBLE CAUSES
RELATED DTCS PRESENT
WIRING AND CONNECTORS
ACCELERATOR PEDAL POSITION SENSOR
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, read Transmission DTCs. Are there any APPS/TPS High or Low DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0124-TPS/APPS INTERMITTENT - DIESEL — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. With the DRBIII®, under Transmission Sensors, monitor the APPS/TPS voltage in the following step. Slowly open and close the throttle while checking for erratic voltage changes. Did the TPS voltage change smooth and consistent? Yes → Go To 4 No → Replace the Accelerator Pedal Position Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Ignition on, engine not running. With the DRBIII®, under Transmission Sensors, monitor the APPS/TPS voltage in the following step. While checking for erratic voltage changes, perform a wiggle test by wiggling all the wiring and connectors pertaining to the APPS/TPS while slowly opening and closing the throttle. Did the APPS/TPS voltage change smooth and consistent? Yes → Go To 5 No → Repair wiring and/or connectors as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0218-HIGH TEMPERATURE OPERATION ACTIVATED

When Monitored and Set Condition:

P0218-HIGH TEMPERATURE OPERATION ACTIVATED

When Monitored: Whenever the engine is running.

Set Condition: Immediately when the Overheat shift schedule is activated with a Transmission Oil Temperature above 116° C or 240° F.

POSSIBLE CAUSES
ENGINE COOLING SYSTEM
TRANSMISSION OIL PUMP FLOW
HIGH TEMPERATURE OPERATIONS ACTIVATED

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	Perform the Oil Pump Flow test per the Service Information. Did the Oil Pump Flow test pass? Yes → Go To 3 No → Repair the cause of either a low, or no Transmission Oil Pump Flow. Refer to the Service Information for the proper repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0218-HIGH TEMPERATURE OPERATION ACTIVATED — Continued

TEST	ACTION	APPLICABILITY
3	Perform Engine Cooling System diagnostics per the Service Information. Is the Engine Cooling System functioning properly? Yes → Go To 4 No → Repair the cause of the engine overheating. Refer to the Service Information for the proper repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints. This DTC indicates that the transmission has been operating in the ″Overheat″ shift schedule which may generate a customer complaint. The customer driving patterns may indicate the need for an additional transmission oil cooler. If there are no possible causes remaining, view repair. Repair Repair the cause of transmission overheating. Refer to the Service Information for the proper repair procedure. Make sure to check for any TSBs pertaining to this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0604-INTERNAL TCM

When Monitored and Set Condition:

P0604-INTERNAL TCM

When Monitored: Continuously with the ignition on.

Set Condition: Whenever the Transmission Control Module (TCM) detects an internal controller problem.

POSSIBLE CAUSES
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair The Transmission Control Module is reporting internal errors and must be replaced. Refer to the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0605-INTERNAL TCM

When Monitored and Set Condition:

P0605-INTERNAL TCM

When Monitored: Continuously with the ignition on

Set Condition: Whenever the Transmission Control Module (TCM) detects an internal controller problem.

POSSIBLE CAUSES
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair The Transmission Control Module is reporting internal errors and must be replaced. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0613-INTERNAL TCM

When Monitored and Set Condition:

P0613-INTERNAL TCM

When Monitored: Continuously with the ignition on.

Set Condition: When ever the Transmission Control Module (TCM) detects an internal controller problem.

POSSIBLE CAUSES
GROUND CIRCUIT OPEN
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition off to the lock position. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Using a 12-volt test light connected to 12-volts, check all four ground circuits in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly on all four ground circuits? Yes → Go To 2 No → Repair the Ground circuit(s) as necessary. Check main ground connection to engine block and/or chassis. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
2	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair The Transmission Control Module is reporting internal errors and must be replaced. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0706-CHECK SHIFTER SIGNAL

When Monitored and Set Condition:

P0706-CHECK SHIFTER SIGNAL

When Monitored: Continuously with the ignition on.

Set Condition: 3 occurrences in one ignition start with a invalid PRNDL code, which lasts for more than 0.1 second.

POSSIBLE CAUSES
SHIFTER OUT OF ADJUSTMENT
TRS T1 SENSE CIRCUIT OPEN
TRS T2 SENSE CIRCUIT OPEN
TRS T3 SENSE CIRCUIT OPEN
TRS T41 SENSE CIRCUIT OPEN
TRS T42 SENSE CIRCUIT OPEN
TRS T1 SENSE CIRCUIT SHORT TO GROUND
TRS T2 SENSE CIRCUIT SHORT TO GROUND
TRS T3 SENSE CIRCUIT SHORT TO GROUND
TRS T41 SENSE CIRCUIT SHORT TO GROUND
TRS T42 SENSE CIRCUIT SHORT TO GROUND
TRS T1 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T2 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T3 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T41 SENSE CIRCUIT SHORT TO VOLTAGE
TRS T42 SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION RANGE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, perform the Shift Lever Position Test. Select the test outcome from the following: Test passes: Go To 3 Test fails with DTC: Go To 4 Test fails without DTC: Go To 23	All
3	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install Transmission Simulator Miller tool #8333. Ignition on, engine not running. With the DRBIII®, perform the Shift Lever Position Test. When the DRBIII® instructs you to put the Gear Selector in a particular position, you must do so using the selector switch on the Transmission Simulator. The LED for the gear position in question must be illuminated on the Transmission Simulator prior to pressing ″ENTER″ on the DRBIII®. **NOTE: When the DRBIII® requests the O/D off button be depressed, you must use the O/D OFF button in the vehicle or you will fail the Shift Lever Position Test with a Shift Lever Error Code 11.** Did the Shift Lever Position test pass? Yes → Go To 5 No → Go To 6 **NOTE: Make sure to disconnect the Transmission Simulator and reconnect all disconnected connectors before proceeding.**	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	With the DRBIII®, observe the TRS sense circuits on the Input/Output screen. (C1 thru C5) Move the shift lever from P to L, pausing momentarily in each gear position. Watch for one of the circuits to not change state. Pick the one that did not change state. TRS T1 sense (C4) Go To 7 TRS T2 sense (C5) Go To 10 TRS T3 sense (C3) Go To 13 TRS T41 sense (C1) Go To 16 TRS T42 sense (C2) Go To 19	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T1 Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T1 Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T1 Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the TRS T1 Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the TRS T1 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T1 Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 22	All
10	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T2 Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T2 Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T2 Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the TRS T2 Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All
12	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the TRS T2 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T2 Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 22	All
13	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T3 Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T3 Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T3 Sense circuit in the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TRS T3 Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the TRS T3 Sense circuit at the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the TRS T3 Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 22	All
16	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T41 Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T41 Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
17	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T41 Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the TRS T41 Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 18	All
18	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the TRS T41 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T41 Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 22	All

P0706-CHECK SHIFTER SIGNAL — Continued

TEST	ACTION	APPLICABILITY
19	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the TRS T42 Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the TRS T42 Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 20	All
20	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the TRS T42 Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the TRS T42 Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 21	All
21	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the TRS T42 Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the TRS T42 Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 22	All
22	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
23	If there are no possible causes remaining, view repair. Repair Adjust the shifter per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE

When Monitored and Set Condition:

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE

When Monitored: Continuously with the ignition on and engine running.

Set Condition: This DTC will set when the desired transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate times are starting temperature to warm up time: (-40° F / -40° C - 35 min) (-20° F / -28° C - 25 min) (20° F / -6.6° C - 20 min) (60° F / 15.5 ° C - 10 min)

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check Transmission DTC's. Are there any other Transmission Temperature Sensor related DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0711. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0712-TRANSMISSION TEMPERATURE SENSOR LOW

When Monitored and Set Condition:

P0712-TRANSMISSION TEMPERATURE SENSOR LOW

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 0.45 seconds.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Transmission DTC's. Are there any Speed Sensor DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0712-TRANSMISSION TEMPERATURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0712. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 8	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector.. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transmission Temperature Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transmission Temperature Sensor Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0712-TRANSMISSION TEMPERATURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0713-TRANSMISSION TEMPERATURE SENSOR HIGH

When Monitored and Set Condition:

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 0.45 seconds.

POSSIBLE CAUSES
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0713. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 3 No → Go To 8	All

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match the DRBIII® readings ± 0.2 volts? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector.. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transmission Temperature Sensor Signal circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Transmission Temperature Sensor Signal circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Transmission Temperature Sensor Signal circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Transmission Temperature Sensor Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT

When Monitored and Set Condition:

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT

When Monitored: Continuously with the ignition on and engine running.

Set Condition: The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a predetermined period of time.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check Transmission DTC's. Are there any Speed Sensor and/or other Temperature Sensor DTCs present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0714. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Input/Output switch to OFF. With the DRBIII®, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator. Compare the DRBIII® readings with the numbers listed on the Transmission Simulator. Do the readings on the Transmission Simulator match a non-fluctuating DRBIII® reading ± 0.2 volts? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0715-INPUT SPEED SENSOR ERROR

When Monitored and Set Condition:

P0715-INPUT SPEED SENSOR ERROR

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If there is an excessive change in input RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine in park. With the DRBIII®, observe the Input Speed Sensor Reading. Is the Input Speed Sensor Reading below 400 RPM? Yes → Go To 3 No → Go To 12	All
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install Transmission Simulator Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1000″ position. With the DRBIII®, observe the Input and Output Speed Sensor readings. Does the input speed read 3000 RPM and the Output speed read 1000 RPM ± 50 RPM? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Input Speed Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Input Speed Sensor Signal circuit from the TCM harness connector to the Input Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Input Speed Sensor Signal circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Input Speed Sensor Signal circuit. Is the resistance Below 5.0 ohms? Yes → Repair the Input Speed Sensor Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Place a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Input Speed Sensor Signal circuit. Is the voltage above 0.5 volts? Yes → Repair the Input Speed Sensor Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Input Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Speed Sensor Ground circuit. Is the resistance Below 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Place a jumper wire between the fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair Speed Sensor Ground circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0720-OUTPUT SPEED SENSOR ERROR

When Monitored and Set Condition:

P0720-OUTPUT SPEED SENSOR ERROR

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If there is an excessive change in output RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off to the lock position. **CAUTION: Properly support the vehicle and raise all drive wheels off the ground.** Start the engine in park. Place the transmission gear selector in drive, release foot from brake. **WARNING: BE SURE TO KEEP HANDS AND FEET CLEAR OF ROTATING WHEELS.** With the DRBIII®, monitor the Output Speed Sensor RPM. Is the Output Speed Sensor RPM below 100 RPM? Yes → Go To 3 No → Go To 12	All
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1000″ position. With the DRBIII®, read the Input and Output Speed Sensor readings. Does the Input Speed read 3000 RPM and the Output Speed read 1000 RPM, ± 50 RPM? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Output Speed Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Output Speed Sensor Signal circuit from the TCM harness connector to the Output Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Output Speed Sensor Signal circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Output Speed Sensor Signal circuit. Is the resistance Below 5.0 ohms? Yes → Repair the Output Speed Sensor Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Place a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Output Speed Sensor Signal circuit. Is the voltage above 0.5 volts? Yes → Repair the Output Speed Sensor Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Output Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Output Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Speed Sensor Ground circuit. Is the resistance below 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All

P0720-OUTPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Place a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit. Is the voltage above 0.5 volts? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0725-ENGINE SPEED SENSOR CIRCUIT

When Monitored and Set Condition:

P0725-ENGINE SPEED SENSOR CIRCUIT

When Monitored: Continuously with engine running.

Set Condition: The DTC will set when the Transmission Control Module (TCM) senses a engine RPM less than 400 with the engine running for at least 2 seconds. RPM information is transferred over the communication bus from the PCM. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED ENGINE DTC'S PRESENT
CRANK POSITION SENSOR SIGNAL CIRCUIT OPEN TO TCM
SENSOR GROUND CIRCUIT OPEN TO TCM
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0725-ENGINE SPEED SENSOR CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	Ignition on, engine not running. With the DRBIII®, check Engine DTC's. Are the DTCs P0320, P1391, and/or P1398 present? Yes → Refer to the Driveability category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Start the engine. Allow the engine to idle. With the DRBIII®, under Engine Sensors, read and record Engine RPM. With the DRBIII®, under Transmission in Sensors read and record Engine RPM. Compare the two readings. Are the two readings within 50 RPM of each other? No → Go To 4 Yes → Go To 7	All
4	Turn the ignition off to the lock position. Disconnect the CKP harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the CKP Sensor Signal circuit between the CKP harness connector and the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Crank Position Sensor Signal circuit for an open. Pay special attention to the location of Crank Position Sensor Signal circuit spice to the Transmission Control Module. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the CKP Sensor harness connector. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Sensor Ground circuit between the CKP Sensor and the TCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Sensor Ground circuit for an open. Pay special attention at the location of the Sensor Ground splice to the Transmission Control Module. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0725-ENGINE SPEED SENSOR CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the point where the CKP Signal circuit and the Sensor Ground circuit splice off from the engine circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0725-ENGINE SPEED SENSOR CIRCUIT - DIESEL

When Monitored and Set Condition:

P0725-ENGINE SPEED SENSOR CIRCUIT - DIESEL

When Monitored: Continuously with engine running.

Set Condition: The DTC will set when the Transmission Control Module (TCM) senses a engine RPM less than 400 with the engine running for at least 2 seconds. RPM information is transferred over the communication bus from the ECM. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
ENGINE SPEED SIGNAL CIRCUIT OPEN
ENGINE SPEED SIGNAL CIRCUIT SHORTED GROUND
ENGINE SPEED SIGNAL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
ENGINE CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET set at 0? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the ECM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Engine Speed Signal circuit from the TCM harness connector to the ECM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Engine Speed Signal Circuit circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P0725-ENGINE SPEED SENSOR CIRCUIT - DIESEL — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the ECM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Engine Speed Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the Engine Speed Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the ECM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Engine Speed Signal circuit in the TCM harness connector. Is the voltage above 10.5 volts? Yes → Repair the Engine Speed Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition switch to the lock position. Replace and Program the Transmission Control Module per the Service Information. Start the engine and allow the engine to idle for 6 minutes. Did the P0725 DTC return? Yes → Go To 6 No → Test complete. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Pay particular attention to corroded terminals and all power and ground circuits. Repair as necessary. If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module per the Service Information. After completion of Engine Verification test make sure to perform Transmission Verification Test. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0725-ENGINE SPEED SENSOR CIRCUIT - DIESEL — Continued

TEST	ACTION	APPLICABILITY
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0731-GEAR RATIO ERROR IN 1ST

When Monitored and Set Condition:

P0731-GEAR RATIO ERROR IN 1ST

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0731-GEAR RATIO ERROR IN 1ST — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's If any of these DTC's are present, perform their respective tests first. Are DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868, or P0869 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 1st Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle or TPS Degree to 30°, for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the Clutch Test pass, Input Speed remain at zero? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not currently present. Check the gearshift linkage adjustment. Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit. Remove the Starter Relay. Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found. Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	Repair the transmission as necessary. If there were any line pressure DTC's present along with this DTC, make sure to inspect the Transmission Oil Pump and Pressure Control Solenoid per the Service Information. If the DTC's P0876 and/or P0875 are also present, replace the Transmission Solenoid/TRS Assembly in addition to necessary internal repairs. If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0732-GEAR RATIO ERROR IN 2ND

When Monitored and Set Condition:

P0732-GEAR RATIO ERROR IN 2ND

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
RELATED PRESSURE SWITCH DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0732-GEAR RATIO ERROR IN 2ND — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's If any of these DTC's are present, perform their respective tests first. Are DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868, and/ or P0869 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 2nd Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the clutch test pass, Input speed remain at zero? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not currently present. Check the gearshift linkage adjustment. Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333. Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, check for other transmission DTC's Is a DTC P0845 2C Hydraulic Pressure Switch and/or P0846 2C Pressure Switch present also? Yes → Repair the Transmission or Solenoid/TRS assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0732-GEAR RATIO ERROR IN 2ND — Continued

TEST	ACTION	APPLICABILITY
6	Repair internal transmission as necessary. If any line pressure DTCs are present along with this DTC, make sure to inspect the Transmission Oil Pump and Pressure Control Solenoid per the Service Information. If DTC's P0846 and/or P0845 are also present, replace the Transmission Solenoid/TRS Assembly in addition to internal repairs. If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0733-GEAR RATIO ERROR IN 3RD

When Monitored and Set Condition:

P0733-GEAR RATIO ERROR IN 3RD

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
PRESSURE SWITCH DTC'S PRESENT
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0733-GEAR RATIO ERROR IN 3RD — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868, or P0869 present also? Yes → Refer to the Transmission category and perform the appropriate symptom.. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 3rd Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the clutch test pass, Input speed remains at zero? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not currently present. Check the gearshift linkage adjustment. Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333. Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found. Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, check for other transmission DTC's Are the DTCs P0870 OD Hydraulic Pressure Switch and/or P0871 OD Pressure Switch present also? Yes → Repair the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0733-GEAR RATIO ERROR IN 3RD — Continued

TEST	ACTION	APPLICABILITY
6	Repair or replace the transmission as necessary. If the transmission is to be repaired, and there were any line pressure DTC's present along with this DTC, make sure to inspect the Transmission Oil Pump and Pressure Control Solenoid per the Service Information. NOTE: If DTC's P0871 and/or P0870 are also present, replace the Transmission Solenoid/TRS Assembly in addition to necessary internal repairs. If there are no possible causes remaining, view repair. Repair Repair internal transmission problem per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0734-GEAR RATIO ERROR IN 4TH

When Monitored and Set Condition:

P0734-GEAR RATIO ERROR IN 4TH

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
RELATED PRESSURE SWITCH DTC'S PRESENT
INTERNAL TRANSMISSION

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0734-GEAR RATIO ERROR IN 4TH — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868 or P0869 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other transmission DTC's Are the DTCs P0987 4C Hydraulic Pressure Switch and/or P0988 4C Pressure Switch present also? Yes → Repair the Transmission or Solenoid/TRS assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Repair or replace the transmission as necessary per the Service Information. If the transmission is to be repaired, and there were any line pressure DTC's present along with this DTC, make sure to inspect the Transmission Oil Pump and Pressure Control Solenoid per the Service Information. If DTC's P0988 and/or P0987 are also present, replace the Transmission Solenoid/TRS Assembly in addition to necessary internal repairs. If there are no possible causes remaining, view repair. Repair Repair internal transmission problem per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0735-GEAR RATIO ERROR 4TH PRIME

When Monitored and Set Condition:

P0735-GEAR RATIO ERROR 4TH PRIME

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0735-GEAR RATIO ERROR 4TH PRIME — Continued

<table>
<tr><th>TEST</th><th>ACTION</th><th>APPLICABILITY</th></tr>
<tr><td>2</td><td>With the DRBIII®, check for other transmission DTC's.
If any of these DTC's are present, perform their respective tests first.
Are the DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868 or P0869 present also?

Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No → Go To 3</td><td>All</td></tr>
<tr><td>3</td><td>With the DRBIII®, perform the 2nd Gear Clutch Test. Follow the instructions on the DRBIII® for the test.
With the DRBIII®, perform the 3rd Gear Clutch Test. Follow the instructions on the DRBIII® for the test.
NOTE: You must test the 2nd and 3rd clutches to verify 4th Prime operation.
Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds for each Gear tested.
CAUTION: Do not overheat the transmission.
NOTE: No DTC's will be set while using the DRBIII® to perform a clutch test.
Did both clutch tests pass, input speed remain at zero?

Yes → Go To 4

No → Go To 5</td><td>All</td></tr>
<tr><td>4</td><td>The conditions to set this DTC are not currently present.
Check the gearshift linkage adjustment.
Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.
Remove the Starter Relay.
NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.
Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333.
Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem.
Verify if the problem is only experienced under extreme hot or cold conditions.
With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.
Were there any problems found?

Yes → Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No → Test Complete.</td><td>All</td></tr>
<tr><td>5</td><td>If there are no possible causes remaining, view repair.

Repair
Repair internal transmission problem. If any Line Pressure DTC's are present along with this DTC, make sure to inspect the Transmission Oil Pump and the Pressure Control Solenoid per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.</td><td>All</td></tr>
</table>

Symptom:
P0736-GEAR RATIO ERROR IN REVERSE

When Monitored and Set Condition:

P0736-GEAR RATIO ERROR IN REVERSE

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0736-GEAR RATIO ERROR IN REVERSE — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. If any of these DTC's are present, perform their respective tests first. Are the DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868 or P0869 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they will cause a Speed Ratio Error. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the Reverse Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle , TPS Degree, to 30°, for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the clutch test pass, Input speed remain at zero? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not currently present. Check the shifter adjustment. Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Check the speed sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333. Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem. If there are any Line Pressure DTC's present along with this DTC, make sure to inspect the Transmission Oil Pump and Pressure Control Solenoid per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored and Set Condition:

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored: During Electronically Modulated Converter Clutch (EMCC) Operation.

Set Condition: Transmission must be in EMCC, with input speed > than 1750 RPM. TCC-L/R Solenoid achieves the maximum duty cycle and can not pull engine speed within 60 RPM of input speed. Also when the transmission is in FEMCC and the engine slips TCC > than 100 RPM for 10 seconds. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC P0750 PRESENT
INTERNAL TRANSMISSION
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read transmission DTC's. Is the DTC P0750 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Read and RECORD ALL Transmission DTC's. After recording DTC's, erase DTC's. Drive the vehicle until the transmission temperature is at least 43°C or 110°F. Perform the following steps 3 times. Drive the vehicle at 80 km/h or 50 MPH. Allow 4th gear to engage for at least 10 seconds. Close the Throttle. Tip back into the throttle until the TPS angle is between 25 and 29 degrees. **NOTE: If the throttle angle goes over 30 degrees, you must close the throttle and try again.** Did the TCC engage (Engine speed approximately equal to input speed) during any of the attempts? Yes → Go To 4 No → Go To 5	All
4	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
5	With the DRBIII®, check for other transmission DTC's. Are the DTCs P1775 and P0841 present also? Yes → Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Inspect the Primary Oil Pump and replace if necessary. If no problems are found in the Oil Pump, replace the Transmission Solenoid/TRS Assembly. Replace the Torque Converter in either case. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0750-LR SOLENOID CIRCUIT

When Monitored and Set Condition:

P0750-LR SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
LR SOLENOID CONTROL CIRCUIT OPEN
LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND
LR SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891, or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check the STARTS SINCE SET counter for P0750. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0750 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Monitor the LR Solenoid LED on the Transmission Simulator. With the DRBIII®, actuate the LR Solenoid. Did the LR Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the LR Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the LR Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the LR Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the LR Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the LR Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the LR Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **NOTE: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0750-LR SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0755-2C SOLENOID CIRCUIT

When Monitored and Set Condition:

P0755-2C SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2C SOLENOID CONTROL CIRCUIT OPEN
2C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
2C SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0755-2C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other Transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891 or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0755. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0755 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Monitor the 2C Solenoid LED on the Transmission Simulator. With the DRBIII®, actuate the 2C Solenoid. Did the 2C Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 2C Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 2C Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0755-2C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 2C Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the 2C Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2C Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the 2C Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **NOTE: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0755-2C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0760-OD SOLENOID CIRCUIT

When Monitored and Set Condition:

P0760-OD SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
OD SOLENOID CONTROL CIRCUIT OPEN
OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891 or P0888 present. Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0760. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0760 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay from the PDC. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Monitor the OD Solenoid LED on the Transmission Simulator. With the DRBIII®, actuate the OD Solenoid. Did the OD Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the OD Solenoid Control circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the OD Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the OD Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the OD Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the OD Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the OD Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0760-OD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0765-UD SOLENOID CIRCUIT

When Monitored and Set Condition:

P0765-UD SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
UD SOLENOID CONTROL CIRCUIT OPEN
UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTCs P0890, P0891or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0765 **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0765 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Monitor the UD Solenoid LED on the Transmission Simulator. With the DRBIII®, actuate the UD Solenoid. Did the UD Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the UD Solenoid Control circuit between the TCM harness connector and the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the UD Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the UD Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the UD Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the UD Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the UD Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **NOTE: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0765-UD SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0770-4C SOLENOID CIRCUIT

When Monitored and Set Condition:

P0770-4C SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
4C SOLENOID CONTROL CIRCUIT OPEN
4C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
4C SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0770-4C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891 or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P0770. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0770 set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Monitor the 4C Solenoid LED on the Transmission Simulator, Miller tool #8333. With the DRBIII®, actuate the 4C Solenoid. Did the 4C Solenoid LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair. Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 4C Solenoid Control circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 4C Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0770-4C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 4C Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the 4C Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 4C Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the 4C Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0770-4C SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0841-LR PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0841-LR PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate code is set if one of the pressure switches are open or closed at the wrong time in a given gear .

POSSIBLE CAUSES
LOSS OF PRIME P0944 PRESENT
RELATED RELAY DTC'S PRESENT
L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
L/R PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other Transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891, or P0888 present?. Yes → Refer to symptom list and perform test for the related Transmission Control Relay DTC (s). Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other Transmission DTC's. Is DTC P0944 present in addition to the DTC that you are diagnosing? Yes → Refer to symptom list and perform test for P0944. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0841. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 12	All
5	Turn the ignition off to the lock position. Remove the Starter Relay from the PDC. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to LR. With the DRBIII®, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 6 No → Go To 7	All
6	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the L/R Pressure Switch Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the L/R Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the L/R Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the L/R Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the L/R Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All

P0841-LR PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 11 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
12	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check for a Primary Oil Filter improperly installed. A dislodged Reverse Carrier Snap Ring will typically set this DTC on heavy throttle acceleration from a dead stop. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0845-2C HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0845-2C HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed above 1000 RPM, the TCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

POSSIBLE CAUSES
RELATED LINE PRESSURE DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
2C PRESSURE SWITCH SENSE CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT OPEN
POOR LINE PRESSURE SENSOR CONNECTION
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
EXCESSIVE DEBRIS IN OIL PAN
LINE PRESSURE SENSOR
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0845-2C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other transmission DTC's Are there any line pressure related DTC's P0867, P0932, P0868, P0869, or P0944 present? Yes → Refer to Symptom List for the related symptom(s). Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other transmission DTC's Is the DTC P0732 and/or P0846 present also? Yes → Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII, Check the STARTS SINCE SET counter for P0845. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 18	All

P0845-2C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Start the engine. Warm the transmission to 82° C or 180° F. Firmly apply the brakes. With the DRBIII®, monitor the Line Pressure during the following step. Move the shift lever to each gear position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range. Did the line pressure remain at a steady value between 585 and 655 Kpa or 85 or 95 PSI? Yes → Go To 6 No → Go To 10	All
6	Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Firmly push the Transmission Line Pressure Sensor connector towards the Transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator Miller tool# 8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. **NOTE: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Did the Line Pressure remain steady in all three positions? Yes → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All

P0845-2C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
10	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool # 8333. With the Transmission Simulator, turn the Pressure Switch selector to 2C. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the 2C Pressure Switch state during the following step. While pressing and holding the Pressure Switch test button, wiggle the wiring harness and connectors pertaining to the 2C Pressure Switch. Did the 2C Pressure Switch state change to closed and remain closed while wiggling the wires? Yes → Go To 11 No → Go To 13	All
11	Remove and inspect the Transmission Oil Pan per the Service Information. Does the Transmission Oil Pan contain excessive debris or contamination? Yes → Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All

P0845-2C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
12	If there are no possible causes remaining, view repair. Repair Repair Internal Transmission as necessary. Disassemble and inspect the Valve Body and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
13	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 2C Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 2C Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 2C Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the 2C Pressure Switch circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All
15	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2C Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the 2C Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 16	All

P0845-2C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 17 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
17	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
18	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0846-2C PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0846-2C PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate code is set if one of the pressure switches are open or closed at the wrong time in a given gear .

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
2C PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
2C PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0846-2C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891, or P0888 present? Yes → Refer to symptom list and perform test for Transmission Control Relay related DTCs. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0846, 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to 2C. With the DRBIII®, monitor the 2C Pressure Switch while pressing the Pressure Switch test button on the Transmission Simulator. Did the state of the 2C Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 2C Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 2C Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0846-2C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 2C Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the 2C Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2C Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the 2C Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0846-2C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check for a Primary Oil Filter improperly installed. A dislodged Reverse Carrier Snap Ring will typically set this DTC on heavy throttle acceleration from a dead stop. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0868-LINE PRESSURE LOW

When Monitored and Set Condition:

P0868-LINE PRESSURE LOW

When Monitored: Continuously while driving in a forward gear.

Set Condition: The TCM continuously monitors transducer Line Pressure Output and compares it to Desired Line Pressure. If transducer Line Pressure Output is more than 10 PSI below Desired Line Pressure, the DTC will set in approximately 2.1 seconds.

POSSIBLE CAUSES
CHECK FOR RELATED DTC'S
5 VOLT SUPPLY CIRCUIT OPEN
LINE PRESSURE SENSOR CONNECTION
5 VOLT SUPPLY CIRCUIT SHORT TO GROUND
5 VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
LINE PRESSURE SENSOR
PLUGGED FILTER
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0868-LINE PRESSURE LOW — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other transmission DTC's Is the DTC P0932 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check the STARTS SINCE SET counter for P0868. **NOTE: This counter only applies to the last DTC set.** Is the START SINCE SET COUNTER 2 or less? Yes → Go To 4 No → Go To 14	All
4	Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure, firmly push the Line Pressure Sensor harness connector towards the Transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All

P0868-LINE PRESSURE LOW — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator Miller tool# 8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. **NOTE: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Did the Line Pressure remain steady in all three positions? Yes → Go To 6 No → Go To 9	All
6	Turn the ignition off to the lock position. Install the Line Pressure Adaptor, Miller tool# 8259, and the Pressure Gage, Miller tool# C-3293, 0 to 2000 kPa or 0 to 300 PSI. Start the engine in park. With the DRBIII® monitor the Line Pressure. Monitor the reading on the Pressure Gage Miller tool# C-3293. Compare the Line Pressure readings between the DRBIII® and the Pressure Gage. Is the Line Pressure Gauge reading within 34 kPa or 5 PSI of the DRBIII® reading? Yes → Go To 7 No → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information. Remove and inspect the Primary Oil Filter per the Service Information. **NOTE: Make sure the Primary Transmission Oil Filter and/or O-ring is not cracked or split.** Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked or plugged? Yes → Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or O-ring. If the Primary Transmission Oil Filter is plugged refer to the Service Information for the proper Hydraulic repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Repair internal transmission problem per the Service Information. Inspect the oil pump per the Service Information and replace if necessary. If no problem is found, replace the Transmission Solenoid/TRS assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0868-LINE PRESSURE LOW — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance Below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All
11	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. Place a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage of the 5-volt Supply circuit in the TCM harness connector. Is the voltage above 5.5 volts? Yes → Repair the 5-volt Supply circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All
12	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Pressure Control Solenoid control circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Pressure Control Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 13	All

P0868-LINE PRESSURE LOW — Continued

TEST	ACTION	APPLICABILITY
13	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
14	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0869-LINE PRESSURE HIGH

When Monitored and Set Condition:

P0869-LINE PRESSURE HIGH

When Monitored: Continuously while driving in a forward gear.

Set Condition: The PCM continously monitors Actual Line Pressure. If the Actual Line Pressure reading is greater than the highest Desired Line Pressure ever used in the current gear, while the Pressure Control Solenoid duty cycle is at or near its maximum value (which should result in minimum line pressure), this code will set.

POSSIBLE CAUSES
CHECK FOR RELATED DTC'S
5-VOLT SUPPLY CIRCUIT OPEN
POOR LINE PRESSURE SENSOR CONNECTION
PRESSURE CONTROL SOLENOID CONTROL CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO GROUND
INTERNAL TRANSMISSION - LINE PRESSURE HIGH
LINE PRESSURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0869-LINE PRESSURE HIGH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other Transmission DTC's Is the DTC P0932 present also? Yes → Refer to symptom list for problems related to P0932. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	The transmission temperature must be at least 180° F or 82° C for the results of this test to be valid. With the DRBIII®, check the STARTS SINCE SET counter for P0869. Is the STARTS SINCE SET COUNTER 2 or less? Yes → Go To 4 No → Go To 13	All
4	Ignition on, engine not running. With the DRBIII®, monitor the Transmission Line Pressure. Firmly push the Line Pressure Sensor harness connector inward towards the Transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the sensor connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All

P0869-LINE PRESSURE HIGH — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator Miller tool# 8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. **NOTE: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Did the Line Pressure remain steady in all three positions? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off to the lock position. Install the Line Pressure Adaptor, Miller tool# 8259, and the Pressure Gauge, Miller tool# C-3293, 0 to 2000 kPa or 0 to 300 PSI. Start the engine in park. With the DRBIII®, monitor the Line Pressure. Monitor the reading on the Pressure Gauge, Miller tool# C-3293. Compare the Line Pressure reading between the DRBIII® and the Pressure Gauge. Is the Pressure Gauge reading within 34 kPa or 5 PSI of the DRBIII® reading? Yes → Go To 7 No → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. Inspect the Transmission Oil Pump per the Service Information and replace if necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly - stuck Pressure Control Solenoid. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the Transmission Control Module harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All

P0869-LINE PRESSURE HIGH — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Transmission Solenoid /TRS harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Pressure Control Solenoid Control circuit from the Transmission Control Module harness connector to the Solenoid/TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Pressure Control Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 11	All
11	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Transmission Solenoid/TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Pressure Control Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Pressure Control Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All
12	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0869-LINE PRESSURE HIGH — Continued

TEST	ACTION	APPLICABILITY
13	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0870-OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0870-OD HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed above 1000 RPM, the TCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets.

POSSIBLE CAUSES
RELATED LINE PRESSURE DTC'S PRESENT
5-VOLT SUPPLY CIRCUIT OPEN
OD PRESSURE SWITCH SENSE CIRCUIT OPEN
POOR LINE PRESSURE SENSOR CONNECTION
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
EXCESSIVE DEBRIS IN OIL PAN
LINE PRESSURE SENSOR
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other Transmission DTC's. Are there any Line Pressure related DTC's P0867, P0932, P0868, P0869, or P0944 present? Yes → Refer to symptom list and perform appropriate test. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other Transmission DTC's. Is the DTC P0733 and/or P0871 present also? Yes → Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0870. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 18	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Start engine. Warm transmission to 82° C or 180 ° F. Firmly apply brakes. With the DRBIII®, monitor the Transmission Line Pressure. Move the shift lever to each gear position and record the Line Pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range. Did the Line Pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI? Yes → Go To 6 No → Go To 10	All
6	Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure while firmly pushing the Line Pressure Sensor connector towards the Transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor harness connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator, Miller tool #8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, turn the selector switch to each of the 3 Line Pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Did the Line Pressure remain steady in all 3 positions? Yes → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
10	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the OD Pressure Switch state during the following steps. With the Transmission Simulator Miller tool# 8333, place the selector switch on OD. While pressing the Pressure Switch test button, wiggle the wiring harness and connectors pertaining to the OD Pressure Switch. Did the OD pressure switch state change to closed and remain closed while wiggling the wires? Yes → Go To 11 No → Go To 13	All
11	Remove and inspect the Transmission Oil Pan per the Service Information. Does the Transmission Oil Pan contain excessive debris or contamination? Yes → Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All
12	If there are no possible causes remaining, view repair. Repair Repair Internal Transmission as necessary. Disassemble and inspect the Valve Body and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the OD Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the OD Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the OD Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the OD Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All
15	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the OD Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the OD Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 16	All

P0870-OD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit at the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 17 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
17	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
18	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0871-OD PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0871-OD PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate code is set if one of the pressure switches are open or closed at the wrong time in a given gear.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
OD PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
OD PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's, P0890, P0891, or P0888 present? Yes → Refer to symptom list and perform test for Transmission Control Relay related DTCs. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, Check the STARTS SINCE SET counter for P0871. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to OD. With the DRBIII®, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the state of the OD Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Relay output circuit in the Transmission Solenoid/TRS harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 7 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the OD Pressure Switch Sense circuit at the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the OD Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance of the OD Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the OD Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All

P0871-OD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the OD Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the OD Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check for a Primary Oil Filter not installed correctly and for a dislodged Reverse Carrier Snap Ring which will typically set this DTC on heavy throttle acceleration from a dead stop. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0875-UD HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0875-UD HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed above 1000 RPM, the TCM momentarily turns on element pressure to the clutch circuits do not have pressure to identify the correct pressure switch closes. If the pressure switch does not close two times, the DTC sets.

POSSIBLE CAUSES
LINE PRESSURE DTC'S PRESENT
SPEED RATIO AND/OR PRESSURE SWITCH DTC'S PRESENT
POOR LINE PRESSURE SENSOR CONNECTION
5-VOLT SUPPLY CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
UD PRESSURE SWITCH SENSE CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
EXCESSIVE DEBRIS IN OIL PAN
LINE PRESSURE SENSOR
INTERNAL TRANSMISSION
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0875-UD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other Transmission DTC's Are there any line pressure related DTC's, P0867, P0932, P0868, P0869, or P0944 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other transmission DTC's Are the DTC's P0731, P0732, P0733 and/or P0876 present? Yes → Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0875. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 18	All

P0875-UD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Start engine. Warm the transmission to 82° C or 180° F. Firmly apply brakes. With the DRBIII®, monitor the Line Pressure in the following step. Move the shift lever to each gear position and record the Line Pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range. Did the Line Pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI? Yes → Go To 6 No → Go To 10	All
6	Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure for the following step. Firmly push the Line Pressure Sensor connector inward towards the Transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor harness connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Remove the Starter Relay from the PDC. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator Miller tool #8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. **NOTE: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure in the following step. With the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Did the Line Pressure remain steady in all three positions? Yes → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All

P0875-UD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance Below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
10	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, monitor the UD Pressure Switch state. With the Transmission Simulator, turn the selector switch on UD. While pressing and holding the Pressure Switch test button, wiggle the wiring harness and connectors pertaining to the UD Pressure Switch. Did the UD Pressure Switch state change to closed and remain closed while wiggling the wires? Yes → Go To 11 No → Go To 13	All
11	Remove and inspect Transmission Oil Pan per the Service Information. Does it contain excessive debris or contamination? Yes → Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All
12	If there are no possible causes remaining, view repair. Repair Repair Internal Transmission as necessary. Disassemble and inspect the Valve Body and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0875-UD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the UD Pressure Switch Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the UD Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the UD Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the UD Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All
15	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the UD Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the UD Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 16	All

P0875-UD HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **NOTE: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 17 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
17	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
18	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0876-UD PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0876-UD PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: This DTC is set if the UD pressure switch is in the wrong state for the current gear. For example, this code would be set if the UD pressure switch remained off while the transmission was in second gear.

POSSIBLE CAUSES
RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
UD PRESSURE SWITCH SENSE CIRCUIT OPEN
UD PRESSURE SWITCH CIRCUIT SHORT TO GROUND
UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
UD PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0876-UD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTCs P0890, P0891, and/or P0888 present? Yes → Refer to symptom list and perform test for Transmission Control Relay related DTC's. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, Check the STARTS SINCE SET counter for P0876. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a TCM - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to UD. With the DRBIII®, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the UD Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the UD Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0876-UD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the UD Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the UD Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the UD Pressure Switch Sense circuit. Is the voltage above 0.5 volt? Yes → Repair the UD Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between Transmission Control Relay circuit and Fused B(+). Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair. Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0876-UD PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check for a Primary Oil Filter not installed correctly and a dislodged Reverse Carrier Snap Ring which will typically set this DTC on heavy throttle acceleration from a dead stop. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0884-POWER UP AT SPEED

When Monitored and Set Condition:

P0884-POWER UP AT SPEED

When Monitored: When Transmission Control Module powers up.

Set Condition: This DTC will set if the TCM powers up and senses the vehicle in a valid forward gear, with no PRNDL DTCs, and a output speed above 800 RPM, approximately 32Km/h or 20 MPH.

POSSIBLE CAUSES
POWER UP AT SPEED

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	This DTC is set when the TCM is initialized while the vehicle is moving down the road in a valid forward gear. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. **NOTE: Check all of the Fused B(+), Fused Ignition Switch Output, and ground circuits to the TCM for an intermittent open or short to ground.** Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. If there are no possible causes remaining, view repair. Repair Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0888-RELAY OUTPUT ALWAYS OFF

When Monitored and Set Condition:

P0888-RELAY OUTPUT ALWAYS OFF

When Monitored: Continuously

Set Condition: This code is set when less than 3 volts are present at the transmission control relay output (pins 16,17 and 36) circuits at the Transmission Control Module (TCM) when the TCM is energizing the relay.

POSSIBLE CAUSES
FUSED B+ CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORTED TO GROUND
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
TRANSMISSION CONTROL RELAY STUCK OPEN
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0888-RELAY OUTPUT ALWAYS OFF — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0888. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set to 0? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition off to the lock position. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused B(+) circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Turn the ignition off to the lock position. Disconnect the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transmission Control Relay ground circuit in the Transmission Control Relay connector.. Is the resistance above 5.0 ohms? Yes → Repair the Transmission Control Relay Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Using a 12-volt test light connected to ground, check the all three Transmission Control Relay Output circuits in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly on all three circuits? Yes → Go To 6 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0888-RELAY OUTPUT ALWAYS OFF — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transmission Control Relay Output circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transmission Control Relay Output circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Transmission Control Relay Control circuit between the Transmission Control Relay connector and the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Transmission Control Relay Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Transmission Control Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transmission Control Relay Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Measure the voltage of the Transmission Control Relay Output circuit in the TCM harness connector. Is the voltage above 10.0 volts? Yes → Replace the Transmission Control Relay. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All

P0888-RELAY OUTPUT ALWAYS OFF — Continued

TEST	ACTION	APPLICABILITY
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0890-SWITCHED BATTERY

When Monitored and Set Condition:

P0890-SWITCHED BATTERY

When Monitored: Ignition key is turned from ″off″ position to ″run″ position and/or ignition key is turned from ″crank″ position to ″run″ position.

Set Condition: This code is set if the Transmission Control Module (TCM) senses voltage on any of the pressure switch inputs prior to the TCM energizing the relay.

POSSIBLE CAUSES
PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter for P0890. **NOTE: This counter only applies to the last DTC set.** Is the ″Starts Since Set″ counter equal to zero? Yes → Go To 3 No → Go To 5	All

P0890-SWITCHED BATTERY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 2C, 4C, LR, OD, and UD Pressure Switch Sense circuits in the TCM harness connector. Is the voltage above 0.5 volt on any of the sense circuits? Yes → Repair the Pressure Switch Sense circuit in question for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0891-TRANSMISSION RELAY ALWAYS ON

When Monitored and Set Condition:

P0891-TRANSMISSION RELAY ALWAYS ON

When Monitored: When ignition key is turned from ″off″ position to ″run″ position and/or ignition key is turned from ″crank″ position to ″run″ position.

Set Condition: This code is set if the Transmission Control Module (TCM) senses greater than 3 volts at the Trans Control Relay Output terminal(s) of the TCM prior to the TCM energizing the relay.

POSSIBLE CAUSES
TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL RELAY STUCK CLOSED
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC’s. Check and repair all engine DTC’s prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC’s. Record all DTC’s and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC’s, check and record all CVI’s. Most DTC’s set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB’s related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0891-TRANSMISSION RELAY ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter equal to 0? Yes → Go To 3 No → Go To 7	All
3	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage at the Transmission Control Relay Control circuit in the Transmission Control Relay connector. Is the voltage above 0.5 volts? Yes → Repair the Transmission Control Relay Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off to the lock position. Remove the Transmission Control Relay. Ignition on, engine not running. Measure the voltage at the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Is the voltage above 0.5 volts? Yes → Repair the Transmission Control Relay Output circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Fused B+ circuit and the Transmission Control Relay Output Circuit, Pins 30 and 87, of the Transmission Control Relay. Is the resistance above 5.0 ohms? Yes → Go To 6 No → Replace the Transmission Control Relay. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0891-TRANSMISSION RELAY ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0932-LINE PRESSURE SENSOR CIRCUIT FAULT

When Monitored and Set Condition:

P0932-LINE PRESSURE SENSOR CIRCUIT FAULT

When Monitored: Continuously while driving in a forward gear.

Set Condition: The PCM comtinously monitors Actual Line Pressure and compares it to Desired Line Pressure. If the Actual Line Pressure reading is more than 172.4 kPa (25 psi) higher than the Desired Line Pressure, but is less than the highest Line Pressure ever used in the current gear, this code will set.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
POOR CONNECTION OR WIRING
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0932-LINE PRESSURE SENSOR CIRCUIT FAULT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any other line pressure related DTC's P0934, P0935, P0868, or P0869 present? Yes → Refer to the Transmission category and perform the appropriate symptom. If the DTC P0934 and/or P0935 are present, perform these tests first. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	**CAUTION: Apply Parking Brake** Start the engine. **CAUTION: Firmly apply the brakes.** With the DRBIII®, monitor the Line Pressure, Desired Line Pressure and the TPS Degree. While firmly applying the brakes place shifter in the R position. Then slowly press the accelerator pedal to a TPS degree of 15. Compare the Line Pressure reading to the Desired Line Pressure reading on the DRBIII®. Does the Line Pressure and Desired Line Pressure stay within ± 34 kPa or 5 PSI? No → Go To 4 Yes → Go To 8	All
4	With the DRBIII®, monitor the Line Pressure Sensor voltage while wiggling the wiring harness and connectors pertaining to the Line Pressure Sensor and the Transmission Solenoid/TRS Assembly. Did the voltage remain steady while wiggling the wiring harness and connectors? Yes → Go To 5 No → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install Transmission Simulator Miller tool #8333. With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch. Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, turn the selector switch to each of the 3 Line Pressure positions. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Does the Line Pressure fluctuate up and down more than 69 kPa or 10 PSI at any of the positions? Yes → Go To 6 No → Go To 7	All

P0932-LINE PRESSURE SENSOR CIRCUIT FAULT — Continued

TEST	ACTION	APPLICABILITY
6	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
7	If there are no possible causes remaining, view repair. Repair Repair internal transmission per the Service Information. inspect the Oil Pump and replace if necessary per Service Information. If no problem is found, replace the Transmission Solenoid/TRS Assembly for a stuck Pressure Control Solenoid. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Where there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0934-LINE PRESSURE SENSOR LOW

When Monitored and Set Condition:

P0934-LINE PRESSURE SENSOR LOW

When Monitored: Continuously with engine running and Output Speed greater than 390 RPM.

Set Condition: This DTC will set when the Line Pressure Sensor output is less than 0.35 volts for 1.4 seconds.

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
LINE PRESSURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0934-LINE PRESSURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 3 No → Go To 9	All
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator Miller tool #8333. Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure. Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions. Note: The readings should be within ± 2.0 PSI on the DRBIII® of the pressure reading specified on Transmission Simulator. Does the Line Pressure on the DRBIII® match the pressures on the Transmission Simulator? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0934-LINE PRESSURE SENSOR LOW — Continued

TEST	ACTION	APPLICABILITY
7	Turn ignition switch to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Line Pressure Sensor Signal circuit and ground. Is the resistance Below 5.0 ohms? Yes → Repair the Line Pressure Sensor Signal circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
9	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0935-LINE PRESSURE SENSOR HIGH

When Monitored and Set Condition:

P0935-LINE PRESSURE SENSOR HIGH

When Monitored: Continuously with engine running, Output Speed greater than 390 RPM and Desired Line Pressure less than 200.

Set Condition: This DTC will set if is Line Pressure Sensor Output is greater than 4.75 volts for 1.4 seconds.

POSSIBLE CAUSES
LINE PRESSURE SENSOR GROUND CIRCUIT OPEN
LINE PRESSURE SENSOR SIGNAL CIRCUIT OPEN
LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
LINE PRESSURE SENSOR
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0935-LINE PRESSURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 3 No → Go To 9	All
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure. Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions. Note: The readings should be within ± 2.0 PSI on the DRBIII® of the pressure reading specified on Transmission Simulator. Does the Line Pressure on the DRBIII® match the pressures on the Transmission Simulator? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Ground circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Line Pressure Sensor Signal circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Line Pressure Sensor Signal circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0935-LINE PRESSURE SENSOR HIGH — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Relay connector. Turn ignition on. Measure the voltage of the Line Pressure Sensor Signal circuit. Is the voltage above 5.5 volts? Yes → Repair the Line Pressure Sensor Signal circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
9	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0944-LOSS OF PRIME

When Monitored and Set Condition:

P0944-LOSS OF PRIME

When Monitored: If the transmission is slipping in any forward gear and the pressure switches are not indicating pressure, a loss of prime test is run.

Set Condition: If the transmission begins to slip in a forward gear and the pressure switch(s) that should be closed are open a loss of prime test begins. Available elements are turned on by the TCM to see if pump prime exists. The DTC sets if no pressure switch(s) respond.

POSSIBLE CAUSES
INVALID PRNDL CODE
TRANSMISSION OIL FILTER
TRANSMISSION OIL PUMP
INTERMITTENT OPERATION

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0944-LOSS OF PRIME — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine. The transmission must be at operating temperature prior to checking pressure. A cold transmission will give higher readings. Firmly apply the brakes and place the gear selector in reverse. With the DRBIII®, monitor the Transmission Line Pressure. Is the Line Pressure below 1034 kpa (150 PSI) or is it fluctuating more than +/- 69 kpa (10 PSI). No → Go To 3 Yes → Go To 4	All
3	The conditions necessary to set this DTC are not present at this time. Verify with the customer if a delayed engagement and/or an intermittent ″No Drive″ condition has occurred. If the customers answer is ″No″ erase the DTC and return the vehicle to the customer. Make sure to check for any TSBs or controller flash updates that my apply. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Has the customer experienced any delayed engagement and/or ″No Drive″ conditions? Yes → Repair internal transmission problem as necessary. Replace the Transmission Oil Pump if inspection reveals no signs of internal seal leakage. Refer to the Service Information for the proper repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All
4	Using the DRBIII®, perform a Shift Lever Position test. Follow the instructions on the DRBIII®. Did the Shift Lever Position Test pass? Yes → Go To 5 No → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Remove and inspect the Transmission Oil Pan per the Service Information. Remove and inspect the Primary Oil Filter per the Service Information. Inspect the oil filter O-ring for damage and proper installation. Does the Oil Pan contain excessive debris and/or is the Oil Filter plugged or O-ring damaged? Yes → Repair the cause of the plugged transmission oil filter or excessive debris, Seal installed onto filter neck instead of into pump bore, seal not fully seated against pump housing, filter neck not engaged into pump. See Service information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P0944-LOSS OF PRIME — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Repair or replace the Transmission Oil Pump as necessary. Refer to the Service Information for the proper repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P0987-4C HYDRAULIC PRESSURE TEST FAILURE

When Monitored and Set Condition:

P0987-4C HYDRAULIC PRESSURE TEST FAILURE

When Monitored: In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.

Set Condition: After a shift into a forward gear, with engine speed > 1000 RPM, the TCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets

POSSIBLE CAUSES
LINE PRESSURE DTC'S PRESENT
POOR LINE PRESSURE SENSOR CONNECTION
4C PRESSURE SWITCH SENSE CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
EXCESSIVE DEBRIS IN OIL PAN
LINE PRESSURE SENSOR
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

P0987-4C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other transmission DTC's Are there any Line Pressure related DTC's P0867, P0932, P0868, P0869, or P0944 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, check for other transmission DTC's Is the DTC P0734 and/or P0988 present also? Yes → Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	With the DRBIII®, Check the STARTS SINCE SET counter for P0987. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 5 No → Go To 18	All

P0987-4C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Start the engine. Warm the transmission to 82° C or 180° F. With the DRBIII®, monitor the Transmission Line Pressure. **CAUTION: Firmly apply the brakes.** With the brakes firmly applied, move the shift lever to each gear position and record the Transmission Line Pressure for each position. Allow the pressure to stabilize for at least 5 seconds in each range. Did the line pressure remain at a steady value between 586 and 655 Kpa or 85 and 95 PSI? Yes → Go To 6 No → Go To 10	All
6	Ignition on, engine not running. With the DRBIII® in Sensors, monitor the Actual Line Pressure. While monitoring the Line Pressure, firmly push the Line Pressure Sensor harness connector towards the transmission. Did the Line Pressure change to about 207 kPa or 30 PSI when the harness connector was pushed? Yes → Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition off to the lock position. Remove the Starter Relay from the PDC. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. With the Transmission Simulator on the Input/Output Speed switch select the OFF position. **NOTE: All three DRBIII® Line Pressure readings should be steady and ± 2.0 PSI of the reading specified on the Transmission Simulator.** Ignition on, engine not running. With the DRBIII®, monitor the Line Pressure during the following step. Using the Transmission Simulator, turn the selector switch to each of the 3 Line Pressure positions. Did the Line Pressure remain steady in all three positions? Yes → Replace the Line Pressure Sensor per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All

P0987-4C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 5-volt Supply circuit from the Line Pressure Sensor harness connector to the TCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 5-volt Supply circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Line Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Repair 5-volt supply circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 17	All
10	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. On the Transmission Simulator, place the Pressure Switch selector switch to 4C. With the DRBIII®, monitor the 4C Pressure Switch state during the following step. Press the Pressure Switch Test button on the Transmission Simulator while wiggling the wiring pertaining to the 4C Pressure Switch. Did the 4C Pressure Switch state change to closed and remain closed while wiggling the wires? Yes → Go To 11 No → Go To 13	All
11	Remove and inspect Transmission Oil Pan per Service Information. Does the Transmission Oil Pan contain excessive debris or contamination? Yes → Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 12	All

P0987-4C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
12	If there are no possible causes remaining, view repair. Repair Repair Internal Transmission as necessary. Disassemble and inspect the Valve Body and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
13	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 4C Pressure Switch Sense circuit between the TCM harness connector to the Solenoid/TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 4C Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 14	All
14	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 4C Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the 4C Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 15	All
15	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Transmission Solenoid/TRS harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 4C Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the 4C Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 16	All

P0987-4C HYDRAULIC PRESSURE TEST FAILURE — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS harness connector. Remove the Transmission Control Relay. Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 17 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
17	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
18	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P0988-4C PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0988-4C PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: This DTC is set if the 4C pressure switch is in the wrong state for the current gear. For example, this code would be set if the 4C pressure switch came on while the transmission was in second gear.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
4C PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
4C PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0988-4C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTC's P0890, P0891, or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P0988, 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator turn the Pressure Switch selector switch to 4C. With the DRBIII®, monitor the 4C Pressure Switch state while pressing the Pressure Switch Test button. Did the state of the 4C Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the 4C Pressure Switch Sense circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the 4C Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P0988-4C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the 4C Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the 4C Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Control Module harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the 4C Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the 4C Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0988-4C PRESSURE SWITCH SENSE CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Check for a Primary Oil filter installed incorrectly. A dislodged Reverse Carrier Snap Ring will typically set this DTC on heavy throttle acceleration from a dead stop. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1684-BATTERY WAS DISCONNECTED

When Monitored and Set Condition:

P1684-BATTERY WAS DISCONNECTED

When Monitored: Whenever the ignition is in the Run/Start position.

Set Condition: This DTC is set whenever the Transmission Control Module is disconnected from battery power (Fused B+) and/or ground. It will also be set during a DRBIII® Battery Disconnect procedure and/or a Quick Learn procedure.

POSSIBLE CAUSES
BATTERY WAS DISCONNECTED
DRBIII® BATTERY DISCONNECT PERFORMED
QUICK LEARN WAS PERFORMED
TCM WAS REPLACED OR DISCONNECTED
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	This DTC is an informational DTC only. This DTC is set due to a momentary loss of the Fused B+ and/or ground to the TCM. Continue to view the possible causes for this DTC. Continue Go To 3	All

P1684-BATTERY WAS DISCONNECTED — Continued

TEST	ACTION	APPLICABILITY
3	Has the battery recently been disconnected, lost it's charge, or been replaced? Yes → This is the cause of the DTC. Erase the DTC and return the vehicle to the customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Has a DRBIII® Battery Disconnect procedure been performed? Yes → This is the cause of the DTC. Erase the DTC and return the vehicle to the customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Has a QUICK LEARN been performed with the DRBIII®? Yes → This is the cause of the DTC. Erase the DTC and return the vehicle to the customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Has the TCM been replaced or disconnected? Yes → Replacing or disconnecting the TCM will set this DTC. Erase the DTC and return the vehicle to the customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. Pay particular attention to the Fused B+ and all ground circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1694-BUS COMMUNICATION WITH ENGINE MODULE

When Monitored and Set Condition:

P1694-BUS COMMUNICATION WITH ENGINE MODULE

When Monitored: Continuously with ignition key on.

Set Condition: If no bus messages are received from the Powertrain Control Module (PCM) for 10 seconds. Note: Some after market equipment will also set this DTC. example: remote starters and communication equipment.

POSSIBLE CAUSES
OTHER BUS PROBLEMS PRESENT
PCI BUS CIRCUIT OPEN
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter equal to zero? Yes → Go To 3 No → Go To 6	All

P1694-BUS COMMUNICATION WITH ENGINE MODULE — Continued

TEST	ACTION	APPLICABILITY
3	With the DRBIII®, attempt to communicate with other modules on the vehicle, check for evidence of a vehicle bus problem. Bus related DTC's in other modules point to an overall vehicle bus problem. Other symptoms such as a customer complaint of intermittent operation of bus controlled features also indicate a bus problem. Does the PRNDL display indicate "No Bus" or is there any evidence of an overall vehicle bus problem? Yes → Refer to the Communication Category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the PCI Bus circuit from the PCM harness connector to the Data Link Connector. **NOTE: CAREFULLY PROBE THE DLC. DAMAGE TO THE DLC TERMINALS WILL RESULT IN POOR TERMINAL TO PIN CONNECTION.** Is the resistance above 5.0 ohms? Yes → Repair the open PCI Bus circuit between the PCM and the Data Link Connector. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Note: Some after market equipment will set this DTC. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1715-RESTRICTED PORT IN T3 RANGE

When Monitored and Set Condition:

P1715-RESTRICTED PORT IN T3 RANGE

When Monitored: Whenever the PRNDL code indicates Temp3.

Set Condition: This code sets whenever the conditions for a code P1776 (47) are satisfied with the shifter in the temp3 zone. This causes a restricted port.

POSSIBLE CAUSES
RELATED TRANSMISSION DTC'S PRESENT
CUSTOMER DRIVING HABITS
MISADJUSTED SHIFTER

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, check for other transmission DTC's Are any of the following DTC's P0731, P0732, P0733, P0734, P1736 or P0715 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All

P1715-RESTRICTED PORT IN T3 RANGE — Continued

TEST	ACTION	APPLICABILITY
3	Check Shifter adjustment per the Service Information. Adjust if necessary. Did the shifter need to be adjusted?. Yes → Adjust the shift linkage per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 4	All
4	This DTC can be set if the customer rests his or her hand on the shift lever while they are driving. The transmission can be put in the T3 position if just enough forward pressure is exerted on the shift lever. When this occurs, the feed port to the clutch is restricted, the transmission will declare neutral, and this DTC will be set. The customer should be informed not to rest his or her hand on the shifter while driving. This DTC can also be set by simply bumping the shift lever toward neutral while accelerating. If there are no possible causes remaining, view repair. Repair This DTC can be set by putting too much forward pressure on the shift lever while it is in the OD position. Make sure the customer is informed. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P1736-GEAR RATIO ERROR IN 2ND PRIME

When Monitored and Set Condition:

P1736-GEAR RATIO ERROR IN 2ND PRIME

When Monitored: The transmission gear ratio is monitored continuously while the transmission is in gear.

Set Condition: If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
INTERNAL TRANSMISSION
INTERMITTENT GEAR RATIO ERRORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1736-GEAR RATIO ERROR IN 2ND PRIME — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's Are any of the DTC's P0944, P0715, P0720, P1794, P0867, P0932, P0868, or P0869 also present? Yes → If any of these DTCs are present, they will cause a speed ratio error. Refer to appropriate symptom in the Transmission category. Perform the test for P0944 first if it is present. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, perform the 2nd prime Gear Clutch Test. Follow the instructions on the DRBIII®. Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds. **CAUTION: Do not overheat the transmission.** Did the clutch test pass, Input Speed remain at zero? Yes → Go To 4 No → Go To 5	All
4	The conditions to set this DTC are not currently present. Check the gearshift linkage adjustment. Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit. Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool # 8333. Gear ratio DTC's can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. If there are no possible causes remaining, view repair. Repair Repair as necessary. Refer to the Service information for the proper internal repair procedure. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	If there are no possible causes remaining, view repair. Repair Repair transmission as necessary. If there were any line pressure DTC's present along with this DTC, make sure to inspect the pump and Pressure Control Solenoid per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION

When Monitored and Set Condition:

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION

When Monitored: During an attempted shift into 1st gear.

Set Condition: This DTC is set if three unsuccessful attempts are made to get into 1st gear in one given ignition start. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC P0841 PRESENT
LR PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's Is the DTC P0841 present also? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter for P1775 at 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to LR. With the DRBIII®, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary. Inspect the Solenoid Switch Valve per the Service Information and repair or replace as necessary. If no problems are found, replace the Transmission Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the LR Pressure Switch Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the LR Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the LR Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the LR Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the LR Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the LR Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. This DTC can also be set by the Solenoid Switch Valve intermittently sticking in it's bore under extreme temperature conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION

When Monitored and Set Condition:

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION

When Monitored: Continuously when doing partial or full EMCC - PEMCC or FEMCC.

Set Condition: If the transmission senses the L/R Pressure Switch closing while performing PEMCC or FEMCC. This DTC will set after two unsuccessful attempts to perform PEMCC or FEMCC and can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
RELATED DTC P0841 PRESENT
LR PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's Is the DTC P0841 present also? Yes → Refer to symptom list and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	Perform a visual inspection of all connectors, wiring, and cooler connections before proceeding. Repair as necessary. With the DRBIII®, Check the STARTS SINCE SET counter. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter 2 or less? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, turn the Pressure Switch selector switch to LR. With the DRBIII®, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator. Did the state of the LR Pressure Switch change while pressing the Pressure Switch Test button? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Per the Service Information repair internal transmission as necessary. Inspect the Solenoid Switch Valve and repair or replace as necessary. If no problems are found with the Solenoid Switch Valve then replace the Solenoid/TRS Assembly. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the LR Pressure Switch Sense circuit from the TCM harness connector to the Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the LR Pressure Switch Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the LR Pressure Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the LR Pressure Switch Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Measure the voltage of the L/R Pressure Switch Sense circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the LR Pressure Switch Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Transmission Solenoid/TRS Assembly harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. This DTC can also be set by the Solenoid Switch Valve intermittently sticking in it's bore under extreme temperature conditions. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1790-FAULT IMMEDIATELY AFTER SHIFT

When Monitored and Set Condition:

P1790-FAULT IMMEDIATELY AFTER SHIFT

When Monitored: After a speed ratio error is stored.

Set Condition: This DTC is set if a associated speed ratio DTC is stored within 1.3 seconds after a shift.

POSSIBLE CAUSES
FAULT AFTER SHIFT

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	This DTC is set along with a speed ratio DTC. Check 1 trip failures if there are no speed ratio DTC's that are current. If there are no possible causes remaining, view repair. Repair This DTC is set if an associated speed ratio DTC is stored within 1.3 seconds after a shift. Refer to the Transmission category and perform the appropriate speed ratio symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P1793-TRD LINK COMMUNICATION ERROR

When Monitored and Set Condition:

P1793-TRD LINK COMMUNICATION ERROR

When Monitored: During torque managed shifts with Throttle angle above 54 degrees. This system is also tested whenever the vehicle is stopped and the engine speed is below 1000 RPM.

Set Condition: This code is set when the Transmission Control Module sends two subsequent Torque Reduction messages (pulses the TRD ckt to ground) to the Powertrain Control Module via the TRD link circuit and the TCM does not receive a confirmation from the PCM over the communication bus.

POSSIBLE CAUSES
RELATED DTC'S PRESENT
TORQUE MANAGEMENT REQUEST SENSE CIRCUIT OPEN
TORQUE MANAGEMENT REQUEST SENSE CIRCUIT SHORT TO GROUND
TORQUE MANAGEMENT REQUEST SENSE CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P1793-TRD LINK COMMUNICATION ERROR — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's Are any of the DTCs P1694, P0731, P0732, P0733, P0734, and/or P1736 present also? Yes → If any of these DTCs are present, disregard the P1793 DTC. Refer to the Transmission category and perform the appropriate symptom.. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P1793. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET set at 0? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the PCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Torque Management Request Sense circuit from the TCM harness connector to the PCM harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Torque Management Request Sense circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the PCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Torque Management Request Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the Torque Management Request Sense circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All

P1793-TRD LINK COMMUNICATION ERROR — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Torque Management Request Sense circuit in the TCM harness connector. Is the voltage above 10.5 volts? Yes → Repair the Torque Management Request Sense circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All
7	Turn the ignition switch to the lock position. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Turn the ignition on. Measure the voltage of the Torque Management Request Sense circuit in the TCM harness connector. Is the voltage above 7.0 volts? Yes → Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. After completion of Powertrain Verification test make sure to perform Transmission Verification Test 1. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
9	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P1794-SPEED SENSOR GROUND ERROR

When Monitored and Set Condition:

P1794-SPEED SENSOR GROUND ERROR

When Monitored: The gear ratio is monitored continuously while the Transmission is in gear.

Set Condition: After a TCM reset in neutral and a ratio of input to output, of 1 to 2. This DTC can take up to five minutes of problem identification before illuminating the MIL.

POSSIBLE CAUSES
SPEED SENSOR GROUND CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	Engine Running. Shift lever in park. With the DRBIII®, read the Transmission Input and Output Speed Sensor RPM. Is the Output Speed Sensor reading twice the Input Speed Sensor reading? Yes → Go To 3 No → Go To 8	All

P1794-SPEED SENSOR GROUND ERROR — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off to the lock position. Remove the Starter Relay. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the Transmission Simulator, set the Input/Output Speed selector switch to the 3000/1000 position. Turn the Input/Output Speed switch to ON. With the DRBIII®, monitor the Input and Output Speed Sensor RPM. Does the Input Speed read 3000 RPM and the Output Speed read 1000 RPM, ± 50 RPM? Yes → Go To 8 No → Go To 4	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input and Output Speed Sensor harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Transmission Solenoid/TRS Assembly, Input and Output Speed Sensor harness connectors. Is the resistance above 5.0 ohms on any of the above measurements? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Disconnect the Input and Output Speed Sensor harness connectors. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Input Sensor Ground circuit and ground. Is the resistance below 5.0 ohms? Yes → Repair the Speed Senor Ground circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off to the lock position. Disconnect the Input and Output Speed Sensor harness connectors. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit. Is the voltage above 0.5 volt? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P1794-SPEED SENSOR GROUND ERROR — Continued

TEST	ACTION	APPLICABILITY
7	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
8	The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
P2700-INADEQUATE ELEMENT VOLUME LR

When Monitored and Set Condition:

P2700-INADEQUATE ELEMENT VOLUME LR

When Monitored: Whenever the engine is running. The LR Clutch Volume is updated during a 3-1 or 2-1 manual downshift with a throttle angle below 5°. Transmission temperature must be at least 43° C or 110° F.

Set Condition: When the LR Clutch Volume falls below 16.

POSSIBLE CAUSES
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, erase DTC″s **NOTE: The TRANS TEMP DEG must be at least 43°C or 110°F before performing the following steps.** Drive the vehicle and perform at least ten 3-1 manual downshifts at closed throttle from speeds of about 32 km/h or 20 MPH. With the DRBIII®, read the LR CL VOL INDEX. Is the LR CL VOL INDEX below 20? Yes → Go To 3 No → Go To 4	All

P2700-INADEQUATE ELEMENT VOLUME LR — Continued

TEST	ACTION	APPLICABILITY
3	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary. Refer to the Service Information for the proper repair procedure for components related to the LR clutch. A broken or weak return spring or a dislocated snap ring could cause this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	**NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 km/h or 50 MPH, then brake lightly to a stop. Turn off engine. With the DRBIII®, record the CL VOL INDEX (CVI) for all clutches. With the DRBIII®, perform a BATTERY DISCONNECT. With the DRBIII®, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT. Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT? Yes → Go To 5 No → Test Complete.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P2701-INADEQUATE ELEMENT VOLUME 2C

When Monitored and Set Condition:

P2701-INADEQUATE ELEMENT VOLUME 2C

When Monitored: Whenever the engine is running. The 2C Clutch Volume is updated during a 3-2 kickdown with a throttle angle between 10° and 54°. Transmission temperature must be at least 43° C or 110° F.

Set Condition: When the 2C Clutch Volume falls below 5.

POSSIBLE CAUSES
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P2701-INADEQUATE ELEMENT VOLUME 2C — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, erase DTC″s Drive the vehicle at about 80 km/h or 50 MPH, then depress the OD off button. This will put the vehicle into third gear. **NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Perform at least ten 3-2 kickdowns by depressing the throttle between 10 and 54 TPS DEGREES at speeds of about 80 km/h or 50 MPH. With the DRBIII®, read the 2C CL VOL INDEX. Is the 2C CL VOL INDEX below 10? Yes → Go To 3 No → Go To 4	All
3	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary. Refer to the Service Information for the proper repair procedure for components related to the 2C clutch. A broken or weak return spring or a dislocated snap ring could cause this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	**NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 km/h or 50 MPH, then brake lightly to a stop. Turn off engine. With the DRBIII®, record the CL VOL INDEX (CVI) for all clutches With the DRBIII®, perform a BATTERY DISCONNECT. With the DRBIII®, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT. Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT? Yes → Go To 5 No → Test Complete.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P2702-INADEQUATE ELEMENT VOLUME OD

When Monitored and Set Condition:

P2702-INADEQUATE ELEMENT VOLUME OD

When Monitored: Whenever the engine is running. The OD Clutch Volume is updated during a 2-3 upshift with a throttle angle between 10° and 54°. Transmission temperature must be at least 43° C or 110° F.

Set Condition: When the OD Clutch Volume falls below 5.

POSSIBLE CAUSES
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, erase DTC″s **NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Drive the vehicle and perform at least ten 2-3 upshifts with the throttle between 10 and 54 TPS DEGREES. With the DRBIII®, read the OD CL VOL INDEX. Is the OD CL VOL INDEX below 10? Yes → Go To 3 No → Go To 4	All

P2702-INADEQUATE ELEMENT VOLUME OD — Continued

TEST	ACTION	APPLICABILITY
3	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary. Refer to the Service Information for the proper repair procedure for components related to the OD clutch. A broken or weak return spring or a dislocated snap ring could cause this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	**NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 km/h or 50 MPH, then brake lightly to a stop. Turn off engine. With the DRBIII®, record the CL VOL INDEX (CVI) for all clutches. With the DRBIII®, perform a BATTERY DISCONNECT. With the DRBIII®, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT. Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT? Yes → Go To 5 No → Test Complete.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P2703- INADEQUATE ELEMENT VOLUME UD

When Monitored and Set Condition:

P2703- INADEQUATE ELEMENT VOLUME UD

When Monitored: Whenever the engine is running. The UD Clutch Volume is updated during a 4-3 kickdown with a throttle angle between 10° and 54°. Transmission temperature must be at least 43° C or 110° F.

Set Condition: When the UD Clutch Volume falls below 11.

POSSIBLE CAUSES
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All
2	With the DRBIII®, erase DTC″s **NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Drive the vehicle and perform at least ten 4-3 kickdowns by depressing the throttle between 30 and 54 TPS DEGREES at speeds about 80 km/h or 50 MPH. With the DRBIII®, read the UD CL VOL INDEX. Is the UD CL VOL INDEX below 10? Yes → Go To 3 No → Go To 4	All

P2703- INADEQUATE ELEMENT VOLUME UD — Continued

TEST	ACTION	APPLICABILITY
3	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary. Refer to the Service Information for the proper repair procedure for components related to the UD clutch. A broken or weak return spring or a dislocated snap ring could cause this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	**NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.** Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 km/h or 50 MPH, then brake lightly to a stop. Turn off engine. With the DRBIII®, record CL VOL INDEX (CVI) for all clutches. With the DRBIII®, perform a BATTERY DISCONNECT. With the DRBIII®, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT. Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT? Yes → Go To 5 No → Test Complete.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P2704-INADEQUATE ELEMENT VOLUME 4C

When Monitored and Set Condition:

P2704-INADEQUATE ELEMENT VOLUME 4C

When Monitored: Whenever the engine is running. The 4C Clutch Volume is updated during a 3-4 upshift with a throttle angle between 10° and 54°. Transmission temperature must be at least 43° C or 110° F.

Set Condition: When the 4C Clutch Volume falls below 5.

POSSIBLE CAUSES
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P2704-INADEQUATE ELEMENT VOLUME 4C — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: Check the Transmission Fluid Level. If the Transmission Fluid is low, repair any Transmission Fluid leak as necessary and adjust the Transmission Fluid Level per the Service Information.** With the DRBIII®, record the 4C CL VOL INDEX. With the DRBIII®, erase DTC's. Perform at least 10 3-4 upshifts with the throttle between 10 and 54 degrees. The Transmission Temperature must be at least 43°C or 110 °F. With the DRBIII®, read the 4C CL VOL INDEX. Is the current 4C CL VOL INDEX below 10? Yes → Go To 3 No → Go To 4	All
3	If there are no possible causes remaining, view repair. Repair Repair the transmission as necessary. Refer to the Service Information for proper repair procedures for components related to the 4th clutch. A broken or weak return spring or a dislocated snap ring could cause this problem. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
4	Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 50 MPH, then brake lightly to a stop. Turn off engine. With the DRBIII®, record the CL VOL INDEX (CVI) for all clutches. With the DRBIII®, perform a BATTERY DISCONNECT. With the DRBIII®, read the CVI's and compare them to the reading recorded before the BATTERY DISCONNECT. Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT? Yes → Go To 5 No → Test Complete.	All
5	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:
P2706-MS SOLENOID CIRCUIT

When Monitored and Set Condition:

P2706-MS SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. It will also be tested immediately after a gear ratio or pressure switch error is detected.

Set Condition: After three consecutive solenoid continuity tests failures. After one failure if a test is run in response to a gear ratio or pressure switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
MS SOLENOID CONTROL CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
MS SOLENOID CONTROL CIRCUIT SHORT TO GROUND
MS SOLENOID CIRCUIT SHORT TO VOLTAGE
MS SOLENOID
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing transmission symptom diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** **NOTE: Check for applicable TSB's related to the problem.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P2706-MS SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, check for other transmission DTC's. Are there any Transmission Control Relay related DTCs P0890, P0891, and/or P0888 present? Yes → Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	With the DRBIII®, Check the STARTS SINCE SET counter for P2706. **NOTE: This counter only applies to the last DTC set.** Is the STARTS SINCE SET counter set at 0? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off to the lock position. Remove the Starter Relay from the PDC. **NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.** Install the Transmission Simulator, Miller tool #8333. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running.. With the DRBIII®, actuate the MS Solenoid. Monitor the MS Solenoid LED on the Transmission Simulator. Did the LED on the Transmission Simulator blink on and off? Yes → Go To 5 No → Go To 6	All
5	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
6	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid /TRS Assembly harness connector **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the MS Solenoid Control circuit between the TCM harness connector to the Transmission Solenoid/TRS Assembly harness connector. Is the resistance above 5.0 ohms? Yes → Repair the MS Solenoid Control circuit for an open. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 7	All

P2706-MS SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the MS Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the MS Solenoid Control circuit for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the MS Solenoid Control circuit in the TCM harness connector. Is the voltage above 0.5 volt? Yes → Repair the MS Solenoid Control circuit for a short to voltage. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Transmission Control Relay Output circuit in the Solenoid/TRS harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.	All

P2706-MS SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
11	The conditions necessary to set this DTC are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Wiggle the wires while checking for shorts or open circuits. Check for any applicable TSB's that may apply. With the DRBIII®, check the EATX EVENT DATA to help identify the conditions in which the DTC was set. Were there any problems found? Yes → Repair as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
*BACKUP LAMPS COME ON WHILE SHIFTER IS NOT IN REVERSE POSITION

POSSIBLE CAUSES
BACKUP SUPPLY CIRCUIT SHORT TO VOLTAGE
TRANSMISSION RANGE SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Firmly apply brakes. Place the Shift Lever in the position which causes the Backup Lamps to come on at the wrong time. Do the Backup Lamps come while the shifter is not in Reverse? Yes → Go To 2 No → Test Complete.	All
2	Ignition on, engine not running. Place the shift lever in a position that causes the Backup Lamps to come on when they should not. Disconnect the Transmission Solenoid /TRS Assembly harness connector. **NOTE: This will cause a DTC to be stored in the TCM. They must be erased before returning the vehicle to the customer.** Did the Backup Lamps go out when the connector was disconnected? Yes → Go To 3 No → Go To 4	All
3	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
4	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Ignition on, engine not running. Measure the voltage of the Backup Light Supply circuit in the Solenoid/TRS harness connector. Is the voltage above 0.5 volt? Yes → Repair the Backup Lights Supply circuit for a short to voltage. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:
*BACKUP LAMPS INOPERATIVE

POSSIBLE CAUSES
BACK UP LAMP GROUND CIRCUIT OPEN
BACKUP LAMP FEED CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
BACKUP LAMP FEED CIRCUIT SHORT TO GROUND
OPEN BACKUP LAMP BULB(S)
TRANSMISSION RANGE SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Place foot firmly on brake pedal. Place the shift lever in the reverse position. Do either of the Backup Lamps work? Yes → Test Complete. No → Go To 2	All
2	Turn the ignition off to the lock position. Install Transmission Simulator Miller tool #8333. Ignition on, engine not running. Press the Reverse Light Test button on the Transmission Simulator while observing the Backup Lamps. Do either of the Backup Lamps come on? Yes → Go To 3 No → Go To 4	All
3	If there are no possible causes remaining, view repair. Repair Replace Transmission Solenoid/TRS Assembly per the Service Information Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
4	Remove both Backup Lamp bulbs. Measure the resistance of both Backup Lamp bulbs. Is the resistance above 5.0 ohms for either Backup Lamp bulbs? Yes → Replace the Backup Lamp bulb or bulbs per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 5	All

*BACKUP LAMPS INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
5	Remove the Backup Lamp bulb. Using a 12-volt test light connected to 12-volts, check the Backup Lamp ground circuit. Does the light illuminate brightly? Yes → Go To 6 No → Repair the Back up Lamp ground circuit for an open. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
6	Turn the ignition off to the lock position. Remove the Backup Lamp bulb. Disconnect the Transmission Solenoid /TRS Assembly harness connector. Measure the resistance of the Backup Lamp Feed circuit from the Backup lamp Socket to the Solenoid/TRS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Backup Lamp Supply circuit for an open. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 7	All
7	Turn the ignition off to the lock position. Remove the Backup Lamp bulbs. Disconnect the Transmission Solenoid/TRS Assembly harness connector. Measure the resistance between the Backup Lamp Feed circuit and ground. Is the resistance below 5.0 ohms? Yes → Repair the Backup Lamp Feed circuit for a short to ground. Check the Fused Ignition Switch Output (RUN) fuse and replace if necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid /TRS Assembly harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Test Complete. No → Repair the Fused Ignition Switch Output circuit for an open. If the fuse is open make sure to check or a short to ground. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:
*BUMP FELT SHORTLY AFTER STOP WITH NO DTC'S PRESENT

POSSIBLE CAUSES
STICKING SLIP JOINT

TEST	ACTION	APPLICABILITY
1	This condition is normally caused by a stick and slip condition between the prop shaft slip joint and the transfer case output shaft. If there are no possible causes remaining, view repair. Repair Check for TSB's relating to this condition. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:

*BUMP FELT WHILE COASTING IN NEUTRAL WITH NO DTC'S PRESENT

TEST	ACTION	APPLICABILITY
1	Check for a TCM flash update or TSB to address this issue. Perform the drive learn procedure for the LR clutch element. **NOTE: Some bump while coasting in neutral is normal.** Perform the above procedures to reduce excessive bump in neutral. Repair Test Complete.	All

Symptom:
*CHECKING PARK/NEUTRAL SWITCH OPERATION

POSSIBLE CAUSES
PARK/NEUTRAL POSITION SWITCH SENSE CIRCUIT OPEN
PARK/NEUTRAL POSITION SWITCH SENSE CIRCUIT SHORT TO GROUND
POWERTRAIN CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, monitor the P/N Position Switch Input status. Move the gear selector through all gear positions, Park to 1st and back to Park. Did the DRB display P/N and D/R in the correct gear positions? Yes → Go To 2 No → Go To 3	All
2	The condition is not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorted and open circuits. Were there any problems found? Yes → Repair as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All
3	Turn the ignition off to the lock position. Disconnect the PCM harness connector. Disconnect the PNP Switch harness connector. **Check connectors - Clean/repair as necessary** Measure the resistance of the PNP Switch Sense circuit between the PCM harness connector and the PNP Switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the Park/Neutral Position Switch Sense circuit for an open. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

*CHECKING PARK/NEUTRAL SWITCH OPERATION — Continued

TEST	ACTION	APPLICABILITY
4	Ignition on, engine not running. Disconnect the PCM harness connector. Disconnect the PNP Switch harness connector. **Check connectors - Clean/repair as necessary** Measure the resistance between the PNP Switch Sense Circuit and ground. Is the resistance below 5.0 ohms? Yes → Repair the Park/Neutral Position Switch Sense circuit for a short to ground. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:
*POOR SHIFT QUALITY

POSSIBLE CAUSES
POOR SHIFT QUALITY

TEST	ACTION	APPLICABILITY
1	**NOTE: A under or over filled Transmission Fluid Level can cause many shift quality problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.** If the transmission shifts early when cold, this is a normal condition. The controller software is designed to protect the transmission from high torque and/or high RPM shifts during cold operation. Check and repair all engine DTC's prior to any Transmission diagnostics. A inconsistent TPS/APPS operation can cause an abnormal or erratic shift pattern. With the DRBIII®, monitor the TPS/APPS voltage for a smooth voltage change while slowly opening and closing the throttle. If the voltage change is not smooth, replace the sensor. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to the test, P0706 Check Shifter Signal, in the transmission category. **NOTE: Verify the flash level of the transmission controller. Some problems are corrected by software upgrades to the transmission controller.** If a controller software update was performed, make sure to perform the Drive Learn Procedure. A abnormal or erratic shift pattern may transpire if the Drive Learn Procedure is not performed. **NOTE: Check for any applicable TSB's that may apply.** Where there any problems found? Yes → Repair as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:
*TRANSMISSION NOISY WITH NO DTC'S PRESENT

POSSIBLE CAUSES
INCORRECT FLUID LEVEL
VERIFY NOISY TRANSMISSION
INTERNAL TRANSMISSION PROBLEM - NOISY WHILE DRIVING
INTERNAL TRANSMISSION PROBLEM - NOISY WHILE STANDING STILL

TEST	ACTION	APPLICABILITY
1	Check and adjust the oil level per the service information before continuing. Place vehicle on hoist. Run vehicle on hoist under conditions necessary to duplicate the noise. Using Chassis Ears or other suitable device, verify that the noise is coming from the transmission. Is the noise coming from the transmission? Yes → Go To 2 No → Refer to the Service Information for the proper repair procedure. Check for any TSBs that may apply. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
2	Check the Transmission Fluid level per the Service Information. **NOTE: The transmission must be hot when checking oil level. When the temperature is below 10° Celsius 50° Fahrenheit it is possible that no oil will show on the dipstick, even though the transmission has an adequate fill level when warm.** Is the fluid level OK? Yes → Go To 3 No → Adjust fluid level. Repair cause of incorrect fluid level. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
3	With the shift lever in neutral, raise the engine speed and listen to the noise. **Note: Make sure the radio is turned OFF. Alternator noise can come through the speakers and be misinterpreted as Transmission Pump Whine. This can happen even with the volume turned down, THE RADIO MUST BE TURNED OFF.** Does the noise get louder or change pitch while the engine speed is changing? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary per the Service Information. Pay particular attention to the bearings in front half of transmission and for any signs of wear. If no problems are found, replace the primary oil pump. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

*TRANSMISSION NOISY WITH NO DTC'S PRESENT — Continued

TEST	ACTION	APPLICABILITY
5	If there are no possible causes remaining, view repair. Repair Repair internal transmission as necessary per the Service Information. Inspect all of the transmission components for signs of wear. Pay particular attention to bearings, pinion gears, etc. Repair or replace as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All

Symptom:
*TRANSMISSION SHIFTS EARLY WITH NO DTC'S

POSSIBLE CAUSES
COLD TRANSMISSION
BUS PROBLEMS
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	If the transmission shifts too early when the transmission is cold, this is a normal condition. Did the problem occur when the transmission temperature was cold? Yes → The software is designed to protect the transmission from high torque and/or high RPM shifts during cold operation. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 2	All
2	Using the DRBIII®, attempt communication with other Modules on the bus, check for signs of a bus problem such as bus related DTC's and/or communication problems. Although it takes two occurrences of a missed TRD link message to set the fault code, one missed message will cause the transmission to short shift until the next start up. If the vehicle has any indications of a bus problem, it must be repaired first. Do any of the other modules show signs of a bus problem? Yes → Refer to the appropriate category for the bus problem. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 3	All
3	Using the schematics as a guide, inspect the wiring and connectors specific to the Torque Management Request Sense circuit. Wiggle the wires while checking for shorted and open circuits. Were there any problems found? Yes → Using the wiring diagram/schematic as a guide, inspect the wiring and connectors and repair as necessary. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:

*TRANSMISSION SHIFTS ROUGH AFTER TCM REPLACEMENT OR REFLASH

POSSIBLE CAUSES
TRANSMISSION SHIFTS ROUGH AFTER TCM REPLACEMENT OR REFLASH

TEST	ACTION	APPLICABILITY
1	Perform this procedure if the transmission shifts rough after TCM was replaced or Reflashed. Does the transmission shift rough after a TCM replacement or Reflash? Yes → Perform Quick Learn and the Drive Learn Procedure Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Symptom:
*TRANSMISSION SIMULATOR WILL NOT POWER UP

TEST	ACTION	APPLICABILITY
1	**NOTE: If the Transmission Simulator, Miller tool #8333 will not power up, this is a symptom of the Transmission Control Relay being open, such as Limp-in, and/or the Simulator is not installed correctly on the vehicle.** **Note: Check the simulator ground cable connection.** Repair these symptoms before having the Transmission Simulator, Miller tool #8333, repaired. Continue Test Complete.	All

Symptom:
*VEHICLE IS SLUGGISH WITH NO DTC'S PRESENT

POSSIBLE CAUSES
ENGINE VISCOUS FAN
COLD TRANSMISSION
BUS PROBLEMS

TEST	ACTION	APPLICABILITY
1	**NOTE: Engine viscous fan sticking can cause this complaint.** Check the engine viscous fan for proper operation per the Service Information. Does the engine fan operate correctly? Yes → Go To 2 No → Repair the engine viscous fan per the Service Information. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST.	All
2	If the transmission shifts too early when the transmission is cold, this is a normal condition. Did the problem occur when the transmission temperature was cold? Yes → The software is designed to protect the transmission from high torque and/or high RPM shifts during cold operation. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Go To 3	All
3	With the DRBIII®, attempt to communicate with other Modules, check for signs of a bus problem such as bus related DTC's and/or communication problems. Although it takes two occurrences of a missed TRD link message to set a DTC, one missed message will cause the transmission to short shift until the next start up. If the vehicle has any indications of a bus problem, the bus must be repaired first. Are there any bus related DTCs or signs of a bus problem in any of the modules? Yes → Refer to the appropriate category for the bus problem. Perform TRANSMISSION NO TROUBLE CODE VERIFICATION TEST. No → Test Complete.	All

Verification Tests

42RLE TRANSMISSION VERIFICATION TEST - VER 1	APPLICABILITY
1. Connect the DRBIII® to the Data Link Connector (DLC). 2. Reconnect any disconnected components. 3. With the DRBIII®, erase all Transmission DTC's, also erase the PCM DTC's. **4. NOTE: Erase DTC P0700 in the PCM to turn the Malfunction Indicator Lamp (MIL) off after making Transmission repairs.** 5. With the DRBIII®, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT - above 43° C or 110° F. 6. Check the Transmission Fluid and adjust if necessary. Refer to the Service information for the Fluid Fill procedure. **7. NOTE: If the Transmission Control Module or the Transmission has been repaired or replaced it is necessary to perform the DRBIII® Quick Learn Procedure and reset the "Pinion Factor"** 8. Road test the vehicle. With the DRBIII®, monitor the engine RPM. Make 15 to 20 1-2, 2-3, 3-4 upshifts. Perform these shifts from a standing start to 45 MPH with a constant throttle opening of 20 to 25 degrees. 9. Below 25 MPH, make 5 to 8 wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown. 10. For a specific DTC, drive the vehicle to the Symptom's When Monitored/When Set conditions to verify the DTC repair. 11. If equipped with AutoStick®, up-shift and down-shift several times using the AutoStick® feature during the road test. **12. NOTE: Use the EATX OBDII Task Manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.** 13. Check for Diagnostic Trouble Codes (DTC's) during the road test. If a DTC sets during the road test , return to the Symptom list and perform the appropriate Symptom. Were there any Diagnostic Trouble Codes (DTCs) set during the road test? Yes → Refer to the Symptom List for appropriate Symptom(s). No → Repair is complete.	All

45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1	APPLICABILITY
1. Connect the DRBIII® to the Data Link Connector. 2. Reconnect any disconnected components. 3. With the DRBIII®, erase DTC's. 4. With the DRBIII®, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT above 43° Celsius 110° Fahrenheit. 5. Check the Transmission fluid and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure. **6. NOTE: If the TCM has been replaced or if the transmission has been repaired or replaced it is necessary to perform the DRBIII® Quick Learn Procedure.** 7. Road test the vehicle. With the DRBIII®, monitor TPS. Make fifteen to twenty 1-2, 2-3, and 3-4 upshifts and (4 - 4 Prime for 545RFE only). 8. Perform these shifts from a standing start to 97 Km/h 60 MPH with a constant throttle opening of 20 to 25 degrees. 9. Below 40 Km/h 25 MPH, make five to eight wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown. 10. Check for DTC's during the road test. **11. NOTE: Use the EATX OBDII task manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.** 12. Perform the Battery Disconnect with the DRBIII®, this will clear the EATX EVENT DATA. Were any Trouble Codes set during the road test? Yes → Refer to the Symptom List for the appropriate diagnostic tests. No → Repair is complete.	All

Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 1	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. Inspect the engine oil for contamination. If oil contamination is suspected, change the oil and filter. 3. If the PCM was not replaced skip steps 4 through 6 and continue the verification. 4. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 7. Attempt to start the engine. 8. If the conditions cannot be duplicated, erase all DTCs with the DRBIII® Is the vehicle still unable to start and/or are there any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptoms list (Diagnostic Procedure). No → Repair is complete.	All

POWERTRAIN VERIFICATION TEST VER - 2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a NO TROUBLE CODE repair, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes or the symptom no longer exists, the repair was successful and testing is complete. 4. If the initial or another symptom exists, the repair is not complete. Check all technical service bulletins or flash updates and return to Symptoms if necessary. 5. If this verification procedure is being performed after a DTC repair, perform steps 6 through 13. 6. Connect the DRBIII® to the data link connector. Using the DRBIII® erase any diagnostic trouble codes and reset all values. 7. If the PCM was not replaced, skip steps 8 through 10 and continue with the verification. 8. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer System (SKIS), Secret Key data must be updated to enable start. 9. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 10. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM 11. Road test the vehicle. If the test is for an A/C DTC, ensure it is operating during the following test. 12. Drive the vehicle for at least 5 minutes at or around 64 Kmh (40 mph). Ensure the transmission shifts through all gears. At some point stop the vehicle and turn off the engine for at least 10 seconds. 13. With the DRBIII®, read DTCs. Are there any DTC(s) present? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). No → Repair is complete.	All

Verification Tests — Continued

ROAD TEST VERIFICATION - VER-2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete. 4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary. 5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue. 6. If the Engine Control Module (ECM) has not been changed, perform steps 7 and 8, otherwise, continue with step 9. 7. With the DRB III®, erase all diagnostic trouble codes (DTCs), then disconnect the DRB III®. 8. Turn the ignition off for at least 10 seconds. 9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11. 10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position. 11. Ensure no DTCs remain by performing steps 12 through 15. 12. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Relay Control Circuit, drive the vehicle for at least 5 minutes with the A/C on. 13. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue. 14. Upon completion of the road test, turn the engine off and check for DTCs with the DRB III®. 15. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

TRANSMISSION NO TROUBLE CODE VERIFICATION TEST	APPLICABILITY
1. Inspect the vehicle to ensure that all engine and transmission components are properly installed and connected. Assemble and connect components as necessary. 2. Check if the initial symptom still exists, this may require a road test. If the symptom still exists, return to the symptom list and perform the appropriate symptom. Make sure to check for any Technical Service Bulletins that may apply. 3. With the DRBIII®, erase any erroneous DTCs that may have been set due to a test procedure. Does the symptom still exist? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

Verification Tests — Continued

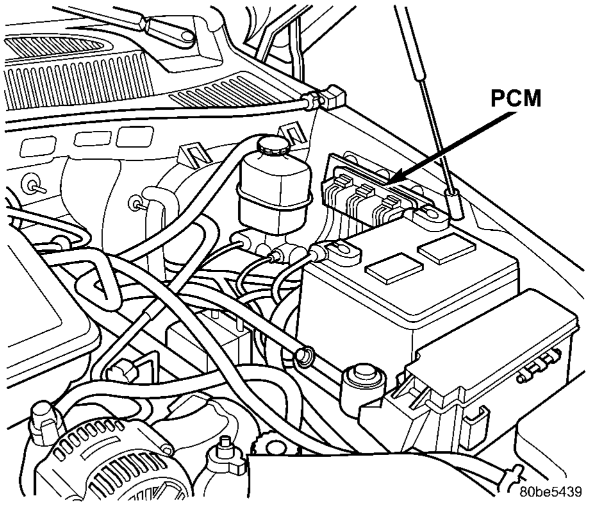
TRANSMISSION NO TROUBLE CODE VERIFICATION TEST	APPLICABILITY
1. Inspect the vehicle to ensure that all engine and transmission components are properly installed and connected. Assemble and connect components as necessary. 2. Check if the initial symptom still exists, this may require a road test. If the symptom still exists, return to the symptom list and perform the appropriate symptom. Make sure to check for any Technical Service Bulletins that may apply. 3. With the DRBIII®, erase any erroneous DTCs that may have been set due to a test procedure. Does the symptom still exist? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

NOTES

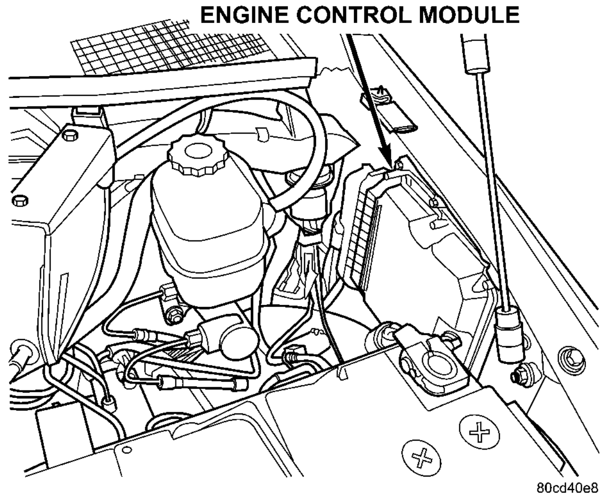
8.0 COMPONENT LOCATIONS

8.1 POWERTRAIN/ENGINE CONTROL MODULE LOCATIONS

42RLE and 45/545RFE

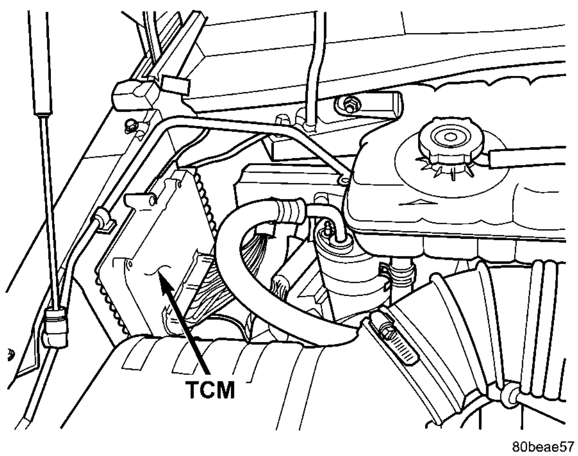


DIESEL

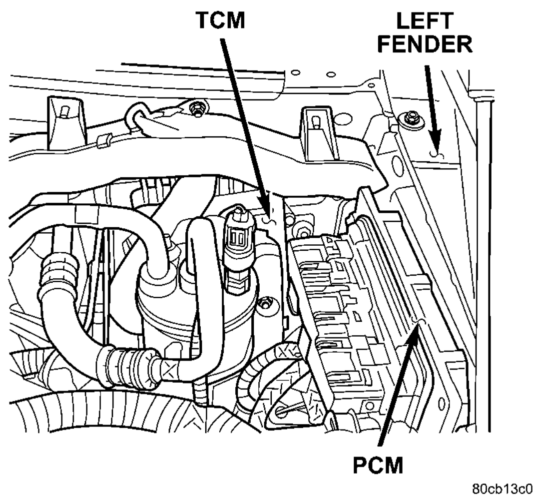


8.2 TRANSMISSION CONTROL MODULE LOCATIONS

Left Hand Drive



Right Hand Drive



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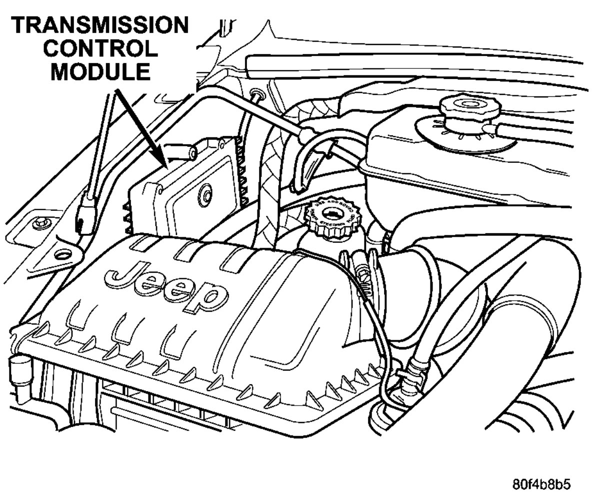
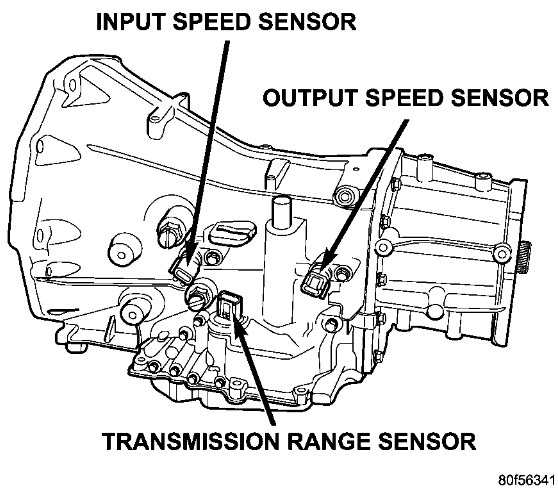
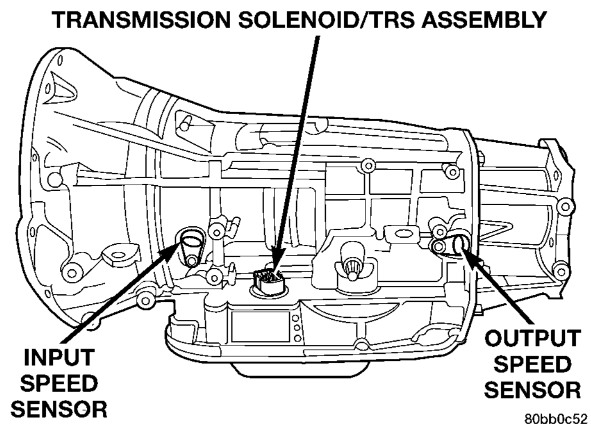


8.3 TRANSMISSION COMPONENT LOCATIONS

42RLE

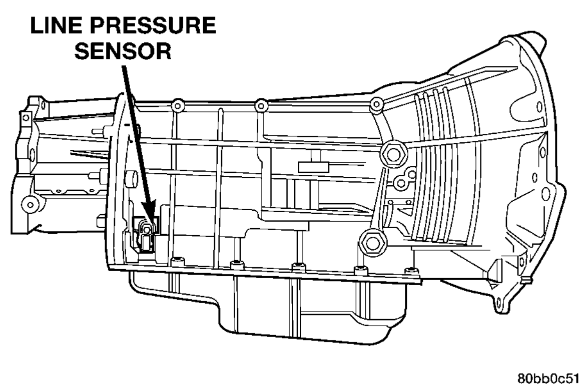


45/545RFE



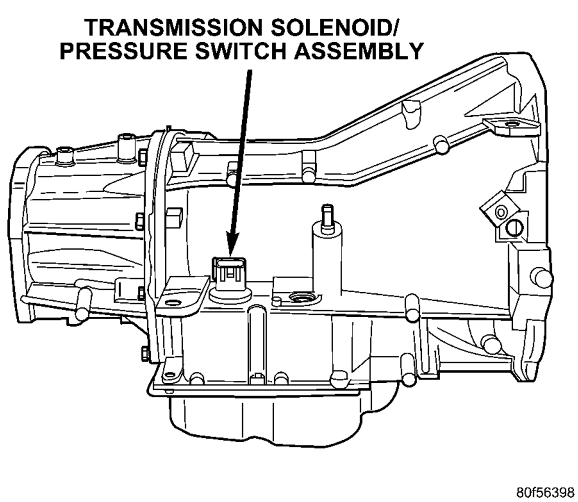
8.4 TRANSMISSION LINE PRESSURE SENSOR

45/545RFE

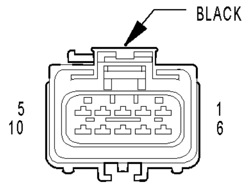


8.5 TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY

42RLE



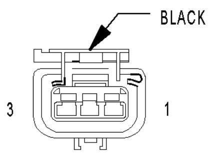
9.0 CONNECTOR PINOUTS



ACCELERATOR PEDAL POSITION SENSOR (DIESEL)

ACCELERATOR PEDAL POSITION SENSOR (DIESEL)

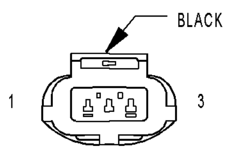
CAV	CIRCUIT	FUNCTION
1	-	-
2	T39 18GY/LB (A/T)	5 VOLT SUPPLY
3	K22 18OR/DB (A/T)	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
4	K4 18BK/LB	SENSOR GROUND
5	K151 20WT	LOW IDLE POSITION SWITCH SENSE
6	T13 18DB/BK (A/T)	SPEED SENSOR GROUND
7	K81 20VT/TN	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
8	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR GROUND
9	-	-
10	K852 20VT/WT	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY



CRANKSHAFT POSITION SENSOR (2.4L)

CRANKSHAFT POSITION SENSOR (2.4L)

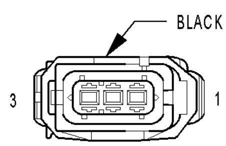
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CRANKSHAFT POSITION SENSOR (3.7L)

CRANKSHAFT POSITION SENSOR (3.7L)

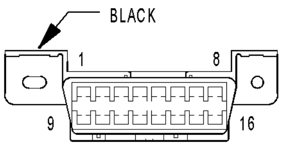
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CRANKSHAFT POSITION SENSOR (DIESEL)

CRANKSHAFT POSITION SENSOR (DIESEL)

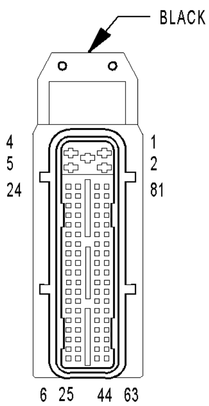
CAV	CIRCUIT	FUNCTION
1	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL 2
2	K3 20LB/BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
3	Y101 18BK/OR	CRANKSHAFT POSITION SENSOR SHIELD



DATA
LINK
CONNECTOR

DATA LINK CONNECTOR

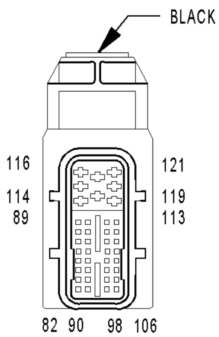
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



ENGINE CONTROL MODULE C1 (DIESEL)

ENGINE CONTROL MODULE C1 (DIESEL)

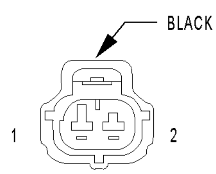
CAV	CIRCUIT	FUNCTION
1	Z108 14BK/DG	GROUND
2	Z108 14BK/DG	GROUND
3	K20 18DG	GENERATOR FIELD CONTROL
4	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
5	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
6	-	-
7	D25 20VT/YL	PCI BUS
8	K944 20BK/LB	CAMSHAFT POSITION SENSOR GROUND
9	K44 20TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL
12	-	-
13	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
14	-	-
15	K81 20VT/TN	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
16	K80 20BK/VT	FUEL PRESSURE SENSOR GROUND
17	-	-
18	-	-
19	F92 20YL/BR	FUSED B(+)
20	Z109 20BK/DB	GROUND
21	K4 20BK/LB	SENSOR GROUND
22	F1 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	K6 20VT/WT	SENSOR REFERENCE VOLTAGE B
24	K3 20LB/BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
25	-	-
26	-	-
27	-	-
28	-	-
29	K77 20BR/WT	TRANSFER CASE POSITION SENSOR INPUT
30	G60 20GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
31	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
32	K118 20PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR GROUND
35	K852 20VT/WT	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
36	-	-
37	-	-
38	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
39	K226 20DB/WT	FUEL LEVEL SENSOR SIGNAL
40	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K21 20BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
42	Y101 18BK/OR	CRANKSHAFT POSITION SENSOR SHIELD
43	K24 20GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL 2
44	-	-
45	-	-
46	-	-
47	L50 20WT/TN	PRIMARY BRAKE SWITCH SIGNAL
48	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
49	-	-
50	-	-
51	-	-
52	-	-
53	-	-
54	-	-
55	B22 20DG/YL	VEHICLE SPEED SIGNAL
56	-	-
57	T10 20/YL/DG (A/T)	TORQUE MANAGEMENT REQUEST SENSE
58	-	-
59	-	-
60	K7 20OR	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL
62	-	-
63	-	-
64	K151 20WT	LOW IDLE POSITION SWITCH SENSE
65	-	-
66	-	-
67	-	-
68	-	-
69	C13 20DB/OR	A/C CLUTCH RELAY CONTROL
70	-	-
71	-	-
72	K236 20GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
73	-	-
74	K90 20TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
75	K132 20DG/LB	CABIN HEATER RELAY CONTROL
76	-	-
77	K152 20WT	GLOW PLUG RELAY NO. 1 CONTROL
78	-	-
79	-	-
80	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL
81	K46 20OR/BK	FUEL PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL)

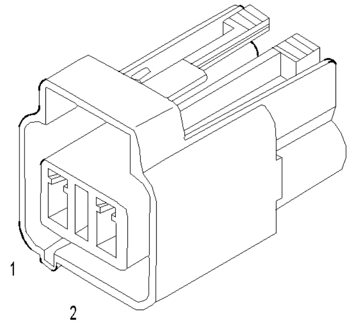
CAV	CIRCUIT	FUNCTION
100	-	-
101	C18 20DB	A/C HIGH PRESSURE SWITCH SIGNAL
102	-	-
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	-
109	-	-
110	-	-
111	-	-
112	T411 18WT/PK (A/T)	TRS T41 SENSE (P/N)
113	-	-
114	-	-
115	K14 2.5mmLB/BR	FUEL INJECTOR NO. 4 CONTROL
116	K63 2.5mmDB/BK	COMMON INJECTOR DRIVER
117	-	-
118	K11 2.5mmWT/DB	FUEL INJECTOR NO. 1 CONTROL
119	K12 2.5mmTN	FUEL INJECTOR NO. 2 CONTROL
120	K13 2.5mmYL/WT	FUEL INJECTOR NO. 3 CONTROL
121	-	-
82	D21 20PK	SCI TRANSMIT
83	K244 20BR/WT (A/T)	ENGINE SPEED SIGNAL
84	-	-
85	-	-
86	-	-
87	-	-
88	-	-
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-



INPUT SPEED SENSOR (A/T)

INPUT SPEED SENSOR (A/T)

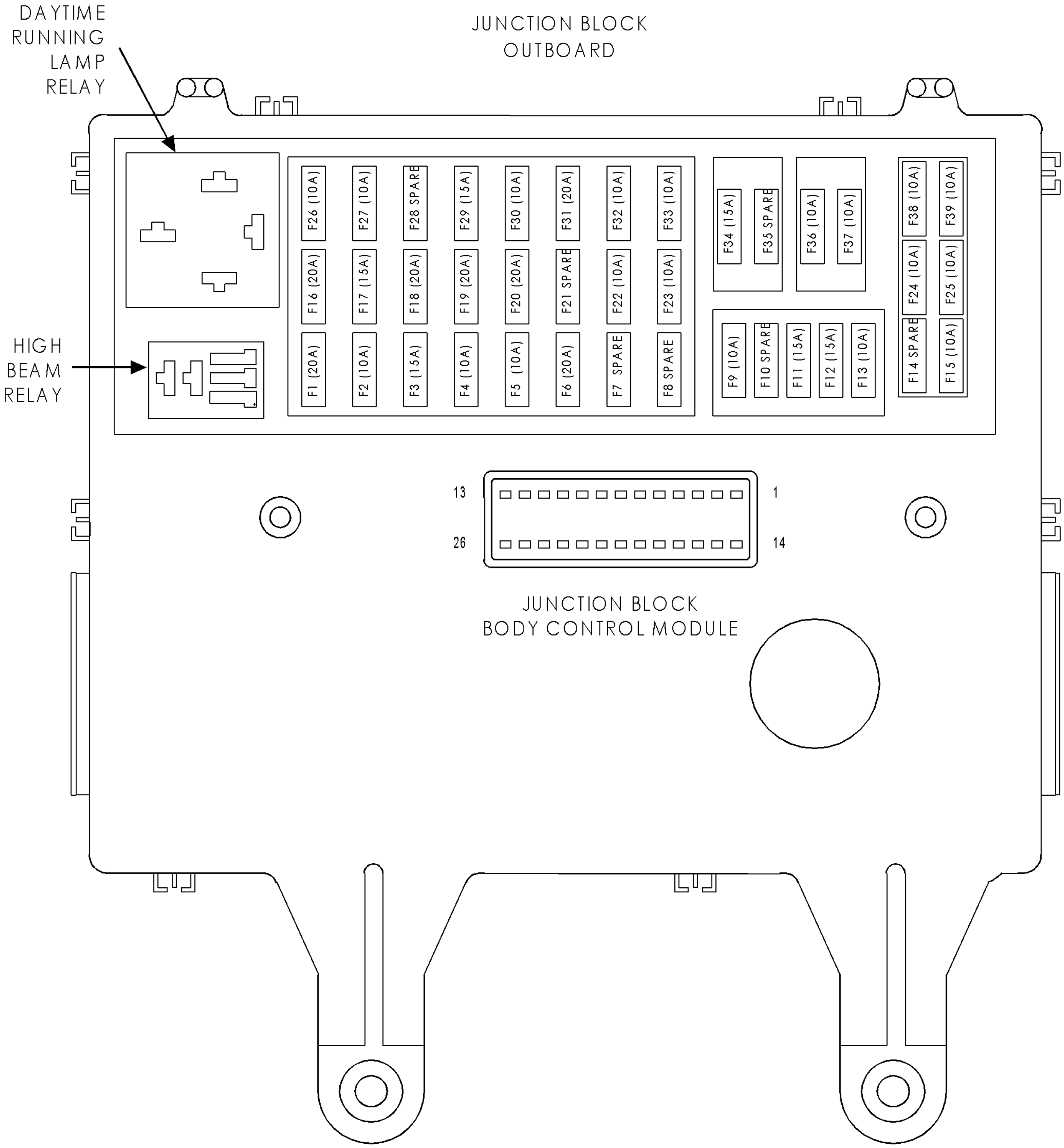
CAV	CIRCUIT	FUNCTION
1	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND



INPUT SPEED
SENSOR
CONNECTOR

INPUT SPEED SENSOR CONNECTOR

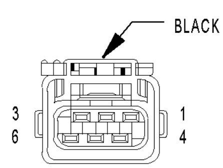
CAV	CIRCUIT	FUNCTION
1	VT/BK	INPUT SPEED SENSOR GROUND
2	BK/RD	INPUT SPEED SENSOR SIGNAL



DAYTIME RUNNING LAMP RELAY
JUNCTION BLOCK OUTBOARD
HIGH BEAM RELAY
F26 (10A)
F27 (10A)
F28 SPARE
F29 (15A)
F30 (10A)
F31 (20A)
F32 (10A)
F33 (10A)
F16 (20A)
F17 (15A)
F18 (20A)
F19 (20A)
F20 (20A)
F21 SPARE
F22 (10A)
F23 (10A)
F1 (20A)
F2 (10A)
F3 (15A)
F4 (10A)
F5 (10A)
F6 (20A)
F7 SPARE
F8 SPARE
F34 (15A)
F35 SPARE
F36 (10A)
F37 (10A)
F9 (10A)
F10 SPARE
F11 (15A)
F12 (15A)
F13 (10A)
F38 (10A)
F39 (10A)
F24 (10A)
F25 (10A)
F14 SPARE
F15 (10A)
13
1
26
14
JUNCTION BLOCK BODY CONTROL MODULE

FUSES (JB)

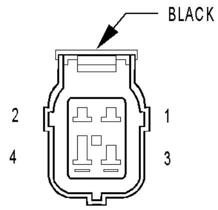
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F38 16RD/WT	FUSED B(+)
2	10A	INTERNAL	FUSED B(+)
3	15A	INTERNAL	FUSED B(+)
4	10A	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
5	10A	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
6	20A	INTERNAL	FUSED B(+)
7	-	SPARE	-
8	-	SPARE	-
9	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
10	-	SPARE	-
11	15A	A15 18PK/OR	FUSED B(+)
12	15A	F32 18PK/DB	FUSED B(+)
13	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	-	SPARE	-
15	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	20A	F41 16PK/VT	FUSED B(+)
17	15A	F70 18PK/BK	FUSED B(+)
18	20A	F60 16DG/RD	FUSED B(+)
19	15A	INTERNAL	FUSED B(+)
20	20A	F85 16VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
21	-	SPARE	-
22	10A	F88 20BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
23	10A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
24	10A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)
25	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
26	10A	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
27	10A	L33 18LG/BR	FUSED LEFT HIGH BEAM OUTPUT
28	-	SPARE	-
29	30A	A3 16RD/WT (HIGHLINE)	FUSED B(+)
30	10A	INTERNAL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
31	20A	F30 16RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
32	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
33	10A	INTERNAL	FUSED B(+)
34	15A	INTERNAL	FUSED B(+)
35	-	SPARE	-
36	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
37	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
38	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
39	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)



LEFT TAIL/
STOP LAMP

LEFT TAIL/STOP LAMP

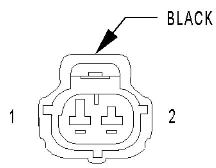
CAV	CIRCUIT	FUNCTION
1	L38 18BR/WT (EXPORT)	REAR FOG LAMP RELAY OUTPUT
2	L77 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
4	L10 18BR/LG	BACK-UP LAMP FEED
5	Z151 18BK/WT	GROUND
6	L63 18DG/RD	LEFT TURN SIGNAL



LINE PRESSURE SENSOR (45RFE)

LINE PRESSURE SENSOR (45RFE)

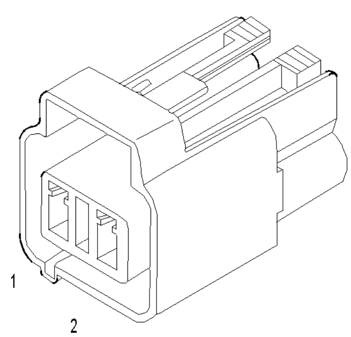
CAV	CIRCUIT	FUNCTION
1	Z112 18BK/LB (GAS)	GROUND
1	Z112 14BK (DIESEL)	GROUND
2	T39 18GY/LB	5 VOLT SUPPLY
3	T38 18VT/TN	LINE PRESSURE SENSOR SIGNAL
4	-	-



OUTPUT SPEED SENSOR (A/T)

OUTPUT SPEED SENSOR (A/T)

CAV	CIRCUIT	FUNCTION
1	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND

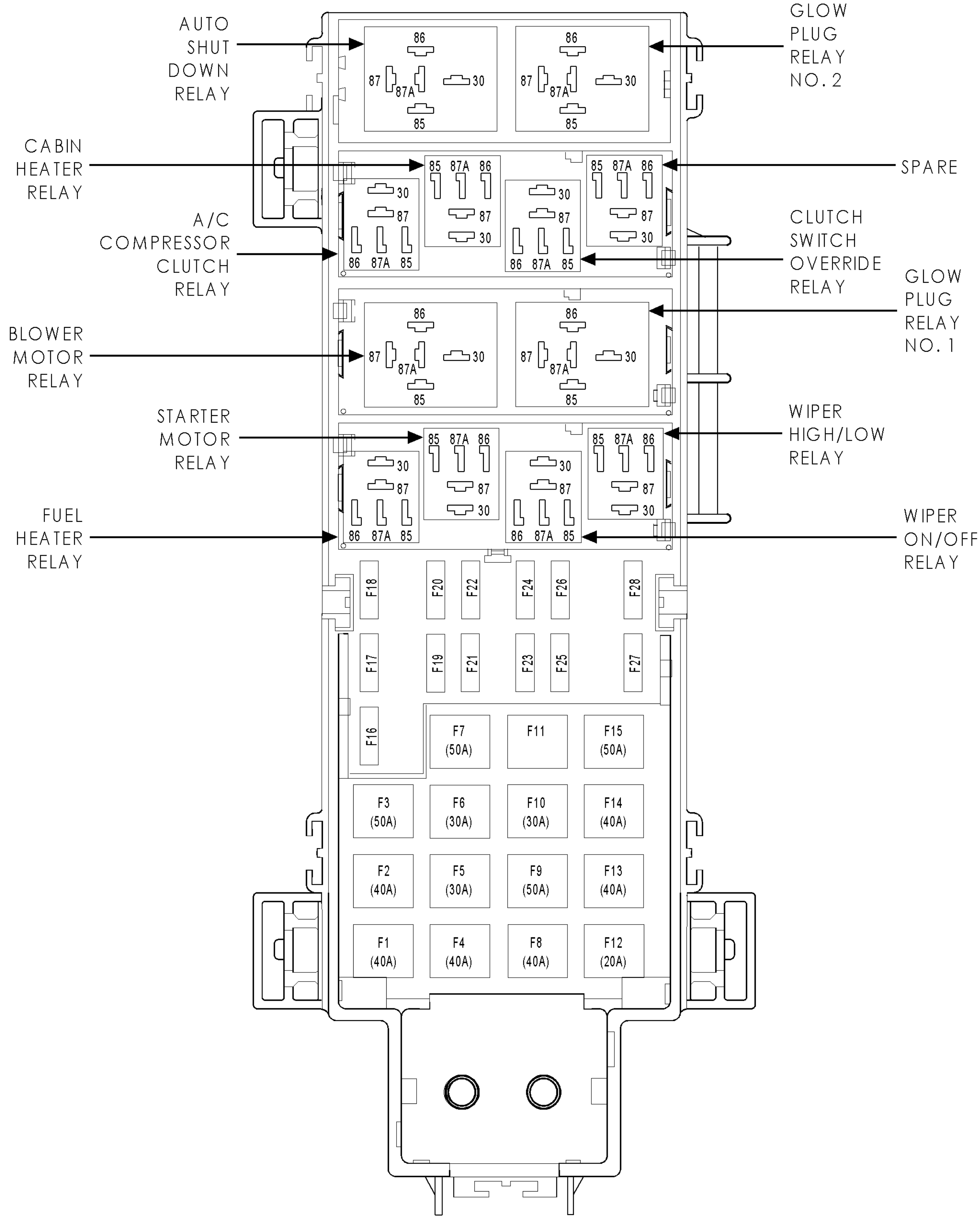


OUTPUT SPEED SENSOR CONNECTOR

OUTPUT SPEED SENSOR CONNECTOR

CAV	CIRCUIT	FUNCTION
1	VT/BK	OUTPUT SPEED SENSOR GROUND
2	BK/RD	OUTPUT SPEED SENSOR SIGNAL

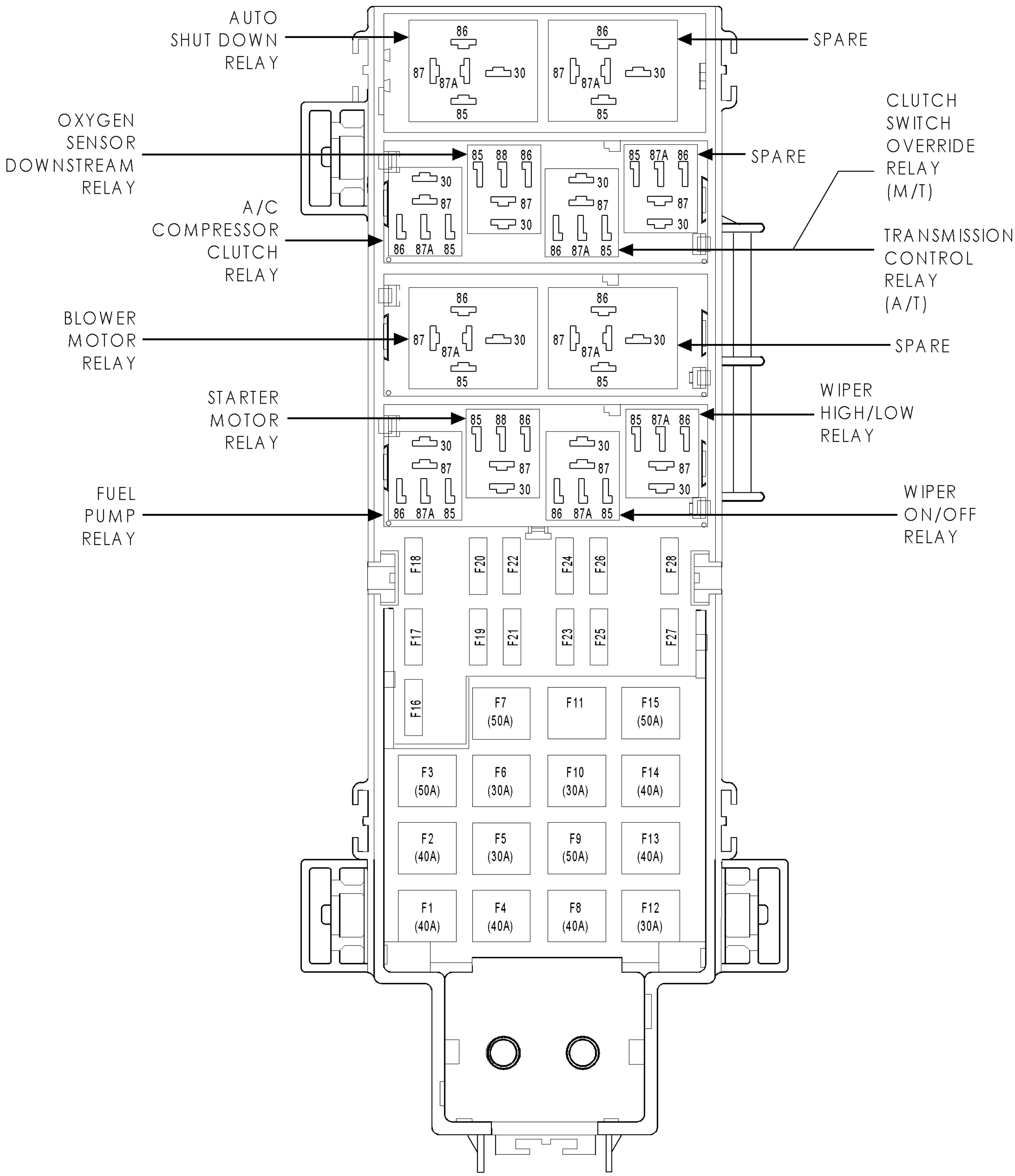
POWER DISTRIBUTION CENTER
DIESEL



FUSES (DIESEL)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	30A	A99 14RD/VT (M/T)	FUSED B(+)
2	30A	A32 14RD/DB (A/T)	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG	FUSED B(+)
5	30A	A32 14RD/DB	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
6	-	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	50A	A54 10RD	FUSED B(+)
11	50A	A58 10RD/GY	FUSED B(+)
12	20A	A34 16LB/RD	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
21	-	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	-	-	-
25	20A	A20 12RD/DB	FUSED B(+)
26	10A	F92 18YL/BR	FUSED B(+)
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
28	-	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

POWER DISTRIBUTION CENTER
GAS

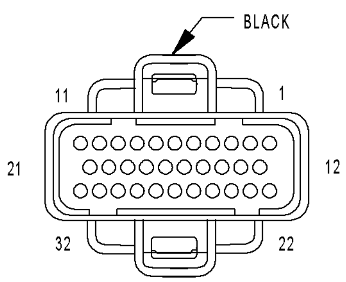


FUSES (GAS)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	A122 12OR	FUSED B(+)
2	40A	C24 12DB/PK	FUSED B(+)
3	50A	A13 10PK/WT	FUSED B(+)
4	40A	A10 12RD/DG (ABS)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
5	30A	A30 14RD/WT (A/T)	FUSED B(+)
6	30A	A9 14RD/YL	FUSED B(+)
7	50A	A7 10RD/BK	FUSED B(+)
8	40A	A2 12PK/BK	FUSED B(+)
9	50A	A18 10PK	FUSED B(+)
10	30A	A99 14RD/VT	FUSED B(+)
11	-	-	-
12	30A	A32 14RD/DB (SECURITY A/T)	FUSED B(+)
13	40A	A25 12DB	FUSED B(+)
14	40A	A1 12RD	FUSED B(+)
15	50A	A12 10RD/TN	FUSED B(+)
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
16	15A	A71 18DG/RD	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	-	-	-
19	30A	A4 12BK/PK	FUSED B(+)
20	-	-	-
21	20A	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	20A	A14 16RD/WT	FUSED B(+)
24	20A	A14 16RD/WT	FUSED B(+)
25	20A	A20 12RD/DB (ABS)	FUSED B(+)
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
26	15A	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	-	-	-
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)
28	15A	F45 18YL/BR	FUSED IGNITION SWITCH OUTPUT (START)

TRANSMISSION CONTROL RELAY (GAS A/T)

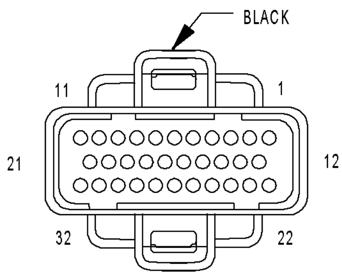
CAV	CIRCUIT	FUNCTION
30	A30 14RD/WT	FUSED B(+)
85	Z142 18BK/WT	GROUND
86	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
87	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
87A	-	-



POWERTRAIN CONTROL MODULE C1 (2.4L)

POWERTRAIN CONTROL MODULE C1 (2.4L)

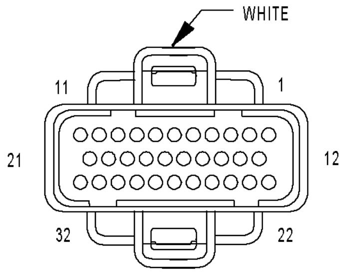
CAV	CIRCUIT	FUNCTION
1	-	-
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	K4 18BK/LB	SENSOR GROUND
5	-	-
6	-	-
7	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	T141 18YL/RD	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	-	-
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	-	-
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	-	-
30	-	-
31	Z107 14BK/DB	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C1 (3.7L)

POWERTRAIN CONTROL MODULE C1 (3.7L)

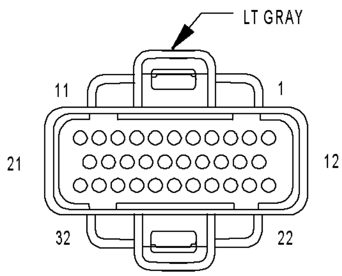
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL ON PLUG DRIVER NO. 3
2	F1 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	K94 14TN/LG	COIL ON PLUG DRIVER NO. 4
4	K4 18BK/LB	SENSOR GROUND
5	K96 14TN/LB	COIL ON PLUG DRIVER NO. 6
6	T41 18BK/WT (A/T)	PARK/NEUTRAL POSITION SWITCH SENSE
7	K91 14TN/RD	COIL ON PLUG DRIVER NO. 1
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 1 DRIVER
12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE
13	F45 18YL/BR (A/T)	FUSED IGNITION SWITCH OUTPUT (START)
13	T141 18YL/RD (M/T)	CLUTCH INTERLOCK RELAY OUTPUT
14	K77 18BR/WT	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 3 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	K95 14TN/DG	COIL ON PLUG DRIVER NO. 5
22	A14 16RD/WT	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MANIFOLD ABOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	K341 18TN/WT	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z107 14BK/DB	GROUND
31	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DG (M/T)	GROUND
32	Z107 14BK/DB	GROUND



POWERTRAIN CONTROL MODULE C2 (GAS)

POWERTRAIN CONTROL MODULE C2 (GAS)

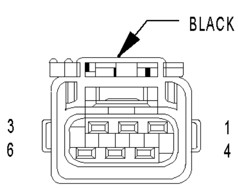
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K38 18GY (3.7L)	FUEL INJECTOR NO. 5 DRIVER
7	-	-
8	-	-
9	K17 18DB/TN (2.4L)	IGNITION COIL NO. 2 DRIVER
9	K92 14TN/PK (3.7L)	COIL ON PLUG DRIVER NO. 2
10	K20 18DG	GENERATOR FIELD
11	-	-
12	K58 18BR/DB (3.7L)	FUEL INJECTOR NO. 6 DRIVER
13	-	-
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	K173 18LG	RADIATOR FAN RELAY CONTROL
18	-	-
19	C18 18DB	A/C PRESSURE SIGNAL
20	-	-
21	-	-
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SWITCH SIGNAL
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	K6 18VT/WT	5 VOLT SUPPLY
32	-	-



POWERTRAIN CONTROL MODULE C3 (GAS)

POWERTRAIN CONTROL MODULE C3 (GAS)

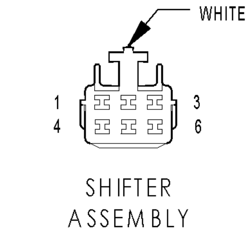
CAV	CIRCUIT	FUNCTION
1	C13 18DG	A/C CLUTCH RELAY CONTROL
2	-	-
3	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	K90 18TN (M/T)	CLUTCH SWITCH OVERRIDE RELAY CONTROL
7	K42 18DB/LB (3.7L)	KNOCK SENSOR NO. 1 SIGNAL
7	K42 18DB/LB (2.4L)	NOT USED
8	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
9	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18YL/RD	SPEED CONTROL SUPPLY
12	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY SENSE INPUT
13	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
14	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE
15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
16	K299 18BR/WT (2.4L)	OXYGEN SENSOR 1/2 HEATER CONTROL
16	K299 18BR/WT (3.7L)	OXYGEN SENSOR 2/1 HEATER CONTROL
17	B22 18DG/YL	VEHICLE SPEED OUTPUT
18	K142 18GY/BK (3.7L)	KNOCK SENSOR NO. 2 SIGNAL
18	K142 18GY/BK (2.4L)	NOT USED
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	EVAP/PURGE SOLENOID CONTROL
21	-	-
22	C21 18DB/OR	A/C SWITCH SENSE
23	-	-
24	K29 18WT/PK	BRAKE SWITCH SENSE
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18DB/WT	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG	SCI RECEIVE (PCM)
30	D25 18YL/VT	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL



RIGHT TAIL/ STOP LAMP

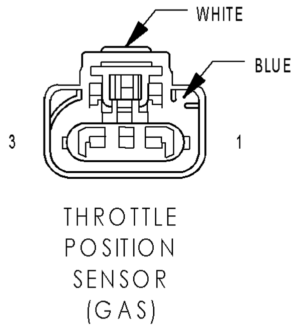
RIGHT TAIL/STOP LAMP

CAV	CIRCUIT	FUNCTION
1	L38 18BR/WT (EXPORT)	REAR FOG LAMP RELAY OUTPUT
2	L78 18DG/YL	FUSED PARK LAMP RELAY OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
4	L10 18BR/LG	BACK-UP LAMP FEED
5	Z151 18BK/WT	GROUND
6	L62 18BR/RD	RIGHT TURN SIGNAL



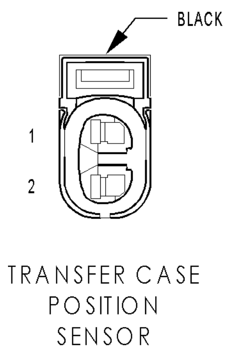
SHIFTER ASSEMBLY

CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z21 20BK/LG	GROUND
3	T6 20VT/WT	OVERDRIVE OFF SWITCH SENSE
4	Z21 20BK/LG	GROUND
5	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
6	K29 20WT/PK	BRAKE SWITCH SENSE



THROTTLE POSITION SENSOR (GAS)

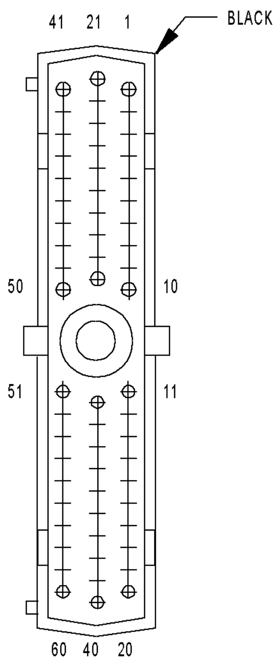
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL



TRANSFER CASE POSITION SENSOR

CAV	CIRCUIT	FUNCTION
1	K77 18BR/WT (GAS)	TRANSFER CASE POSITION SENSOR INPUT
1	K77 20BR/WT (DIESEL)	TRANSFER CASE POSITION SENSOR INPUT
2	K4 18BK/LB	SENSOR GROUND

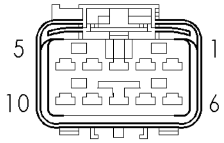
CONNECTOR PINOUTS



TRANSMISSION CONTROL MODULE

TRANSMISSION CONTROL MODULE

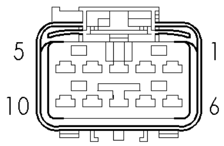
CAV	CIRCUIT	FUNCTION
1	T1 18LG/BK	TRS T1 SENSE
2	T4 18PK/OR (EXCEPT 42RLE)	TRS T2 SENSE
3	T3 18VT	TRS T3 SENSE
4	-	-
5	-	-
6	K24 18GY/BK (3.7L)	CRANKSHAFT POSITION SENSOR SIGNAL
6	K244 20BR/WT (DIESEL)	ENGINE SPEED SIGNAL
7	D21 20PK (DIESEL)	SCI TRANSMIT
7	D21 18PK (3.7L)	SCI TRANSMIT
8	F45 18YL/BR (3.7L)	FUSED IGNITION SWITCH OUTPUT (START)
8	F45 18YL/RD (DIESEL)	FUSED IGNITION SWITCH OUTPUT (START)
9	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 18YL/DG (3.7L)	TORQUE MANAGEMENT REQUEST SENSE
10	T10 20YL/DG (DIESEL)	TORQUE MANAGEMENT REQUEST SENSE
11	F1 18DB (3.7L)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
11	F1 20DB (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	K22 18OR/DB (GAS)	THROTTLE POSITION SENSOR SIGNAL
12	K22 18OR/DB (DIESEL)	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
13	T13 18DB/BK	SPEED SENSOR GROUND
14	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
15	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
16	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
17	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
18	T591 18YL/DB (EXCEPT 42RLE)	PRESSURE CONTROL SOLENOID CONTROL
19	T119 18WT/DB	2C SOLENOID CONTROL
20	T20 18LB	LOW/REVERSE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	B22 20DG/YL (DIESEL)	VEHICLE SPEED OUTPUT
29	T29 18GY (EXCEPT 42RLE)	UNDERDRIVE PRESSURE SWITCH SENSE
30	T38 18VT/TN (EXCEPT 42RLE)	LINE PRESSURE SENSOR SIGNAL
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	T16 14RD (EXCEPT 42RLE)	TRANSMISSION CONTROL RELAY OUTPUT
37	Z113 14BK/YL (EXCEPT 42RLE)	GROUND
38	T39 18GY/LB (EXCEPT 42RLE)	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
39	Z113 14BK/YL (EXCEPT 42RLE)	GROUND
40	T140 18VT/LG (EXCEPT 42RLE)	PRESSURE CONTROL SOLENOID CONTROL
41	T411 18WT/PK	TRS T41 SENSE (P/N)
42	T42 18VT/WT	TRS T42 SENSE
43	D25 18VT/YL	PCI BUS
43	D25 20VT/YL	PCI BUS
44	-	-
45	-	-
46	D20 18LG	SCI RECEIVE
47	T147 18LB (EXCEPT 42RLE)	2C PRESSURE SWITCH SENSE
47	T47 18DB (42RLE)	
48	T48 18DB	4C PRESSURE SWITCH SENSE
49	T6 18OR/WT	OVERDRIVE OFF SWITCH SENSE
50	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
51	K4 18BK/LB (3.7L)	SENSOR GROUND
52	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
53	Z112 14BK/LB (3.7L)	GROUND
53	Z112 14BK (DIESEL)	GROUND
54	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	T59 18PK (EXCEPT 42RLE)	UNDERDRIVE SOLENOID CONTROL
56	A30 14RD/WT	FUSED B(+)
57	Z113 14BK/YL	GROUND
58	-	-
59	T159 18DG/WT (EXCEPT 42RLE)	4C SOLENOID CONTROL
59	T59 18PK (42RLE)	
60	T60 18BR	OVERDRIVE SOLENOID CONTROL



TRANSMISSION RANGE SENSOR (42RLE)

TRANSMISSION RANGE SENSOR (42RLE)

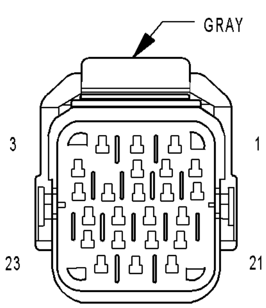
CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-
3	T13 18DB/BK	SPEED SENSOR GROUND
4	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
6	L1 18VT/BK	BACK-UP LAMP FEED
7	T1 18LG/BK	TRS T1 SENSE
8	T3 18VT	TRS T3 SENSE
9	T42 18VT/WT	TRS T42 SENSE
10	T411 18WT/PK	PARK/NEUTRAL SWITCH SIGNAL



TRANSMISSION SOLENOID/ PRESSURE SWITCH ASSEMBLY (42RLE)

TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY (42RLE)

CAV	CIRCUIT	FUNCTION
1	T60 18BR	OVERDRIVE SOLENOID CONTROL
2	T59 18PK	UNDERDRIVE SOLENOID CONTROL
3	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
4	T19 18YL/DB	2-4 SOLENOID CONTROL
5	T47 18DB	2-4 PRESSURE SWITCH SENSE
6	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
7	T20 18LB	LOW/REVERSE SOLENOID CONTROL
8	-	-
9	-	-
10	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE



TRANSMISSION SOLENOID/TRS ASSEMBLY (A/T EXCEPT 42RLE)

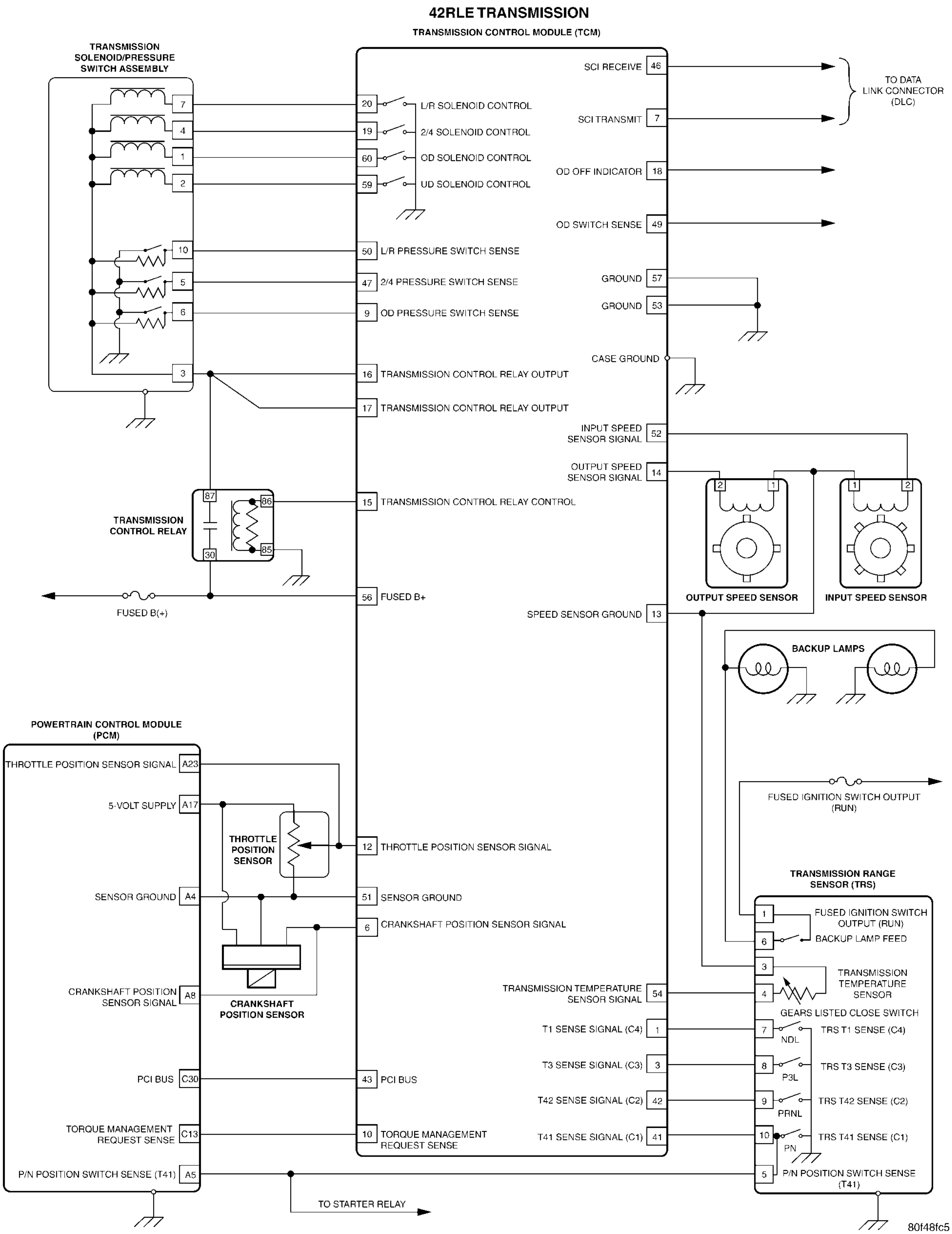
TRANSMISSION SOLENOID/TRS ASSEMBLY (A/T EXCEPT 42RLE)

CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	T20 18LB	LOW/REVERSE SOLENOID CONTROL
3	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
4	T411 18WT/PK	TRS T41 SENSE (P/N)
5	T42 18VT/WT	TRS T42 SENSE
6	L10 18BR/LG	BACK-UP LAMP FEED
7	T60 18BR	OVERDRIVE SOLENOID CONTROL
8	T3 18VT	TRS T3 SENSE
9	T1 18LG/BK	TRS T1 SENSE
10	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
11	T48 18DB	4C PRESSURE SWITCH SENSE
12	T591 18YL/DB	PRESSURE CONTROL SOLENOID CONTROL
13	T4 18PK/OR	TRS T2 SENSE
14	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
15	T147 18LB	2C PRESSURE SWITCH SENSE
16	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
17	T59 18PK	UNDERDRIVE SOLENOID CONTROL
18	T29 18GY	UNDERDRIVE PRESSURE SWITCH SENSE
19	T159 18DG/WT	4C SOLENOID CONTROL
20	T119 18WT/DB	2C SOLENOID CONTROL
21	T140 18VT/LG	PRESSURE CONTROL SOLENOID CONTROL
22	T13 18DB/BK	SPEED SENSOR GROUND
23	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL

NOTES

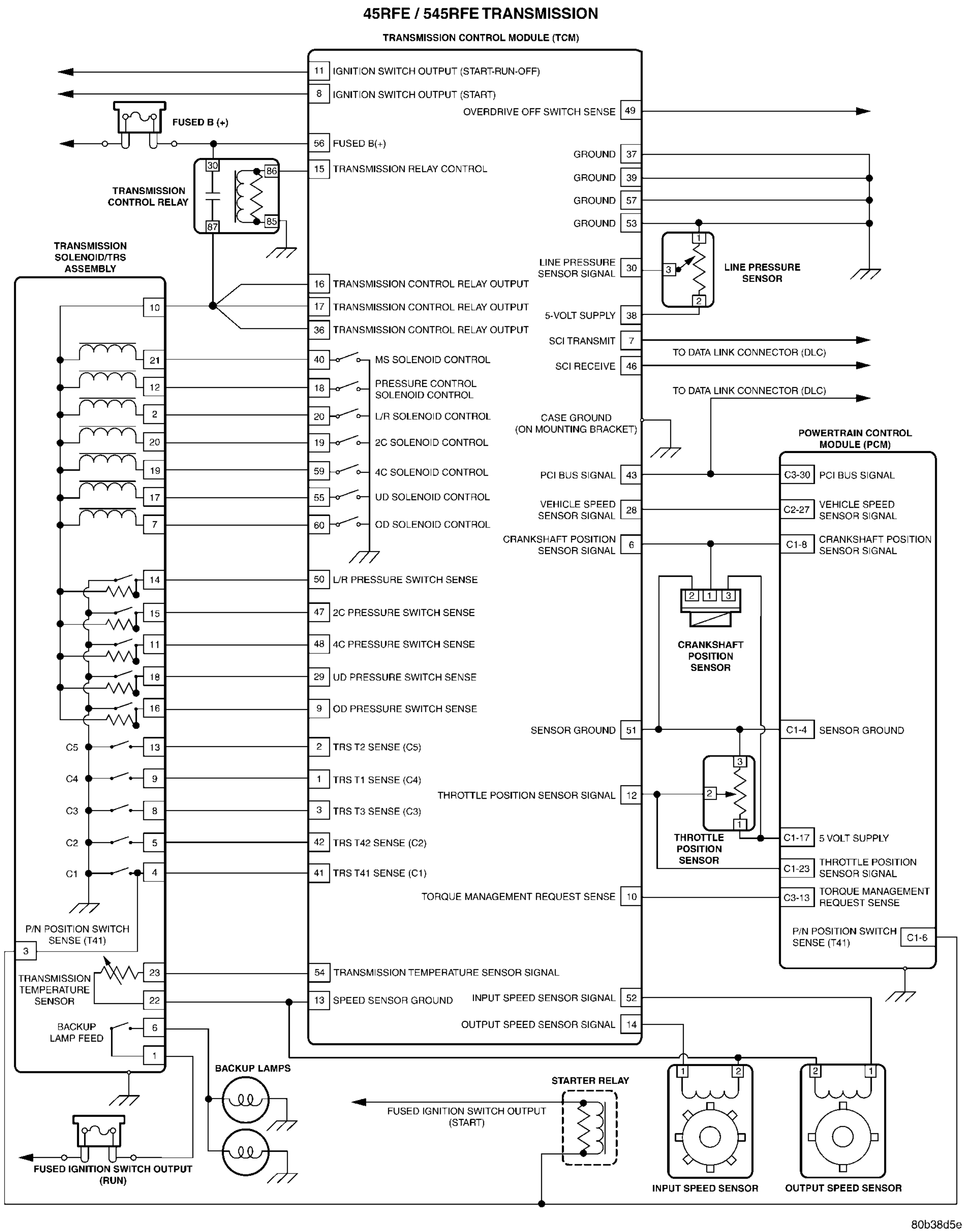
10.0 SCHEMATIC DIAGRAMS

42RLE

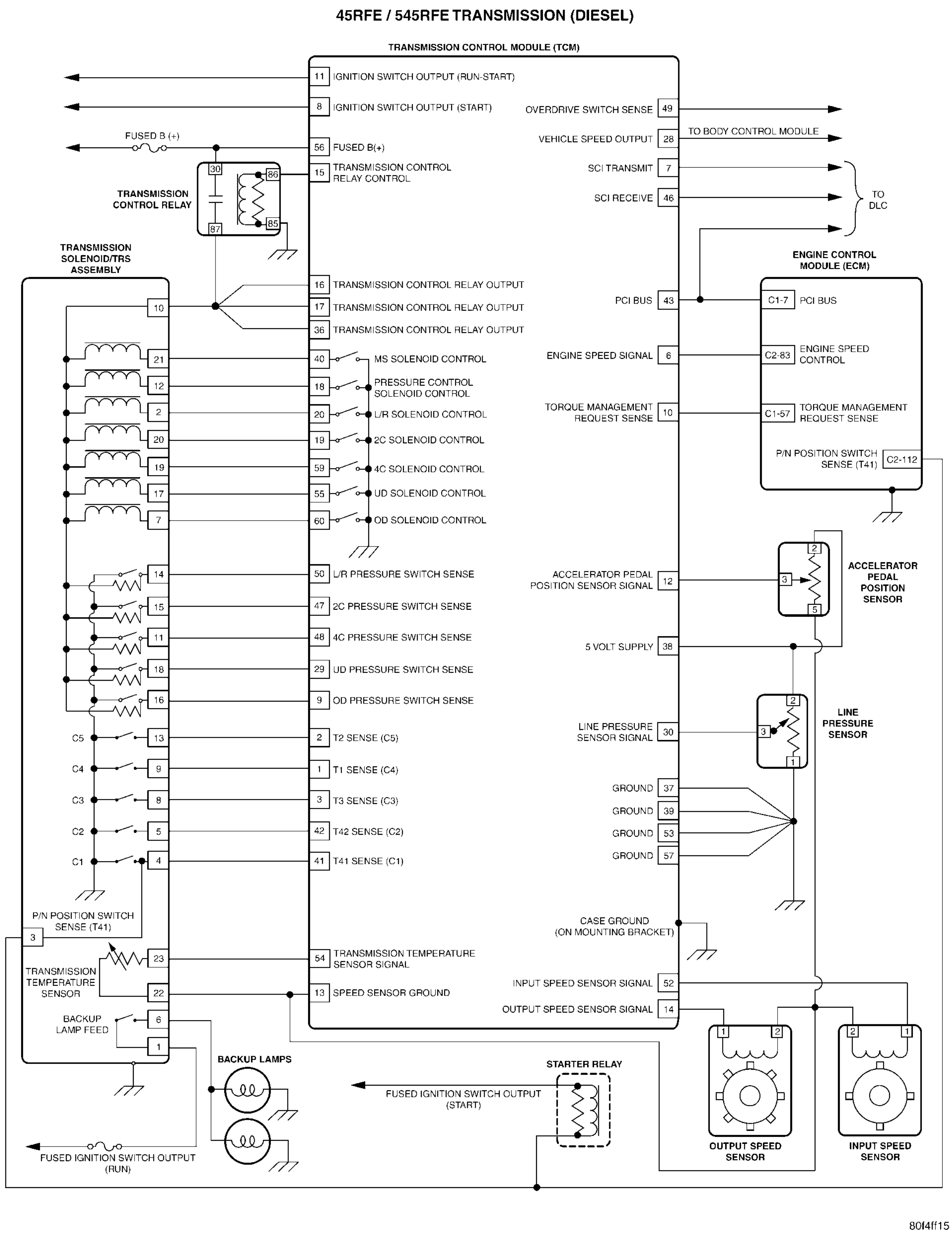


S C H E M A T I C D I A G R A M S

45/545RFE


45RFE / 545RFE TRANSMISSION
TRANSMISSION CONTROL MODULE (TCM)
IGNITION SWITCH OUTPUT (START-RUN-OFF)
IGNITION SWITCH OUTPUT (START)
FUSED B (+)
OVERDRIVE OFF SWITCH SENSE
FUSED B(+)
TRANSMISSION RELAY CONTROL
TRANSMISSION CONTROL RELAY
GROUND
LINE PRESSURE SENSOR SIGNAL
LINE PRESSURE SENSOR
TRANSMISSION SOLENOID/TRS ASSEMBLY
TRANSMISSION CONTROL RELAY OUTPUT
5-VOLT SUPPLY
SCI TRANSMIT
SCI RECEIVE
TO DATA LINK CONNECTOR (DLC)
MS SOLENOID CONTROL
PRESSURE CONTROL SOLENOID CONTROL
L/R SOLENOID CONTROL
2C SOLENOID CONTROL
4C SOLENOID CONTROL
UD SOLENOID CONTROL
OD SOLENOID CONTROL
CASE GROUND (ON MOUNTING BRACKET)
POWERTRAIN CONTROL MODULE (PCM)
PCI BUS SIGNAL
VEHICLE SPEED SENSOR SIGNAL
CRANKSHAFT POSITION SENSOR SIGNAL
L/R PRESSURE SWITCH SENSE
2C PRESSURE SWITCH SENSE
4C PRESSURE SWITCH SENSE
UD PRESSURE SWITCH SENSE
OD PRESSURE SWITCH SENSE
CRANKSHAFT POSITION SENSOR
SENSOR GROUND
TRS T2 SENSE (C5)
TRS T1 SENSE (C4)
TRS T3 SENSE (C3)
TRS T42 SENSE (C2)
TRS T41 SENSE (C1)
THROTTLE POSITION SENSOR SIGNAL
THROTTLE POSITION SENSOR
5 VOLT SUPPLY
THROTTLE POSITION SENSOR SIGNAL
TORQUE MANAGEMENT REQUEST SENSE
P/N POSITION SWITCH SENSE (T41)
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION TEMPERATURE SENSOR SIGNAL
SPEED SENSOR GROUND
INPUT SPEED SENSOR SIGNAL
OUTPUT SPEED SENSOR SIGNAL
BACKUP LAMP FEED
BACKUP LAMPS
STARTER RELAY
FUSED IGNITION SWITCH OUTPUT (START)
FUSED IGNITION SWITCH OUTPUT (RUN)
INPUT SPEED SENSOR
OUTPUT SPEED SENSOR
80b38d5e

DIESEL


45RFE / 545RFE TRANSMISSION (DIESEL)
TRANSMISSION CONTROL MODULE (TCM)
11 IGNITION SWITCH OUTPUT (RUN-START)
8 IGNITION SWITCH OUTPUT (START)
FUSED B (+)
56 FUSED B(+)
15 TRANSMISSION CONTROL RELAY CONTROL
TRANSMISSION CONTROL RELAY
30
86
85
87
TRANSMISSION SOLENOID/TRS ASSEMBLY
16 TRANSMISSION CONTROL RELAY OUTPUT
17 TRANSMISSION CONTROL RELAY OUTPUT
36 TRANSMISSION CONTROL RELAY OUTPUT
40 MS SOLENOID CONTROL
18 PRESSURE CONTROL SOLENOID CONTROL
20 L/R SOLENOID CONTROL
19 2C SOLENOID CONTROL
59 4C SOLENOID CONTROL
55 UD SOLENOID CONTROL
60 OD SOLENOID CONTROL
50 L/R PRESSURE SWITCH SENSE
47 2C PRESSURE SWITCH SENSE
48 4C PRESSURE SWITCH SENSE
29 UD PRESSURE SWITCH SENSE
9 OD PRESSURE SWITCH SENSE
2 T2 SENSE (C5)
1 T1 SENSE (C4)
3 T3 SENSE (C3)
42 T42 SENSE (C2)
41 T41 SENSE (C1)
C5
C4
C3
C2
C1
P/N POSITION SWITCH SENSE (T41)
TRANSMISSION TEMPERATURE SENSOR
BACKUP LAMP FEED
54 TRANSMISSION TEMPERATURE SENSOR SIGNAL
13 SPEED SENSOR GROUND
BACKUP LAMPS
FUSED IGNITION SWITCH OUTPUT (RUN)
STARTER RELAY
FUSED IGNITION SWITCH OUTPUT (START)
OVERDRIVE SWITCH SENSE 49
VEHICLE SPEED OUTPUT 28
TO BODY CONTROL MODULE
SCI TRANSMIT 7
SCI RECEIVE 46
TO DLC
ENGINE CONTROL MODULE (ECM)
PCI BUS 43
C1-7 PCI BUS
ENGINE SPEED SIGNAL 6
C2-83 ENGINE SPEED CONTROL
TORQUE MANAGEMENT REQUEST SENSE 10
C1-57 TORQUE MANAGEMENT REQUEST SENSE
P/N POSITION SWITCH SENSE (T41) C2-112
ACCELERATOR PEDAL POSITION SENSOR SIGNAL 12
ACCELERATOR PEDAL POSITION SENSOR
5 VOLT SUPPLY 38
LINE PRESSURE SENSOR SIGNAL 30
LINE PRESSURE SENSOR
GROUND 37
GROUND 39
GROUND 53
GROUND 57
CASE GROUND (ON MOUNTING BRACKET)
INPUT SPEED SENSOR SIGNAL 52
OUTPUT SPEED SENSOR SIGNAL 14
OUTPUT SPEED SENSOR
INPUT SPEED SENSOR
80f4ff15

NOTES

11.0 CHARTS AND GRAPHS

11.1 PRESSURE SWITCH STATES

42RLE

PRESSURE SWITCH STATES

SWITCHES	R	N	1ST	2ND	3RD	4TH
L/R	OPEN	CLOSED	CLOSED	OPEN	OPEN	OPEN
2/4	OPEN	OPEN	OPEN	CLOSED	OPEN	CLOSED
O/D	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED

80d9d3b5

45/545RFE

45RFE/545RFE NORMAL PRESSURE SWITCH STATES

GEAR	L/R	2C	4C	UD	OD
R	OPEN	OPEN	OPEN	OPEN	OPEN
N	CLOSED	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2 PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	CLOSED	CLOSED	OPEN	CLOSED
4 PRIME	OPEN	OPEN	OPEN	OPEN	CLOSED

NOTE: L/R PRESSURE SWITCH OPENS ABOVE 150 OUTPUT RPM IN 1ST GEAR AND CLOSES BELOW 100 OUTPUT RPM.

80e94351

11.2 SHIFT LEVER ERROR CODES

42RLE

SHIFT LEVER ERROR CODES
REPORTED BY THE DRBIII®

ERROR CODE	SWITCH STUCK	POSITION
1	T1/C4 STUCK	OPEN
2	T1/C4 STUCK	CLOSED
3	T3/C3 STUCK	OPEN
4	T3/C3 STUCK	CLOSED
5	T42/C2 STUCK	OPEN
6	T24/C2 STUCK	CLOSED
7	T41/C1 STUCK	OPEN
8	T41/C1 STUCK	CLOSED

80ccf2de

45/545RFE

SHIFT LEVER ERROR CODES
REPORTED BY THE DRBIII®

ERROR CODE	SWITCH STUCK	POSITION
1	T41/C1 STUCK	OPEN
2	T41/C1 STUCK	CLOSED
3	T42/C2 STUCK	OPEN
4	T42/C2 STUCK	CLOSED
5	T3/C3 STUCK	OPEN
6	T3/C3 STUCK	CLOSED
7	T1/C4 STUCK	OPEN
8	T1/C4 STUCK	CLOSED
9	T2/C5 STUCK	OPEN
10	T2/C5 STUCK	CLOSED
11	OD LOCKOUT STUCK	OPEN
12	OD LOCKOUT STUCK	CLOSED

80ccf5bb

11.3 SOLENOID APPLICATION CHART

42RLE

SOLENOID APPLICATION CHART

GEAR	UD	OD	REV	2/4	LR
PARK					X
REVERSE			X		X
NEUTRAL					X
1ST	X				X
2ND	X			X	
3RD	X	X			
4TH		X		X	

80ccf4c0

11.4 TRANSMISSION RANGE SENSOR SWITCH STATES

42RLE

TRANSMISSION RANGE SENSOR STATES

TRS	PARK	T1	REVERSE	T2	NEUTRAL	T2	OD	T3	D3/AS	T3	L
T1 (C4)	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
T3 (C3)	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED
T41 (C1)	CLOSED	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
T42 (C2)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	CLOSED

80f49d8d

45/545RFE

45RFE/545RFE TRS SWITCH STATES

TRS	PARK	TMP1	REV	TMP 2	N1	N2	TMP 3	D	TMP 4	2	TMP 5	L
T1 (C4)	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN
T2 (C5)	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED
T3 (C3)	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED
T41 (C1)	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
T42 (C2)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN

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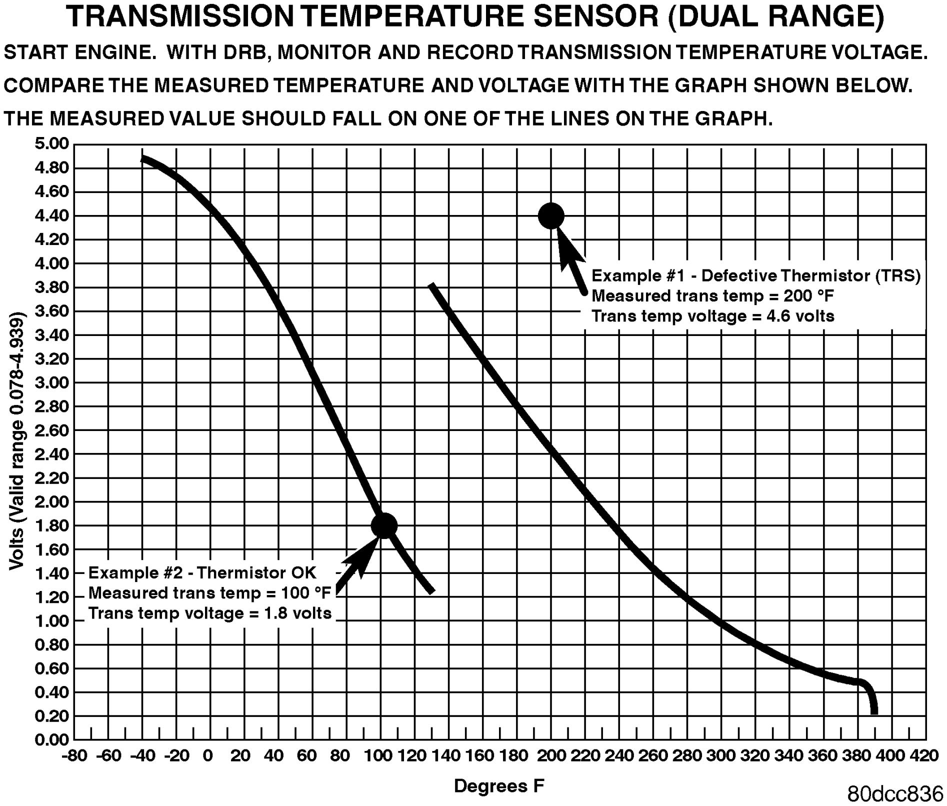
11.5 TRANSMISSION TEMP SENSOR

42RLE



NOTES